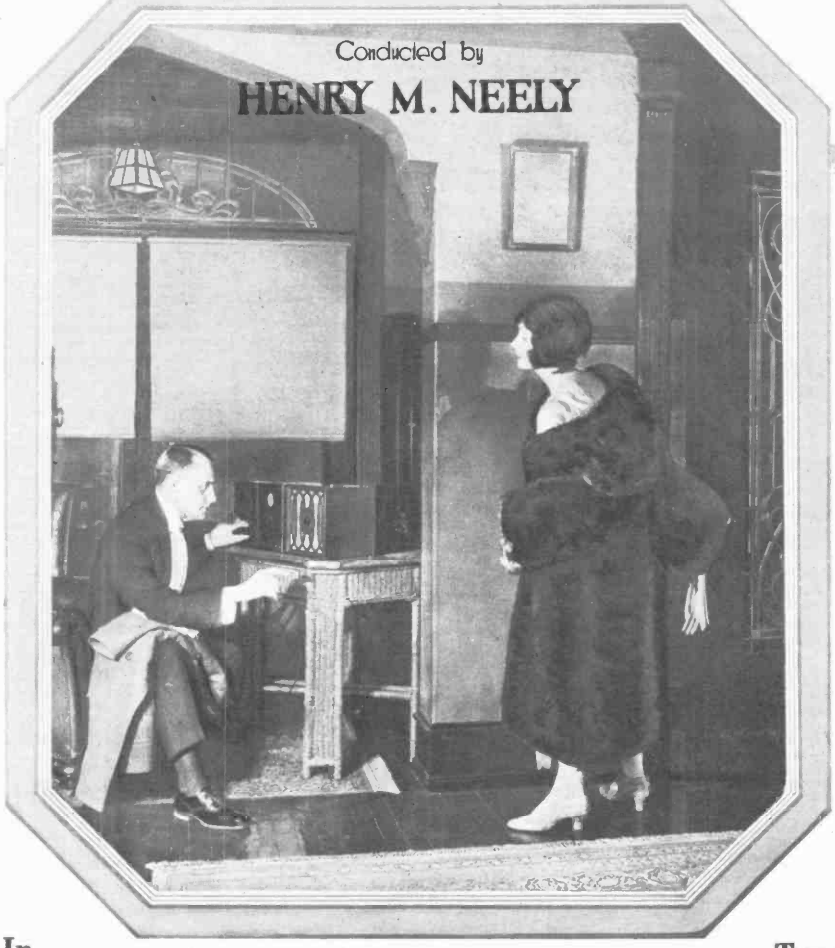
JANUARY, 1924

Radio in the Home

Conducted by
HENRY M. NEELY



"Wait! This sounds better than the concert we were going to!"
Photo courtesy of J. S. Timmons

In This Issue:

Twenty Cents

Some Plain Truths About Radio—by Henry M. Neely

Two Ways of Building Grimes' New Two-Control Duplex Receiver

The Largest Congregation in the World Belongs to WOAW'S Radio Church

OFFICIAL ORGAN

Bring your jazz-band home!

Roll up the rug, connect MUSIC MASTER and dance! It's almost as good as being in your favorite hotel!

MUSIC MASTER fills the room with the teasing tones of the versatile violin, the moaning sax, the laughing brasses and the ever active piano.

All of it comes to you accurately and *naturally* through this wonderful reproducer. The *wood* horn of the MUSIC MASTER brings out the full, rich resonance of the instruments.

If you love a home dance to the music of your favorite hotel orchestra (without the cover charge), get MUSIC MASTER at radio dealers *everywhere.*

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21-inch Horn (dark finish only) for Concerts, Sells for $35.

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Music Master

RADIO REPRODUCER

Bristol Single Control Radio Receiver

USING GRIMES INVERSE-DUPLEX CIRCUIT

The Bristol Single - Control Receiver with Power Amplifier. Grimes Inverse-Duplex Circuit. The smaller picture shows how all connections are made in the rear, out of sight.

The Bristol Junior Audiophone

The Bristol One-Stage Power Amplifier.

Bristol One-Stage Power Amplifier

Designed to use with any good receiving set to build up amplification so that, when a loud speaker is used, the distant stations will come in like the locals. It is the same Power Amplifier incorporated as the last step in Bristol Single Control Radio Receiver. However, in this convenient single unit form, it can be instantly connected to and used with other receiving sets. A third stage of amplification without howling. No "C" Battery required. Price $25.00.

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It is easy to listen to the Audiophone reproductions because they are so perfect. The speech, songs, and instrumental music are not blurred or disguised by mechanical distortions. You get all the fine shadings and every inflection. In fact, the very personality of the artist seems to be present as you listen.

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Made in three models—

Senior Audiophone . . .	$32.50
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The Bristol Senior Audiophone

Equal to All Demands

THIS IS NUMBER FOUR OF A SERIES

Every tube you add to your receiver makes it just that much more important for you to use Eveready "B" Batteries, for each additional tube increases the work the "B" Battery has to do. It demands a more capable, long-lived battery.

Here is a table that shows just what each type of receiving tube draws from your "B" Battery. The current is measured in milliamperes, or thousandths of an ampere.

Current (in milliamperes) Taken from the "B" Battery by Various Tubes

"B" Volts	WD-11 WD-12	UV-199 C-299	UV-201 C-301	UV-201-A C-301-A
22½	0.5	0.5	0.5	0.5
45	1.5	1.4	1.5	1.5
67½	2.5	2.4	2.5	3.5
90	4.5	4.0	3.9	6.0

Above figures are at zero grid bias

The table shows that the "B" Battery current drain increases much more rapidly than the increase in voltage. For example, if the voltage doubles from 45 to 90, the current drain increases threefold in one case and fourfold in another case. This all means that the life of the "B" Battery may be materially lengthened by not using a higher voltage than is necessary to obtain the desired results.

The most popular type of receiver to-day has at least three tubes, operating a loud speaker. As ordinarily employed, it places a fairly heavy drain on the "B" Battery.

Under light and heavy service, Eveready "B" Batteries prove up. More and more fans buy them every day because they are the most economical. According to the work they have to do, so is their life.

You get most energy for your money in Eveready "B" Batteries—*they last longer.*

"the life of your radio"

The Metal Case Eveready "B" Battery, No. 766. The popular 22½-volt Eveready Battery in a *new* handsome, durable, waterproof metal case. At all dealers, $3.00.

Eveready "B" Battery No. 767. Contains 30 large size cells, as used in the popular No. 766. Voltage, 45. Made especially for sets using detector and one or more stage of amplification. The most economical "B" Battery where 45 volts are required. At all dealers, $5.50.

Eveready Radio Battery No. 771. The Eveready "Three" The ideal "C" Battery. Voltage, 4½—three terminals permitting the use of 1½, 3 or 4½ volts. The correct use of this battery greatly prolongs the life of the "B" Battery. At all dealers, 70 cents.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, Inc.

Headquarters for Radio Battery information

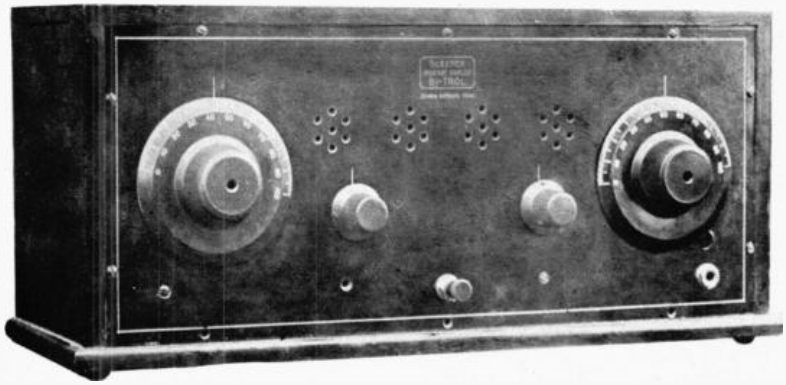
New York **San Francisco**

CANADIAN NATIONAL CARBON CO. Limited

Factory and Offices: Toronto, Ont.

NOTE—*This is No. 4 of a series of informative advertisements, printed to enable users to realize the utmost in battery economy. If you have any battery problem, write to G. C. Furness, Manager, Radio Division, National Carbon Co., Inc., 120 Thompson Avenue, Long Island City, N. Y. Ask for special booklets on "A", "B" and "C" Batteries.*

EVEREADY
Radio Batteries
—they last longer



The Grimes two-control in its manufactured form

The New Grimes "Two-Control" System

By DAVID GRIMES

Chief Engineer, Sleeper Radio Corporation and Consulting Radio Engineer, the Bristol Company

YOU can take your choice of the two methods for constructing the Grimes two control inverse duplex circuit given here. With either one, it will give you the possession of a set which will surprise you for its selectivity, its long arm in reaching out and grabbing that distant station and its sharp tuning combined with accurate logging of the setting of the two dials for all stations.

When Mr. Grimes first brought his set over to Station 2XP, he had constructed it using the Sleeper fixed coupler. We agreed that he should write his article with those instruments in view, but I am glad to say that he later experimented with home-made coils for the benefit of those who could not get the Sleeper apparatus and he is including in this article his full directions for making the coils.

Not knowing that he had done this, but to take care of readers to whom Sleeper fixed couplers were not available, I cast about for some method of using other instruments. We had a box of Fada neutroformers in the shop and we went to work with them.

We are more than pleased with the results. You can use the Sleeper or the Fada instruments or you can roll your own—by any one of the three methods, and by following either one of the two hook-ups, you will have a lot of fun. If you are using the Sleeper instruments or winding your own coils as Mr. Grimes directs, I advise you to use his circuit. We found it necessary to make a few changes to suit Fada neutroformers, so follow our diagram when using them.

H. M. N.

DURING the past few months considerable interest has been aroused throughout the country in connection with certain systems of tuned radio frequency amplification. Because tuned radio amplification has more or less successfully met the requirements of certain limited conditions of reception, it has been exaggeratingly heralded as the panacea of radio.

Tuned radio amplification is the oldest form of radio frequency circuit. In the same patent which disclosed the art of amplifying radio energy before detection, the theory of tuning this high frequency signal was also set forth.

This patent was issued in this country in 1914 to two Germans and, strangely enough, it covers not only radio frequency amplification and tuned radio, but also reflexing. It shows merely the use of one tube or stage of radio.

As cascading, or the connection of vacuum tubes in tandem, was at that time being appreciated as a desirable thing, it was natural that Alexanderson should file and have granted to him a patent covering a series of tuned radio stages. This patent was granted in 1916, number 1,173,079. These multi-tube tuned radio circuits had a tendency to oscillate, which greatly impaired their efficiency.

It was then that Chester W. Rice, of the General Electric Company, made a thorough study of these oscillations and admirably set forth their cause and remedy in a patent application filed in 1917 and granted in 1920. This is patent number 1,334,118. He employes the neutralizing condensers and neutralizing transformers, which have since been modified in various manners in more recent developments of tuned radio amplification. Perhaps the two best known methods of the latter type are those of Lester Jones and, more recently Professor Hazeltine.

There are several other methods, however, less widely known, of obtaining multi-stage tuned radio amplification without the detrimental oscillations. The reason that all of these were not popular long ago was because of their limited advantages and many disadvantages, particularly in localities where they were not needed.

Tuned radio transformers were originally used in multi-tube radio circuits because of the difficulty at that time of building efficient and satisfactory fixed radio frequency transformers. The art of transformer design, although highly perfected for low frequency currents, had not been entirely successful for frequencies employed in radio transmission.

Now, many of these difficulties have been overcome and, for the broadcast range, several good fixed radio transformers are now on the market. This line of development has engaged the attention of many engineers the past few years because it was felt that such an accomplishment would be a decided advance in the art. Fixed radio transformers, then, are a more recent acquisition to radio science than tuned transformers, and in most receiving locations are more to

PUBLISHED MONTHLY BY THE HENRY M. NEELY PUBLISHING COMPANY
608 Chestnut St., Philadelphia, Pa.

Bell, Telephone—Lombard 8481 — Experimental Station (2XP), Delanco, N. J.

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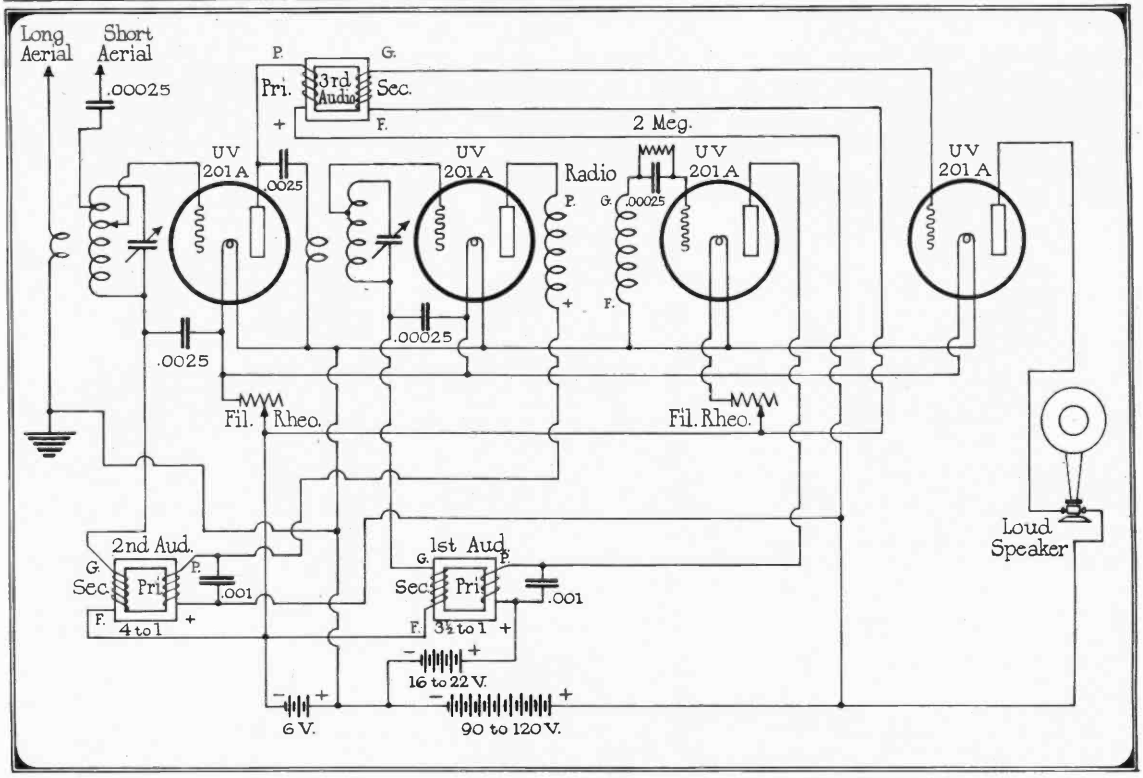
NORMAN NEELY.....Art Editor

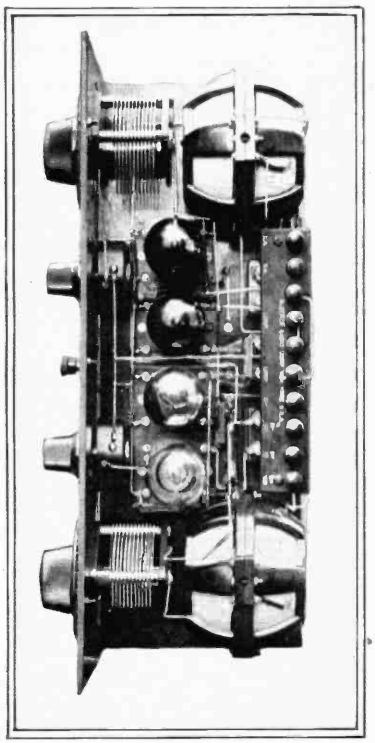
Radio in the Home is sold at 20c per copy at all newsstands, radio shops and bookstores. Subscription in the United States and Canada, $2.00 per year.

Printed on the rotogravure presses of the Public Ledger, Philadelphia, Pa.

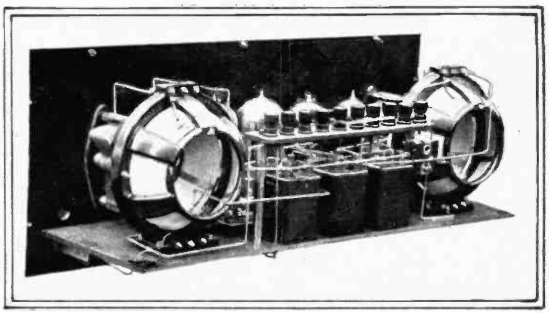
Entered as second-class matter May 26th, 1922, at the Postoffice, Philadelphia, Pennsylvania, under the act of March 3, 1879



The symbol diagram of the new Grimes two-control circuit



Looking straight down on the set as Mr. Grimes built it



A rear view of Mr. Grimes' set showing the Sleeper fixed couplers, the audio frequency transformers and the Eby binding posts

be desired. However, for the listening fan who lives within a very few miles of a high power broadcasting station and wishes greater selectivity with more tuning controls, tuned radio offers some advantages, and it is the purpose of this article to disclose the details concerning the adaptation of tuned radio to the Grimes Inverse-Duplex System. My development has been called a system because it is not a circuit. It is a system of circuits. It may be applied to most any of the present popular circuits. It may be used with any number of tubes and may employ tuned or untuned radio amplification. It may use regeneration or not. It may be operated on an aerial or a loop, as the spirit moves. I have even "inverse - duplexed" the super heterodyne, greatly reducing the number of tubes which that circuit necessitates.

And so this article will discuss one of the many possibilities of the Inverse-Duplex -- the use of tuned radio.

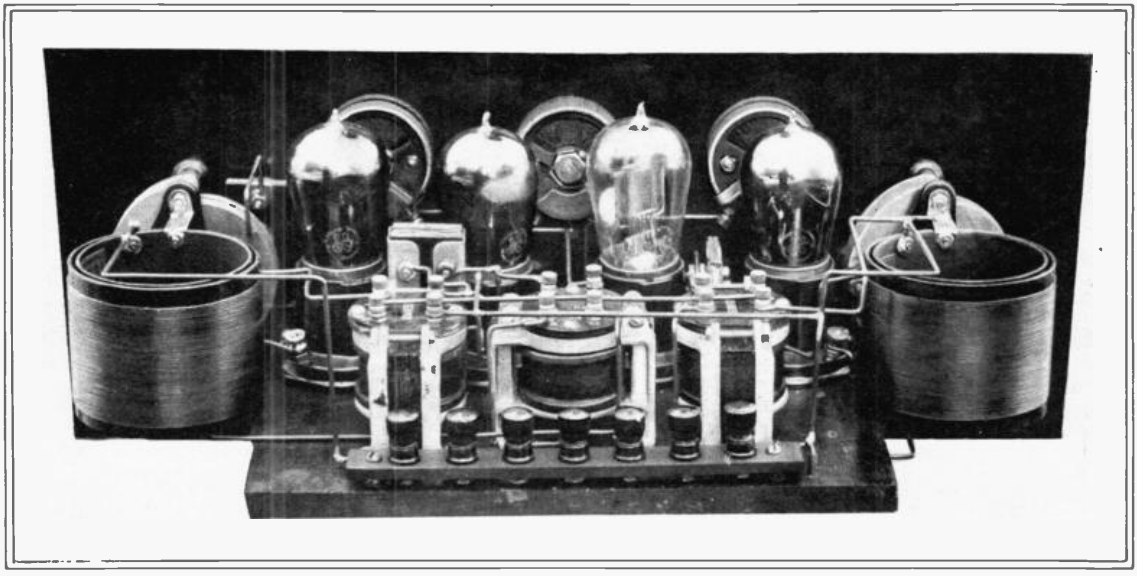
Past experience has shown that two stages of tuned radio will cope with almost any situation and the expense of an additional stage is usually not warranted. Even with two stages of tuned radio, three controls are usually required. These three are:

(1) The tuned input into the first amplifier tube.

(2) The tuned input into the second amplifier tube, and

(3) The tuned input into the detector tube.

This makes it rather awkward in tuning, especially in locating a station for the first time. Unfortunately, Mother Nature hasn't accommodated us with three hands. In my experience, I have found it extremely desirable to install but two controls —one for each hand—and the dials constructed to follow each other. This greatly simplifies the operation without any appre-



A rear view of the Grimes two-control set as we built it at Station 3XP using Fada neutroformers

ciable sacrifice in selectivity. To reduce the number of controls thus, it is only necessary to have a fixed transformer working into the detector circuit in place of the tuned coil.

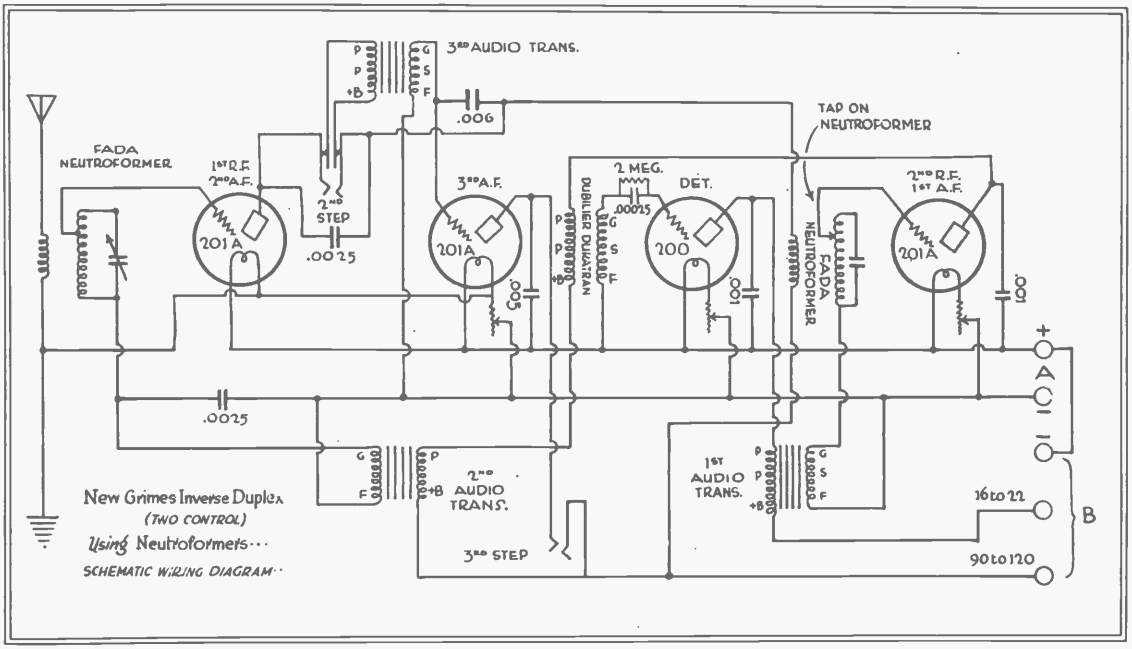
The accompanying drawing shows a four-tube tuned radio Inverse-Duplex set arranged for aerial and ground operation. The first two tubes in the series are the two tuned radio stages as well as the first two audio stages. The third tube functions as a detector and the fourth tube accomplishes the third, or power audio, stage of amplification.

