February, 1924

Radio in the Home

Conducted by HENRY M. NEELY

Radio in the studios of Ralph Pallen Coleman (left) and H. Weston Taylor (below), both at 524 Walnut street, Philadelphia, Pa.

Miss Grace Taylor ("Miss Ocean City") posing

Photos by Henry S. Tarr

In This Issue:

OFFICIAL ORGAN

The AFRICAN "Drum talk" of TODAY

Boom! Boom! Boom! Boom!

Thus the drum talk of the natives of Africa broadcasts to a radius of fifty or sixty miles the departure of white men leaving one village for another. To the weird Boom! Boom! of the huge drum, the travelers with their porters commence the perilous journey, knowing that their arrival is expected at the next village.

What a far cry this crude method of sending messages is from our modern, useful, pleasure-giving radio. And how very backward it seems when we consider the rapid strides made in the radio industry in just a few years' time as told in this Crosley Radio Message.

A CROSLEY RADIO MESSAGE

In February, 1920, Powel Crosley, Jr., then engaged in the manufacturing business in Cincinnati, became interested in radio. Production of radio apparatus was commenced shortly afterwards under the name Crosley Manufacturing Company. About January 1, 1923, Powel Crosley, Jr., and his associates acquired the capital stock of The Precision Equipment Company, one of the original licensees under the Armstrong patent.

The growth of the two institutions known as Crosley Manufacturing Company and The Precision Equipment Company in the radio field has been phenomenal. The public recognizing unusual value, has clamored for the products of these two companies. Both institutions have been operated entirely independently of each other, but for various reasons, merger has been effected in the following manner:

The name of The Precision Equipment Company, of which Powel Crosley, Jr., was and continues to be President, has been changed to The Crosley Radio Corporation.

An arrangement has been made whereby the business of the Crosley Manufacturing Company in its entirety has been taken over by The Crosley Radio Corporation. Thus many economies will be effected in production, administration, management, advertising, and in many other ways. The same policies will be effective as heretofore, with the same personnel in charge.

Believing the Crosley Manufacturing Company and The Precision Equipment Company have each individually been producing more radio receiving sets than any other manufacturer in the world, an idea may be obtained as to the volume of production made possible by uniting the two institutions.

The Crosley Radio Corporation now occupies three large plants in the city of Cincinnati, including its own wood working cabinet plant. A fourth plant larger than the present three combined has just been purchased for additional expansion.

The products of the Crosley Manufacturing Company have carried the trade name "Crosley"; those of The Precision Equipment Company the trade name "Ace". In the future all products of The Crosley Radio Corporation will bear the trade name "Crosley".

Practically every dependable radio dealer in the United States sells Crosley apparatus; if not, he can get it for you. The success of the name "Crosley" in the radio field is founded upon a well defined policy of producing efficient radio apparatus, simple in construction, in large quantities to be sold at moderate prices, thus thoroughly living up to the Crosley slogan "Better—Cost Less".

Armstrong regenerative receivers, manufactured by The Crosley Radio Corporation, are licensed under U. S. Patent No. 1,113,149.
Insist upon Crosley radio apparatus from your dealer, or write for catalog and free copy of book "Simplicity of Radio".

THE CROSLEY RADIO CORPORATION

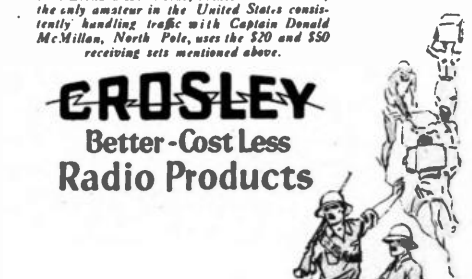
POWEL CROSLEY, JR., President
FORMERLY
The Precision Equipment Company *and* Crosley Manufacturing Company
260 Alfred Street Cincinnati, Ohio

The Crosley Radio Corporation owns and operates Broadcasting Station W L W

Following Is a List of the Most Popular Crosley Receiving Sets With Their Prices

Crosley Type V (formerly Ace) one tube regenerative	$ 20.00
Crosley Type 3-B (formerly Ace) three tube regenerative	50.00
Crosley Type 3-C (formerly Ace) consolette model	125.00
Crosley Model VI, two tube incorporating radio frequency	30.00
Crosley Model X-J, four tube, incorporating radio frequency	65.00
Crosley Model X-L, four tube Consolette	140.00

Mr. Leonard H. Weeks, Minot North Dakota, the only amateur in the United States consistently handling traffic with Captain Donald McMillan, North Pole, uses the $20 and $50 receiving sets mentioned above.



CROSLEY
Better-Cost Less Radio Products

CROSLEY MODEL X-J—PRICE $65

A 4 tube radio frequency set combining one stage of Tuned Radio Frequency Amplification, a Detector, and two stages of Audio Frequency Amplification. A jack to plug in on three tubes for head phones, the four tubes being otherwise connected to loud speaker. new Crosley Multistat, universal rheostats for all makes of tubes for dry cells or storage batteries, new condenser with molded plates, filament switch and other refinements add to its performance and beauty.

For bringing in distant stations no set can excel it.
Cost of necessary accessories from $40. 00 up.

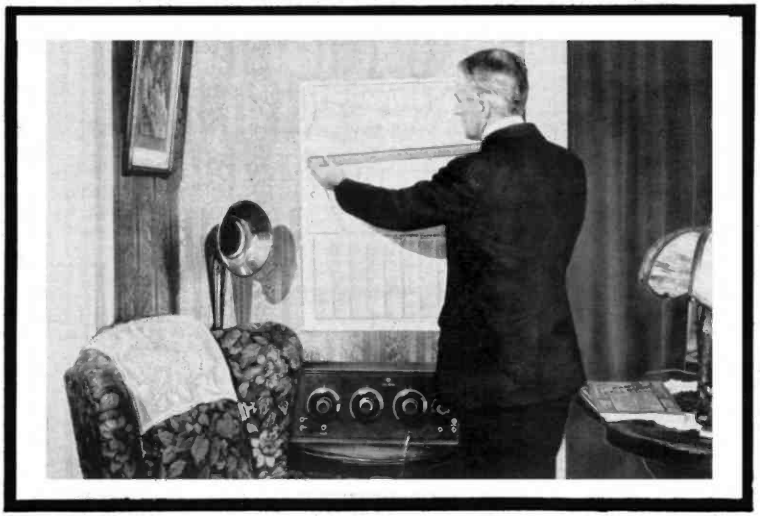
—MAIL THIS COUPON TODAY—

The Crosley Radio Corporation, 260 Alfred St., Cincinnati, O.

Gentlemen:—Please mail me free of charge your complete catalog of Crosley instruments and parts together with booklet entitled "The Simplicity of Radio."

Name _____

Address _____



FADA "ONE SIXTY" WITH THE NEUTRODYNE CIRCUIT

Distance

The real thrill of radio is in listening to voice or music on the loud speaker from broadcasting stations located in cities a hundred or a thousand miles away.

To tune them in almost at will is a feature that has made hosts of enthusiastic friends for the FADA "ONE SIXTY" radio receiver. Here is a four-tube receiver combining the famous Neutrodyne circuit with the craftsmanship and experience that have made the name FADA synonymous with quality in radio. It is a receiver that is the equal of any five-tube set of any type or make.

Selectivity, volume, distance and clarity are outstanding features of the FADA "ONE SIXTY" radio receiver. Once the dial readings of any station are recorded, that same station can always be tuned in again by returning to the same settings—and almost always, with loud-speaker volume, no matter where the station may be located. Price, $120 at dealers. Extra for tubes, batteries and phones.

F. A. D. ANDREA, INCORPORATED
1581 Jerome Avenue, New York City

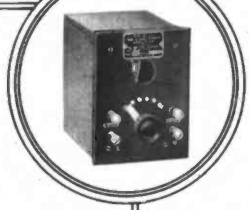
Fada RADIO

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.

Audiophone Loud Speaker

A Real Reproducer of the Original Broadcasting

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.

No auxiliary batteries are required for magnetizing.

Made in three models—

Senior Audiophone . . .	$32.50
Junior Audiophone . . .	22.50
Baby Audiophone . . .	12.50

THE BRISTOL COMPANY : WATERBURY, CONN.

Branch Offices:

Boston, New York, Philadelphia, Pittsburgh, Chicago, Detroit, St. Louis, San Francisco

The Bristol Senior Audiophone

"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"

Eveready "C" Battery

4½ volts, three distinct uses. Length, 4 in.; width, 1⅝ in.; height, 3 in.; weight, 14 oz. At all reliable radio dealers.

This "C" Battery is a Wonder Worker

YOU can make the loud speaker respond with a new fullness and naturalness of tone. You can save money by adding months to the life of your "B" Batteries. These things you can do by using the new Eveready "Three" as a "C" Battery.

You already have an "A" Battery for the filament and a "B" Battery for the plate. A "C" Battery is connected to the third element of your vacuum tube, the grid, affording a control that is marvelous in action on audio frequency amplifiers.

As a "C" Battery the Eveready "Three" prevents distortion and excessive flow of current from the "B" Battery, lengthening its life. It is a wonder worker that saves its small cost many times over. Connect it in your audio frequency amplifier and note the difference. Full directions on the label and in "How to Get the Most Out of Your 'B' Battery," a booklet on "B" and "C" Batteries, sent free on request.

This triple-use battery can also be used as an "A" Battery in portable sets. Light and full of pep. Its third use is as a "B" Battery booster.

Use the Eveready "Three"—a tested product of the world's leading electro-chemical battery laboratory. It serves more radio uses and effects more economies than any radio battery heretofore developed.

If you have any battery problem, Radio Battery Information Headquarters will solve it for you. Write G. C. Furness, Manager, Radio Division, National Carbon Company, Inc., 120 Thompson Ave., Long Island City, New York.

NATIONAL CARBON COMPANY, Inc., New York—San Francisco

Headquarters for Radio Battery Information

CANADIAN NATIONAL CARBON CO., Limited. *Factory and Office:* Toronto, Ontario

EVEREADY
Radio Batteries
—they last longer

RADIO IN THE HOME

Must the Broadcasters Pay for Music?