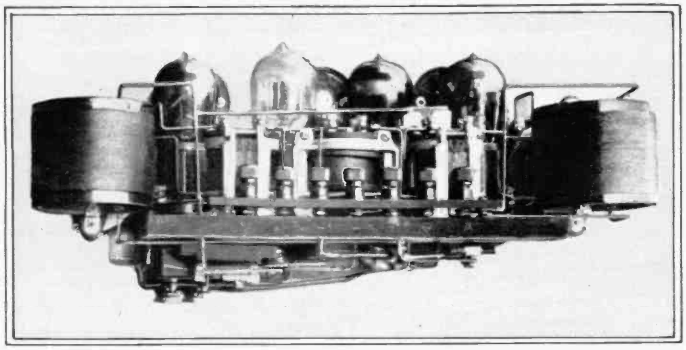
While it is possible to duplex all three of the amplifier tubes. It is not recommended. as the circuit is easily overloaded on local reception, and the additional results gained on distance work are not worth the effort.

The UV-201A tubes are shown as amplifiers because the dry cell tubes do not approach them in volume or efficiency. The UV-200 is used as a detector tube because of its extreme sensitivity. It is advertised by the Radio Corporation as their "long distance" detector and while it is somewhat critical, it so far surpasses all other tubes as a detector of weak signals it should be used in preference to them for best results.

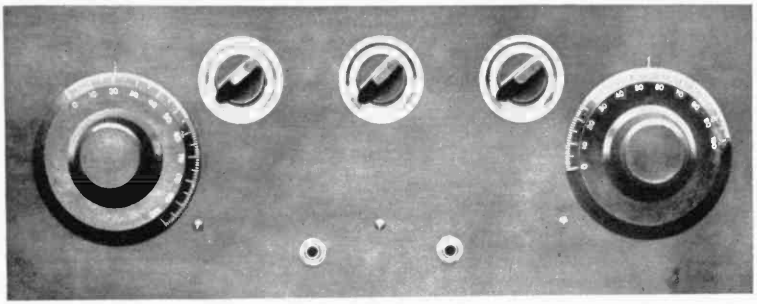
Any departure from the use of the above-mentioned tubes, unless it be corresponding Cunningham tubes, will result in decreased results. This is true on any kind of a circuit employing several tubes and should be remembered in conducting other experiments.

Three stages of audio amplification also have to be handled with care. Most of you have probably confined your tests so far to two stages of audio. With three stages

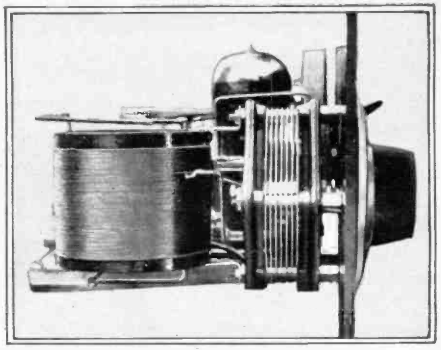




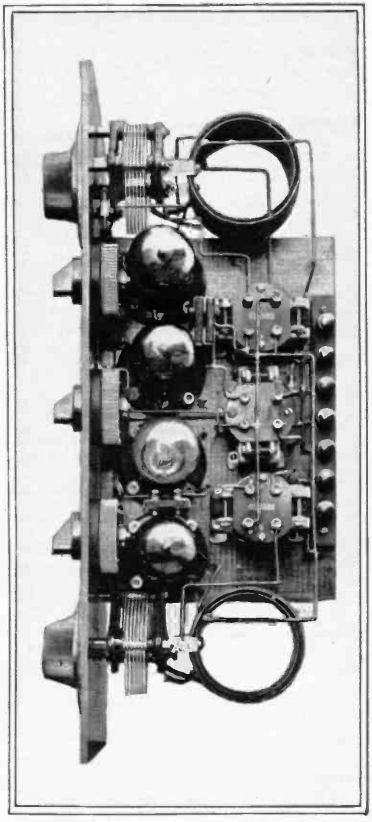
Looking straight at the back of the 3XP set, you can see the Duratran radio frequency transformer and the Carter jacks and several other instruments mounted on the bottom with the tubes and the audio frequency transformers and neutroformers on the top of the board



A front view of the panel as we laid it out at Station 3XP



The side view of the set showing mounting of the neutroformers and the variable condensers



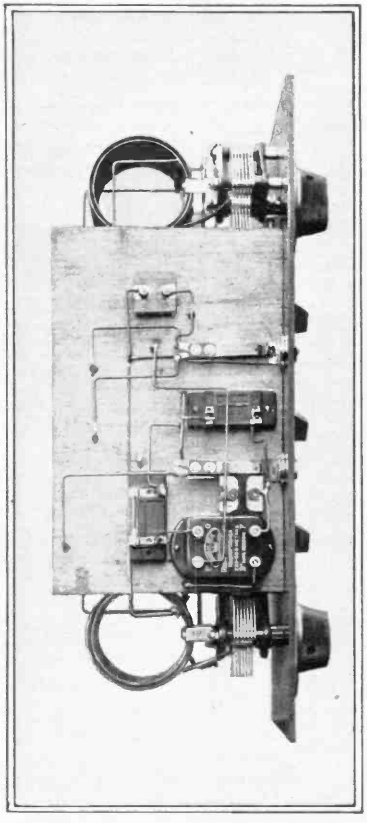
you will ordinarily have to employ a separate B battery for your detector tube. Using the same battery, by tapping off at the 22 volts, will often cause howling as the detector tube is turned on to full brilliancy.

If an audio howl is present when the detector tube is entirely off or removed from the socket, it is an indication that the first audio transformer is of too high a ratio or that the .00025 condenser in the grid circuit of the first audio is not quite large enough.

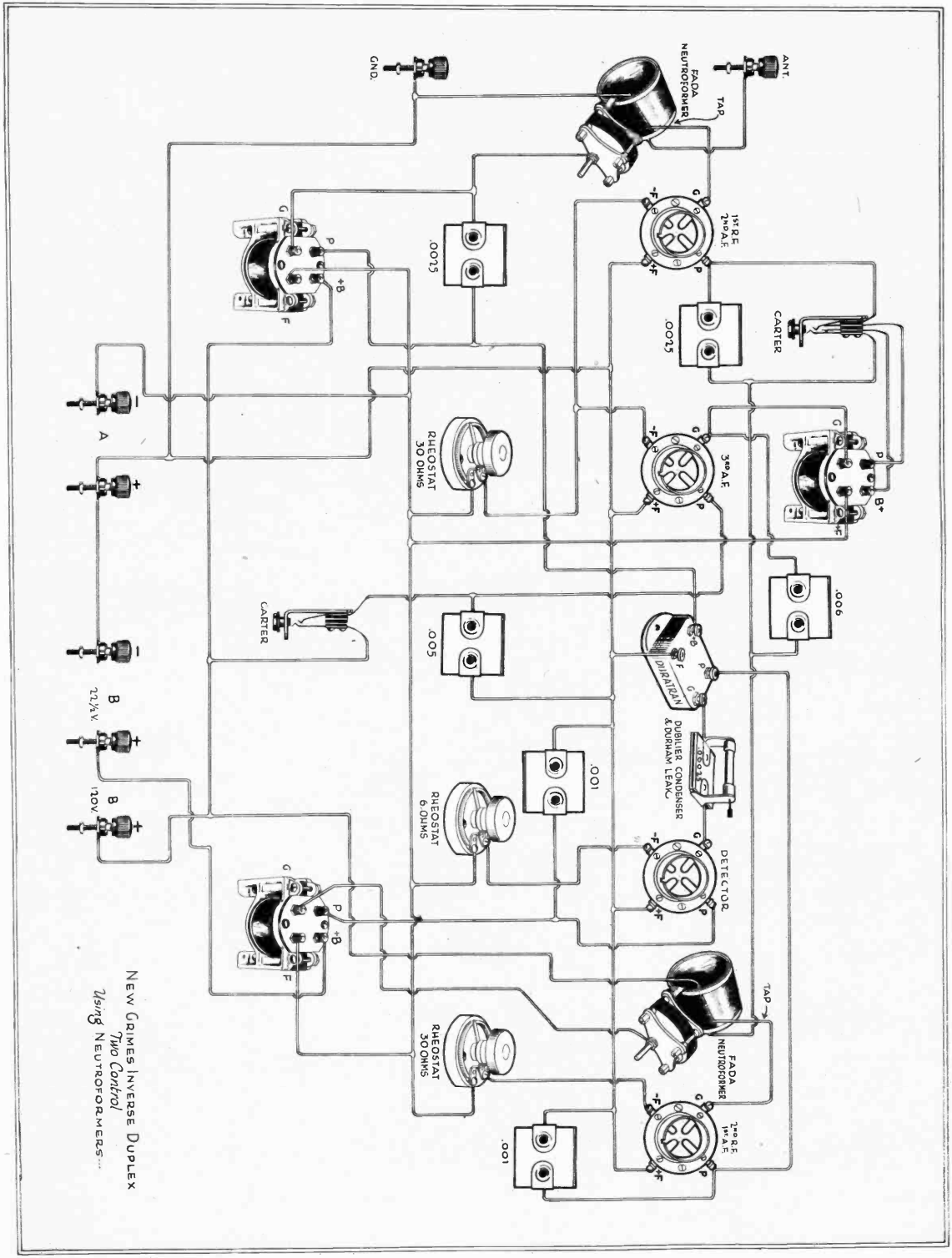
In any case, the ratio of the first audio transformer should be low, and under certain circumstances it may be desirable to double the value of the by-passing condenser in the grid circuit of the first audio, making it .0005. This should not be made any larger.

The radio transformer shown between the second and third tube is of the conventional design for fixed radio frequency amplification. There are many types on the market, some of them being very good. The other two tuned transformers shown at the inputs of the first two tubes are fairly easy to construct. They consist of a primary and a secondary wound on a cylinder of insulated material about three inches in diameter.

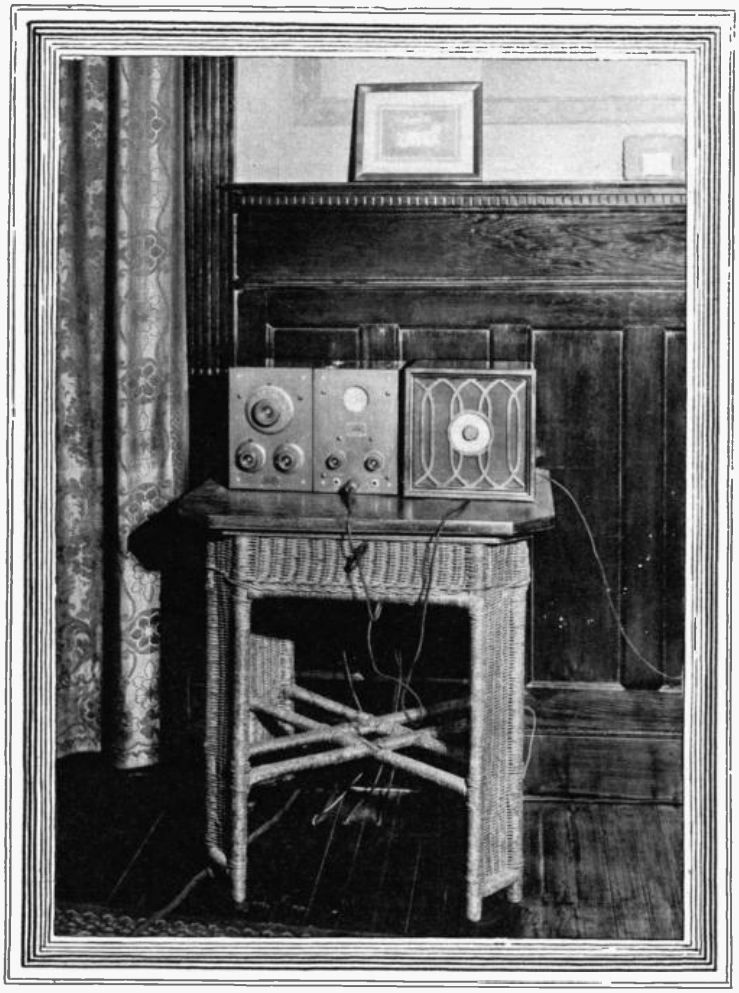
The secondary is composed of about forty turns of No. 28 double cotton-covered wire and the primary has eight turns of the same wire wound (Continued on Page 41)



Left—Looking straight down upon the Grimes set built at 3XP
Right—Looking straight up at the underneath part of the baseboard of the set built at 3XP showing the mounting of the radio frequency transformer, several of the fixed condensers and the two jacks



New Grimes Inverse Duplex
Two Control
Using Neutroformers



Radio in the Home of Mr. William R. McLain, 741 N. 63rd St., Philadelphia, Pa.

Photo courtesy of J. S. Timmons.

Some Plain Truths About Radio

By HENRY M. NEELY

THREE great national radio shows have been held in different cities during the past month or more and visits to all three of them have given me some quite definite opinions about radio merchandising as it is being carried on at the present time.

I did not go to these shows particularly to see the goods which were displayed because I am familiar with most of the apparatus and sets being put on the market. I went particularly to see the crowds and to study the methods of the salesmen demonstrating apparatus and sets.

These shows have left me with some very serious misgivings—not about the apparatus or the sets nor about the efficiency of modern radio equipment—but misgivings about the methods that are being used to try to induce prospective buyers to purchase. My main impression is this: *Radio today is suffering from a very bad case of over-selling.*

What I mean by that is that, in their enthusiasm, salesmen and demonstrators are leading novices to expect more from radio than radio can be depended upon to deliver.

There is no one who is more of a radio enthusiast than I am; there is no one who listens in more eagerly and more persistently or who turns his dials more expectantly to tune in that far distant station, yet I do recognize the fact that this attitude of mine is not the attitude of the novice who has not yet been completely captured by the lure of this modern marvel.

I think it is only fair to the novice, and still more vital and valuable to the future of the industry, to point out some of the plain truths about radio.

In the first place, let us realize that there are two viewpoints from which radio must be considered. The first is the viewpoint of pure entertainment in the home, without any reference to distant reception or to the marvel which is being performed by the radio set. From this viewpoint we must realize that no reproduction can be considered really satisfactory or worth the money unless this reproduction is comparable to the reproduction furnished by a first-class Victrola.

This means that there must be full and strong volume of sound and that this sound must be constant and not fluctuating and not subject to sudden changes and that the reproduction must be free from the extraneous noises such as, some score of years ago, used to mar the reproduction in the earliest type of talking machines.

The Victrola has set a standard in the purely entertainment phase of music and voice reproduction which must be considered in this talk on radio.

Now, from this viewpoint, what is the plain truth about radio?

A friend of mine not long ago was talking with some of the most expert of the Western Electric Company's engineers in

New York. They were discussing radio transmission and radio reception and I think it is safe to say that there is no group of men who are better informed on this subject than the engineers of the Western Electric Company. My friend asked them this question:

"Suppose I have a really efficient set as sets are made now-a-days.

"Suppose I want to get reproduction comparable to the reproduction of the Victrola with no distortion and no extraneous noises and with constant volume and absolute dependability 365 nights in the year.

"Suppose I want to go away from Station WEAF in New York but that I want to receive that station with that standard of reproduction.

"How far away can I go before you will cease to guarantee that I will get satisfactory reception under these conditions?"

And without any hesitation whatever, the Western Electric engineers replied almost in unison: "FIFTY MILES."

My friend was naturally very much astonished.

"Why," he said, "I see very many set manufacturers advertising coast to coast reception with almost unfailing regularity. Do you really mean to tell me that you will not guarantee satisfactory reception more than fifty miles away from such a powerful station as WEAF? That station has been heard in Europe and many thousands of miles away."

"Yes," said one of the engineers, "but you asked us to guarantee reception 365 nights in the year and you demanded reproduction which would be comparable to a good Victrola.

"It is undoubtedly true that WEAF has been heard for many thousands of miles. So has every other powerful broadcasting station. But these records are made under freak conditions and cannot be guaranteed for duplication.

"Another thing is that reception at that distance is ordinarily not by any means comparable to a Victrola.

"If you are willing to put up with a certain amount of fading and some unpleasant interruptions by static, then we might raise the limit to 100 miles or even go as far as 300 miles, but at this extreme distance we could not guarantee reception 365 night in a year and I would almost say that two nights out of three your reception would not by any means compare with the reproduction that you will get from the Victrola."

It seems to me that it is time that this sort of thing was very clearly explained to the novice who is just getting interested in radio and who is now contemplating buying a set.

As a matter of fact, I would personally consider fifty miles quite a good distance for guaranteeing satisfactory reception every night in the year, winter and summer. Out at station 3XP, Delanco, New Jersey, fourteen miles away from Philadelphia, the only stations from which I would make any such guarantee as that are the Philadelphia stations. These we can get always with all the volume and all the clarity we want.

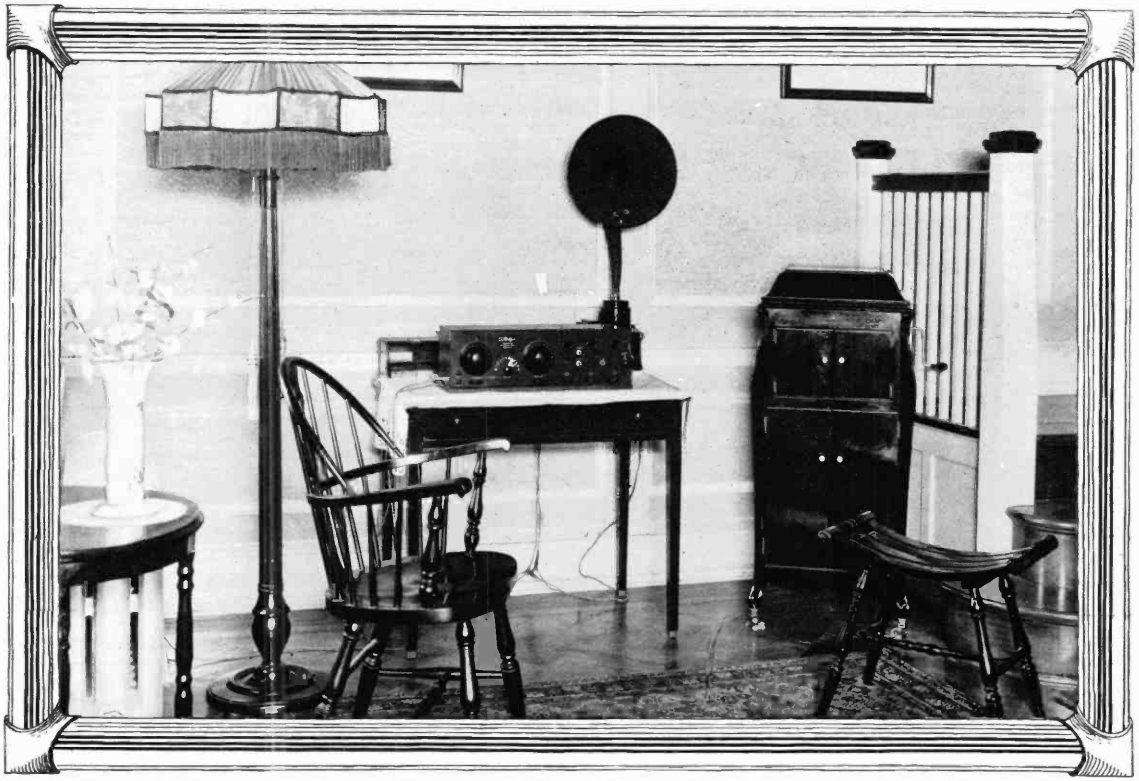
Even on bad static nights in the summer, these powerful stations drive through with signals so much stronger than the static disturbances that they are virtually perfect in their reproduction and the static is annoying only during the intermissions between numbers.

Station 3XP is only about eighty miles away from Station WEAF. I can always guarantee to get WEAF on a loud speaker, but there are only one or two months in the very best weather in winter time when I can honestly say that the reproduction is at all comparable to the reproduction of a Victrola. For the rest of the time, it is only the extreme enthusiasm of the radio fan which enables me to delude myself into thinking that the reception of WEAF is really satisfactory.

I do not want any one to conclude from this that my attitude toward radio is at all unfavorable, because it is not. I am just as much of a nut as the most ardent dial twister in the United States of America. In fact, I think I must be even more of a nut than he is or I never would have started this magazine.

What I am trying to do is simply to correct an impression that has got out among people who know nothing of radio but who are contemplating buying a set.

Through the implications in a great deal of radio adver- (Continued on Page 40)



Radio in the home of Clarence J. Deisroth, 5707 North Thirteenth street, Philadelphia, Pa.

Photo by Henry S. Tarr, courtesy of Gimbel Brothers, Philadelphia, Pa.

LESSON FOUR

THE RADIO

By HENRY M. NEELY

AND now I feel that this kindergarten class has progressed far enough in some of the fundamental facts of radio to get a fairly complete mental picture of the marvelous things that are going on while we are sitting listening to a concert from our favorite broadcasting station. I am going to draw this picture now in words that may be a little different from those that I have used, and although I will again take up certain of the things I have already spoken of, it will be done now in a fairly consistent story and the object will simply be to give you a complete picture made up of the parts that have been presented to you already.

There is one very amazing fact which I want you to get firmly fixed in your mind. It is this:—

The most tremendous power that is being exerted in the mechanical world today is due entirely to the very tiniest particle that is known to man.

This tiny particle is the electron. I will not tell you what an electron is because I do not know. Nobody knows. Scientists have never seen an electron and probably never will be able to see one, but their investigations have convinced them that such a thing really does exist and that furthermore it is responsible for the greatest advances which civilization has yet achieved.

This remarkable statement is made because of this fact:—

Electricity is nothing more or less than electrons in motion. Everything that electricity does is done by electrons in motion.

When we see a huge battleship electrically driven, ploughing through the ocean at from thirty to thirty-five knots, we see about as impressive an exhibition of tremendous power as it is possible to witness. And this whole exhibition is staged and produced by the tiniest thing that it is possible for us to imagine, even with the trained mind of a scientist.

An electron is, to all intents and purposes, merely a minute charge of negative electricity. It is so minute that it is virtually impossible to consider it with any actual degree of understanding.

Not so long ago, scientists thought that the atom was the smallest particle of matter that man would ever know. An atom is so small that if you were to gather over a million of them together you could place them on the head of a pin and still leave room for a great many thousand more atoms. From this you will realize that an atom is a very tiny thing indeed.

And yet scientists now ask us to regard the atom not as an elemental substance, composed of only one thing, but as something so wonderful that it seems impossible to realize it.

We all know what astronomers mean when they speak of the solar system. We know that our huge brilliant sun is the center or nucleus of the solar system and that the earth and all of the other planets revolve around this sun or nucleus—Mercury and Venus and the earth and then outside of us Mars and Saturn and Jupiter, Uranus and Neptune.