In last month's issue we printed an article by William N. Shaw, President of the Eisemann Magneto Corporation, setting forth some of the problems of radio broadcasting for the future. Among these difficulties, Mr. Shaw mentioned that the broadcasting stations were having a controversy with the owners of the copyrights of certain music and that this difficulty seemed among the most important of the immediate problems. Herewith, I am printing an article by one of the recognized leaders of these copyright owners, setting forth the position taken by the opposite side of the controversy. These claims must be considered seriously before any decision can be reached about the broadcasting situation.
H. M. N.

By E. C. MILLS

Chairman, Executive Committee, Music Publishers' Protective Association; Chairman, Administrative Committee, American Society of Composers, Authors and Publishers

DIRECT and truthful statements lead to clear understandings. Clear understandings, based upon good faith and honest intent, eliminate bad feeling and promote harmony, even though we differ from the "other fellow."

There has been much confused and inaccurate argument anent the widely discussed difference between the proprietors of musical copyrights and the broadcasters as to the claims asserted by the former in behalf of their right to insist upon being paid by the latter for the public performance of their copyrighted compositions by broadcasting.

The subject is one that must directly concern every "listener-in," and as these now number some millions of persons, it is hoped that the interest will be sufficient to inspire the reading of this article. Copyright is to the author and composer what patent right is to the inventor. Copyright in the one case, and letters patent in the other, is a grant by the Government to the creator of an original literary or musical work or an original invention, of an exclusive monopoly in and dominion over the product of his brain.

Every civilized country in the world recognizes the principle of granting such monopoly for the encouragement of culture in the arts and sciences, for through the exercise of the monopoly granted the creator, he may reward himself for his creation and at the same time increase the efficiency, comfort and happiness of the human race.

The monopoly granted by copyright, as with patent right, is exclusive, and in the case of an author or composer includes the right to arrange, adapt and translate the work; to print, reprint, publish and vend it; to reproduce it mechanically, as in the form of phonograph records and player-piano rolls; and, lastly, to perform the copyright work publicly for purposes of profit.

It is with the last-named right that we are concerned in this article, for the copyright owner possessing under the law the exclusive right to *perform publicly for purposes of profit*, none other than he can so lawfully perform it, except by license from him authorizing such performance.

It is impracticable for the individual author and composer to assert the last-named right, as an individual, for the very simple reason

Published Monthly by the Henry M. Neely Publishing Company, 608 Chestnut St., Philadelphia, Pa.
Bell, Telephone—Lombard 8431 Experimental Station (3XP), Delanco, N. J.
HENRY M. NEELY.....President and Editor | DAVID GRIMES | BRAINARD FOOTE | .....Contributing Editors
G. W. KRAFT.....Secretary and Treasurer
NORMAN NEELY.....Art Director
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

that he cannot have representatives available to protect his rights at all places where his product is used, and unless he has a representative "on the ground," experience has proved that his works will be used without any regard whatever for his lawful rights.

So, in order to secure lawful protection, a number of composers and authors have banded themselves together, with their publishers, in an organization known as the American Society of Composers, Authors and Publishers, with its principal office in New York City, and thirty branch offices scattered over the country in its principal cities, and it is the purpose of this society to safeguard and protect the rights of its individual members.

It may be said that the society is an absolutely nonprofit organization, its entire net revenue being divided quarterly amongst its members, according to their classification as fixed by the merit and use made of their works.

Such controversy as there has thus far been between musical copyright proprietors and radio broadcasters has been as between the American Society of Composers, Authors and Publishers and the broadcasters, individually and through their organization, known as the National Association of Broadcasters.

The controversy has grown out of the claim asserted by the music men that their product when used by the broadcasters is "publicly performed for purposes of profit" and that they are entitled to compensation for such use, just as they are compensated by thousands of theatres, dance halls, cabarets, etc., which publicly perform their works for *purposes of profit.*

The broadcasters have asserted that their performances are not *for purposes of profit,* in that they derive no revenue from the operation of broadcasting, but that it is done more or less as a public service. They have further asserted that it is unfair for the music men to require them to pay for the use of copyrighted works in this manner for the reason that they, through broadcasting the music, create a demand for the printed copies, the records and rolls, and thus the copyright proprietor is compensated through profits from the sale of sheet music and the royalties received from record and roll manufacturers.

We need not concern ourselves in this article with the minor arguments advanced by both sides; in the main the preceding two paragraphs state the essence of the controversy.

On the first point, as to whether broadcasting is or is not a *public performance for purpose of profit,* it should be simple to reach a decision. If the expense of broadcasting is undertaken by a commercial organization, such as a manufacturer of radio apparatus, a department store or a newspaper, *why is it thus undertaken?*

In the case of the manufacturer of radio apparatus one does not need to search far for the reason. Obviously, if there were no broadcast service of interesting material, there would be no demand for the apparatus which the manufacturer has to sell, hence he has every reason to engage in and promote broadcasting activities so that his sales of apparatus may be maintained at maximum levels.

In the case of a department store one does not need to search much further for a sufficient commercial reason, for it seems equally obvious that broadcasting is undertaken as a commercial advertising proposition pure and simple; else why is it undertaken? One grants the desire of high grade departm stores to render service to the commun ..es in which they exist, without argument, but no reasonable person would urge that in undertaking the operation of broadcasting that is their primary object, or why the frequent repetition in announcement of the source of the broadcasting? It is simply a matter of "good will" advertising—that and nothing else—that inspires operation by a department store of a broadcasting station.

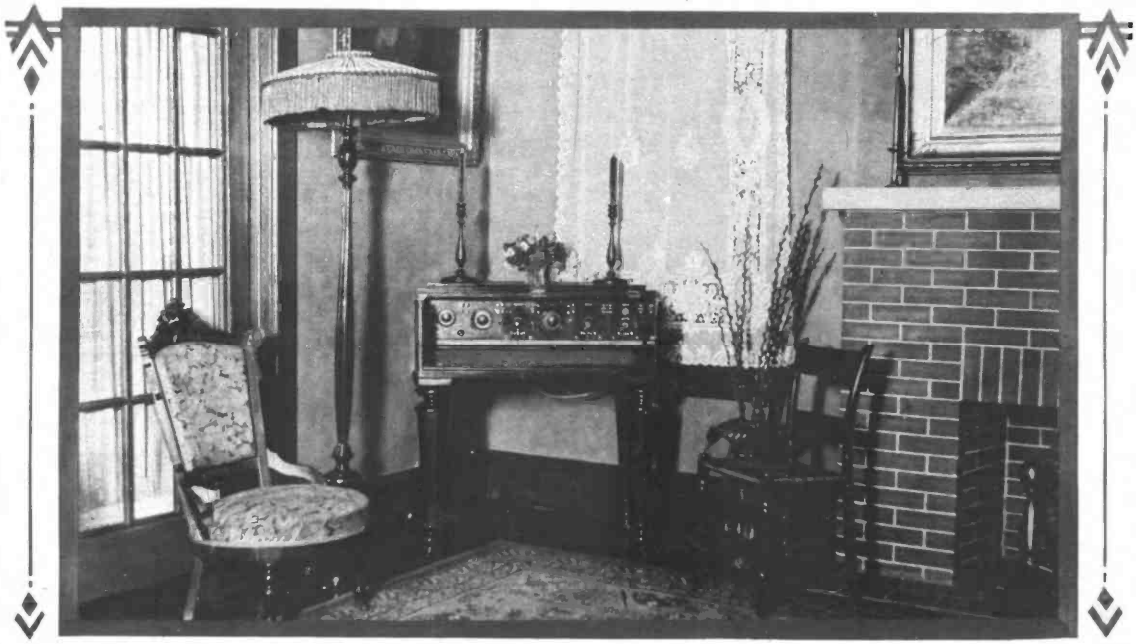
In the case of a newspaper is there any difference? Again it becomes a matter of "good will" advertising—the increasing of interest in and friendship for the newspaper in the area it serves. From these come increased circulation, increased advertising, increased revenue and profit.

They broadcast, all of them, *for purposes of profit,* and nothing else, in my opinion, notwithstanding much grandiloquent expression concerning their love for the public and their desire unselfishly to serve it. As to whether or not broadcasting is a *public performance,* that question has not been much debated, nor does it seem debatable. Any performance that serves the enormous and constantly growing radio audience would seem, to me at least, to be manifestly *public.*

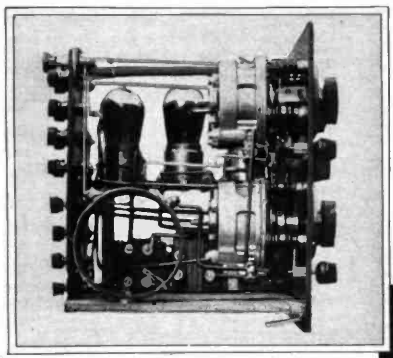
If then, it be granted that broadcasting, in the usual and popular sense, is a public performance and that its purpose is profit, is it fair, right and lawful that the creator of the broadcasting material should be compensated for such use of his works?

As I have said, thousands of theatres, dance halls, cabarets, etc., compensate the copyright proprietor for the use of his works in public performance, not indirectly, but directly for a license issued authorizing such use.

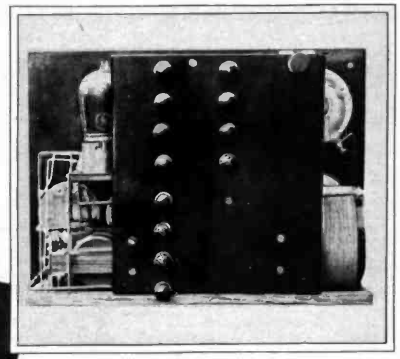
Radio is today the most menacing competitor the theatre, dance hall, cabaret, etc., have, notwithstanding the use made by such establishments of (Cont'd



Radio in the home of W. F. Drehs, 307 Penn Avenue, West Reading, Pennsylvania



To the left is a view of the left side of the Riley set, showing the binding posts on the rear panel, the fixed coil, the tubes on their shelf, and two of the variable condensers. To the right is a rear view of the set, showing how all of the battery, loop and aerial binding posts are mounted on a panel in the back



A CIRCUIT TUNING *with* CONDENSERS

IT SEEMS that the majority of circuits in present-day radio are getting away from the idea of having taps and variable coils to tune the incoming signals. Most of the recent popular arrangements do their tuning by the use of condensers. This is a logical method of tuning any radio set, as it allows a very fine adjustment in the incoming signals.

The Riley capacity tuned circuit which we are showing here was developed by G. W. Riley, of the Philadelphia office of the Bristol Company, who is a radio experimenter and designer by profession. This hookup is really a modification of the ultra-audion hookup. Mr. Riley utilizes three variable condensers for tuning. In view of the fact that the circuit uses three variable condensers to tune with, the three circuits become very fine in adjustment and the set is absolutely critical for distant stations and also sharp for local reception in selectivity.

This Riley circuit uses for an inductance only a 35-turn honeycomb coil. With this small amount of inductance in the circuit it will tune from the lowest broadcasting station away up to over 600 meters. It is a very desirable feature to cover this band of wave lengths without having to fool with switches and moving coils.

All of this tuning is done by the different combinations of the settings of the variable condensers.

This circuit is highly regenerative, as the adjustments put all three circuits in exact resonance, but it should be understood that this very advantage carries the disadvantage of adding some difficulty to the tuning. It requires patience and care. Most of you have, no doubt, at one time hooked up the well known Gibbons circuit, which is a modification of the De Forest ultra-audion. You know just exactly how sharp this circuit tunes. In fact, it is so sharp in its operation that it is almost a necessity to have a vernier attachment on the dials for the best adjustment.

Now there are [illegible] there are stations close to you, when even the Gibbons circuit, with its remarkably sharp tuning, is not capable of shutting out these stations. Mr. Riley was aware of this when he decided to build a circuit which would eliminate any of the interference from any other station, and so in his experiments he at last developed this "capacity" circuit.

One variable condenser is in the antenna circuit for tuning that part of the hookup and another condenser is across the 35-turn honeycomb coil and really acts as a wave meter or wave trap. The third variable condenser is shunted directly across the phones. By shunting, we mean that one terminal of the variable condenser goes to one side of the phones and the other side of the variable condenser goes to the other side of the phones.

Now with this Riley circuit, even if you lived on a top floor with a broadcasting station on the roof, I really believe that it would be possible for you to get rid of the local station with absolutely no interference from it.

This circuit has the qualities that make it tune very, very sharp. It utilizes variable condensers that have the capacity of .0005, which is the 23-plate condenser.

It will absolutely separate stations broadcasting on waves differing only four or five meters, but let me say once more that it is no set for the novice to try to operate. It takes time and patience to learn to handle, but once you get the hang of it you will have an outfit that will do almost anything you ask of it. Its DX range will compete with any other, its tone quality is fine and its selectivity really wonderful.

We separated stations only one or two degrees apart on the dials and if we wanted to go back and pick up the same station, all we had to do was to set these dials at the settings we had before and by a little adjustment on our detector tube rheostat we were able to bring them in again.

The cabinet that this set is mounted in is one of the cabinets that was put on the market for sale by the Radio Corporation of America. It is an old cabinet which was at one time made to house the Westinghouse R. C. set. These cabinets may be purchased very reasonably. In fact, they are being sold in Philadelphia for $1.95. They are of mahogany and it is a wonderful "buy" for any one who wishes to put a set in it. Mr. Riley has built several sets and he uses these R. C. cabinets exclusively.

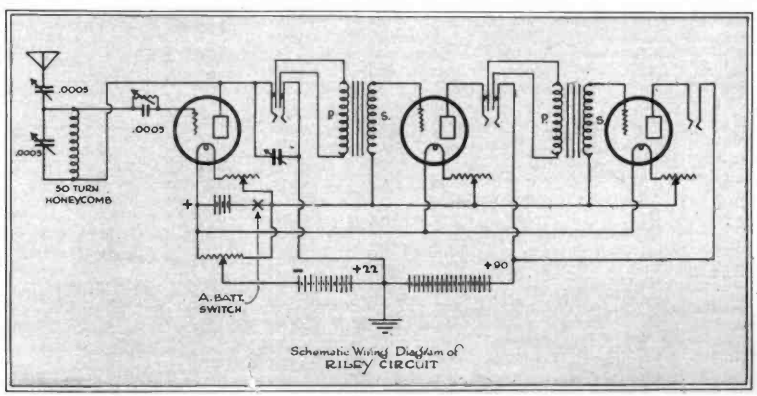
Now let us turn to this particular set:

The condenser in the upper left-hand corner is the aerial condenser.

The condenser below this is the condenser which is across the 35-turn honeycomb coil, the combination acting as a wave meter or a wave trap.

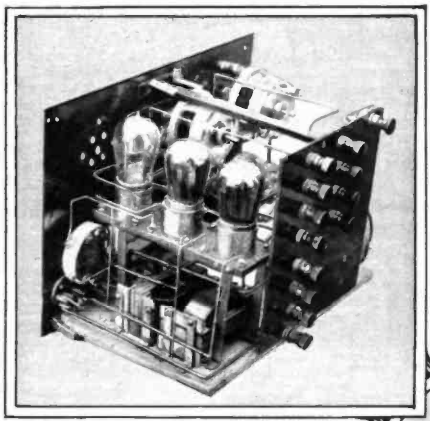
The third variable condenser given in the center of the panel near the top is the condenser which is across the phones, and this tunes the plate circuit.

The small dial in the center of the cabinet is fastened to the



Schematic Wiring Diagram of RILEY CIRCUIT

Resistron variable grid leak and is used to tune the grid circuit of the tube. I do not like to say variable grid leak in this case, as I find that this unit is really more than a grid leak. It has a very fine adjustment that allows you to tune the grid and I find that with this circuit on distant stations I can tune out one station and tune in another just by turning the Resistron. It seems to admit the proper amount of energy to



Looking down on the set you see how the audio-frequency transformers are mounted on the bottom, and alse how many of the other instruments are put in place

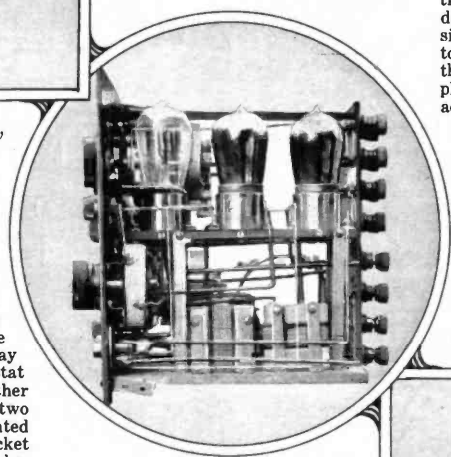
the grid of the tube. To the right of this we have the potentiometer, which is directly across the A battery and the center tap of which goes to the negative B battery. Then we have two rheostats. One of these controls the filament of the detector tube, and this may be either the Resistometer, the Bradleystat or the 30-ohm Pacent rheostat. The other rheostat controls the filament of the two amplifying tubes. The tubes are mounted one directly behind the other on a bracket with the audio frequency transformers below them. In this circuit Mr. Riley used the Federal No. 65 transformers. These can, however, be any good transformer, such as the Kellogg, the General Radio Company of Cambridge, Mass., the Acme or the All-American. All of these transformers have been tried and thoroughly tested at our laboratory at 3XP and we can recommend them very highly.

Below these rheostats we have three jacks. The first is for the detector tube and the second for the first stage amplifier and the third for the second stage amplifier. These jacks should be Pacent, Kellogg or Carter. All of these are very reliable pieces of apparatus and if you use them you may be sure that the best reception will be gotten from your radio set, due to the fact that there is no leakage across the insulators of the jacks.

Look at the photographs accompanying this article and you will find the best layout if you want to make this circuit. Mr. Riley claims the best results he has had with this circuit are with the Faradon variable condensers which are manufactured by the Radio Corporation of America. They are also of small diameter, which is necessary if you are going to use an R. C. cabinet for your set. Otherwise, you can use the Kellogg, Garod, Chelten or any standard 23-plate condenser with vernier.

Those of you who have wired and constructed the Gibbons ultra-audion circuit know that it is a very simple hookup to build. This Riley hookup is virtually the same thing and is wired much the same as the Gibbons. The placing of the variable condenser across the phones in an ordinary circuit does not really have any effect on the tuning, yet in this Riley circuit we find that this condenser is just as sharp in tuning as any of the other condensers. In the straight Gibbons circuit it is absolutely impossible to place the condenser across the phones. By so doing, you by-pass all of your radio energy from the antenna directly to the ground without going through the circuit.

In this Riley circuit, it is necessary to have a variable condenser across the phones. You will notice that the circuit is slightly changed and somewhat the old ultra-audion. The incoming radio energy is impressed on the grid of the tube instead of on the plate, as in the Gibbons circuit, but looking at this circuit in another light, by reversing the aerial and ground you will find that the incoming energy does really go to the plate as well as to the grid. Then, by having this condenser across the phones, it makes a by-pass for the radio energy to hit the plate rather than go through the telephones, which keeps the radio energy off of the part of the circuit where it should not go, due to the high resistance of the phones.



The right hand side of the set

Let us start wiring at the aerial circuit. We connect a wire from our aerial binding post and it goes to the movable plates of the variable condenser. The fixed plates of this condenser are then connected to the 35-turn honeycomb coil, across which is another 23-plate condenser.

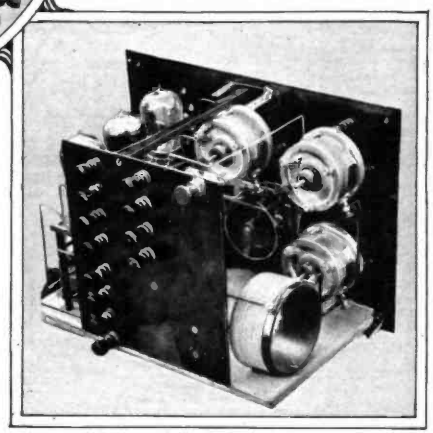
While we are on this subject let us give a little talk on just what this coil and condenser do in this circuit. This coil, shunted by a condenser, becomes in technical terms a closed oscillating circuit. This means that the coil and condenser are capable of being tuned to resonance with your incoming signal.

Now if you were to detune slightly either the incoming frequency or the coil and the condenser, the two are thrown out of resonance and the two waves are opposing each other. Of course, when these two are opposing each other it means that the coil is probably in resonance with some other incoming radio frequency and allows that undesirable frequency to flow through it rather than be by-passed or discarded and go to a part of the circuit where we don't want it.