We know that the earth is about ninety-three million miles away from the sun. This is a tremendous distance and yet in the solar system it is a mere nothing. Uranus and Neptune are so much farther away that we on the earth cannot even see them with the naked eye. And yet, even at that almost infinite distance, they belong to the sun and are held revolving around the sun by the attraction of gravitation between themselves and the sun.

This is a stupendous picture to get in our minds. And yet scientists now ask us to get an even more difficult picture by insisting that we regard the tiny atom as in reality a complete universe in itself, just as is the solar system. They ask us to believe that inside of this minute thing there is a central nucleus which is analogous to our sun and that around this nucleus are revolving one or more electrons, exactly as the planets in our solar system are revolving around our own sun.

And they ask us to imagine this nucleus and these electrons as so very tiny that, in their relative sizes, they are quite as far apart from each other as Uranus and Neptune and the earth are from each other and from the sun.

Can you conceive of anything so wonderful as this? We are asked to picture all of this complicated system of planets on so small a scale that the entire system can be grouped into a space so small that it is much less than one millionth of a pin head.

This means that all substances which we know are really not solid, as we have imagined them, but are simply huge collections of these tiny universes and that these universes have wide open spaces in them between the revolving electrons and the nucleus. Therefore even the most solid substance—that is, the one we consider the most solid—is really quite wide open for such tiny things as electrons, and an electron flung free from its own universe could naturally go hurtling through the universes of which a piece of steel is made as a comet goes hurtling in among the planets of our solar system and disappears again into outer space. And that is exactly what

Photographs courtesy of Radio Corporation of America.

KINDERGARTEN

we are asked to picture electrons as doing. That is exactly what they do when we use a receiving set with an indoor loop aerial. We can put our set with an indoor aerial within a room, shut every door and window and seal them tight, and still the electrons set in disturbance by the signals from the broadcasting station will come hurtling through the atoms of which the walls and windows are composed and, striking on the wire of our loop aerial, will set the electrons there into rapid motion and thus create the currents of electricity which go in through our set and are amplified into the signals which we receive on our head telephones or our loud speaker.

Even if we were to exhaust all of the air out of the room and leave a perfect vacuum there, the electrons would come in—in fact, they would have much less difficulty in going through the room than they have while the air is in it, because the air is full of little particles of actual matter and many electrons striking against these particles are absorbed by them or permanently captured by them.

There is one thing that is very essential for you to remember about electrons and that is that they are all negative. There is no such thing as a positive electron. As soon as we get a particle of matter which is charged positively we call it a positive ion, but you need not bother about ions, because I do not think it will be very necessary to deal with them much in these kindergarten talks.

The electron, however, is about the most important thing in the world for us to be acquainted with if we are to know anything about radio, and that is why I am taking it up again in this lesson, because I want you to be thoroughly familiar with it by the time we begin to talk about the vacuum tubes in our set and what goes on in them. That is really the most fascinating part of our study of radio. The vacuum tube has well been called the "Aladdin's Lamp" of science and it is usually agreed now that science has given us nothing more wonderful than these tubes.

And now let us follow the actions of these billions and billions of electrons from the time the singer begins to sing in the broadcasting station until we hear the song in the comfort of our own homes.

The whole process is a matter of disturbance. Singers *are* sometimes disturbing, but that is not the kind of disturbance I mean. I am referring now to the regular back and forth disturbance that we know of as vibration or oscillation. We can have vibrations of mechanical substances such as vocal chords or the diaphragm in our telephone transmitters or our loud speakers, or we can have vibrations in the air, and these are vibrations of the actual particles of matter in the air, or we can have vibrations of electrons, and these are in the ether, which is entirely independent of the air, although the ether and air are spread all over the earth together. One difference is that the air extends not more than one hundred miles above the surface of the earth, whereas the ether goes on out into infinity.

First then in transmitting a song, the vocal chords in the singer's throat vibrate. This disturbance causes the same kind of disturbance in the air and these air disturbances go on outward until they strike the diaphragm in the microphone in the studio.

This diaphragm is so constructed and attached that its vibrations are transformed through the phenomenon of magnetism to certain wires attached to the apparatus and the electrons in these wires are set into violent vibration in time with the vibrations of the air and therefore of the singer's vocal chords. These electron vibrations travel along the wire to the tubes in the great transmitting apparatus of the station; they are amplified a million or more times in this system of apparatus and are shot out into the aerial of the transmitting station.

Here the violent agitation or vibration of electrons sets up a similar disturbance among the electrons in the ether all about the aerial and this disturbance, like the disturbance of the water when a stone is thrown into it, travels outward in all directions in constantly widening circles.

These vibrations take the form of waves in the ether just as the vibrations of the water take the form of waves when you throw in a stone.

It is also necessary to realize that these waves vibrate in exactly the same number of times per second or the same "frequency" as the vibrations of the electrons within the transmitting apparatus and the frequency of this is the factor which governs the wave length on which transmission is conducted.

The waves in the ether have this frequency, but each wave is moulded in its outline by the number of vibrations of the singer's vocal chords which caused the microphone diaphragm to start the vibrations originally. This moulding of the shape of the waves is what we know as "modulation." It is this moulding that gives us the spoken word or the different changes in pitch or the different quality of sound, although the number of separate waves remains exact-

(Continued on Page 46)

Photograph courtesy Union Trust Co., Cleveland, Ohio.

EDITORIALLY SPEAKING *and*—

By HENRY M. NEELY

ON PAGE 34 of this issue you will find an exceedingly interesting article by William N. Shaw, president of the Eisemann Magneto Corporation. I was particularly glad that this article came to my desk when it did. Mr. Shaw deals with exactly the subject that I had intended to take up here this month. And his viewpoint, coming as it does from one of the best known men in the radio manufacturing industry, is sufficient evidence of a fact that I had intended to point out—that the future of broadcasting is causing considerable concern to manufacturers of radio apparatus and radio sets and that there is a general feeling that something definite must be done to assure the permanence of the splendid business which is being built up by the new art.

I have not yet seen any evidence that the general public is much concerned about this, but that is due to the fact that the public does not really understand the exact conditions that are surrounding broadcasting at present. Mr. and Mrs. Listener-In have got so accustomed to sitting comfortably at home with their receiving set and listening with varying degrees of pleasure to the concerts that are being sent to them free that they have come to consider this as a matter of course, and it never enters their heads that there is any possibility that the service is in danger of being discontinued.

And yet it seems to me that there should be a realization of the fact that no great business has ever been built permanently upon the principle of giving something for nothing. Mr. Listener-In may answer that by saying that he paid so many hundred dollars for his set. That is perfectly true; it would be an excellent answer if it were based upon the practice of taking a certain proportion of that money and applying it to the cost of the broadcasting service.

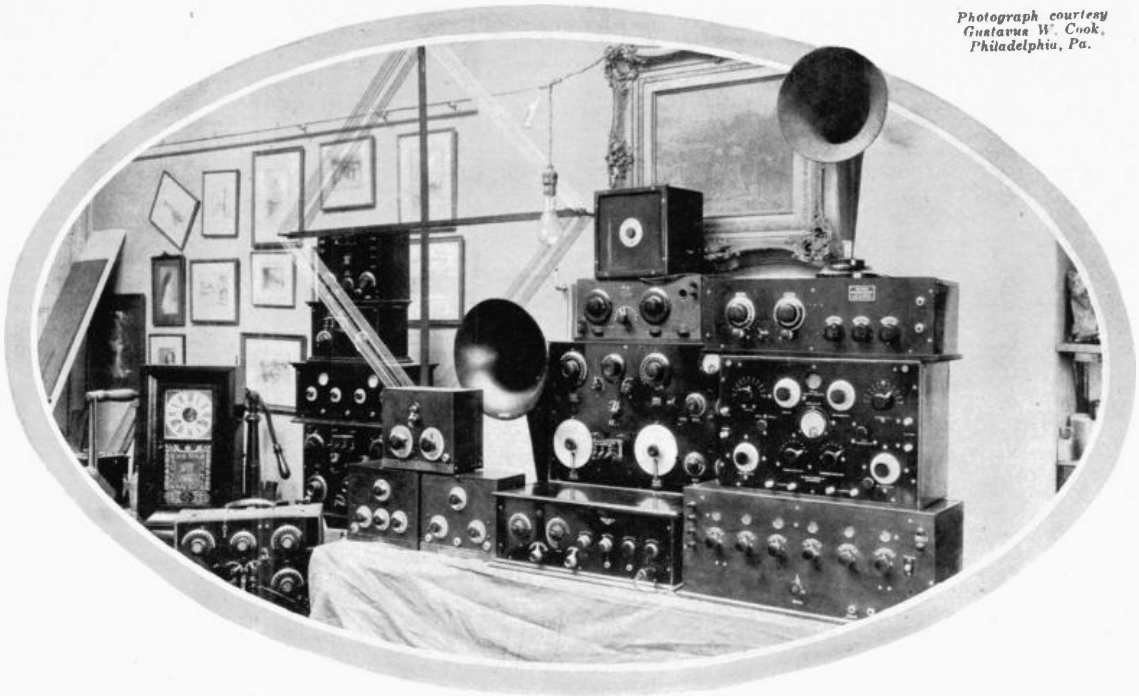
But this is not being done. Broadcasting today is being carried on by various groups, several of the large manufacturers of radio apparatus conducting stations in order to stimulate the sale of their goods, a number of large department stores conducting the service because of the general good will toward them which they believe it creates among their customers or prospective customers, newspapers doing it for the same purpose, churches and colleges doing it with motives that are partly educational and partly with the hope of increasing their own revenues. And so it goes.

During the last month or two, there has been a surprising number of cancellations of class B broadcasting licenses. This is one of the facts that has stirred the radio manufacturer with anxiety as to whether it means that those who are still retaining their licenses will follow the lead of those who have given up, and will gradually one by one discontinue.

Personally I am glad that a number of these big stations have given up. I think there is far too much interference at the present time for the genuine success of radio and, if the broadcasting stations could be reduced in number and distributed more evenly throughout the population, it would be a mighty good thing for everybody connected with radio.

I should say that the ideal number would be something like one hundred and that these should be divided in two large general classes—first, the class that will specialize in what is known as the higher grade programs, and the other the class that would satisfy the demand of the younger element and the element that does not care particularly for the educational or classical form of entertainment. Both of these classes are very large ones and each one is absolutely entitled to the particular service it desires.

Now, if there were some general organization, such as suggested by Mr. Shaw, to assist these broadcasting stations in getting star performers to augment their own programs, this idea could be carried still farther by means of the present system of hooking together two or more stations by land wire for simultaneous broadcasting. There are now no engineering difficulties



Photograph courtesy Gustavus W. Cook, Philadelphia, Pa.

still EDITORIALLY SPEAKING

in the road of this and, if it were generally done, the cost could be very easily brought down to a fairly reasonable basis.

Such simultaneous broadcasting, of course, would be done only for great stars or very important events. Ordinarily, the stations could broadcast individually with their own programs.

I speak of stars because I agree with the general impression among the radio manufacturers that we will not expand the radio market to its full extent until we do get the real headliners of music, of oratory, of education and public life into our broadcasting stations. This statement may require a little explanation, but to me it seems perfectly simple.

In the first place, I am quite convinced that the people with the most money are not yet "sold" on radio. Let us divide all of the population into classes, from Class A to Class Z, not according to their culture or refinement, but according to the amount of money they have to spend. This is an important way of dividing them from a merchandising viewpoint and I am now discussing this subject from that viewpoint. And let me say that I am not, in this, treading on any one's toes, because, on that basis of division, I myself would rank in about Class Q. I think no one will disagree with me when I say that Classes A and B in the financial grouping are the classes who will mostly demand the star system of entertainment. I do not mean that these classes have any more musical appreciation or musical knowledge than classes from C to M—in fact, my own opinion is that they have not.

But Classes A and B, with plenty of money, live a social life which is largely a matter of following the leader, and this, in their musical activities, has led them to subscribe for boxes at the Grand Opera and the Symphony Orchestra and to patronize only such concerts as other people in their own classes patronize. These concerts and these operas and these orchestra performances are undoubtedly made up upon the star system. It therefore is perfectly natural that the people in Classes A and B should unconsciously absorb the idea that, unless an artist is known to them through these various phases of musical activities, he is not worth listening to.

This may or may not be right. Nevertheless, it is the opinion of Classes A and B. And undoubtedly there is a good deal of logic in this viewpoint because ordinarily no artist gets to be a star unless he has proved his ability and talent.

The less known artists who may and very frequently do perform most excellently and satisfactorily are quite acceptable to everybody in Classes C to M and these classes also enjoy hearing the stars who are desired by Classes A and B. However, Classes A and B will not bother to listen to the lesser known artists and so, as these lesser known artists are the ones who are doing most of the broadcasting, radio has not yet entered very widely into the home life of Classes A and B.

It therefore resolves itself down to this: Classes C and D and so on down to Z are doing most of the buying of radio sets and parts and they are very much pleased with the present broadcasting and would be still more pleased if they could also get the stars. Classes A and B, who are not doing the buying, but who are able to spend vastly more than the other classes, are not at all satisfied with the present kind of broadcasting talent, but would undoubtedly get into the radio market if they were assured that they would be able, in their own homes, to hear the star artists with whose names they have been made familiar through their own social activities and the social activities of their own kind.

It therefore seems to me a logical conclusion to draw from this that there is a vastly greater financial return awaiting the radio manufacturer if he can in some way assist in placing the star system at the disposal of a selected group of fine broadcasting stations. When that day comes, the price of a radio set can be almost anything from twenty dollars up to two or three thousand dollars, and it will find ready buyers among those whose bank accounts are best fitted

(Continued on Page 33)

The Largest Congregation in the World

By EUGENE KONECKY

RECENTLY the Associated Press flashed this over the country: "The world's largest congregation, one hundred thousand members." In view of previous startling figures of fifty thousand members in Bible classes by Long Beach, California, and Kansas City churches this statement from the middlewestern metropolis, Omaha, seemed overwhelming. Yet this calculation for the Radio Church of the World is, if anything, an under-estimate.

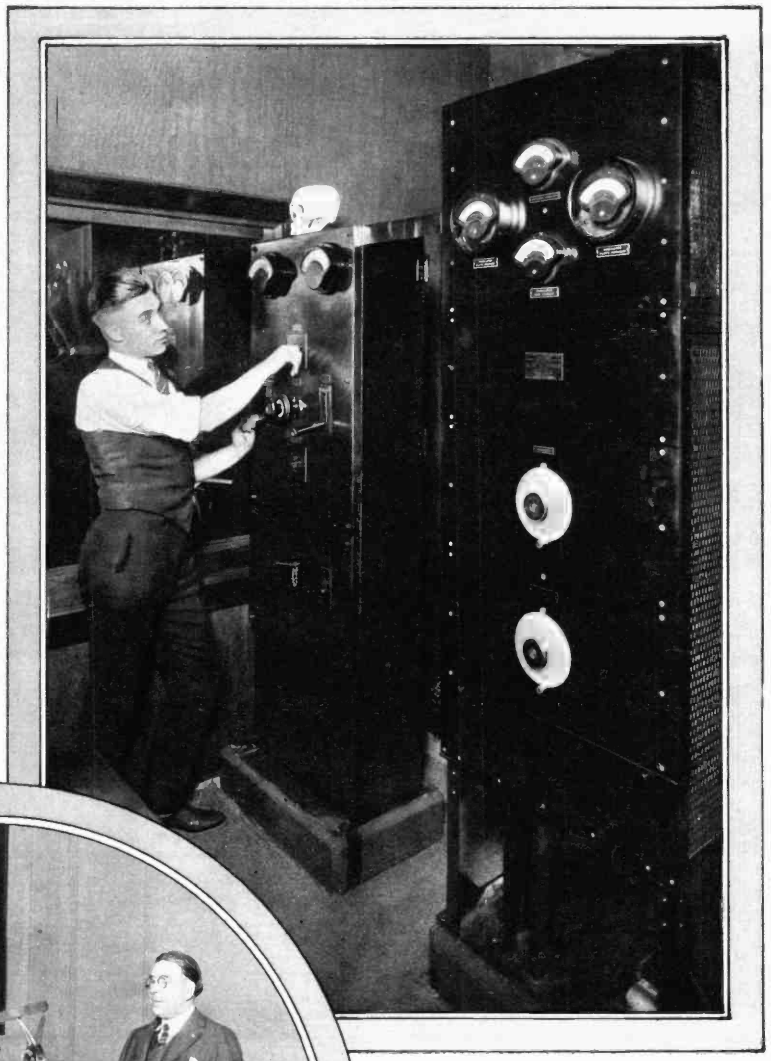
But, before going any further, I take this opportunity to inform the reader that the Radio Church of the World is a part of radio station WOAW, owned and operated by the Woodmen of the World Life Insurance Association from its headquarters. Omaha, Nebraska. It is from the world-known abbreviation of this organization—W. O. W.—that the station was christened by radio fans as the "Wonder of (the) West."

That, in the short period of eight months, this station should organize a radio church and build a congregation to the figure of one hundred thousand members confirms its title. It is a wonderful achievement. Those who are skeptical of the facts will certainly doubt my own estimate, which doubles the figures given by the officials of Station WOAW. Yet simple scientific analysis suffices to kill the Doubting Thomases. There are two services broadcast from WOAW each Sunday, one in the morning and one at night. To each of these services a conservative average of 250 reports is received, making a total of 500 reports. Assuming that one listener in a hundred makes a report, we can now place the total number of listeners at 50,000.

But, WOAW officials know that more than one person on an average listens at each set. Using two listeners for each set they arrived at their final figure, 100,000. But, when I personally investigated the

actual facts to ascertain the truth of these figures, I was prompted to place the total far short of the real size of the congregation. With the help of the stenographic force of Station WOAW, I computed an average of 378 letters reporting on each service. For both Sunday services then there were 756 reports. The average of two persons at each receiving set, I concluded, was ridiculously low. When one learns, as I did, that many State institutions, including penitentiaries whose inmates number hundreds; and hundreds of townspeople, in some cases whole towns; as well as hospitals, garages, steamships and even churches and Bible classes—as in Maryville, Missouri, with 300 members—listen to WOAW religious services, we may place the average number of persons for each set at three and sometimes four. Using this as our formula, 756 reports x 3 persons at a set x 100 (one in a hundred persons reporting), our estimate totals 226,800 members in the congregation of the Radio Church of the World.

If there is any doubt about the conclusion that one person in a hundred who listen actually reports on the reception, it should be a doubt whether it is low enough. Knowing human nature as I do, and considering the competition between the various stations for reports, I believe that we may conservatively estimate that one person in two or three hundred reports to each station. This would make a congregation of half a million souls, which is not beyond practical conception. I have before me a letter from Mr. Henry Field, of Shenandoah, Iowa, in which he says: "I think you will be interested to know that we have received over 6000 letters from people who listened to our program." It seems to me that a figure like this



The transmitting apparatus in Station WOAW

really indicates the great number of people who listen to WOAW programs. Mr. Field says further: "I figure that these 6000 are only a drop in the bucket compared to the number of people who were listening but did not bother to write." It would be entirely within one's rights to figure that one person in a thousand writes to radio stations acknowledging receptions of programs.

But I want to impress upon you the fact that this enormous radio congregation is merely a part of the audience of millions who listen to WOAW every night; and that WOAW is merely the realization of the great vision of one man, W. A. Fraser, Sovereign of the Woodmen of the World. William Fraser comes from the biggest State in the Union, Texas, and he is typically Texan in every way. In the world of fraternal insurance they call him "Big Bill" Fraser; and big he is, both in size and vision.

W. A. Fraser, Sovereign Commander Woodmen of the World, broadcasting from Station WOAW

Pastor Brown and his associates in the radio church of Station WOAW

When he conceived the idea of operating a broadcasting station, he showed himself to be a pioneer of progress in the insurance world. Moreover, when he decided to put the idea over "big" he simply proved that he was incapable of being a "piker." In this respect, allow me to quote from the Fraternal Monitor, one of the largest publications of its kind in the world:

"One of the outstanding features of the recent meeting of the National Fraternal Congress was the address of Sovereign Commander W. A. Fraser of the Woodmen of the World, one of the most dynamic and forceful executives of the fraternal field. Sovereign Fraser always brings thoughts on phases of fraternal work which command the closest attention because of their insight and originality. In the month of April the W. O. W. opened its radio distributing center. At an expense of $50,000 plans have been developed which give promise of increased interest in local meetings on the part of members. Sovereign Fraser believes that it is absolutely essential to keep abreast of the times. He feels that matters of present interest should be utilized if

Rev. R. R. Brown, pastor of the largest congregation in the world

members are expected to retain their interest.

"Fraternal societies should do more than pay claims," said Sovereign Fraser. "They must do something more than deliver certificates and make payment at the death of the member. Their influence should be felt along civic lines. The question is, 'Can you deliver the goods?' When this can be favorably answered there will be no limit to achievement."

These then, were the phases of Mr. Fraser's vision: (1) An insurance society must keep abreast of the times. (2) It must be felt along civic lines. (3) It must deliver the goods, which means it must do more than pay claims. It must serve, educate and interest its members.

And the answer to all these things was Radio Station WOAW. That this vision was not impractical idealism is the only conclusion possible after one has thoroughly followed the remarkable career of the station beginning with its official opening night, April 2d, 1923.

"Big Bill" Fraser is a fraternalist. It is no coincidence that he carried his fraternalism into the radio field. In fact, he visioned a great fellowship of the air, a fraternity of men, women and

The stenographic force employed at Station WOAW

children communicating with one another by means of the latest scientific marvel of the century.

But when he organized the Radio Church of the World he was giving fraternalism a field of action inconceivably vast, hitherto undreamed of by fraternalists. To organize this radio church involved some delicate problems which necessitated not merely vision, but diplomacy and practicability.

First of all, Sovereign Fraser had to organize a church that would not compete with existing churches, but support and supplement them. Second, in broadcasting religion to the world, he had to make it acceptable to the world. Here is the story of how these two problems were ingeniously solved:

Mr. Fraser invited all the ministers, pastors, reverends, fathers and rabbis in Omaha and one hundred and forty towns surrounding Omaha, within a radius of one hundred and twenty-five miles, to join the Radio Church of the World. Without a single exception they accepted his invitation. There were no refusals, no hesitancy in conducting religious services via WOAW by the representatives of the various denominations. Thus, the Radio Church supported and was supported by existing churches. The clash of the Radio Church and other churches never materialized.

Hon. W. A. Fraser, Sovereign of the Woodmen of the World, the insurance organization which operates Station WOAW

The second problem proved equally simple. In order to make the religious services acceptable "to the world," speaking in radio terms, Mr. Fraser decided to broadcast in addition to the services by various denominations in the evening, an *interdenominational* service in the morning.