This coil and condenser help to make this circuit the wonderfully sharp tuning hookup that it is. It allows all undesired signals to be by-passed rather than go through the regular performance of the desired signal.

One side of this coil and condenser goes to the grid of the tube, which has a variable high resistance and a capacity in series with it. This variable high resistance is the Resistron unit and the capacity condenser is the Dubilier .0005. The other side of this coil and condenser is connected to the plate of the tube and from the plate there is also a wire which runs to the telephones and the variable condenser that goes across the telephones. The other side of the telephones is connected to the ground and the ground is connected to the plus post of the B battery. The minus B battery connection goes to the center tap of a 400 ohm potentiometer, the two outside terminals of which are connected to the plus and minus filament battery that lights the tubes.

Thus far the description takes in the detector tube. Of course, if you wish to add the amplification, it is necessary for you to install a double circuit jack. The center prongs of this jack go to the primary of the first audio frequency transformer. The diagram for the two-stage audio frequency amplifier is shown in one of the previous issues of this magazine, and it will not be necessary for me to go over that part of the circuit here



This view shows how the fixed coil is put in place and also shows the mounting of the variable condensers and the potentiometer

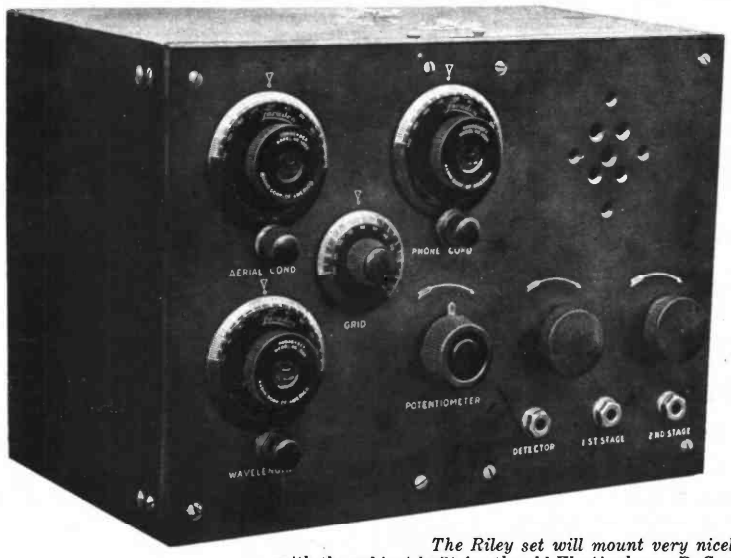
notice that we are using an A battery switch in this circuit to control the filament current of the tubes; that is to say, when you pull out this switch and open the circuit, it does not admit any A battery to the filament. This A battery switch is also so connected that it automatically cuts off one side of the potentiometer from your A battery and prevents the continual drain from going through this potentiometer after you have turned off the filaments.

In wiring this circuit be sure that you use a good stiff wire such as a number 12 either tinned or plain copper wire. If you are using spaghetti, be sure that you are using the good cambric covered tubing which is varnished with insulating varnish rather than the cheap spaghetti that is on the market at the present time.

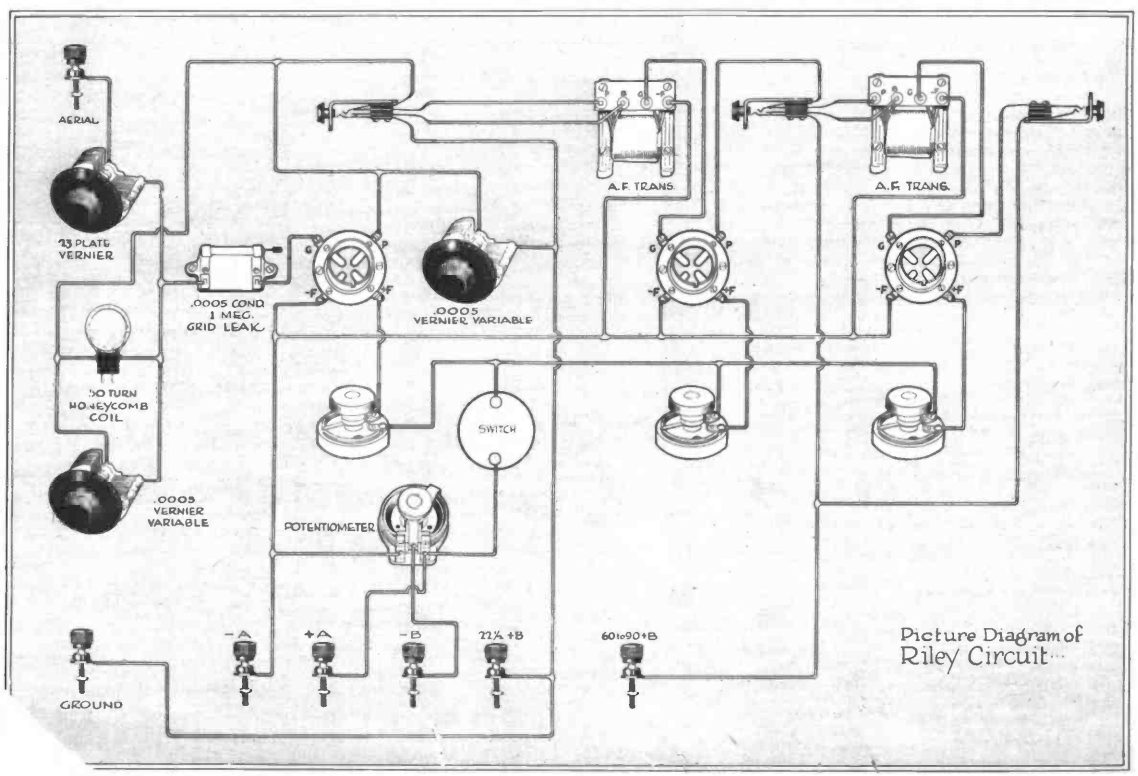
Have all of your connections soldered and use only rosin core solder or a mixture or rosin in alcohol or rosin in Carbona. This is very desirable as the rosin is a very good insulator, and if it should happen to flow between any two connections, it will not mean that you are sacrificing any radio energy by it leaking across this rosin. Paste and acid should never be used in any radio circuit, as the conductivity of paste and acid and corrosion of such paste and acid are very detrimental to reception and apparatus.

I had a very good example of this not long ago when a friend who was playing around our workshop at Station 3XP offered to solder two wires to a jack I wished to use in something I was building. I did not watch him do his soldering, but when I connected up the jack and plugged a milliammeter into it for the purpose of detecting a very small current, the milliammeter did not register any current whatever.

I was absolutely certain that some current must be flowing in that particular part of the circuit and so I made an examination. I found evidences of acid on the insulating material between the blade of the jack and I asked my friend if he had used any of a small tin of paste which we happened to have on the work bench. He replied that he had. I at once took the jack, connected it (Continued on Page 46)



The Riley set will mount very nicely with the cabinet built for the old Westinghouse R. C. set



Oval—This is "G. C. A.," or G. C. Arnoux, chief announcer and program director. He announces the 9:30 to 10:15 o'clock concert — and he wrote this article

Right—WBAP's Hired Hand is noted for his humor. He is president of the Truth League, with more than 100,000 members

Introducing WBAP and the Hired Hand

By G. C. ARNOUX

THIS is a story of radio by the man in front of the microphone for the fans behind the receiver. It isn't often that the announcer gets his chance to air his views and give his slants on radio, but through the courtesy of the editor of *Radio in the Home*, this golden opportunity has come to the writer of this story and he has hastened to take advantage of it before Mr. Editor changes his mind—and even yet he may decide that its "place in the sun" rightfully belongs in the waste basket rather than in printers' ink between the frontispiece and the last page of this magazine. So here goes, and here's hoping the waste basket will be full when this "masterpiece" arrives in the editorial sanctum sanctorum. And from past experience the presiding genius in the editorial Holy of Holies often fails to share the optimism of the writing person.

E. L. O., or E. L. Olds, as his full name is, handles the day market periods and announces the 7:30 to 8:30 concert

For nigh on to two years the writer has followed the radio game as program director and radio editor of WBAP, the broadcasting station of the Forth Worth, Texas, Star-Telegram, and in that time has come to the conclusion that the world is full of a number of kinds of persons, to please all of whom is as easy as converting the Mexican populace to the virtues of disarmament. However, it can be done, and the radio station that can give all of the people what they want most of the time is the one that wins the sweepstakes in the ether.

Radio has been for the past two years, from the broadcasting point of view, a 100-yard dash for recognition in the air. For perhaps the first time in American history there has been witnessed the spectacle of great organizations and corporations spending thousands of dollars a year to entertain the people, without a sheckel of direct returns coming in to the cash till. And the aim of every one of the broadcasters has been to give the BEST, and the word is spelled in capital letters, to the listeners—to stand out from among the rest as having the finest station in the United States.

Consider for a moment the cost of broadcasting the nightly programs as paid by the operators of such stations. Striking an estimate of $25,000 yearly for operating and upkeep for each of the Class B stations, a little more than fifty in number, you have an expense of $1,250,000, and putting the cost of the 450-and-odd Class A and Class C stations as low as $3000 we have another million and a quarter, or a total of $2,500,000 a year for operating expenses alone. When you add to this the expenses of the artists coming from a distance the figure grows rapidly.

For instance, one college, the Sam Houston State Normal, at Huntsville, Texas, paid $550 in traveling expenses to come to WBAP for an hour and fifteen minutes of broadcasting.

The Chamber of Commerce at Memphis, Texas, last year voted $375 to send its orchestra 350 miles to Fort Worth for the same purpose. John Tarleton Agricultural College of Stephenville, Texas, spends $100 a month for nine months of the year for the privilege of giving an hour program each month over our station. the writer could cite innumerable i

of other Texas and Oklahoma organizations spending like amounts to broadcast from Fort Worth.

Radio therefore demonstrates the one known exception where the the public gets something for nothing and the best of its kind to be obtained at that.