There was a second reason for the morning services. It was a psychological reason. Mr. Fraser believed that religion makes its strongest appeal in the morning, when our senses have been refreshed by a night's rest, when we are vitally awake to the world around us, and when we are susceptible to deeper and more fundamental subjects of thought. And Mr. Fraser's judgment has since been verified by the fact that, regardless of the extraordinary character of the men who conduct the evening services, their listeners invariably react most favorably to programs with short sermons and varied musical programs; while in the morning, longer and more sustained sermons receive favorable comment.

It was necessary to select a man of powerful personality for the morning (Continued on Page 30)

Radio in the Home and in Every Room

WHEN one magazine copies word for word an entire article that is published by another, you can depend upon it that that article is something decidedly out of the ordinary. That is the case with the story and the pictures which I am reprinting here.

This story shows how a whole house can be wired so that people in any room can have the pleasure of listening to radio concerts. The article and the pictures appeared in the December issue of "Electrical Merchandising" under the title of "Multiplying the Pleasure of Home Radio." I am reproducing them here by permission of "Electrical Merchandising" and I wish to acknowledge the courtesy of Mr. Maurice Clements, of that publication, in furnishing me with the photographs and diagram. H. M. N.

ELECTRICAL men are in general familiar with the "convenience-outlet" idea and have been thoroughly sold on the desirability of having electric service available *at convenient points all throughout the average home.*

But with the coming of radio a new kind of convenience outlet has made its appearance — "radio outlets" of the familiar standard telephone-jack type, for distributing radio music and entertainment to every room in the house.

Think for a moment, just what it means to have such a wiring layout for distributing radio to the individual rooms of a home.

The children in their upstairs nursery can have bedtime stories delivered right to their own little beds. After listening to the tales of the Star Man and Billy Cottontail, they drop off to sleep to the strains of distant melody. And knowledge of the fact that the Bedtime Story Man tells his delectable tales on a schedule by the clock, means promptness in getting to bed "right on the minute," so that no word will be lost. A special switch, downstairs, cuts off the nursery circuit, after the hour when little eyelids should be closed.

And for the older people in the family who prefer to retire early to the privacy of their own rooms, yet dislike to be shut out of the cheerful music and interesting addresses coming in over the radio in the living room—the whole evening's program can be carried upstairs and alongside easy-chair or bed, so that comfortable deshabille does not interfere with sharing the music being enjoyed below.

And for the maid-of-all-work who, the dinner dishes done, ascends to the barren comforts of her attic chamber—that attic instantly becomes an anteroom of the liveliest jazz ballroom in the distant metropolis, so that even "going out to the movie" will, for her, lose much of its appeal. Where, indeed, is the housewife or householder who would not authorize any reasonable expense that will more tightly secure Katie, Olga or Hilma?

And when bedtime for the whole family comes, it is not so hard to tear away from those "best programs of the evening" of the distant broadcasting stations which always come in clearest after midnight — if every one in the family knows that these concerts will follow him or her to bedroom and guestroom, so that one's last drowsy memory between cool coverlets is of "Indiana Moon" or "The Golden Shore."

Right here, of course, it should be explained that the secret of letting the family "go to sleep by radio" is a clock switch (of the type used on electric cookers), which is inserted in the A battery circuit, and opens that circuit after the lapse of any pre-determined time, from 10 minutes to two hours. For the womenfolk who are usually at home all day long, radio throughout the house offers relief from tedium of household tasks, kitchen work, sewing, etc., when those hours can be lightened with the music of a metropolitan concert or lecture—which would otherwise take half or a whole day to attend! How all the possibilities described have been actually worked out in a small home in the suburbs of New York City, is shown in the accompanying pictures and diagram of the radio secondary circuits in use in the home of the editor of *Electrical Merchandising*, at Bronxville, New York.

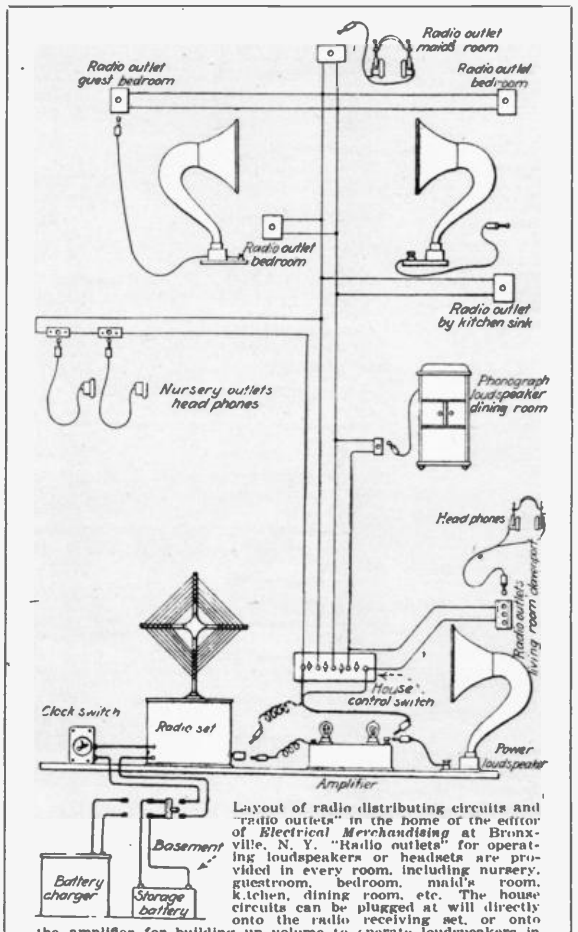
The various house circuits are controlled by a group switch, which short-circuits the lines not to be operated. The plug which feeds this house circuit can be plugged into the radio set directly, for operating headphones only, or can also be plugged into a jack on the amplifier, when it is desirable to build up volume for the loud speakers in the various rooms.

All the circuits are in series, with short-circuiting jacks, except the pair feeding the various bedrooms, which is a pair in the 10-wire cable for the various house intercommunicating telephones. Outlets tapped from this pair are bridging connections, with jacks that remain open-circuited on removal of the plugs.

The "radio outlets" as improvised, consist of standard jacks mounted in single-hole switch faceplates. These plates are made for use with switches having one push-button (one push to light and one to extinguish), and are available from jobbers' stocks on special order. The hole exactly fits the standard jack. It is surprising, however, that no regular wall-type "radio outlet" has so far been placed on the market. As the desirability of "radio throughout the house" becomes known to the present 7,000,000 broadcast listeners, there should be a real demand for such "radio outlets."

At all points for interconnection in the Bronxville house, standard multi-jacks and duplicating plugs have been used, affording the greatest flexibility of connections. But the prayers of millions of future laymen broadcast-listeners will doubtless go up to the radio manufacturer who replaces the present (to the layman) complicated system of bat-

(Continued on Page 46)



Layout of radio distributing circuits and "radio outlets" in the home of the editor of *Electrical Merchandising* at Bronxville, N. Y. "Radio outlets" for operating loudspeakers or headsets are provided in every room, including nursery, guestroom, bedroom, maid's room, kitchen, dining room, etc. The house circuits can be plugged at will directly onto the radio receiving set, or onto the amplifier for building up volume to operate loudspeakers in the various rooms. The nursery can be shut-off separately from the rest of the rooms. A clock switch enables the whole system to be left running for a predetermined length of time so that the family can "go to sleep" to music half a continent away.

Why Not Have Radio in Every Room in Your House?

From central receiving set in the living room of the editor of "Electrical Merchandising" at Bronxville, N. Y., circuits run to loud speakers or head sets on all floors

LIVING ROOM

GUEST'S ROOM

MAID'S ROOM

LIVING ROOM

CONTROL BOX ON STAIRWAY

A complete list of rooms in the average home in which radio outlets might be desirable, follows:

Living room	*Bedrooms*	*Sun-parlor*
Dining room	*Guestroom*	*Billiard room*
Kitchen	*Nursery*	*Porch*
Laundry	*Maid's room*	*Work shop*

NURSERY

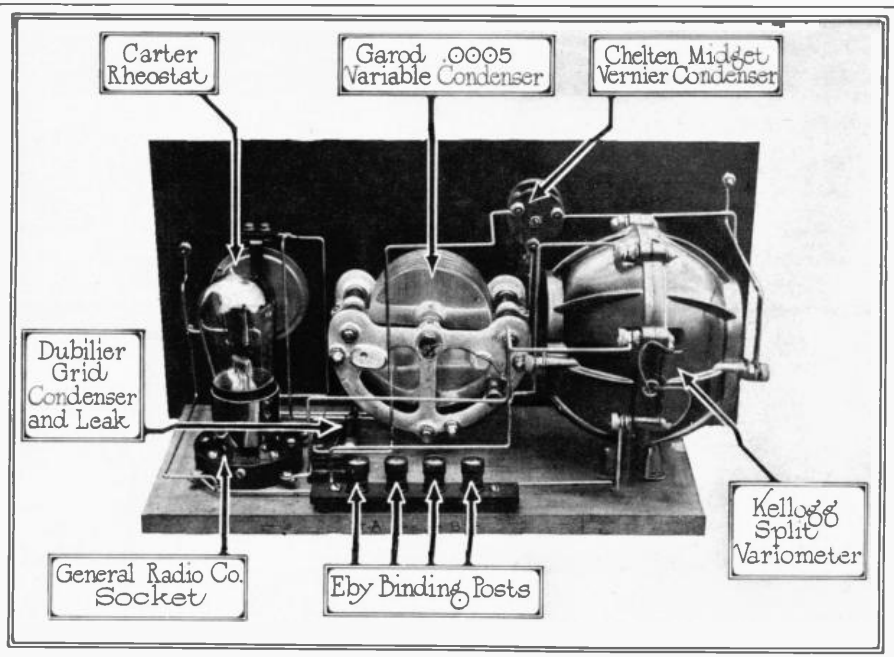
IN THE nursery there is a radio outlet beside each child's bed. By means of switches this circuit and others can be shut off.

The radio outlet in the maid's room is in the side of her intercommunicating telephone set, the radio circuit being carried as one pair in the house-telephone cable.

At various points in the living room there are also jacks for headsets, in case some of those present wish to read or converse and do not care to listen to the power loudspeaker. The outlet at the kitchen sink serves to beguile, with music and lectures, the tedious hours of kitchen work.

Either headsets or loudspeakers can be operated throughout the house, and by means of a clockswitch on the main battery circuit, the whole system may be left running for any predetermined time, delivering distant music to every room, so that the whole household can retire and fall asleep to music.

KITCHEN



An Ideal Circuit for the Ducon Plug

IT KEEPS the average radio editor or radio experimenter busy trying to satisfy the almost infinite variety of conditions which are met by radio fans all over the country.

I have had so many demands for a circuit which could be used with an indoor loop aerial or without any aerial and with only a ground connection or anything that would get away from the necessity of putting up an outdoor antenna, which seems to be so difficult, that I have paid most attention to that kind of circuit in past issues and have given a number of them.

I have, however, had many questions from people who can put up short aerials which are not very efficient, but who seem unable to reach a good ground connection unless they lead a long wire away from the set to some water pipe or steam radiator in such a way that this wire is constantly getting under the feet of people and causing trouble.

This difficulty in the ground connection is most frequently met with by people who wish to use the Ducon plug to screw into their electric light system and use that for an aerial instead of the ordinary one. Such people usually want their sets placed in the most convenient part of their living rooms in their homes, and these situations are frequently some distance away from radiators or water pipes and so it is difficult to get a satisfactory connection to the earth.

This matter of getting up a good circuit without an earth connection has puzzled me for a long time and I was very much pleased to receive from a reader a letter containing a hookup which he had designed to work without any earth connection.

I immediately took this out to Station 3XP and there we put the set together and found it was everything the reader claimed for it. In my estimation it is the ideal circuit for use with a Ducon plug and this enables the user to operate his set with no ground connection and with no outside aerial.

In case you have no electric lights in your house, this circuit operates with a short indoor aerial with most remarkable efficiency.

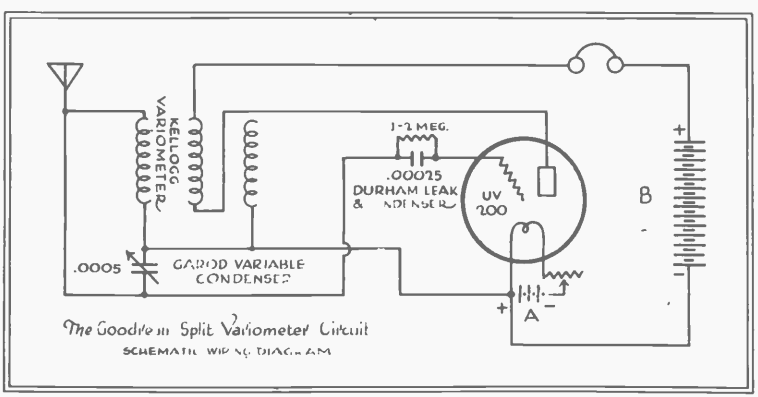
I am going to quote the letter in which this was sent to me because it has such a very human interest touch to it. The writer is W. Francis Goodreau, 40 Walling Street, Providence, R. I.

Mr. Goodreau writes:

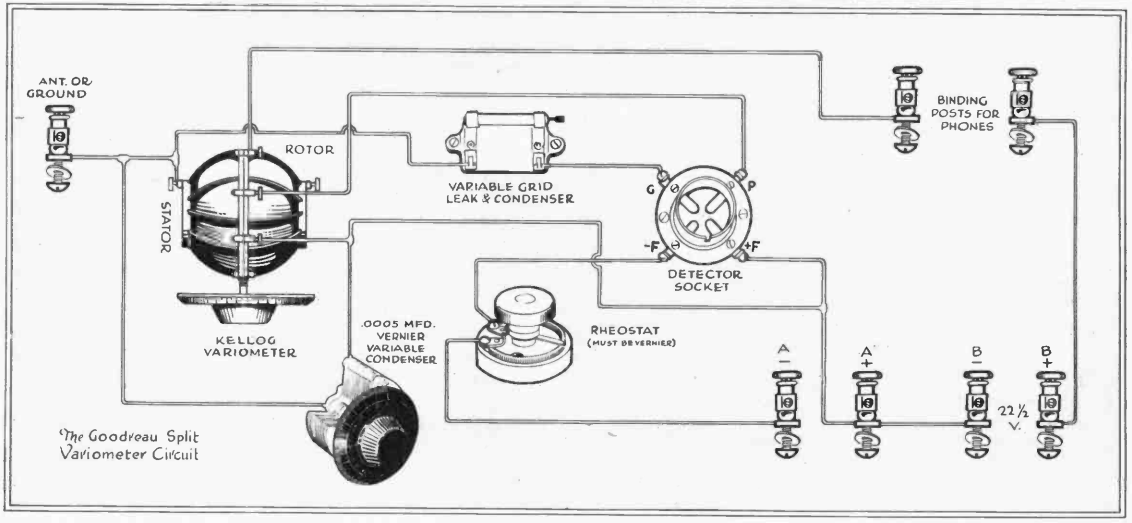
"I read your interesting magazine quite often and think it a real good one, and the articles very interesting. Was more than interested in the Flather's loop circuit published in your October issue. My reason for this is because I have a set using just the same parts.

I have been working on this set for six months and I'm sure satisfied with it. Here is what I do with the set.

"I reach out every night for stations within sixteen hundred miles and if they



Schematic wiring diagram of Goodreau circuit



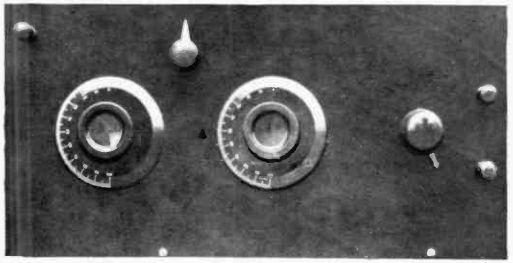
The Goodreau Split Variometer Circuit

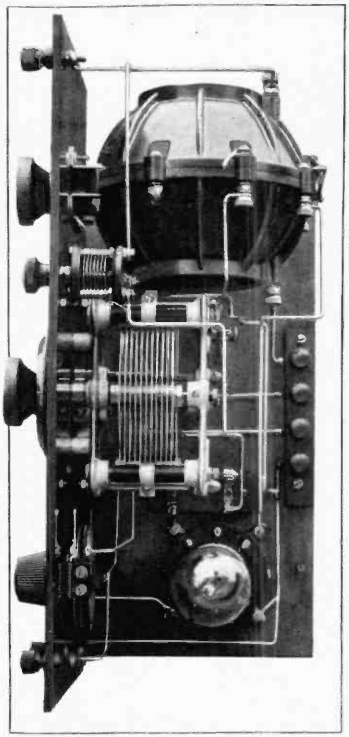
are on the air I get them. I have been doing this all summer and am still doing it.

"Set is so selective I tune out 500 watt station two miles away and bring in distant stations on nearly same wave length, with no interference. Set uses only antenna for DX. Ground should not be used, however. Will work without antenna or ground. The set uses only WD12 tube and parts listed in recently published Flather's circuit.

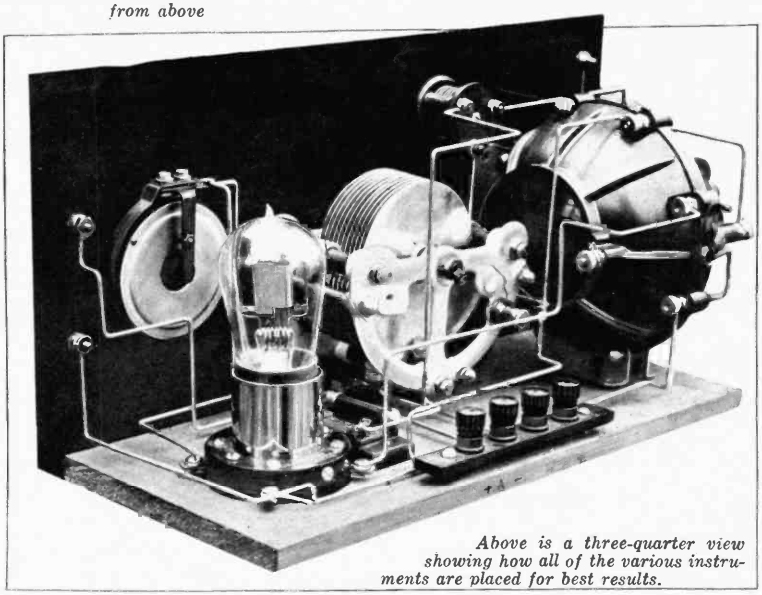
"I am a radio experimenter; have been confined to bed for the last three years, having been ill seven years, but I design and construct radio sets, not for sale, but for my own pleasure. I drill all panels, etc., while flat on my back, and I sure do have a lot of fun. I build all kinds of sets, including the Grimes as described in one of your past issues. Also tried regeneration with Grimes, and my advice is DON'T DO IT. For a living I write for magazines.

"If you are interested in this receiver please let me know and I will be glad to write an article on this set, or should you desire I will give you all the dope on it and you can build it and describe it to your readers. I have several sets now, including a reflex, but this one is my best for distance. My list of (Continued on Page 37)





At the top is the picture diagram of the Goodreau hookup. Next is the panel as we mounted it. To the left is a view of the set looking straight down on the baseboard from above



Above is a three-quarter view showing how all of the various instruments are placed for best results.

Miss Sidney Lear

I Told You So, Clubwomen!

By SIDNEY LEAR

Miss Lear has been insisting so long that women ought to use radio to further their clubs' interests that I can hardly blame her for the note of I-told-you-so in this article. After months of dreaming of radio for women's clubs, Miss Lear and I got together and the result is one of the most successful features that is now being sent out by station WIP in Philadelphia—the Women's Club meetings held by having the speaker and officers in the studio and the members gathered around a receiving set in the club house.

I commend this idea to women's clubs in other cities as the best possible means of gaining champions for themselves among the skeptical and commend it particularly to the directors of other broadcasting stations as a sure-fire method of getting publicity in the newspapers when things are otherwise rather slack and it is hard to get the activities of the station printed. H. M. N.

OF COURSE by this time the radio club meeting is an old story. It's an established fact. The only uncertainty about it is the identity of the club which will broadcast next week. The only thrill is for those who have never seen a broadcasting station before and are called upon to conduct or speak at the meeting. But consider the feelings of one who had something to do with bringing about this new kind of meeting.

Suppose, for instance, that you were an unassuming, writing sort of person with a lot of ideas, some good, some not so good, some wild, some tame, some useful, some only for personal, private entertainment. As that person, you didn't know anything about radio this time last year, except that it was wonderful. Then, as you learned more about it, the ideas began to form into line. Radio was so powerful, so marvelous, but so practical, so useful for people who discovered its uses and took advantage of them. Women, especially, should be interested in it, you thought, and so you gave them some of your ideas on the subject.

The thought of women very naturally led to the field of women's clubs and you found it a most promising one for radio. It was so big, so ready for suggestions and so receptive. And there were so many, many ways in which it could broaden itself, spread its influence, enlarge its membership, better its impression upon the world by means of radio. Indeed, it seemed to you that the possibilities were unlimited if two such powerful, vital things as radio and women's clubs could be brought together.

So, you wrote a story for *Radio in the Home*, telling, in the form of semi-fiction, a number of ways in which you thought club women might use radio. You looked them over after they were written down, tried to think about the story as if it had been written by somebody else, and, in spite of being a very critical person, couldn't see why they weren't perfectly good, practical, useful ideas. Having had success with that "best pal and severest critic," yourself, you called on what you modestly refer to as the practical side of your imagination and wrote another story, telling some more things for club women to do with radio, showing how these same club women might carry on their work of help for others in connection with the broadcasting stations, from the production

end of the aerial. It seemed perfectly possible, decidedly plausible, and you knew that as far as the broadcasting stations were concerned, entirely acceptable.

Well, that was all right, but, of course, you were writing entirely in the dark. You felt that you were not going in the wrong direction, and the genial editor of *Radio in the Home* hadn't started to make faces at you when he saw you on the street. but still you couldn't be sure. You had never had any proof that the women to whom you addressed your stories didn't feel convinced that the ideas you had presented were some of your not-so-good, wild ones.

Imagine, then, still as the Unassuming, Writing Sort of Person, the thrill of discovering that not only had the clubwomen heard your impassioned pleading, but they also had accepted your radio idea and were holding their regular club meetings by means of it! You really, in the emotion of the moment, felt sorry about Columbus —if only radio had been known in his time so that he could have broadcast back to Isabella, "I told you so!"

But, to let you go back to your own individuality, you do know about the radio club meetings, don't you? Well, they're perfectly delightful. The first one that I attended was at the Philomusian Club, Fortieth and Walnut streets, Philadelphia. It was a regular stated meeting, everything quite as usual, except that the reading of the minutes and the treasurer's report were omitted, on the president's plea that they were "family affairs and not to be discussed in public."

There was a gracious introduction by the president, Mrs. Montrose Graham Tull, after which the chairman of each committee explained the work under her care, and there were solos by a gifted member of the club. George Wentworth Carr gave an address on Philadelphia's Sesqui-Centennial celebration. It was all quite formal—and just as clear and distinct as if the speakers had been right in the room.

It didn't look like a club meeting, though. The members were sitting in comfortable chairs about a large homelike room, pleasantly furnished. There was a fireplace at one side of the room, a table at one end, and near this stood a mahogany tea wagon temptingly set with tea cups and a huge vase of yellow chrysanthemums. Some of the ladies were knitting, a group near the door were conversing in quiet tones, the whole scene looked like an afternoon tea of informal nature at which the "eats" had not as yet been served.

But there were three men present. One of these came forward at a few minutes to three, lifted one drop leaf of the tea wagon, fussed around a bit with his hands and stepped back. Almost immediately a man's voice was heard, apparently from nowhere—the voice of the editor of *Radio in the Home*—announcing that this was Station WIP, Gimbel Brothers, in Philadelphia, and that the president and chairmen of committees of the Philomusian Club were there at the studio and would broadcast their regular meeting under the auspices of this magazine.

All the formality was at the studio—even the applause after the speeches. At the club all was easy, informal, comfortable and cozy. Nothing interrupted the speak-

In the Philomusian Club house sat the members of the club about the beautiful mahogany radio tea wagon, through which they listened to the speakers at the club meeting held by radio. This photograph is by courtesy of Durham & Company, who furnished the tea wagon that afternoon

ers, yet if one member wanted to tell another that her hat was on crooked, or that it was good looking, or that she didn't like the one on the member across the room, she could do so, and did, without causing any flurry or uneasiness. Indeed, when the second of the men took command of the room and shooed the ladies up to group around the radio tea wagon for a flashlight picture, taken by the second man, they shooed obediently, took their places, gave involuntary little cries of shock when the explosion went off, and the speakers spoke calmly on, and nobody missed a word of what they were saying.

It was rather amusing—to the unassuming, etc., at least—to hear one of the speakers at this unique meeting say that Philadelphia was such an enemy to anything new! There wasn't anything newer at that moment than just exactly what was going on there and then, and Philadelphia is the first city to try it out.

The trial has certainly been a success, to judge by the enthusiastic remarks made about these meetings. There are so many obvious advantages, such as the publicity which always helps every organization except a secret society, the involuntary new membership campaign which this amounts to, the ease and comfort of the meetings. But there are many more which do not appear on the surface for your consideration of them. For example, it wasn't a particularly pleasant day, the afternoon of the Philomusian Club meeting, and there were not more than twenty members present. But there must have been any number confined to the house by slight colds, household responsibilities, etc., who could take just as active a part in the meeting by listening in over their own radio sets. And I don't doubt for a second that they were listening in.

"Well, of course," you may object, "this may be a wealthy club, able to equip its clubhouse with an expensive radio set. But ours is small and we have other things to use our money for."

That is all the more reason for you to make use of this means of advertising your club. Broadcast your needs of members, workers and money. Prove the good work you do by telling about it in a way that will reach many homes and lots of persons who would glance over your letter of personal appeal and throw it away. You don't have to have your own radio set. The Philomusian Club has no set of its own, the radio tea wagon was donated for the occasion. The Woman's Club of Chester, which broadcast a meeting the week before, is fortunate in having for its chairman of art and literature Mrs. H. Weston Taylor, whose husband is a radio fan. He loaned his big set and his services in tuning in for the afternoon of their meeting. Somebody among your membership must have a set which you could have for one meeting.

In some communities advertising in this way is really a necessity if the membership is to be enlarged to include a certain two classes of women. Just saying you have a wonderful club and do so much and have such good times will not convince them. The cry of one is, scornfully, "Women's clubs! Not for me! Just a lot of uninteresting women sitting around chattering because they haven't enough to do at home to keep (Continued on Page 38)

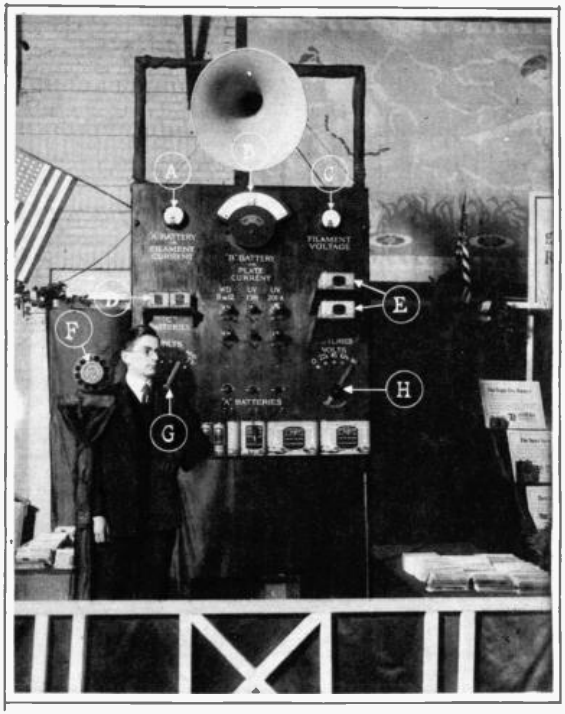
Mrs. Tull, president of the Philomusian Club, seated at the studio with the speakers gathered around her, and George Wentworth Carr, the special speaker of the afternoon, directly behind her. This picture was made in the studio of Station WIP

Radio in Surroundings It Deserves

In the home of Dr. William H. Bristol, at Waterbury, Conn., radio finds the kind of surroundings which this magazine has for some time been advocating. Here we have the radio set designed, built and installed in such a way as to be an integral part of the beauty of the home itself. We have no network of wires to gather dust nor do we have any of the usual careless looking job that has for so long a time made the woman of the home antagonistic to radio. Installed in this way, radio becomes part of the home furnishing and the woman of the house, instead of being antagonistic to it, becomes proud of it. Below is an exterior view of Dr. Bristol's home, above is an interior of the room in which the radio is installed, and to the left is a close-up view of the radio set.

Photo courtesy of the Bristol Company

The "C" Battery Cuts Down Your "B" Battery Expense



This panel used in proving the value of a "C" battery. This panel was seen at all the radio shows and the article which follows was the speech made by the demonstrator. The letters on this picture are explained in the text.

THE talk of a demonstrator at a radio show must be mighty good to induce a hard-boiled magazine editor to have stenographic notes made of it and print it. Yet that is exactly what I am doing here.

At the three radio shows this past month I was struck particularly with the interest shown by the crowds gathered in front of the exhibit of the National Carbon Company. This exhibit was a huge panel on which were mounted various measuring instruments, switches and bulbs. The demonstrator, F. T. Bowditch, stood in front of this and before him was the kind of microphone (F) we use in broadcasting stations. Above him was a horn and behind the panel was a power box so connected that he could speak in the most ordinary tone of voice and yet the microphone, picking up his voice, and having it amplified through the power box, threw it out of the horn so that it could be heard by all of the crowd in front of the panel in spite of the noise that went on at the different shows.

This talk given by Mr. Bowditch is the best lesson that I have ever heard for the novice in the use of the "B" battery and the "C" battery.

Let me say for the novice who knows nothing whatever about radio terms that he will find in this talk the words "volt" and "voltage" and the words "ampere" and "milliampere."

These are very easy to understand. Simply consider an electrical battery to be a tank or reservoir of water. Then, when you see the word volt, simply imagine that it means pounds pressure coming from this water tank, and when you see the word ampere or milli-ampere, simply consider that it means quarts or gallons flowing from this reservoir.

In other words, the volt is merely a measure of electrical pressure and the ampere is merely a measure of electrical quantities. The milliampere is one one-thousandth of an ampere. You need not bother to know how much an ampere is just so long as you understand that it is a comparison of the amount of electricity drawn from a battery and that voltage is the comparison of the pressure which is forcing the current along the wire.

H. M. N.

WE have here a panel designed to show you how to get the most out of your "B" batteries by showing the effect of different factors on the amount of current drawn from the "B" batteries in your radio receiving set. We will demonstrate particularly the effect of connecting a "C" battery in your set which of itself furnishes no current, but still makes your "B" batteries last much longer and improves the quality of your reception.

In the center of the panel we have mounted two each of the three most popular dry-cell receiving tubes, the WD-11 or 12, the UV-199 and the UV201-A. Immediately below each one of these tubes is a small knife switch, by means of which that tube can be thrown in or out of the circuits in our panel.

In the upper left hand corner of the panel is an ammeter (A), which shows the current furnished in the filaments of the different tubes by these "A" batteries at the bottom of the board. In the upper right hand corner of the panel is a voltmeter (C), which reads that portion of the "A" battery voltage impressed across those filaments.

On the two shelves at the right we have four of our 22½-volt Ever-ready "B" batteries in the new metal case (E). These batteries are connected in series to give ninety volts, and immediately below those shelves is a switch (H), by means of which these batteries may be connected in steps of 22½ volts into the plate circuits of any of the tubes. The current delivered by these batteries will be registered on the large illuminated scale

milliammeter (B) in the center of the panel at the top. That meter reads the current furnished by the "B" batteries to the plate circuits of the different tubes.

On the shelf at the left (D) we have two of our Ever-ready 4½ volt "C" batteries connected in series. Each of these batteries has a 3 and a 4½ volt tap, so that by using the switch just below the shelf (G) we can insert these batteries in steps of 3, 4½ or 7½ volts into the grid circuits of any of the tubes. By means of a third battery, a reversed, that is, positive "C" battery voltage of 1½ volts may also be inserted into these grid circuits.

The first thing we want to show you is the effect of the number of tubes you have in your set on the amount of current drawn from your "B" batteries. The more tubes you have in your set, the more current you draw from your "B" batteries and the shorter their life will be. Two tubes operating at the same plate voltage take just twice as much current from your "B" batteries as one tube takes, so that two tubes will run down your "B" batteries just twice as fast as one tube will.

One WD-12 tube at a plate voltage of 90 draws a little over 4 milliamperes from your "B" batteries while two WD-12 tubes at the same plate voltage take just twice as much, or almost 9 milliamperes. Two of these tubes will, therefore, run down your "B" bateries just twice as fast as one tube will.

The same thing applies to the UV-199 tubes. One UV-199 with 90 volts on the plate draws four milliamperes from your "B" batteries. Two UV-199 tubes draw twice as much, or 8 milliamperes; so that the more tubes you have in your set, the more current you are going to draw from your "B" batteries and the shorter their life will be.

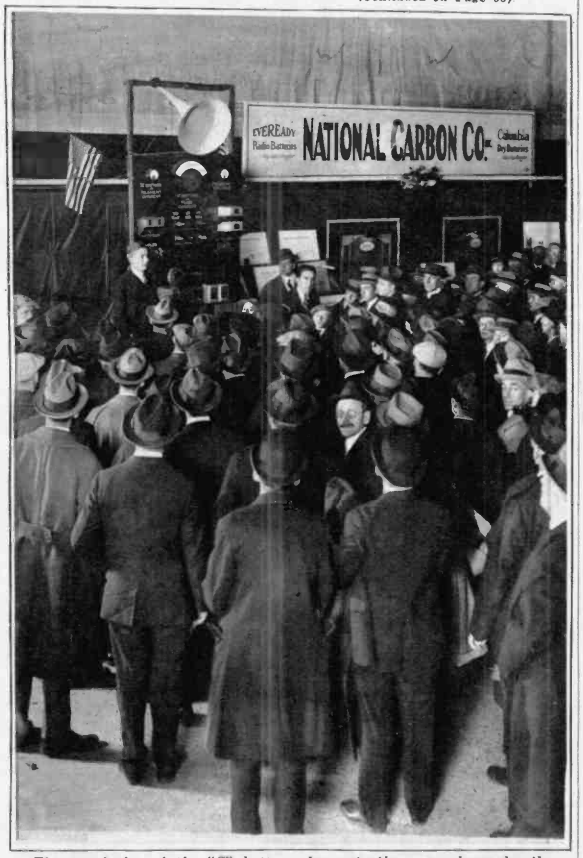
Now we will take the UV-201-A tubes. One UV-201-A at the same plate voltage of 90 draws 5½ milliamperes from your "B" batteries, while two UV-201-A tubes draw twice as much, or practically 11 milliamperes. Again we have demonstrated that the more tubes you have in your set the more current you are going to draw from your "B" batteries, and the shorter their life will be.

In passing, we wish to call your attention to the fact that these 201-A tubes are operated by Radio "A" dry cells—not a storage battery. You will find that it is more economical as well as more satisfactory to use dry cells for one or two 201-A's than a storage battery. If you have three or more 201-A's you will probably prefer a storage battery.

Another thing that affects the life of your "B" batteries is the kind of tube you are using in your radio receiving set. The more powerful the tube, the more current it draws from your "B" batteries, and the shorter their life will be.

We take one WD-12 tube, 90 volts on the plate, and we draw approximately 4 milliamperes from our "B" battery. We take one UV-199 tube at the same plate voltage, and

(Continued on Page 33)



The popularity of the "C" battery demonstration was shown by the crowds which were always gathered in front of the panel.

Largest Congregation in the World

(Continued From Page 19)

services, a man who could give his personal attention to the task of building up a great congregation and holding it together. The man must also possess a magnetism that could cross great distances of space and carry a deep religious message with convincing power. In selecting the Rev. R. R. Brown Mr. Fraser again proved the depth of his vision. Dr. Brown is paster of the Omaha Tabernacle, 2006 Douglas street, Omaha, and superintendent of the Western District of the Christian and Missionary Alliance, a world-wide interdenominational organization.

As a speaker, he has a national reputation. It is due to his efforts and his magnetic personality, that the radio church has reached its present size and scope.

What that scope is can be illustrated by the following telegram received by Station WOAW from Jack Barnesly, operator of the American Radio Relay League at Prince Rupert, B. C., Canada, who caught the message from Donald Mix, radio operator on the Bowdoin:

"Refuge Harbor, Greenland.

"Deeply appreciative of chapel service of Bethany Presbyterian Church, Council Bluffs, Iowa. Heard every word. Music excellent. Would appreciate special service for myself and men. We are frozen in the ice in schooner Bowdoin in North Greenland, eleven and a half degrees from North Pole."

(Signed) DONALD McMILLAN.

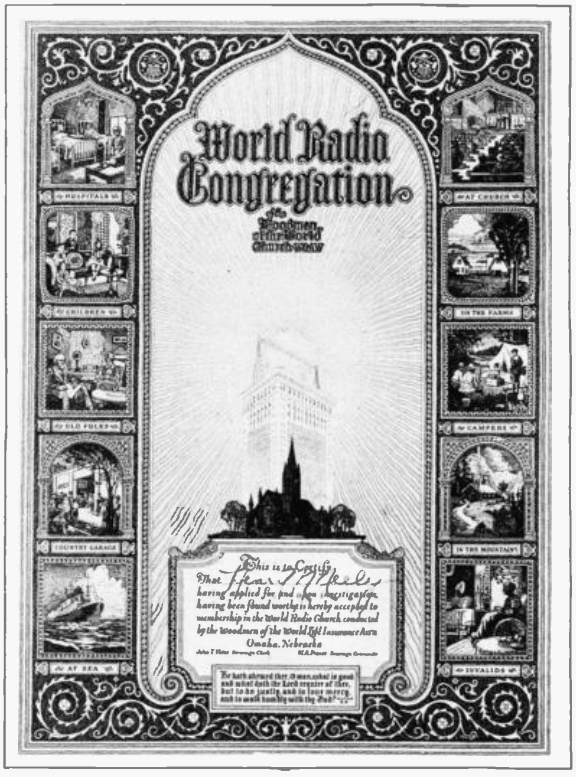
Woodmen officials wired Barnesly to ask McMillan by wireless to report on special religious services to be broadcast Sunday morning and evening from WOAW, dedicated to McMillan and his daring crew.

Thus the message of the radio church has penetrated into the frozen regions eleven degrees from the North Pole, giving this brave crew of explorers the spiritual comforts of a genuine church service, bringing to them the encouraging message of their distant fellowmen, and closing the gap of that mighty stretch of space between them and civilization.

But even in localities of so-called civilization there exist extreme conditions of isolation. To these places the services from Station WOAW bring a hopeful message. There are many cases, but lack of space makes it impossible to go into details.

However, in one case a congregation has been organized twenty miles from a church and thirty miles from a railroad station. In another small town, where a church was pastorless, a receiving set was installed and a regular attendance to the WOAW morning services was instituted. Firemen and railroad agents pass the lonely hours by listening to these services.

There are a lot of people technic-



The certificate given by Station WOAW to listeners-in who have become members of the largest church in the world

ally known as "shut-ins" who have found the radio to be a Godsend in their lives. From a letter written by a lady ninety years of age I quote: "I have been a complete shut-in with rheumatism, from all the privileges and pleasures of the outside world, and, being quite hard of hearing, I have not been able to meet with the people of God in over fifteen years: but I must say that last Sabbath I was permitted to enjoy a 'grand feast.' I sat down by the radio and listened. They were singing. I kept listening. Oh, how beautiful the music sounded! It floated into my listening ears from Station WOAW."

Another letter from Fort Madison, Iowa, from an inmate of a penal institution, states: "I assure you we enjoy the services, and often have requests from some of the men that they be advised when your services are being given. We enjoy hearing of the letters and messages you receive from aged and infirm people, and we speculate how wonderful radio must seem to those old people."

In fact, there is no limit to this phase of radio church services. I have personally read almost a thousand similar letters from all places and all types of people, all expressing appreciation and gratitude. Grocery stores, pool halls, cigar stores, garages, hotels, hospitals, telephone companies, penitentiaries and steamships are all places of reception. Cripples confined for many years, and even partially deaf people, have been helped by these religious services. Recently in Omaha a woman who had been almost totally deaf for thirty-five years placed her ear trumpet to the loud speaker and was surprised to hear clearly the sermon of Dr. R. R. Brown.

One outstanding fact in regard to the attitude of listeners to these church services may bear mention. The interest in these services has grown from one of mere curiosity to a sincere and profound devotion.

Darwinism has often been the casus belli between religion and science. Religion, it is averred, conflicts with science. But not in Mr. Fraser's opinion. He believed that science and religion should be mutualized, and by constructing Station WOAW in the most scientific manner possible he turned the trick. By the aid of expert radio engineers, using the best modern equipment, the Woodmen of the World radio station was so scientifically built that it is no wonder its warm religious services penetrate to the frozen northland in the region of the North Pole.

Let us now visit the studio of WOAW. It is in this room that the artist plays her music, or the speaker gives his oration, and it is this room on which depends the success of the station and the quality of that which is broadcast.

This room must be so designed that there will be no reverberation either from the walls, the ceiling or the floor, so we must put a protection, or sound insulation, over the walls, ceiling, floors and windows. We do this by stretching cotton flannel (woolly side out) one-half inch from the walls and ceiling. Over this we stretch a layer of velvet (pile out) over the walls and ceiling. The windows must be heavily draped, the lighting fixtures covered with silk, the chairs must have slips and the piano should be heavily scarfed.

The reason for this may not be apparent to some. However, when you take into consideration the fact that every sound produced in that studio is amplified sometimes as high as 9,000,000 times, you can easily perceive that any reverberation or echo alone would reach the proportion of a cannon roar, and so would have a tendency to spoil the true quality of any music produced within the room.

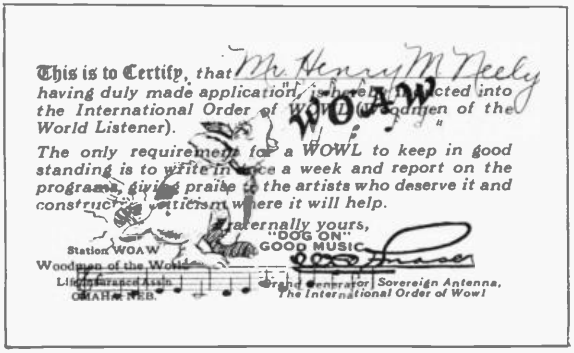
As an illustration: Those of you who have ever been in a cave or deep well, or cistern, or tunnel, or large auditorium will know that if one shouts to another the echo thus started will make it practically impossible to understand what the person was trying to say who was shouting.

Thus, the acoustic character of the studio is entirely reversed in principle to the acoustics of churches, theatres and forums. When one speaks, the voice sounds flat and dead. This was an obstacle for the church services, as it often takes the heart out of a performer to hear these dull quality tones. But it was by this non-reverberating condition of the studio that it became possible to send out into the world the human voice charged with all the original fire and magnetism of its speaker. It was through this deadness that the words were given life.

Science thus contributed to the task of spreading the gospel. The unique factor in these sacred services is that they are broadcast direct from the scientifically and chemically treated studio of station WOAW. There is no remote control as in the case of religious services broadcast by many other stations in the United States.

The sleeping giant is publicity, or, rather, *was;* because the Woodmen of the World have awakened him. When the first radio wave rushed forth upon the ether from WOAW on the memorable night of April 2, no one really dreamed of the immense amount of reaction it would create.

But the "boomerang" has been terrific. When I speak of boomerang, however, I do not mean an unwelcome come-back. It was something wished and hoped for. During the early days of broadcasting, a force of ten telephone girls, fifteen typists,



The membership card given to listeners-in who write to Station WOAW. This card makes them members of the WOWL's—the Woodmen of the World's listeners

half a dozen stenographers and numerous other general employes were necessary to cope with the enormous volume of communication by telephone, telegram and mail.

In several months over three hundred thousand pieces of mail were sent out from the Woodmen of the World headquarters relative to the broadcasting station.

Shortly after the commencement of WOAW programs, the insurance organization started publication of "The WOAW Radio Bulletin," a newsy, four-page paper which was to be sent every two weeks to all radio fans who wrote for it. But, when more than 100,000 requests had been received in a short while, and others kept pouring in steadily, the executives of the Woodmen of the World decided it was inadvisable to carry out the intended general distribution of the Radio Bulletin. Too much "overhead"! Consequently, this neat, interesting publication is now confined to a 5000 circulation and is mailed out semi-monthly, containing two weeks' programs in advance, as well as pictures of the various artists and brief descriptions of their work and professional careers. It is distributed to newspapers, magazines, public institutions and more than 3000 artists who have contributed to WOAW programs.

Certainly you must give the public what it wants. In the long run the public knows best. As judged from the experience with the Radio Bulletins, Mr. Fraser knew that the public wanted something from WOAW more tangible than songs, stories, speeches and instrumental selections.

So, every person who had listened to at least three church services and who wished to become a member of the Radio Church of the World, writing to the Woodmen of the World, received a beautiful certificate of membership. This certificate was a genuine work of art designed and drawn so that it would be suitable for framing and hanging in any home. And it proved a popular souvenir. More than 21,000 of these certificates have been presented.

But affiliation with Station WOAW's Radio Church was inadequate in many ways. There were thousands of fans who did not belong to the church who wanted to affiliate with the station in appreciation of its nightly programs, especially its dance affairs; for every Friday evening was official dance night for Station WOAW. The radio dance craze became so popular that dance-hall managers were writing to WOAW offering substantial sums of money to arrange dance programs at special hours. But WOAW was not a capitalization scheme.