The writer has often wished that a composite picture could be painted of one night's radio audience listening to one station. If such a thing were possible it would be the most interesting portrait ever painted, for it would show a cross section of humanity. Often on one night's concert we have received letters from an isolated trading post in the Hudson Bay country, from the hut of a Forest Ranger perched in the heart of the high Rockies; from the headquarters of a Montana ranch, thirty miles from the railroad; from a sugar plantation in Cuba; from the hacienda of a Mexican land king; from ships far out on the ocean lanes; from the steel jungles of New York City, where the receiver has his aerial on top of his apartment house; from a hospital bedside.

They all bring to the mind's eye a different picture, but every one tells the same story—what radio means to the world today, and more particularly what broadcasting means to the people.

In our files at the Fort Worth Star-Telegram we now have some 300,000 of these letters. They come from every State in the Union and from every clime, reaching out far into the South Pacific Islands on the West and to the coast of France on the East; From Northern Alaska under the Aurora Borealis on the North to remote Mexican and South American hamlets under the Southern Cross. Many of the fans who write in tell of their life at some length and these collections of letters and cards at WBAP and other broadcasting stations constitute perhaps the most unique and certainly the most interesting collections ever assembled.

And what is most important of all they answer in unmistakable terms the question, "Is Radio Here to Stay?" And the answer is the single word "*Yes*," in letters a mile high. The broadcasting game, as viewed from the standpoint of the program director —the man "on the inside looking out"— is now starting on a new period in its development—the weeding out process. Last November the tide commenced to set strongly that way and this year will see the "weak sisters," in most instances, properly laid to rest. The day of the low power, low efficiency broadcaster is just about out. In short, their numbers are up. For after all, while the listeners are getting something for nothing, the broadcasters are all getting returns in one form or another—from WBAP's standpoint our returns are in good will and good friends. Without them no newspaper can exist.

Radio is peculiar in that the returns come in only with the best programs, the most entertaining entertainers; and further, the broadcasting station that fails to give the broadcasting public just that not only does not make good friends but loses even those that it has.

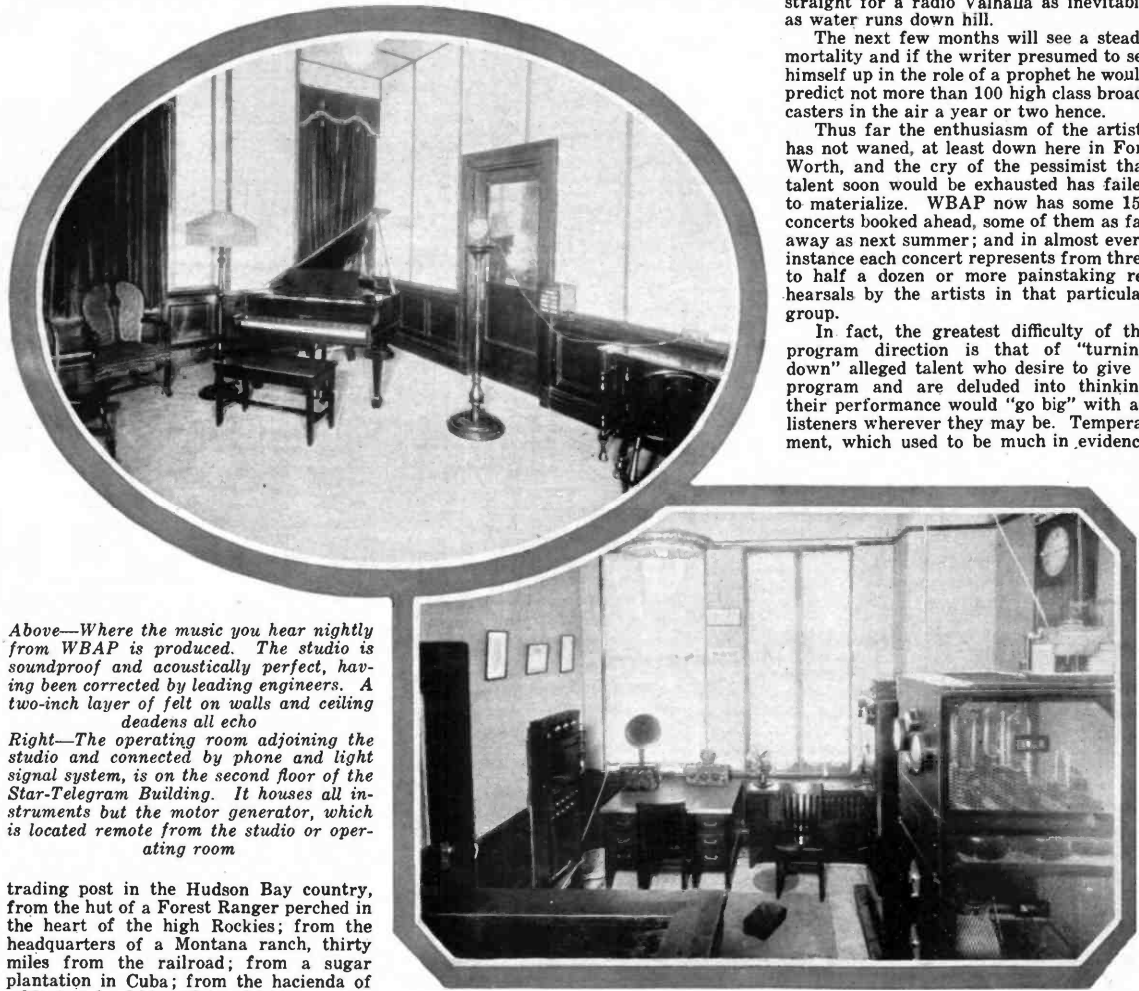
The "air cloggers," the low power stations with poor programs, poor transmission and faulty modulation, are headed straight for a radio Valhalla as inevitably as water runs down hill.

The next few months will see a steady mortality and if the writer presumed to set himself up in the role of a prophet he would predict not more than 100 high class broadcasters in the air a year or two hence.

Thus far the enthusiasm of the artists has not waned, at least down here in Fort Worth, and the cry of the pessimist that talent soon would be exhausted has failed to materialize. WBAP now has some 150 concerts booked ahead, some of them as far away as next summer; and in almost every instance each concert represents from three to half a dozen or more painstaking rehearsals by the artists in that particular group.

In fact, the greatest difficulty of the program direction is that of "turning down" alleged talent who desire to give a program and are deluded into thinking their performance would "go big" with all listeners wherever they may be. Temperament, which used to be much in evidence even in radio, is wearing away, under tactful treatments by the program managers. The temperamental prima donna who ventures into the concert room finds the atmosphere unfavorable for the fostering of this delicate flower, and 99 per cent of the entertainers are A No. 1 good scouts.

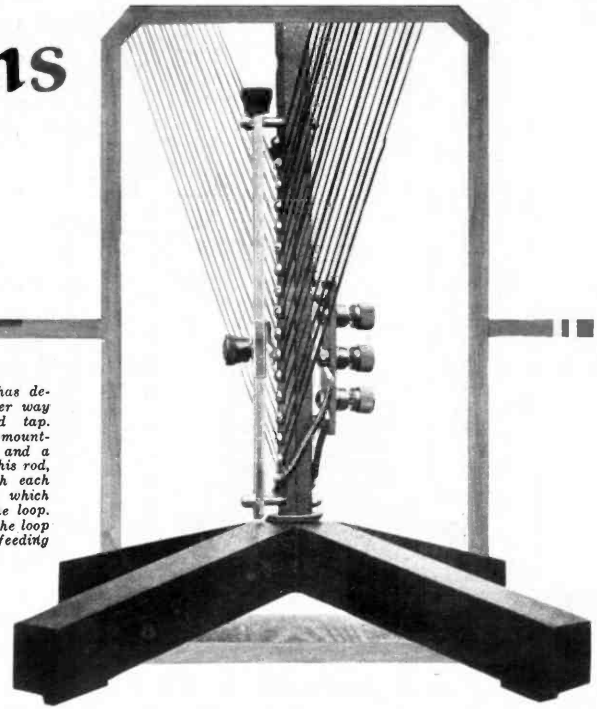
We have found that the human touch has done more to make WBAP"s' program receive the modicum of popularity that has come our way than any other single factor, including the pro- (Continued on Page 4)



Above—Where the music you hear nightly from WBAP is produced. The studio is soundproof and acoustically perfect, having been corrected by leading engineers. A two-inch layer of felt on walls and ceiling deadens all echo

Right—The operating room adjoining the studio and connected by phone and light signal system, is on the second floor of the Star-Telegram Building. It houses all instruments but the motor generator, which is located remote from the studio or operating room

Grimes Designs New Coil For His System



The Mercury loop has developed a very clever way of using the grid tap. There is a metal rod mounted on the upright and a slider passes along this rod, making contact with each one of the screws which hold the turns of the loop. Thus every turn of the loop can be tapped for feeding to the grid

By DAVID GRIMES

THE use of tuned radio frequency amplification has attracted so much attention lately as to cause me to devote considerable time to applying it to the Inverse-Duplex system. The article last month gave a little of the history of tuned radio and showed a diagram which permitted its use with inverse-duplex on an aerial and ground. Tuned radio, at its best, is complicated and for this reason, the present commercial adaptations have been confined to aerial operation. The aerial collects enough energy to give an audible signal even with the dials set only approximately correct. Furthermore, the atmospheric noises picked up by the aerial, to say nothing of the telegraph, permit the operator to learn the sequence of tuning on his numerous dials at any time, not depending on broadcasting.

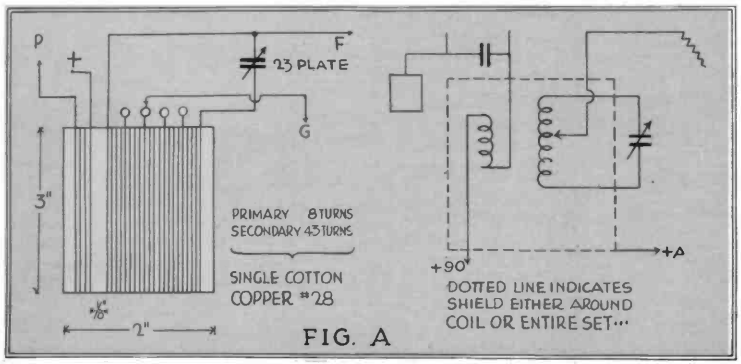


FIG. A

Diagram showing the winding of the coil as designed by Mr. Grimes

It was an effort toward retaining the cream and throwing away the skim milk of the above possibilities of tuned radio that led me to concentrate my experiments on putting the whole system on a loop. The loop for reception has many advantages over an aerial. These have been thoroughly discussed before. A loop gives greater freedom from atmospheric and telegraph disturbances. It permits greater selectivity with a minimum number of controls. It requires no installation and permits the set to be moved about. Until recently it has not been practical to combine loop operation with tuned radio on account of serious instabilities—and much less practical to combine tuned radio on loops plus the Inverse-Duplex. During the past month, however, I have built several such sets and am now prepared to give sufficient information to enable the experienced experimenter to duplicate my successful results.