For these dance hounds and jazz panegyrists, it organized the WOWL CLUB. The WOWL CLUB signified a "Woodmen of (the) World LISTENER."

The entire country was divided into Antennas. Each Antenna had a regular set of officers, on a descending scale from Grand Oscillators, Galenas, Generators, Crystals, "Mikerophones," to ordinary Wowl's. Membership cards, signed by W. A. Fraser the Great Grand Generator of the International Order of WOWLS, were sent to each individual who expressed a desire to become a WOWL. It was the duty of a WOWL to report weekly to the station.

So popular did this organization become that it was necessary to form a Junior WOWL Club for youngsters under twelve.

In this way through the Radio Church Certificates and WOWL Club cards, WOAW succeeded in making thousands of individuals feel that WOAW was as much *their* station as it was the Woodmen of the World's. From the reports and letters of these affiliated fans it learned just what the public wanted or did not want. And it built up a mass of followers to such an extent that when the Buffalo Register recently conducted a voting contest to determine the ten most popular stations in the country, WOAW was on the list. This achievement in little more than six months' time is truly remarkable.

It would be an anachronism to say that WOAW is putting Main Street on the map; but it is absolutely conceded that it is putting the small town on the air. It is fast dispelling the idea that Main Street is the small, provincial self-centered "hick" town that Sinclair Lewis spanked across his knees in his famous novel, "Main Street."

One hundred and forty towns within a radius of one hundred and twenty-five miles of Omaha are broadcasting programs from WOAW in a splendiddly successful manner. Towns like Council Bluffs, just across the "Big Muddy" Missouri; Fremont, Lincoln, Clarinda, Iowa; Grand Island; Shenandoah, Iowa, and hundreds of others have been giving the world a surprising quality of music, good humor, vocalizations and orchestrations.

Some of the performances of Main Street talent rank with the best put forth by Chicago, New York or San Francisco, and any time you visit the WOAW studio at Omaha, Nebr., they will show you letters from New York, Philadelphia, St. Louis, Pittsburgh, San Francisco, Toronto, New Orleans and the far-off Hawaiian Islands to prove this. In fact, WOAW is the pioneer station to feature extensively the small towns.

While exploitation in a commercial manner is not a primary purpose of this station, it is proving a big business boomer in many indirect ways.

Thousands of copies of public songs featured by this station have been sold. Professional musicians who have performed for this station are always in demand. The city of Omaha itself has through this station, received publicity on a scale never before known. People have obtained employment through the announcements from this station. Much interest has been displayed in the programs by amateur talent in Omaha. This station has been instrumental in placing many of these amateurs who have contributed to the station's programs on a professional basis.

It often happens that an insurance prospect is landed by means of the radio station. I quote one letter as typical:

"Honorable W. A. Fraser,
Sovereign Commander, W. O. W.

The District Attorney of Pima County, Tucson, Ariz., requests that I advise you that as a result of listening to an address you made over the radio a few days ago, he has joined W. A. Fraser Camp, No. 111, Tucson, Ariz., taking out a twenty-year pay $3,000 policy. This gentleman's name is Sov. Mathews, of Tucson, Ariz. Splendid work, Mr. Fraser, keep it up!

G. E. McDONALD,
State Manager."

All this business comes by means of this great air medium, which promises to extend its field considerably in this direction in the future.

At present the station is on the air daily four hours, from 6 P. M. to 8 P. M. and from 9 P. M. to 11 P. M., central standard time, on a 526-meter wave length. Wednesdays it is silent. Sunday its hours are 9 to 11, both morning and evening.

Its schedules are booked far in advance, often three months, in spite of the regular four-hour schedule. Its programs are always sufficiently varied to prevent monotony. The hot

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The "C" Battery Cuts Down Your "B" Baltery Expenses

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again we draw about 4 milliamperes from our "B" batteries. These two tubes are about the same.

Now we take one UV-201-A tube at the same plate voltage of 90, and instead of 4, we are drawing approximately 5½ milliamperes from our "B" batteries. The UV-201-A is a more powerful amplifying tube than either one of the first two tubes we tried, and therefore, it draws more current from your "B" batteries.

Now, the thing that probably has the greatest effect on the amount of current taken from your "B" batteries and therefore on the life of those batteries, is the value of the "B" battery voltage you are using on the plates of your tubes. The higher the plate voltage, the more current you draw from your "B" batteries and the shorter their life will be.

We have here two 201-A tubes operating at a plate voltage of 22½ volts and we are drawing about 1 milliampere from the "B" battery. We now double the plate voltage to 45 volts and we see that the drain on the "B" battery has increased from 1 milliampere to 3 milliamperes. In other words, we double the voltage, but we treble the current. We will now double the voltage again raising it to 90 and the current increases from 3 milliamperes to about 11 milliamperes. In this case by doubling the voltage we have almost quadrupled the current.

In any case, raising the "B" battery voltage increases the current drain to a disproportionate extent. Therefore, the higher the voltage you use on the plates of your tubes, the higher the current you are drawing from your "B" batteries, and the shorter their life will be. You always want to operate your tubes at the lowest value of plate voltage that will give you the results you want. If you use a higher value you will simply run down your "B" batteries that much faster.

However, it is often desirable to operate your amplifying tubes at a high plate voltage in order to get sufficient volume to operate a loud speaker. Now I will show you how this can be done without drawing such a heavy current from your "B" batteries as we have just shown here.

You do that by connecting a "C" battery into the grid circuits of all your amplifying tubes. This battery puts a negative bias on the grid with respect to the filament, and while it furnishes no current itself, it greatly reduces the "B" battery current drain, and improves the quality of your reception.

Here we have two UV-201-A tubes with 90 volts on the plate and with zero grid bias, which is the condition obtaining in radio receiving sets operating without the use of a "C" battery and without utilizing the voltage drop in the filament rheostat as a bias, and we are drawing almost 11 milliamperes from our "B" batteries.

Now, suppose we leave the plate voltage the same, but simply insert a "C" battery of 3 volts (G) in the grid circuits of our tubes; and we see that the drain on our "B" batteries drops from 11 to about 6 milliamperes. Merely by the addition of a 3-volt "C" battery, we have practically cut our "B" battery drain in half, and, therefore, almost doubled the life of these batteries.

We can carry that still further, and use a "C" battery of 4½ volts, and now our "B" battery drain is only 4½ milliamperes. While if we use a "C" battery of 7½ volts, we only draw two milliamperes from our "B" batteries; where with zero grid bias and the same plate voltage, we were drawing practically 11 milliamperes from these batteries.

Therefore, if you want to operate your amplifying tubes at a high plate voltage, be sure that you connect a "C" battery into the grid circuits of those tubes; and thereby you will not only greatly increase the life of your "B" batteries, but you will greatly improve the quality of your reception through the reduction of distortion. As I mentioned before, the current drain on your "C" battery is practically nothing, so that it will outlast any of the "B" batteries in your set in addition to greatly prolonging the life of these batteries.

Now I will show you the result of putting a *positive* bias on the grids of your tubes, which you could do in either of two ways. First, the "C" battery might by mistake be connected backwards with the positive end next to the grid; or second, you might bring your grid return back to the positive "A" battery terminal, in which case the positive bias on your grid would be equal to the voltage of the "A" battery. With 201-A tubes this might be as much as 6 volts.

On our panel here we have our two 201-A tubes with 90 volts on the plates and zero grid bias, drawing 11 milliamperes from the "B" batteries as before. We put a positive bias of 1½ volts on the grids of the tubes and the drain on our "B" batteries rises to 14 milliamperes, an increase of 3 milliamperes in the current which must be furnished by these batteries.

Now, detector tubes almost always operate with a slight positive bias on the grid which is obtained without a "C" battery by connecting the grid return of the detector tube to the positive terminal of the "A" battery. The amount of positive bias obtained in this manner is determined by the value of the grid leak which is connected to the terminals of the grid condenser. With a grid leak of 2 to 5 megohms, the average amount of positive bias is about 1 volt.

Never use a "C" battery on a detector tube, but on all your amplifying tubes operating at high plate voltage be sure to bring your grid returns back to the negative side of the "A" battery with a "C" battery included in the grid circuit.

NOTE—Most readers know that, in audio-frequency amplification, there is an "F" or "A" binding post on the secondary of the transformer, which is wired to the minus or negative side of the filament or "A" battery. To insert a "C" battery, open this lead, connect the minus of the filament or "A" battery to the positive of the "C" battery and connect the negative of the "C" battery to the post on the transformer. In the article on "A Two-Step Amplifier," in our November number, there was a mistake in this connection; we showed positive "A" connected to positive "C." It should have been negative "A" connected to positive "C."

H. M. N.

Largest Congregation in the World

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summer weather did not cause this station to cut down its programs; and it was one of the few stations that continued on full schedule.

Its relations with unions, music publishers and other stations is of the most cordial kind. The personnel of the station consists of men who have vision and practical experience. It cannot help but continue to succeed on an ever-increasing scale.

Radio~It's Influence and Control

By WILLIAM N. SHAW
President of the Eisemann Magneto Corporation

IT WAS only about three years ago that radio, as the public knows it today, was started. For some time previous, the amateurs had been communicating by radio, but the public in general has had this advantage for only a short time.

In this remarkably short period, radio communication has developed as no means of communication has ever developed before and we have now reached the point where the human voice can be heard almost around the world.

It behooves us to stop and consider what is the effect of this enormous power. Is it for good or is it for evil?

Of course, the fact that one man can speak and be heard by a million of his fellow men gives to that man a tremendous power.

This was illustrated recently during the short visit of David Lloyd George to this country. It is probable that, during the history of the human race, no other man has swayed more people by his voice and it is impossible to measure the tremendous influence he exerted upon the American people through the broadcasting of his speeches while in this country.

As the state of the art now stands, a broadcasting station can be built for $15,000.00 and can be maintained for less than $1000.00 a month. These figures, of course, apply only to the electrical equipment necessary for the work and exclude the cost of the artistic studios and the extravagances that usually go with them.

As the law stands now there is little or no difficulty in obtaining a broadcasting license and, therefore, it would appear that any person, or corporation, for a moderate outlay, can embark in broadcasting and thereby be in a position to talk to an audience of from one hundred thousand to a million people.

IS RADIO broadcasting on a permanent basis now? If it is not, is it possible for us to envolve some plan by which it can be made permanent and satisfactory? There is probably no question before us today that is of more interest and importance than this one and it involves the broadcasting station, the manufacturer and dealer, and the whole great army of listeners-in.

It is a complicated question and a complex one. No one plan has yet been presented which seems to solve all of the difficulties and I am afraid it will be some time before such a plan can be perfected. Meanwhile, however, it is important that all phases of the question be adequately presented by those who are in a position to have their ideas considered as authoritative and I shall be very glad to print from month to month articles such as this one from the pens of men of such undoubted standing as Mr. Shaw.

Mr. Shaw's opinions are founded upon a long merchandising career and a close study of all phases of this subject. I am frank to say I do not agree with all of his points; I have my own ideas about the matter and Mr. Shaw will not agree with all of my points. However, it is well to consider every phase of every opinion and I am very glad to be able to present Mr. Shaw's ideas to the readers of this magazine. H. M. N.

It is desirable to stop and consider how broadcasting is being conducted today. There are at present about 562 broadcasting stations of various kinds in continental United States, of which approximately one hundred are class "B" stations, having an output of five hundred watts, which gives them a very broad range of distribution. By far the majority of these stations are conducted by firms or corporations which are doing it solely for the advertising advantages, although direct advertising is taboo.

This list includes radio equipment manufacturers, automobile manufacturers, dry goods stores, hotels, colleges, churches, etc., but it is a rare exception that a station is maintained solely for the good of the public.

If the advertising motive is to control broadcasting, it is reasonable to suppose that, in time, there will be such a large number of broadcasting stations and the output will become so permeated with advertising that the interest of the public will wane and only such stations as are best located, managed and maintained can expect to continue. The future of radio is dark indeed if the public must rely on broadcasting being maintained as an advertising medium only. It seems to be the universal experience that where churches have broadcast their services the results have been very effective. It has brought to the homes of a great many people the opportunity to hear noted speakers that they were unable to enjoy prior to broadcasting and the influence thus extended has been very great on the unseen audience.

Similar results may be expected when the colleges appreciate the importance of broadcasting and settle down to maintain a regular broadcasting service to their students.

The police departments of the various States and cities have not been slow to appreciate the advantages of broadcasting police information concerning the commission of crime and many are the instances of the quick apprehension of criminals by use of the lightning-like spread of information.

Politicians are waking up to the fact that broadcasting affords them a most powerful and effective method of influencing the public. In years past it has been really a physical endurance test for a man to run for office. By working night and day and speaking five and six times a day, in a period of about six weeks, he could cover his district, be it county or State. But by means of radio he can sit at home, or in a studio, and, quietly, without physical effort, talk and be heard by all of the people in his district who have the curiosity to listen in.

The foregoing is largely on the positive side of the question. But what about the negative side?

Here is a means of communication whereby any man, by the expenditure of a few thousand dollars, can get a perfectly tremendous audience to listen. He is not cramped in his style by the necessity of reducing his remarks to cold type. He has no restrictions on what he may say, as the newspapers are limited by thoughts of circulation and effect on advertising. He can go to any limit that he desires in what he says over the air and, if he owns his own station, no one can stop him.

When the framers of the Constitution guaranteed free speech to the citizens they could little foresee what the effect of free speech might be by radio, and *it is well within the bounds of possibility that the freedom of speech, at least by radio, will have to be curbed.*

To appreciate the hazards of the situation we have only to contemplate the action of the Federal Government in the event of a war with a first-class power. Think of the dangers to the state in having several million unlicensed receiving sets scattered over this broad land with the knowledge that many receivers have gained as to radio operations.

It would furnish spies of a foreign power almost unlimited facilities for conducting their work and would be a most serious handicap to the Nation in the conduct of war.

The great oustanding problem in radio today is, of course, *who shall maintain the stations and how shall they be controlled?*

In several of the foreign countries, the governments themselves have endeavored to control and to subsidize broadcasting stations and their efforts have not been successful from their point of view, and it has further retarded the development of the art.

It would be very unfortunate, with the limited knowledge the public has, if Congress should endeavor to pass laws governing the limitation or control of broadcasting, for the reason that the men in the industry most interested have a wide diversity of views as to what is best to them, and it would be almost impossible for Congress, with its limited time and many influences, to get a view that would not be detrimental to the industry.

The costs of broadcasting should be maintained by those taking advantage of the service, but the difficulty arises immediately as to how this can be done other than by voluntary contribution.

Various suggestions have been made and various expedients have been tried, such as the system in England, where every receiver pays a yearly tax of about $2.50, a proportion of which sum is given to the broadcasters. This method has not been altogether satisfactory for the reason that a substantial number of those who build their own receiving sets fail to report them and are, therefore, not contributing their share.

The manufacturer or dealer sells a set without any guarantee that broadcasting will be maintained and the public buys the set without any assurances and with only hope or faith that the broadcasting will continue. In settling this problem there are three parties

who, in their order of importance, are:

1—The public.
2—Broadcasting stations.
3—Radio equipment manufacturers.

The public is, of course, vitally interested and must be considered. The listeners-in must be given the kind of broadcasting that they want and at the times they want it. They must be given a variety which shall include educational and religious instruction, music and entertainment, news items and business information. This must be so arranged that adequate service is maintained to enable a receiver to obtain his choice simultaneously of the foregoing.

There must be a directing head that will collaborate and synchronize the various stations to obtain the results the public demands. This control must be absolute and must have in mind only the protection of the public.

The problem is large and cannot be solved immediately to the satisfaction of every one. Various organizations have attempted to meet the conditions in one way or another, but it seems elementary that broadcasting must be controlled, maintained and paid for and that this cost has got to be placed on the consumer.

One way in which the cost of broadcasting can be maintained is by the organization of a national association that shall be composed of all of the manufacturers, who shall pay into that association a sales tax, or a maintenance tax, of say one per cent of gross sales and, having agreed to pay such tax, such manufacturer shall be authorized to mark for identification all of his products with a symbol, which symbol to the public shall mean that the article so marked has paid its share of the cost of broadcasting, *and further that this article has met the electrical requirements that shall be laid down by either the Bureau of Standards, or some board created for the purpose.*

The sum so collected shall be paid over to certain trustees known as the NATIONAL BOARD OF CONTROL, who shall be charged with the responsibility of subsidizing such of the broadcasting stations as they see fit. These trustees shall have control of the substance of the broadcasting and shall have the final say on all matters pertaining to broadcasting.

It is, of course, of the utmost importance that a board having such power should be carefully selected and should be unrestricted in its operations.

It is suggested that the board shall be composed of ten well-known men, of whom four shall be direct representatives of the public, and shall be composed as follows:

1—Secretary of Commerce.
2—President of the Chaber of Commerce of the State of New York.
3—President of the Chicago Board of Trade.
4—President of the American Bankers' Association.

The remaining six members of the Board of Control shall be elected by the associate manufacturers, three from the manufacturing group, and three from the broadcasting group. This Board of Control should keep in close touch with the Radio Division of the Department of Commerce and could effect rules and regulations which would aid the Government immensely in the conduct of its naval and commercial radio communication.

The figures quoted above as to the possible minimum expenditure for operating a radio station were not intended as a guide as to what actual high class operations cost, as there is not an amount included in the figure for a bureau to manage the musical or literary work of the broadcaster, and it has been suggested that the proper cost of a high class operating station would probably be in the vicinity of $15,000.00 per month.

The sales tax, if comprehensive enough to cover the entire manufacture, would probably produce in the year 1923 the sum of $1,500,000.00 and it is believed that each year will show a substantial increase over this sum.

The reception of broadcasting is becoming so universal that if it were possible to organize a society along the lines of the Geographic or Red Cross the receivers would probably be only too glad to contribute $1.00 or $2.00 per year, which would give a very substantial increase to the funds available to the Board of Control.

Among the broadcasters there is a wide difference of opinion as to the number of stations necessary to supply the needs of continental United States and estimates as low as eighteen stations have been made as to the requisite number. As the quality of the receiving sets is being improved it is much more common for the maximum range under good conditions, to be from 500 to 1,000 miles than it was a few years ago. It would tend to prove that a fewer number of stations than the existing stations will serve the needs.

A receiving set that can call on four to six stations at will, with ranges up to 1,000 miles, seems to indicate that the number of stations required is not many.

Radiophonic communication will have a powerful influence in moulding public opinion, in spreading information and in policing the country and it is of the utmost importance that the best minds of the country should direct their energies towards controlling this influence for the public good.

Still Editorially Speaking

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by the particular price. Mr. Shaw points out a very logical way by which this star system could be placed at the disposal of the broadcasting stations without any undue tax on anybody's pocketbooks. All that it requires is that the radio manufacturers of the United States forget their present difficulties and their present differences of opinion and their present petty jealousies and their present attitude of suspicion one toward the other and get together into a body which is really determined to do something to place broadcasting on a permanent basis, even though that may require a certain amount of self-sacrifice from every member of the organization.

I think the most promising sign that was developed by the radio shows held during the last month or two was the general discussion of this very topic which went on among the better radio manufacturers and the very general expression of willingness to go along in the formation of such an organization if only some definite plan was evolved that seemed to promise practical results.

It is just now very much a question of organization. There was some slight talk of achieving the purpose through the National Radio Chamber of Commerce, but this talk did not go very far. The Chamber has never functioned very efficiently, and it has never really gained a standing of respect among radio manufacturers. It has been top-heavy and there has been a very general impression that the views it has put out have reflected a very small clique of minor manufacturers who do not in the slightest represent the larger interests in radio. I think it is safe to eliminate the Chamber as a possibility in doing

anything toward an adequate solution of this problem.

There does seem to me, however, to be one organization that has lately loomed up as a very promising meeting ground for all concerned. This organization was called into being by the demand of the owners of the copyrights of a great deal of music, who insisted that all broadcasting stations pay them a tribute every year for the privilege of using any music that was copyrighted by their members.

This Society has undoubtedly a great deal of right on its side. As the owner of many copyrights myself, I should very much resent any one calmly taking my own work and doing as they pleased with it. The copyright is a protection which any author or composer is entitled to and he is furthermore entitled to a say, as to how his products shall be used and how they shall not. I have no quarrel whatever with the Society so far as the right and wrong of this is concerned.

But I do very definitely disagree with them in their attitude on the financial end of the dispute. They are perfectly frank in admitting that they have no settled basis on which to pro-rate the demands they are making on various broadcasting stations, and they have admitted that their only idea is to charge according to their belief in the ability of the individual broadcasting station to pay. Their demands range anywhere from $5000 a year for such stations as are owned by the Westinghouse Company, General Electric or the Radio Corporation of America, down to $750 a year for the stations which are run by department stores, newspapers and so forth. Furthermore, they refuse to enter into any kind of agreement not to raise the fee next year and raise it still farther the following year. In other words, if they can get any station to pay a tribute this year, that station will thereby formally acknowledge its subservience to the Society and the Society can then continue putting on all that the traffic will bear financially.

In my own view, the Society is very short-sighted, for nothing will do more to sell the copies of their own compositions than radio, but they are the owners of the copyright and they have the right to decide for themselves.

Their short-sightedness and the weakness of their stand is proved by the fact that many of their own members are bitterly opposed to having any quarrel with radio. As director of a broadcasting station, I have had offers from two of their best-known and powerful member music publishers to furnish me all the attractions I want for broadcasting with full release of copyright. These companies are doing this because radio has boosted their sales more efficiently and more cheaply than any other medium they have ever had. I am using one of these companies regularly for my dance and dinner music programs from Station WIP. Station WDAR is using the other in the same way.

All of this is, however, beside the point. The point that I want to make is that, when these demands were first made upon the broadcasting stations, a number of the larger stations got together and formed the National Association of Broadcasters. Headquarters have been secured at 1265 Broadway, New York City, and these headquarters and the work of the organization are in charge of Paul B. Klugh, as executive chairman.

This organization has now been functioning for some time, and I have watched it as carefully as possible. My reaction is altogether favorable. It seems to me that Mr. Klugh is proving himself an unusual man in an unusual job, and I consider him capable of carrying the job still further in an unusual way if he is given any kind of support.

Mr. Klugh has faced much this same situation in two other industries. He went through it with the piano manufacturers and with the music-roll producers.

In both cases his organization leadership resulted in wiping out petty jealousies quite as violent as those in the radio business today, and his consolidation and mobilization plans brought order out of chaos.

It seems to me that the Broadcasters' Association is an organization already functioning, and functioning very efficiently, to which the manufacturers and all of the rest of the broadcasting stations can very logically ally themselves.

If there should be any objection, on the grounds that this association is in an association of broadcasters and that manufacturers should have their own association, I can only say that in facing this particular problem the manufacturer must realize one thing—*his business absolutely depends upon the broadcasting stations. The moment the broadcasting stations close down, his business closes down. The moment the broadcasting stations decrease in their efficiency the manufacturer's business will decrease. The moment the broadcasting stations increase in efficiency and increase the number of listeners-in, the business of the manufacturer increases with this.*

Broadcasting is the heart and soul and life-blood of the radio business,

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Every now and then an editor runs across a real genius in the publicity of some big corporation. Not often—but every now and then. Above is a photograph which came to this magazine with the following caption:

"Miss Helen Kearns, of 29 James Street, Newark, N. J., who is employed in the offices of the Western Electric Company's Kearny, N. J., works, acquired greater speed in taking dictation by writing in shorthand speeches she heard while listening in to radio-broadcast programs.

"Miss Kearns avers that this kind of practice in shorthand writing offers excellent opportunities to increase speed in stenography and to accustom the stenographer to varied styles of delivery of speakers."

When we first saw the photograph on the editorial desk, we did not think it really represented radio in the American home, but, as we examind the picture more closely, we saw on the table beside the young lady a copy of this magazine and of course we simply had to use the photograph. The publicity man who had that photograph taken is certainly some genius.

Photo courtesy of Western Electric

An Ideal Circuit for the Ducon Plug

(Continued From Page 23)

calls heard reads like a Broadcast Directory, so I won't name them all, but here are a few I get every time they are on the air:

"WEAN, WJAR, WSAD, WNAC, WBZ, WMAF, WGI, WEAF, WGY, WJZ, WJY, WHAZ, WMAK, WOR, KDKA, WLW, WRC, WDAP, KOP, WBCD, WOC.

"Many others, but would take too long to write them."

Incidentally this circuit gave me my first real opportunity to test a new variable condenser which has just been put on the market by the Garod Corporation of Newark, N. J. I am showing this condenser in the photograph, and the reader will at once notice the difference in appearance between it and the usual type of variable condenser.

This Garod condenser is about as free from losses as it is possible to make a condenser at the present time.

It is not necessary for you to understand just exactly what these losses consist of. Scientists have very long names for them and very complicated explanations of what the losses do.

All you need to know is this: If you have a condenser which is poorly made and in which there are excessive losses, very much of your signal strength is absorbed in this condenser and only the remainder of it is left to give you the signals in your telephones or loud speaker. If you have a condenser made like this Garod condenser or a Kellogg or a Chelten or any of the better ones on the market, there are virtually no losses in the condenser and all of the signal strength is diverted to your circuit and operates in the phones or loud speaker, where you want it.

While it is true that the price of radio apparatus is not an absolute standard by which to judge its efficiency, the fact remains that it is impossible to build a good variable condenser and put it on the market for one or two dollars. It simply cannot be done at the present time.

If you could only put a cheap variable condenser in a circuit, make a thorough test of it and measure the signal strength, then take the cheap condenser out and put in a condenser of good make and then measure the signal strength you get with that and the distance which it reaches, I think you would from then on spurn all offers of the silver-tongued salesmen and would insist upon waiting until you could afford the very highest class of apparatus in putting a radio set together rather than waste your money, your time and your patience on the stuff that is put out by the gyp and the cut-price stores.

This circuit uses the Kellogg variometer, which has the windings between the rotor and the stator already split. As you buy the variometer it is virtually a variocoupler. To change this into a variometer, a jumper wire is necessary between the rotor and the stator, but to use it in this circuit it is not necessary to place the jumper wire, as we use the windings separately. The variable condenser is a 23-plate, having a capacity of .0005.

This circuit requires one tube socket. This is just the detector tube that we have shown here on our panel. This socket may be either the General Radio Company or the Na-Ald, made by the Alden Manufacturing Company. The grid leak and condenser is the well-known Durham variable grid leak in conjunction with the Dubilier fixed .00025 condenser.

This circuit works best with the UV200 detector tube. It may also be worked with the UV199 or the WD12 tubes. I do not believe that there is another detector tube on the market as good as the UV200, and if you wish to get the best results with this circuit I would advise using the UV200 tube.

You will notice in the wiring diagram that we do not use a ground connection. All of our reception is done either on the antenna alone or on the ground alone. When you are using an antenna you disconnect your ground. Almost anything will do for an antenna. Mr. Goodreau, the inventor of this circuit, states that he gets Schenectady, 200 miles away from his home, on a gold pencil which he uses for his aerial. He gets Chicago, 900 miles away, on a bedspring, and on an antenna which is about fifty feet long and ten feet high he reaches WOC, which is Davenport, Iowa.

This circuit is very sensitive, as you can see from the results which Mr. Goodreau has had with it. It is not absolutely necessary for you to have an antenna. If you can make a good ground connection, just disconnect your aerial and put your ground connection where we show the aerial and you will have the same results which you had with the aerial.

There is nothing tricky about this circuit. The antenna post comes in and goes to one side of the variometer and the center tap on the variometer—that is, the one which connects the two halves of the stationary windings together—is one terminal to the 23-plate variable condenser. The aerial post goes to the other side of the 23-plate variable condenser.

There is no connection to the other side of the variometer—that is, the opposite half of the windings—and the only connections to the stationary windings are the beginning of the winding on one side or one-half of the variometer and the center winding of that half. The other end winding is left free and the rotor is connected one side to the plate on the detector tube and the other side to the telephones. The grid connections are made from the antenna post over through the grid leak and stopping condenser to the grid of the tube.

The positive side of the filament battery is connected to the movable plates of the variable condenser, which is also connected to the center tap of the windings on the split variometer.

You will notice that we use the little Chelten midget vernier condenser for our fine adjustment. If, however, you are using the Kellogg variable condenser, which already has the vernier attachment to it, it is not necessary for you to include the Chelten midget. This circuit tunes very sharp, and it is necessary that you have a vernier condenser to bring in the stations at their maximum strength.

In building this circuit you require one panel, which is either hard rubber or bakelite, 14 inches long, 7 inches high and 3-16-inch thick. This size panel gives you ample spacing without crowding any of the instruments which you wish to mount in this circuit.

The photographs show the front view of the set. In the left-hand corner we have a dial for the variometer and the next dial is for the variable condenser. Between these two and a little above them we show the small Chelten midget condenser and to the right of this we have the rheostat. This rheostat has a resistance of 30 ohms and is made by the Carter Electric Company of Chicago.

Over on the extreme right-hand side of the panel, in the center, we show two Eby binding posts. These binding posts may be either for the telephone connections or for the connections which would go to a two-stage audio frequency amplifier. The binding post in the upper left-

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them busy. I'm not so hard up for entertainment as all that, and when I am I'll choose my own club; there's too much democracy in some of these places to suit me."

You cannot make them believe that there is anything worth while in club life. They have made up their minds that it is nothing but an excuse for some women to get out of their homes, a free tea for others, a chance to gossip all afternoon to a third group. That's their story and they stick to it.

The other class is just as scornful, but will admit that the club does some good.

"Oh, yes," they say magnanimously, "of course those women do good work. They are very useful and helpful, and they take up matters that need attention badly. No doubt they have a great deal of influence in the town. But you don't meet anybody you know at those places. None of my friends belong; we feel that we do our work through the church, and we could not possibly take an interest in the social side of the club, as we do not know any of the women who belong; they have nothing to give us, we have nothing to give them."

The only way to prove conclusively to these two groups that they can find what they want in the club is to show them. And how can you show them, if not by radio? They will not come to your meetings, they will not believe your talk, they will not read your letters.

The only thing to do is to "get them right where they live." If they won't come to the club, you take your club to them in their own homes. Give your play at the studio the week before you present it on the stage. Have an evening of music by talented members, readings by others. Let these skeptical women hear the report of a month's work, and see whether they still think you can chatter and drink tea all afternoon and manage to get so much done besides.

Arrange talks on various topics of the day, debates, open discussions, for the benefit of those who look down upon clubwomen. Let them hear with their own ears that women of culture, refinement, education and dignity make up a great part of your membership.

After all, it really is the exceptional person who isn't "from Missouri," who doesn't have to be shown, in order to be convinced. You go to your club meetings week after week and talk every time about how cute and precious and unbelievably sweet your baby is, but none of those women who have cute babies of their own will accept your enthusiastic words as truth until you have invited them to your home and shown them your baby. Then probably they'll tell other women and you'll have them stopping in to see for themselves and break up the routine of the baby's day. They will all be convinced because they have seen. You cannot broadcast a baby, but you can send a club meeting or entertainment through the air to reach the homes of scoffers who think that it's just because it's yours that you are so crazy about it.

And speaking of entertainment, why wouldn't the radio be a good medium for long-distance Reciprocity Days? Of course, when your guests are local, it is nicer to entertain them by inviting them to your clubhouse and having your day there. But it would be fun and it would make for a closer and firmer national bond to entertain a club from another city.

Now this would be impossible in some cases. If, say, a Philadelphia club decided to call a Chicago club its guest for one evening, it would be —well, no Philadelphia club would do such a foolish thing.

But it would be perfectly possible for that Philadelphia club to get up an evening of entertainment, a play, a musical program or a miscellaneous performance and arrange to have it on the date of a meeting of the Chicago club. A courteous note from president to president would inform the Chicago club that the Philadelphia club desires the honor of its presence around a radio set on such and such a date, when it will be entertained by a program by the members of the Philadelphia club, given specially for the Chicago club. Regretting that it is not possible to come face to face, but hoping that the entertainment will be accepted and considered as a personal courtesy, as nearly as possible on the order of a Reciprocity Day, in spite of the fact that the general public is also invited to listen in, and remaining, very cordially—

It goes without saying that the Chicago club would just about break its neck working up its "talent" to a point at which it would feel able to return the compliment. Wouldn't that make splendid cross-country feeling, create a warmth of sympathy and friendship that would make the national conventions even more powerful and more harmonious than ever?

And to get grossly material, one joy about this kind of entertaining of a friend is that it doesn't cost a cent for the "hall." Even the best regulated clubs have to consider that. And no food is needed, either. Both expensive and important items.

Now that the brand newness of the radio club meeting has worn off a little, it's up to somebody to make another sensation. A party at which hostesses and guests are separated by half a continent, or at least a few States, ought to be remarkable enough to last for a while at least. Who's going to be the first to try it? That's the important consideration—to be the first to do it.

That, and the feelings of the Unassuming, Writing Sort of Person, who, as soon as she hears that some club is going to do this, will place her hat upon her swelled head, rush hurriedly to some broadcasting studio and shout to all the world once more, "I told you so, clubwomen!"

* * *

I Told You So, Clubwomen!

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THE RADIO-CLUB-MEETING FROM THE STUDIO

By C. H. VAN HOUSEN

"S-S-S-S-H! All quiet, please! Now, Mrs. Tull! All ready!" And the editor of *Radio in the Home*, officiating at Station WIP, turned to a small black metal box hanging on a central pillar of the studio and snapped a button. A round red eye instantly glowed near the top of the box, a signal that the meeting was "on the air," as the radio operator's slang has it. A dead silence settled over the room, and then, calmly and as serenely as if she were seated at the speaker's table in the club rooms, Mrs. Tull addressed herself to the microphone, introducing to the

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High School Clubs Hold Logging Contest

The first of a series of radio entertainments under the auspices of the Interscholastic Radio Association was given recently from Station WIP, Philadelphia, by the Germantown High School Mandolin and Glee Club and by the West Philadelphia High School Symphony Orchestra. The above photograph shows the Mandolin and Glee Club of the Germantown School, taken just before they broadcast their concert. These broadcasts, being held twice a month, alternately between Station WIP, Gimbel Brothers, and WDAR, Lit Brothers, are proving among the most popular features of Philadelphia radio entertainment

IN A logging contest in the Philadelphia district, run under the auspices of the Interscholastic Radio Association of America, John F. Worman, of Abington High School, the winner, logged stations in forty-five different cities on the continent. He traveled a total of 22,500 miles for the cost of an efficient receiving set. The remarkable thing about this feat is the fact that John is only sixteen years of age and has had only one year's radio experience.

He lives in Fort Washington, Pa., and attends Abington High School. He is only one of the thousands upon thousands of boys in similar circumstances—all of them high school boys, all radio enthusiasts, and all working to advance the science of radio. The high school boy made radio, and it is through him that radio will be advanced in the future.

The contests took place November 19, 20 and 21 between the hours of 7:30 P. M. and 3 A. M.

The winners in the contest are as follows:

	Stations
One-tube sets—	
1. Wesley Bolan, Abington High	31
2. Louis Wolf, Frankford High	30
3. Simon Fahrer, West Philadelphia High	30
Two-tube sets—	
1. Bernard Elfman, Central High	26
2. Charles Patterson, Abington High	18
3. Louis Oddy, West Philadelphia High	15
Three-tube sets—	
1. John Worman, Abington High	45
2. Charles Hacken, Northeast High	18
3. Walter S. Beck, Abington High	17
Larger sets than three tubes—	
1. Edward Kieper, Swarthmore High	25
2. Lloyd DuBois, Northeast High	19

The standing by schools is:

One-tube sets—1, Frankford High; 2, Abington High; 3, Central High.

Three-tube sets—1, Abington High; 2, Northeast High; 3, Frankford High.

The data accompanying these results serve a dual purpose to the executives and the engineers of the Interscholastic Radio Association of America. They serve primarily to determine the winners, which will be only a temporary service, and secondly to form a basis for a very exhaustive study, which will be a permanent and authoritative record for the coming generations of high school boys.

In studying the data, the judges discovered only four factory-made sets were used by the long list of contestants. This means that most of the sets were home built. The results of this intensive study will be tabulated and rated and kept as permanent records for use by the Interscholastic Radio Association of America.

Every radio fan knows how valuable such records will be. The data as to apparatus and materials used in the contestants' sets will serve as standards of comparison in making purchases. Nearly every radio enthusiast has been deceived in at least one purchase of radio goods and many costly mistakes have been made. All from the lack of proper education along the lines of radio merchandising. The Interscholastic Radio Association of America will endeavor, through these con-

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tising rather than through direct statements the impression has spread that a good radio set should bring reception from coast to coast without the slightest difficulty in tuning in and with reproduction that compares favorably with the Victrola. Any one in radio knows that this is not true. The manufacturer who attemps to give this impression or who permits his advertising by implication to give this impression is simply throwing a boomerang into the air, and it is likely to haul around and come back and bump him on his own bean.

I hear many people say, "I want a radio set that will give me the local stations perfectly. I do not care anything about distance." And my answer to them is invariably something like this:

"All right; any standard set will give you the local stations perfectly. But you are totally wrong in thinking that distance is a matter of no importance to you. It is not now, I will admit. But I venture to predict that you will not have your set one week before you will be cussing the local stations for 'hogging' the air and demanding a silent night every week so that you can hunt for the most distant points of the compass."

These people usually smile then in a very superior way and say: "No, you are wrong. What I want is good music. I am not a radio fan and never will be."

And then I say: "All right; you are about the one millionth person of your kind whom I have met and it always amuses me to meet your kind about a month after you have your set. I will give you thirty days to twist your dials and then I am willing to bet that you will meet me some morning and the first thing you will do will be to give a hurrah and tell me that you received eighteen stations the night before on the loud

Some Plain Truths About Radio

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speaker and fourteen others on head phones at three o'clock in the morning and some of them were so many thousand miles away."

And the best thing about radio is this; once this enthusiasm grips the novice, it does not matter how bad the actual reproduction of the music or the voice is nor how much broken up it is by static, the thrill that comes from hearing a man speak or a woman sing or a band play two or three thousand miles away is sufficient compensation for all of the unfavorable aspects. The music may be so badly distorted or so badly broken up that the unenthusiastic skeptic sitting next to you will declare it is frightful, but you, in your new found enthusiasm, will think it is almost the song of the angels that you are listening to.

My only thought in writing this article is to tell the absolute truth to the man or the woman who is thinking of buying a set and who is at first only about luke-warm in the desire to possess one. In other words, I am trying to put radio exactly as it is for the benefit of those who have not yet been caught by its lure.

I am perfectly satisfied that, once you get a set in your home, this lure will get you as it gets everybody else and after that we will hear no more demands from you for perfect reproduction or freedom from static, but will be bored to death to see you pull from your pocket a long list of the stations that you have logged, with a total of the mileage which your set has traveled during the past month.

This is the viewpoint which I think the salesman should present to the inquiring prospective customer. The fault that I find is that the salesman says nothing whatever to make this very great distinction between enthusiasm and mere luke-warm interest.

It seems to me, if I were a salesman in a booth at a show, and if I were strictly honest—supposing a radio salesman or a radio enthusiast really can be strictly honest—and you, a novice, who knew nothing about radio, were to come up to me and say, "How far will this set of yours receive?"—*if* you asked me that it seems to me that honesty would compel me to say something like this:

"Well, sir, this set will receive just as far as any other set under the same conditions and we really think it will do better than most of our competitors. However, the choice of a radio set is very much like the choice of an automobile. The standard radio sets put out by reputable manufacturers are, tube for tube, very much on an equality so far as reception is concerned and the choice is largely a matter of personal taste.

"There are some sets that are very difficult to learn to tune and there are other sets that are very easy to learn to tune and there are other sets which are about half way between these two. But, once you have learned to tune whatever set you buy, you will probably get just about the same results as your neighbor who has one or the other make of sets.

"There is one thing you must understand in the first place, and that is, if you are going after distance, I must warn you not to expect perfection of reproduction. The two things do not go together.

"Radio engineers who are honest with themselves are perfectly frank in saying there is always a certain amount of static present in the atmosphere and static always produces an unpleasant crackling or crashing noise in the head phones or the loud speaker, the unpleasantness depending upon the volume of noise that the static produces.

"Some nights it is very loud and some nights it is not so loud, but radio engineers know that there is a certain amount of static present every night of the year.

"Now the satisfaction that you will get from reception will depend entirely upon how much stronger the signals are than the static is at that particular time. If you happen to have a night when the static is at a minimum and when the signals are coming in at a maximum — such a night as a good receiving night in winter time—you will be almost unconscious of the static. In fact, on such a night as that, you are very likely to get beautiful and quite satisfactory results over distances of two or three thousand miles. But this is under freak conditions and can't be expected night after night. Still, if you get it once in a while, you will be so thrilled that the reward will be sufficient.

"There is another thing you must understand, and that is that nowadays there is a good deal of interference by other broadcasting stations and by ships at sea or coming into the harbor or by shore stations.

"Now, it is a usual fact that, with sets that are not absolutely up to date, the easier they are to tune, the less they will be capable of eliminating this interference. The older sets, in order to eliminate it, or to get what we call 'sharp tuning,' have to have a

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—Still Editorially Speaking

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and any manufacturer who does not admit this is either short-sighted or else is not honest with himself.

The broadcasters themselves must inevitably take the lead in this present situation. They must be supported by the manufacturer and they, in turn, can be depended upon to support the manufacturer. They will make him the beneficiary whether they intend to or not, because, in order to make it worth their own while to broadcast, they must continue to give better and better programs, and this, in turn, builds up the business of the manufacturer.

No broadcasting station under ordinary circumstances can afford to put on star programs very often. Once in a while a few of them can do it by means of remote control stations in opera houses or theatres, but this reaches only a limited number of people who are served by the individual station and does not greatly benefit the radio industry as a whole.

Let us take Mr. Shaw's suggestion of a supporting contribution of one or two per cent on all radio goods sold and let us assume that it raises a million or two million dollars a year, which it might easily do.

Now suppose that we were to engage a dozen really good stars for a season of so many weeks and suppose we were to provide for the greatest numbers of listeners-in by booking the stars through central stations, the central stations to be connected through land wires to four or five adjoining stations within a radius of one hundred and fifty or two hundred miles.

It would require only a comparatively few such systems as this to cover the entire country. It would not take a fortune to engage a man like John McCormack to go on a short tour, appearing in person at the central studio of each system and having his voice broadcast simultaneously by means of the land wires over a vast part of the country. Ten or twelve such systems would cover the United States and the cost would not be prohibitive in the light of the returns that would come from it.

Does this sound like a wild dream? Well, a year ago it would have sounded like a wild dream if any one had predicted that WEAF would broadcast President Coolidge's speech over such a vast area. And yet it was done by one organization. It is not by any means beyond the power of the radio manufacturers and broadcasters to put this star system into widespread effect in the very near future. All that is required is the burying of petty jealousies, a getting together in harmony, and a leader who has the respect of every one concerned, and who can go ahead seriously with his plans, confident that he will not only get ample moral support but the financial support necessary to achieve success.

I feel certain from conversations held with various manufacturers at the different radio shows that they are really in a very receptive mood for such a proposition as this.

Will you join, Mr. Manufacturer?

I should like very much indeed to know what the reaction is to a suggestion like this and, if it seems to be favorable from a majority, there is no reason why action should not be taken at once to get everybody together.

Will you write me, Mr. Manufacturer, and tell me frankly what you think of this idea—on my promise to treat your letter as absolutely confidential unless and until you give me permission to show it to others?

Will you write me, Mr. Broadcaster, and let me know what your reaction is—under the same promise of strict confidence?

If I were not sure that there is a definite demand from representative men for some such action as this, I would not bother to give you any such invitation. But I have very decidedly heard this demand. I have very decidedly been conscious of the receptive attitude. I believe that all that is needed is for some outsider to gather the data as to who is in favor of it and who is not and that, with this all gathered, there will be no difficulty in everybody getting together around a table and starting something definite.

I know two big men who stand ready at any time to hand over their checks for $1000 in advance against any contribution that may be decided upon. I know a dozen who are not only willing but anxious to go into such an organization and who would take the lead themselves, except for the fear that they might be accused of motives of exploiting their own business.

Several of them have suggested to me that a radio publication would be the obvious neutral meeting ground for the preliminary negotiations. And so I am making this first approach to the subject.

More and more, the radio public is demanding better programs. More and more, the broadcasting stations are finding it increasingly difficult and expensive to furnish such programs.

You, Mr. Manufacturer, are the one who is going to suffer if this continues. Public sentiment is going to swing this thing one way or the other, and it is up to you not only to save your own business, but to take some action to see that it expands until it is almost the universal phase of home entertainment in the United States.

The New Grimes "Two-Conhrol" System

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on the same cylinder and at one end of the secondary. The secondary of the first tuned transformer is tapped about every five turns to permit the controlling of the radio energy. This prevents overloading of the amplifying tubes on local reception. The secondary of the second tuned transformer is tapped in only one place and this is about two-thirds the way over from the primary or filament end. This is for the purpose of increasing the sharpness of tuning, which is necessary when only two controls are used. Tuning condensers of about 23 plates, or .0005 mfd. should be used with the tuned transformers.

The rest of the sketch is, I believe, self explanatory. In an article of this length it is impossible to go into great detail, but enough information has been included to permit the average amateur to duplicate the results. At a later time, another article will give more of the constructional data for the benefit of the beginner.

* * *

The New Grimes Circuit As We Built It at 3XP

By HENRY M. NEELY

AS I have stated in my introduction, we at Station 3XP decided to build the new Grimes circuit, using some form of coupler that could be found on sale in almost any small town in the country. We had some Fada neutroformers in the shop, and as we knew they were being widely marketed; we hooked them up and experimented until we had found out what changes were necessary to make these coils function in the circuit.