In the first place, I have definitely arrived at the conclusion that any tuned radio set which employs more than two tuning controls is doomed as far as the average individual is econcerned. Unfortunately, Mother Nature has not supplied us with more than two hands. Any increase in the number of controls over the number of hands we possess greatly complicates the adjustment. If you don't believe it, just try tuning your three-circuit tuner some time with one hand in your pocket. And then imagine that same set in the hand of a novice under the same conditions. Two controls, then, must be all the tuning adjustments this loop set of mine can possess.

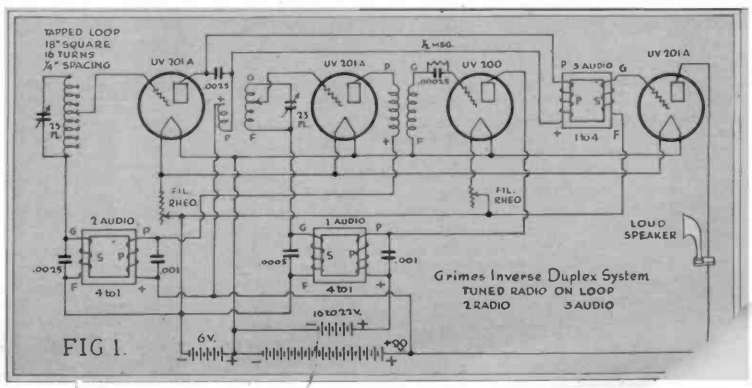


FIG 1.

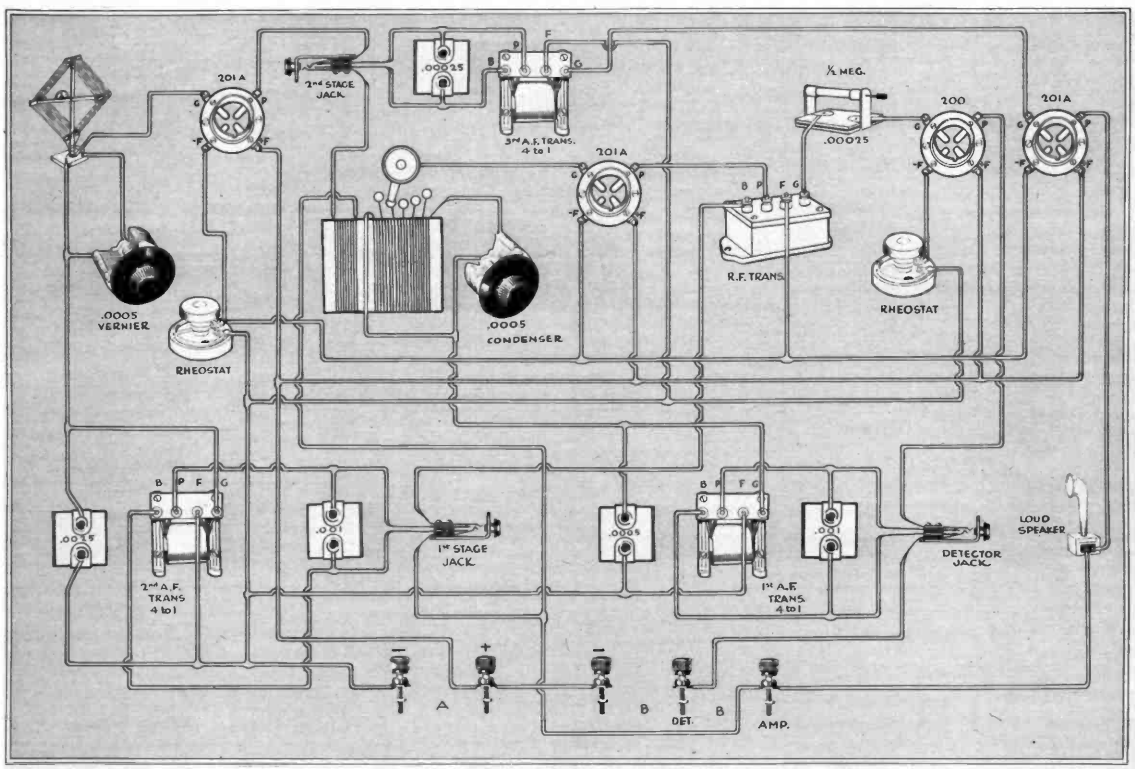
Reference is here made to the diagrams, which show a four-tube tuned radino loop set employing the Inverse-Duplex system to obtain two radio, a detector, and three audio stages of amplification. The loop is tuned by means of a condenser and the radio transformer between the first and second radio tubes is tuned by a condenser. This is the extent of the tuning adjustments. The three amplifier tubes are controlled by a common rheostat designed to carry at least three-quarters of an ampere. The detector tube is controlled by a separate rheostat that carries at least one ampere.

The tubes recommended for use in this or any other circuit for best results are the UV201-A or C301-A for amplification and the UV200 or C300 for detection. Any departure from this will result in decreased efficiency that is particularly noticeable on loop reception. Don't forget that even the crude little crystal under certain conditions will operate several hundred miles on an aerial. Merely because a tube detects when used on an aerial is no sign that it is a good detector. Many times a crystal would do as well—why use a tube? But even the manufacturers of the dry cell tubes advertise the UV200 and C300 as the "long distance detectors" and the UV201-A and the C301-A as the super amplifiers. The tubes, of course, require storage batteries for operation, but the time hasn't yet arrived when we can obtain a great deal for nothing. Whenever circuits are designed for [illegible] results with storage battery [illegible] must not expect full satisfaction others. A storage battery will last for many years, if charged often and otherwise treated properly, and will pay for itself in the end.

The loop is shown with volume control taps as in previous loop Inverse-Duplex arrangements. This is to prevent overloading and any tendency toward regeneration on local powerful stations. These taps will change the tuning very little, as they are not in the tuning circuit. The tuning condenser remains across the entire loop no matter where the tap is located. The two dials, then, will practically always read the same for a given station. Whether they will read alike depends on variations in the tuning condensers, coils and wiring. Usually they will not, but their difference will be so slight as not to be troublesome.

The tuned transformer is shown on page 14 and is very simply made. It consists of a small piece of 3-inch tubing. This tubing is standard material and is usually made from bakelite, micarta, formica or other insulating material. It is cut about two inches long. The primary and secondary are wound with No. 28 single cotton covered wire. The primary has eight turns and the secondary forty-three turns. This will fit the ordinary 23-plate tuning condenser. Both windings should be wound in the same rotation and the leads wired as indicated in the drawings. The phase on the primary is reversed. This is necessary to avoid oscillation. The secondary is tapped every seven turns for experimental purposes. This tap when once determined is left fixed. Some types of radio transformers are designed to function as proper transformers. Others act more like radio choke coils, passing the radio on to the next tube by means of the capacity between primary and secondary windings. The latter type are highly inductive and often cause oscillation if any considerable amount of inductance is located in the grid circuit of the same tube. In this set, we will use a fixed radio transformer working into the detector circuit. If this fixed transformer is of the pure transformer type, no taps will be necessary on the secondary of the tuned transformer. However, if the fixed transformer is inductive to a large degree, taps will be necessary. This grid tap should be adjusted so that no noise or regeneration takes place on any setting of the condenser.

It is desirable to have both tuning condensers alike and so we will use a 23-plate



to tune the loop. The design of the loop for operation with a 23-plate tuning condenser should be such as nearly to match the tuned transformer in inductance and self capacity. A little experimentation is necessary here, depending on the wiring in the set, but it is suggested that a square loop of sixteen turns, eighteen inches on a side, spaced one-quarter inch, be first employed. This should be tapped about every other turn. Details of such a loop were shown in the December issue of *Radio in the Home.*

In regard to the audio transformers, most any good low ratio type is suitable. Ordinarily higher ratios than 4 to 1 should not be used. Some higher ratio transformers I have tried with success. Most all of the low ratio types were successful. These transformers (Continued on Page 36)

Lots of Volume with this Three-Circuit Coil

The Kelcoil mounts easily and neatly on the back of the panel

THERE seems to be no end to the number of modifications possible in the old favorite Armstrong three-circuit feed-back hookup. Radio fans adopt every new hookup that comes out, going into superheterodyne and limitless radio frequency amplication, but, after all is said and done, somebody comes along with a record made on the good old regenerative circuit and once more the fans swing back to their first love.

This Armstrong three-circuit feed-back system is most familiar in the form of the three honeycomb coil hookup or the same hookup using three spiderweb coils. It has also been adopted by the Radio Corporation in a number of their most famous sets, only instead of using the three honeycomb or spiderweb coils, they have very cleverly designed specially wound coils with one or two rotors inside of them and have thereby accomplished the same purpose, confining the range of their set to the broadcasting wave lengths.

The Haynes circuit is simply this three-circuit system, only the primary, instead of being separate from the secondary and inductively coupled to it, is a part of the same winding and is what we call "conductively coupled." The "Home-built" coil is another modification of this and now lately fans in the eastern part of the United States have been going mad over a new form of coil known to the trade as "the Little Kelcoil." This Kelcoil is a wonder and there is no getting away from that. Like several of the other more recent systems, it uses an untuned primary wound over a secondary, the secondary being tuned by a variable condenser in parallel. The tickler is wound as usual on the rotor form inside of the cylinder, upon which the primary and secondary are wound.

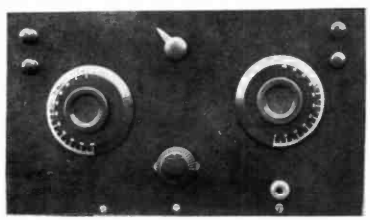
In this coil, both the primary and tickler are wound with Litz wire, the rotor having a small size and the primary having a generous size Litz wire. This seems to make all of the difference in the world in the volume of the signals received and the hookup which I am showing here with the Kelcoil is the only straight hookup without amplifying transformers that I have tried that really gives signals with satisfactory volume on a loud speaker with one tube alone. This circuit will work with any of the standard tubes, but volume of signals will depend upon which tube you adopt. With WD11 or WD12 you will probably have to use head phones; with the 199 or 299 you will probably also need phones, unless you are close to the station. With the 200 or 300 you can begin to get it on the loud speaker; with the 201-A or 301-A you can get it quite well on the loud speaker if you are near the station, and with a 5-watt power tube or the Western Electric power tube you can put it on the loud speaker with very good volume.

Just off hand I should say that this is the cheapest set I know of for working a loud speaker within fifteen or twenty miles of a good broadcasting station. It uses fewer parts than any other that I know of and the sharpness of its tuning is most unusual when you consider the minimum of expense to which you are forced to go.

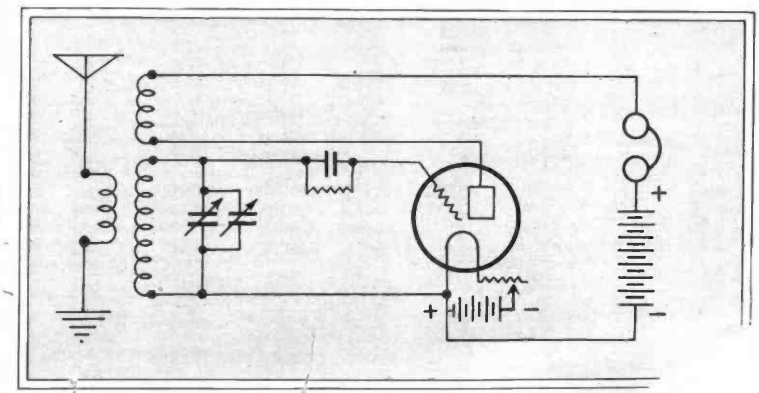
Its distance getting qualities are also unusual and we at Station 3XP have been able to reach out almost all over the country with one tube and a pair of head phones even while the Philadelphia stations were working full blast only fourteen miles away from us. The sharpness of tuning is further emphasized by the necessity of a vernier on the variable condenser. In this case I am showing one of the little Chelten midget condensers hooked up in parallel to the new Garod condenser and I have found this outfit very satisfactory.

As you see the set in the photograph accompanying this article here is a complete list of parts necessary:

1 Kelcoil
1 23-plate condenser
1 Chelten midget condenser
1 Rheostat adapted to the type of tube you use
1 Socket
1 Dubilier grid condenser with variable grid leak
2 Na-Ald dials
1 Pacent or Kellogg double circuit jack
4 Eby binding posts for front of panel
4 Eby binding posts for back of baseboard for battery connections



The controls make a nicely balanced panel for the set



The panel on which we mounted this set was 7 inches high and 12½ inches wide and this leaves plenty of room to spare so that the wiring is perfectly easy even for the clumsiest of fingers. The baseboard is 7½ inches deep and 12 inches wide and this leaves ample room for all of the instruments and some room to spare.

The two binding posts on the right-hand side of the front panel are for a permanent connection to the loud speaker if you wish to use one on local stations. In such a case, when you plug your phones into the jack, you receive the signals on the head phones, but nothing goes to the loud speaker. Then, when you withdraw the phones from the jack, it automatically transfers these signals to the loud speaker.

These two binding posts can also be used for hooking up a two-stage amplifier if you later decide to build one, and let me say that with this set you will find it well worth while because that will give you most of the distant stations on the loud speaker also. Any of the standard two-step amplifier hookups will do.

This is an ideal set to make now and to add later a three-tube push-pull amplifying unit, diagrams and description of which will be published in the next month's issue of *Radio in the Home*. This gives ideal amplification and, while it uses three tubes, it is really only two steps because the second step uses the two tubes in parallel in what is known as the push-pull system and this system gives maximum amplification with no distortion and almost total freedom from the usual transformer noises.

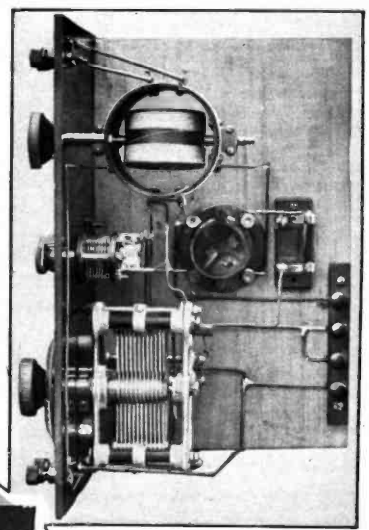
I strongly advise the purchase of a regular factory made Kelcoil, because it has been very carefully designed and is especially adapted to the circuit as we are showing it here. The man who is fairly well advanced in radio may possibly be able to make his own with fair satisfaction, although I do not think it is worth his while to do it for the mere saving of the price of the manufactured article. For the sake of those who cannot find the Kelcoil near them, I am giving here the data upon which it is constructed:

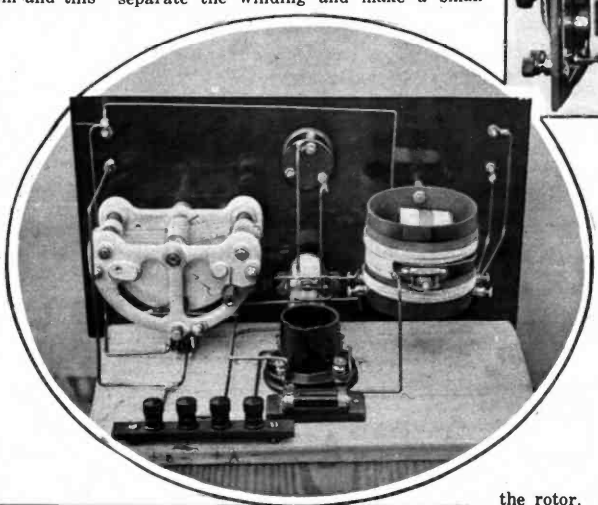
The coil is a sort of vario-coupler as far as shape is concerned. It consists of a stationary cylinder and a rotating cylinder. The windings are very peculiar and the constructor should follow instructions very carefully.

The size of the stationary cylinder is: length 2½ inches by 2⅞ inches in diameter (outside dimensions). Bore two holes in opposite sides of this cylinder directly in the middle of it to allow for the bearings of the rotating coil. Now we are ready for the winding.

The first coil, a secondary, to be wound will be No. 23 silk covered wire. A quarter pound will be too much. Your dealer will probably sell you thirty feet of this wire. Start your winding one-half inch from the end of the tube, leaving enough of the end of the wire over to make connection in the hookup. Wind twenty-two turns and then measure a space of one-half inch. Then run the same wire over this space using only one-half turn in doing so and then wind twenty-two more turns. This should bring you about one-half inch from the other end of the cylinder. Bore a small hole and slip the end of the wire through the same as done at the other end for connecting in the hookup.

The next winding, or primary, will be over the top of this first winding and Litz wire must be used. About twenty feet of Litz will be needed. Take a pencil and count down eleven turns on the secondary winding already on the coil. At this point separate the winding and make a small hole. Put about two inches of the end of the Litz wire through this hole for connecting and begin winding on top of the silk wire winding. Wind eight turns and again leave one-half inch space, span the Litz wire over the space close to and parallel with the silk wire. Now count nine turns from the space on the silk wire, and again wind eight turns of the Litz wire, making a small hole in which to insert the end of the Litz wire for connecting. Now we come to the rotor,