The result has been more than satisfactory. I hope that readers will not bombard me now with letters asking if other neutroformers can be used as well or how many turns of wire to put on home-made neutroformers. Frankly, I don't know. I

tried only the Fada coils and any man who isn't willing to buy two of these must do his experimenting for himself. And I say this in spite of the fact that the Fada people do not advertise with me.

Undoubtedly any neutroformer will work just as well, but it may mean some changes in fixed condensers and other parts. You'll have to figure these out for yourself.

In this new Grimes circuit we have one neutroformer that acts as the tuning inductance in the antenna circuit and controls the wave lengths that come in on the first radio frequency tube. The other neutroformer is one stage of radio frequency amplification. Then for the second stage we use the Dubilier Duratran radio frequency transformer.

I think that in the December and June issues of Radio in the Home we covered almost every point in telling exactly how and why you may reflex or duplex your tubes—that is to say, to use them both for audio and radio frequency—so I will not dwell on that part of the subject. I am going to cover only the necessary points of how to construct this new circuit so that you may be able to build it and have success with it.

Look at the photograph that shows the front view of the panel as we built it at 3XP. You will find that in the left-hand corner we have one dial which is on the shaft of the variable condenser of the first neutroformer. Then in the right-hand corner we have another dial which is on the shaft of the other variable condenser on the other neutroformer. These are the controls that do your tuning for your wave lengths.

Then above this we have the three rheostats, first the rheostat that controls the first radio-audio tube and also controls the third audio frequency tube. The center rheostat controls the filament to the detector tube and the third rheostat controls the filament to the tube, which is the second stage of radio frequency and the first of audio frequency.

I do not think it advisable for you to use two or more radio frequency tubes on one rheostat and that is the reason we combined the radio frequency and the audio frequency on the first rheostat. It does not require very fine adjustment for your audio frequency amplification.

Below these rheostats we have two jacks. The first jack cuts into the second stage of audio frequency amplification and the other is the third step of audio frequency amplification.

The rheostats which we use are the Pacent and the jacks were made by the Carter Company of Chicago. We use these Carter jacks because I do not believe that there is a better jack made. It is very substantial and it has good heavy contact. The Carter rheostat is also very fine.

The sockets we usually use are made by the Alden Mfg. Co. and have the trade name of Na-Ald.

The radio frequency transformer is made by the Dubilier Company and is called the Duratran. The audio frequency transformers are made by the General Radio Corporation of Philadelphia and have the trade name of Geraco. This line has now been discontinued, so I advise any standard audio frequency transformer with a ratio of from 3 to 1 up to 5 to 1. We use only the Dubilier fixed condensers in the circuit. The binding posts are made by the Eby people. It is always advisable to use binding posts which are insulated as these are. It means that if you happen to drop a wire carelessly from one place to another, you will not short circuit your batteries and burn the filaments. These Eby binding posts can be bought already engraved to show which wires are to be connected to them.

The panel which we use is 18x7x 3-16-inch thick. The "baseboard" is mounted about half way in the center. On this baseboard are mounted the sockets and the audio frequency

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great many different controls and all of these controls have to be set very accurately. Naturally this means that tuning this set for any particular station is difficult.

"Modern sets, however, are very largely overcoming this difficulty and now it is possible to get a set which is easy to tune and which is also very selective in its tuning.

"But I advise you very strongly to get a good radio set. Don't wait for the much-talked-about 'revolution' in radio which will make all of these sets out of date overnight. Those of us who are in the business do not expect any such thing. The sets which were made two years ago are receiving concerts today just as well as they did then. Naturally, there are improvements in radio just as there are with the automobile, but still the old sets function and their owners find them well worth the money they cost.

"Another thing which I cannot too strongly emphasize is that you will, as I say, get perfect reproduction all the time from your local stations and you will find these local stations putting out programs just as good as the programs being put out by the distant stations. There is nothing to this distant station stuff so far as actual home entertainment is concerned; it is entirely the lure and the wonder and the marvel of radio that makes the distant work so fascinating. You will get to it before you are done. Meanwhile get a good set and have some really genuine fine entertainment in your home."

And finally let me explain why I have said all of this.

It has come within my personal experience a great many times during the past two years that novices have been misled by the implications in salesmen's talks, or in advertising. They, in their total ignorance of radio, have got the impression somehow or other that all you have to do is buy a good radio receiving set, install it in your home, press a button and music from three thousand miles away rolls in absolutely perfect, without any distortion or any fading or any static, and quite as satisfactorily as the music comes from their Victrola.

As a matter of fact, we might just as well face the truth and tell these people that *there is not a single radio set built in the world today from which this can be guaranteed even ten nights in a year.*

These people have bought their radio sets in all good faith and when, night after night, they have found tuning difficult to the novice and failed to bring in these very distant stations, they have come to the conclusion that they have been swindled and that all radio is a fake.

It is exactly this general impression which is doing more damage among the better class of buyers than anything I know of. These people become disgruntled, and a disgruntled man will go to more trouble to spread his opinion than will a man who is absolutely satisfied.

It is up to us who are in the radio business with some sort of ideals and viewpoint to prevent this kind of antagonism spreading. It is up to us, even though it does sound like throwing cold water on radio, to tell the absolute truth to the novice, confident that he will sooner or later fall for the lure of radio and, once he has fallen for it, he will be among the most enthusiastic of the "nuts" in the game.

Because, after all is said and done, and with full realization and a frank admission of the limitations of radio—what is there in modern life that is one half so wonderful or that is doing one half the good that radio is doing?

New Grimes "Two-Control" System

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transformers with the radio frequency transformer mounted underneath.

Looking at the photograph which shows the top view of the set, the tubes are as follows: The first tube is the first radio frequency and second audio frequency tube and the last tube is the second radio frequency and first audio frequency tube. The next to the last tube is the detector tube and the second tube from the left is the third stage of audio frequency amplification only. It may seem funny to you that we have the tubes staggered in this way, but I will explain that.

What we wanted to do was to get the two neutroformers as far apart as possible, which meant that we had to place one on one side of the panel and one on the other side of the panel. Then by doing this and still to keep the leads from the grid to the neutroformers as short as possible, we had to place the second stage of radio frequency right next to the neutroformer which is on the right-hand side of the panel.

When you wire this circuit be sure that you make your leads straight

Radio in the home of Walter Deisroth, 234 E. Highland avenue, Chestnut Hill, Pa.

Photo by courtesy of Gimbel Brothers

and make the connections as short as you possibly can. The fixed condensers are so placed in this circuit as to by-pass any radio frequency that may come up to them.

You will notice in this circuit that the second neutroformer has the grid lead coming down to a tap on the neutroformer. This is done to control the incoming radio frequency to prevent it from overloading the tube. By putting the lead of the grid of the tube on to this tap we change this coil into an auto-transformer. That means that the circuit is divided and not all of the energy is going to the grid of the tube. You will find that it will be necessary for you to use this tap, otherwise the circuit will be very mushy and that is a sure sign that your tubes are overloaded.

You will notice on the wiring diagram that I have labeled on the first neutroformer "tap optional." That means that if you have hooked up your circuit and you still find that you have too much energy coming into your radio frequency tubes, you will have to use the tap in the first neutroformer to help cut down the radio frequency energy.

I do not know whether you will have to use it or not; you will have to try it both ways.

I found that when my detector tube was turned off entirely I had an awful howl. To eliminate this, I tried reversing the leads on the primary of the Duratron transformer. This I found helped to stop the howl. If this does not completely stop it for you, try changing the leads on the primary or secondary of the audio frequency transformer. Take the first audio frequency transformer and switch the primary leads—that is, take the lead from one post and put it on the other and then that lead to the first post. Then see if this eliminates the howl. If not put the leads back and switch the secondary leads. You will find that one of these two leads being switched will cut out all of your howls and whistles, or it may be that you may have to switch the leads on another audio frequency transformer to give the desired results. It is absolutely impossible for me to tell you just exactly what leads you will have to switch, but you can easily find out for yourself.

Do not do any soldering on the fixed condensers. Make all your connections to them by the use of a machine screw and nut. This eliminates any possibility of the heat of the soldering iron damaging the inside of the condenser.

When you are using the third step of audio frequency amplification in this circuit you will find that you may have to use a separate B battery for your detector. If you do not, you will probably get a howl in your circuit. I have found that, in any radio frequency circuit, it is always best to use a separate B battery rather than taking off the 22½-volt tap on the 45-volt battery. In this circuit your detector B battery may vary anywhere from 16 to 22 volts. On the amplifier side 90 volts may be used satisfactorily, but I do not advise you to use anything under 90 volts, as the tubes doing double duty require a greater B battery voltage than you ordinarily use. If you want any volume I would use at least 120 volts.

Now to give a little time to the operation of this circuit.

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We found that the circuit tunes very sharp.

We were listening one evening to Station WDAR broadcasting on 395 meters when one-half a degree turn on our secondary dial cut out Station WDAR completely and brought in the new 390 meter Willard Storage Battery station WTAM at Cleveland, Onio, with amazing volume. In fact, the circuit tunes so sharp that we have little difficulty in tuning apart stations that are within five meters of each other in wave length.

Our log shows that stations fifteen to seventeen meters apart can be separated very nicely with one or two degrees difference in the dials, and on these stations we have absolutely no interference from the undesired stations. And another beautiful thing about this circuit is that after you have once had a log on a certain station you may be assured that if that station on it and you set your dials to that setting, they will always come in.

When you start to operate this circuit the best thing to do will be to locate a local station—that is, to get the broadcasting on a local station and make a note of it on your log. You will know then what the broadcasting wave length is for that dial setting. Let us say that we have logged the dials for a station on 509 meters. Now we want to get Station WEAF in New York City, on 495 meters. This is a difference of seventeen meters in wave length, so we know that we will have to move down on our dials a little to bring in WEAF. So we turn the second dial towards zero about two degrees and then we rotate the first dial backward and forward over a distance of say five degrees, very slowly. If we do not receive any signals here, we move our right-hand dial down one or two more degrees and again turn the first one back and forth until we get the station desired. Then we get this at maximum volume and mark that on our log and so we go hunting down the whole scale of the second dial and log every station that we get. And we can always get them at exactly the same setting at any future time.

I Told You So, Clubwomen

(Continued From Page 38)

great unseen audience the Philomusian Club and the objects of the club's first "open meeting."

But a moment before the studio had echoed to the sound of animated conversation, laughter and all the flutter and flurry that generally precedes any club meeting, whether held by the "mere male" of the species or his sisters, mothers, and daughters. And then, the warning hand and voice and behold! A miracle! For more than an hour, a group of very real and very live women gave the lie to that age-old axiom that "it is impossible for a woman to keep still!"

Maybe it was the realization they were, after all, to "have the last word," as far as the meeting was concerned, that held them quiet and calm as their chairman unfolded the purposes of the meeting and introduced the various speakers of the afternoon. It might have been that, only it was something far different. The moment their president began speaking, the interest of every woman present was centered in what was said. Whether at a broadcasting studio or in the privacy of their own club rooms, these women, leaders in the literary, musical, art and civic activities of the city, hold first in interest those projets dear to their heart and their organization.

If any of the speakers was nervous when she "talked at the little round disc" known as the microphone, she hid her feelings so well that not one person among the dozens who crowded outside against the glass windows of of the studio could detect, even with the gaze of the very curious and inter-

ested spectator, but that all the speakers were well trained in radio broadcasting.

"Well, it is a little queer, talking that way with just the members present," explained Mrs Harriet Lummis Smith whose beautiful talk calling attention of the club members and the listeners-in to the great need of today for a more decided reaching after the ideals in art, music, literature and the home by the American Nation thrilled all who heard it.

"But I had taked once before in front of a microphone and knew a little of what it is like. One can not though, get rid of the feeling there are so many people out there listening to all you say," she added.

Other speakers whose first experience in broadcasting had given them somewhat of a thrill admitted the affair had not been such an ordeal after all.

If there came to any of the women any sense of the unusual to change their manner of addressing the club, over that followed at the regular meetings of the organization it showed most of all in a tendency to speak in a lower tone than that used in speaking from the speaker's rostrum at the club. The microphone had been placed in the center of a large table in the studio, at the head of which sat Mrs. Tull, the president, and around which comfortably seated in large easy chairs were grouped the speakers.

Radio in the Chevy-Chase Country Club of Washington, D. C.
Photo by Tenschert & Flack, courtesy of the Radio Sales Studio, of Washington, D. C.

"Keep your voice up a little, please," admonished Mr. Neely. "Everything is going fine, but it would be better to speak just a little louder," he suggested encouragingly, smiling brightly as the group nodded in understanding.

"That's one of the great things about being a studio director," observed one of the very few men present. "You can jump all over a person, and then, before they get a chance to come back at you you say 'S-s-s-h!' and turn on the red light and the 'mike's' on the air and everyone present has to shut up!"

"Why, I thought I was speaking plenty loud enough," whispered one of the speakers to a companion. But neither Mr. Neely nor the microphone heard what was said. But it wouldn't have mattered. Studio directors and microphones both know that while millions may listen to the voice of radio, opportunities for speaking by radio are not yet so frequent that all citizens generally can be expected to know just the proper tone of voice to use in addressing a microphone.

"Makes me think of Einstein," murmured a spectator in the studio.

"Einstein," countered a companion.

"Yes," he responded. "It's funny how everything, after all, is relative. Here, while this meeting is going on, there are a thousand and one small things one notices that one wouldn't pay any attention to at a meeting in the club rooms.

"In the club rooms, one has a chance to cough a little, now and then, or even, at the proper time, to get up and move about. But in here, a person's afraid to stir or almost to breathe! One remembers stories of how these microphones can catch the footfalls of a fly, the beating of the heart or the tick of the finest Swiss watch. It makes one afraid to whisper"—and it did, for at that moment, the eye of the editor-director fell on the offending (male) speaker, and a withering glance stopped that particular conversation instanter!

Just at this moment, Mrs. Tull announced an address on the Sesqui-Centennial by George Wentworth Carr. Mr. Carr enjoyed the distinction of being the only man permitted to speak (out loud) at the meeting. In his request that the microphone be so placed he could address it standing up, he emphasized in a peculiar manner the difference in address between himself and the women speakers present.

All of them had seated themselves at the table while speaking, this being a procedure followed much more at meetings of women's organizations than those conducted by men. But the habit of many years of public speaking at many public functions was so strong upon him, he found it literally impossible to drop the habit of addressing an audience in any manner than that permitting free movement about the platform, with eloquent gestures of hands and arms. These were not in any way marked during the address of Mr. Carr, but they would have been impossible had he been seated at the table.

Also, keeping his voice at the proper pitch properly to operate the diaphragm of the microphone was for him an effortless task. He did it without thinking it necessary, due to years of training in making words carry to the outer edges of large audiences. Thus, even moving about did not affect the transmission of his voice. If one speaks loud enough, it's pretty hard to lose a microphone!

And then off went the red light and a smaller green light flashed on under the red bulb, signal that the speakers and visitors could return to a normal plane of thinking, talking and acting. Deep breaths of relief came from those to whom the silences of the studio were still very new and rather trying. A small buzz of conversation sprang up, when—

"S-s-s-s-s-h!" came the voice of Mr. Neely, and once again the so-still-you-could-hear-a-pin-drop silence descended on the room. A pause,

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About the Multiflex

THE following letter is self-explanatory. It refers to an article in the December issue describing the new Multiflex one-tube circuit. We have since communicated with the Mr. Rogers referred to and readers will be glad to know that he has promised us articles on the further development of this efficient circuit into adaptations for two and three tubes.

Mr. Henry M. Neely, 608 Chestnut St., Philadelphia, Pa.

My dear Mr. Neely: I was in the city Saturday and received my December issue of "Radio in the Home" and was sure surprised to see my name in the Multiflex hookup.

It was through a misunderstanding that the name of the originator of this circuit was not given, so I wish to give credit where credit is due.

Personally, I do not wish any credit whatsoever for the origin of this circuit, as it would be unfair to the gentleman who sent the same. So in order to give justice to him I wish to announce to my many radio friends that my friend mentioned at the head of your article in the December issue of "Radio in the Home" was Mr. Stuart Rogers, of the S. & R. Manufacturing Company, of Fresno, Calif., who was the gentleman who sent me the hookup to try out in the East.

I wish to thank you for your wonderful assistance to me in trying this circuit out; as I knew I could depend on what H. M. N. at 3XP said in regard to the circuit, and I would take the same as a final test. I had experimented with the circuit before handing it to you, with wonderful results.

Again I wish to thank you, and I cannot speak too highly of your work and wonderful assistance to the amateur.

So I hope that you will kindly print in the Home" so as to do justice to this in your January issue of "Radio Mr. Rogers, providing it will in no way inconvenience you.

As ever,
Your friend for Better Radio,
WM. NORMAN KEARNEY.

High School Clubs Hold Logging Contest

(Continued From Page 39)

tests, and its staff of executives and engineers, to help in clearing up these difficulties and also to help to bring about the much-talked-of and sought-after standardization of radio parts. If this were the only object of the Interscholastic Radio Association of America it would justify its existence, the members believe. But this is by no means the only object of the society.

The association is going very deeply into research work on the subject of standardization. Manufacturers of radio parts are being classified and rated. There were about 300 concerns who advertised last year, upon whom no one could procure a rating. The men who backed them were a mystery. They were mostly fly-by-night establishments, only exploiting the radio market for their own profit to the detriment of the thousands of hard-working boys in our high schools.

I Told You So, Clubwomen

(Continued from Page 45)

and Mrs. Tull, addressing her fellow club-members in the studio, those gathered before the receiver at the club rooms and in their own homes, and the great unseen, unknown, uncounted audience, announced:

"This ends the first and last open meeting of the Philomusian Club," following this with final announcements and bidding her radio audience a very kindly and friendly farewell. Once again came the business of the turning on and off of the very mysterious lights. Opening with the song "America," the session closed with song—a song dear to the hearts of the Philomusian Club—"The Sesqui-Centennial Rallying Song."

This, set to the stirring strains of "John Brown's Body Lies A-mouldering in the Grave," brought other eager spectators to stare through the glass partitions of the studio and to wonder at the sound of militant music from so calm and composed a gathering. Led by Isabella Buchanan Akimoff, at the piano, and Mrs. George M. Ferguson, violinist, who had played during the meeting, the special words, appropriate to the Centennial celebration, sped on the wings of radio thousands and thousands of miles beyond the ken or hearing of the singers. And as the last note died away, the editor-director (and he had the last word after all) stepped to the microphone and announced:

"This is Station WIP, Philadelphia. You have just listened to a stated meeting of the Philomusian Club of Philadelphia, broadcast under the auspices of *Radio in the Home*. This will conclude the transmission for this period. Good afternoon, all!"

Then the mysterious red light blinked, went out and stayed out this time.

An Ideal Circuit for the Ducon Plug

(Continued From Page 37)

hand corner of the panel is either for the ground connection or for the aerial connection.

You will notice in the photograph, looking down on top of the set, that we have four Eby binding posts in the rear. These binding posts are for the "A" and "B" battery connections. Two of them are for the "A" battery and the other two are for the "B" battery. The baseboard which we use is one foot long and five and one-half inches wide by one-half inch thick. This is large enough to mount the socket and the binding posts for the battery and the grid condenser and leak.

Now, just a few words on tuning this circuit. Place the rotor of the variometer at 100 degrees—that is, so the windings of the rotor are assisting the windings of the stator, by placing them in the same direction. Place the variable condenser at about fifty degrees and then light the filament of the tube. With the rotor of your variometer left in this position slowly turn the variable condenser between zero and 100 until it comes to a carrier wave. This carrier wave is the same as you would receive in any other regenerative circuit. Then with the vernier get into the center of this carrier wave and then turn your variometer rotor toward the zero mark until the whistle stops. You will find, however, when you are coming down with the rotor of your variometer toward the zero position that you will have to reset the variable condenser by moving the rotor to throw your circuit slightly out of tune, and this must be brought back into tune with the variable condenser. After you have had the maximum signal strength of your circuit you may probably find that it can be still increased slightly by either increasing or decreasing the filament of the tube by raising or lowering the rheostat.

Radio Kindergarten

(Continued From Page 13)

ly the same throughout the entire transmission. The difference is in the voice or sound mouldings on each wave.

Now these moulded waves go on outward through space and strike our own receiving aerial. Here they set up a similar agitation or vibration in the electrons in the aerial and these electrons rushing back and forth cause currents of electricity to rush back and forth through our set to the ground and return.

This introduces them into our set and by means of various adjustments in tuning, we are enabled to build these tiny currents up to quite strong vibrations by means of our B battery and these strong vibrations are the ones which cause the disturbance of the diaphragm in our head telephones or in our loud speaker.

Here we leave the electrons. From then on it is only a step and this step is not an electrical one. In other words, we reverse the process that went on in the studio of the transmitting station. There the singer's voice caused the air to vibrate and the vibrating air caused the diaphragm of the microphone to vibrate. On our end, the diaphragm in our head phones or loud speaker vibrates and this, causing the air to vibrate, sends the vibrations to our ear drums and the ear drums are made to vibrate in unison. This vibration of the ear drums is what effects our nerves of hearing and we are conscious of what we call "sound."

This is the entire process reduced down to simplest form. During the process there are many changes from mechanical vibration to physical or air vibration and from that to magnetic vibration—which we have in many parts of the apparatus—particularly around the magnet in the microphone and in the head set or loud speaker and also from one coil to the other in both the transmitting and receiving sets. We have already learned about these magnetic vibrations in the lesson in which we studied the effects of transferring electrical energy from one coil to another even though the two coils were not connected by any conducting wire. This process, as you remember, is called induction.

There is a good deal of technical material in this lesson and I do not think it is wise to crowd too much of this sort of thing into your mind at this stage of your progress in the study of radio. And so I am going to make this a short lesson, but I advise you to read it over twice and be very sure that you have a perfectly clear mental picture of everything before going on any further.

This is necessary because the further study of radio is all founded upon the fundamental facts laid down here.

Radio in the Home and in Every Room

(Continued From Page 20)

tery binding posts, by a simple arrangement of polarized plugs which cannot be incorrectly connected.

Radio outlets throughout the house constitute a new field of wiring sales for the electrical contractor and radio dealer.

Already certain progressive builders are incorporating radio wiring into their speculative homes as selling points. But the possibility of multiplying the enjoyment of radio by having its broadcast programs available through radio outlets in every room in his own home, should appeal to any householder as a remarkable enhancement of home comfort which is obtainable at a very small cost.

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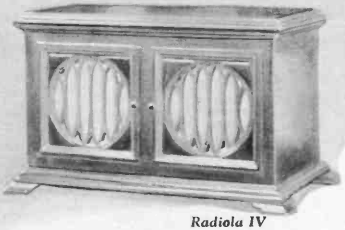

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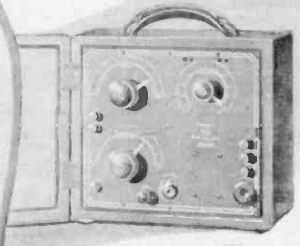

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