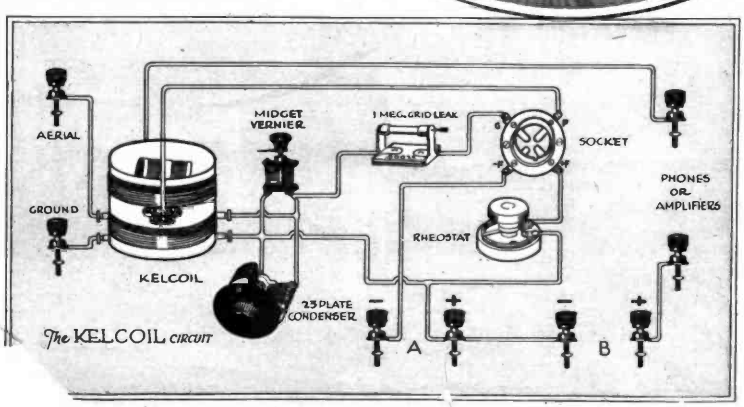


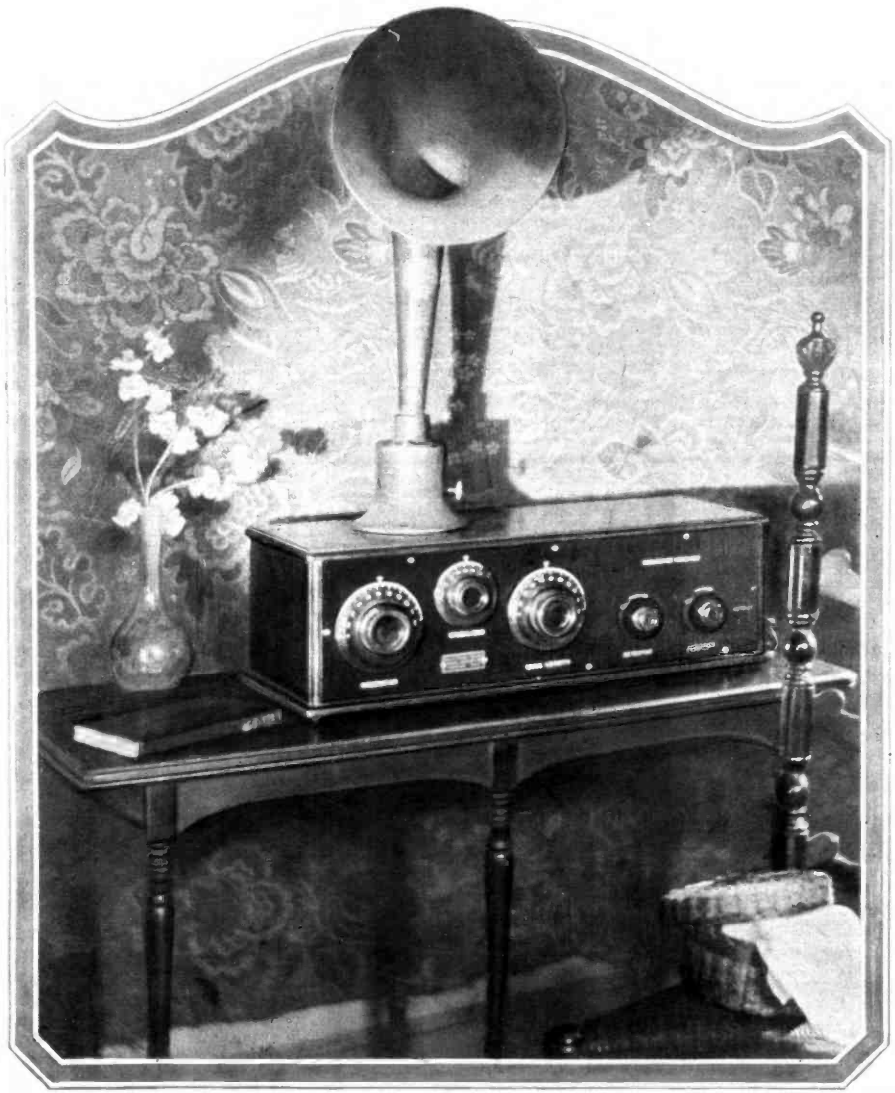
Above is a view looking straight down on the baseboard and to the left is a view looking down from the rear. With these two pictures and the dimensions given in the article, it will be easy for any one to duplicate this set

which is a tube 2⅛ inches in diameter and 1⅜ inches long. Bore two holes for the two shaft rods to pass through in the middle of the tube at opposite sides. No. 28 silk covered Litz wire is used for winding the rotor. Begin the winding as close to the edge of the tube as possible. After winding twenty-four turns, leave a space of about three-eighths of an inch and after spanning the space with one-half turn of the wire, wind twenty-four more turns, leaving enough wire at each end to make connections as usual.

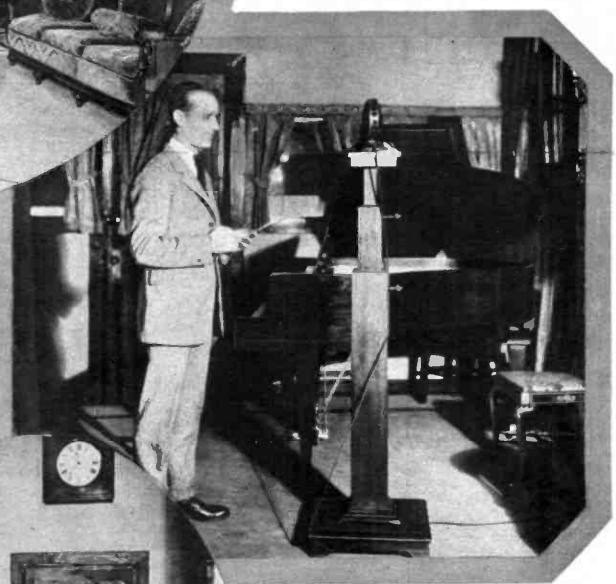
Now you are ready to put the coil together.

Fasten by soldering the wire at each end of the rotor to the rod which fits into the bearing. This will make the bearings connecting points of the rotor. The connections for the other windings can be made to binding posts secured through holes in the stationary cylinder, two on one side for the primary (Litz wire) for aerial and ground connections and two on the other side for the secondary (silk covered wire) for connection to the (Continued on Page 35)





Radio in the Home of L. B. Underwood,
5406 Angora Terrace, Philadelphia
The set is a Tuska Superdyne with loud speaker
Photograph courtesy of the C. D. Tuska Co.



Station WDAR, in Lit Brothers store, Philadelphia, has a glass-enclosed studio so that the crowds in the store can see into the studio while broadcasting is going on. An interior view, looking toward the reception room, is shown at the left. The center picture shows Harry E. Ehrhart, the famous "Dream Daddy" of the children's hour, and the "H-double-E announcing" of other periods. The lower picture shows "Gene" Goebel operating the station

WDAR and an Editorial Policy

By ARNOLD ABBOTT

WHEN our friend, Henry M. Neely, came to me and said that he wanted a batch of photos of Station WDAR, Lit Brothers in Philadelphia, and the personnel of the station, it was easy for me to assure him that it would be easy to supply them. But then, when he said that he wanted an article concerning the station and its personnel, it wasn't so easy to assure him that he would get that, too.

WDAR, and for that matter any other first-class broadcasting station, is a great deal like Topsy.

You remember Topsy, out of "Uncle Tom's Cabin," who, when she was asked about her birth, replied: "Ah wasn't bohn, ah jes' growed." Leastways, that is the way we remember the story.

And that's WDAR. While it has a birthday to observe, if we insist upon technicalities, it otherwise has "jes' growed," and it is growing yet, and so long as there is a WDAR it will continue to grow. By "grow," we mean the use of the word in its fullest sense—spiritual sense—somewhat as it is used in the Bible where it says: "And he grew in wisdom and knowledge, and in favor with God and man."

WDAR has a distinct "editorial policy," just as it has a distinct personnel and distinct features; and this policy has only been gained by the experience of just growing—advancing in wisdom and knowledge.

You may wonder at the use of the words—editorial policy. Heretofore, you have been accustomed to seeing it used only by newspapers, magazines and other publications.

And that is just the reason why WDAR has an editorial policy. We regard ourselves—and our potential utility and power—in the same light that a great American daily regards itself. The position in our American life, the potential power for good (or evil), the economic, social, political, religious, ethical and benevolent position of our great newspapers is too well defined to need exemplification here. And while radio broadcasting, as it is do-

the first-class broadcasting staions, is a new comet blazing across our sky, it is more nearly akin to the newspaper than to any other single thing. You will note we say *single thing*.

And here is the reason. A recipe.

Take a certain amount of newspaper, mix thoroughly with a cup of theatre, add a dash of social service, and knead. Roll out into portions sufficient for a day, sprinkle with a bit of religion here and there so that it will keep right. Then put into a hot oven, keeping your eye on it all the while. This is vital! Add before serving an enveloping sauce of education and miscellaneous knowledge, and serve hot.

Then, if you find you haven't mixed it just right, and haven't put in enough of one ingredient, or too much of another, it is best to retire into your favorite cyclone cellar for a spell, for a veritable storm will break about your ears otherwise.

Clearly, with an octupus of so many arms, a policy is necessary, very necessary.

A friend of the station, who happened to be visiting in our office one day, was asked how he would express the policy of our station in as few words as possible.

"That is easy," he chuckled, being blessed with a sense of humor, "your call letters sum it up. Listen!

Will
Do
Anything
Right

"Howzat?"

"Fine!" we cried.

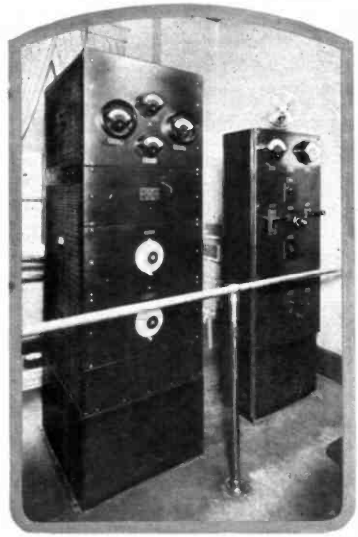
It is a fine slogan, and it is a good motto for all of us in the broadcasting profession to keep before our eyes, a beacon and a spur.

It means that nothing will be done in a slipshod manner; and it is better that a thing be done not at all than shabbily.

Beyond this generalizing motto or slogan, however, lies a deeper appreciation of our task. It would be hard to specify in just so many words what this appreciation is, or how it is translated into proper action. But just as the reporter on a great American paper knows instinctively whether the story he has dug up is the kind his paper wants, so the personnel of WDAR know instinctively the underlying policy of the station. The "editorial policy" of WDAR is as virile, detailed, omnipotent and omnipresent as the English Constitution, and it is just as unwritten, and will probably remain so.

To translate such an unwritten but potent policy into forty hours of action every week requires obviously an organization of minds of peculiar capability, and it is in the surrounding of himself with such minds that Jack E. Lit, managing director of the station, has been most successful.

Just as in the building of an arch, no matter how perfect or precise the stones, the success of the building depends upon the keystone, so it is with this organization. Jack E. Lit possesses the instinctive qualities of correct judgment, inspiration, and, at times, necessary repression, which correlate the efforts of the many different members of the WDAR staff.



The cases containing the 250-watt tubes and controls for operating current

When the station was opened about a year ago, on groundwork laid by Preston Shivers, one of the original Philadelphia amateurs and connected with Lit Brothers' store, the work of assembling the staff was begun.

You will remember the beginnings of radio, in its broadcasting sense. It was referred to as a child's toy. What a toy it has become! You will also remember that the most immediately accepted feature of each of the large stations was the bed-time story-telling period.

What more natural, then, than that the staff should start to build around a character whose name has since become known to the entire States, about whom stories have been built, in whose honor songs and poems almost without number have been composed.

"Dream Daddy!" Harry E. Ehrhart! They are one.

Handsome, capable, inspired with an inborn love of the child, Harry Ehrhart has made the character of "Dream Daddy" his own. His vibrant, penetrating voice—also recognizable as "H-double-E. announcing"—has charmed untold thousands of children from one end of the country to the other

The center picture is another interior view of the WDAR studio, looking toward the operating room. To the left is a visualization of the station's most familiar announcement—"Edna Finestone at the piano"

with his stories of the Jack and Jill Birds; of the Dreamland Train; of Flopsy, Mopsy, Cotton-tail and Peter; on and on.

And he is a real man, too, handling a man's job, for as "H-double-E announcing," he is the chief operator of WDAR. His efficiency in putting the station's programs on the air in the skillful manner which is a characteristic of the station, attests to this. It's a he-man's job.

Every one connected with WDAR is more than one-sided person; some of do so many things so well it is a j

The Greenough Players rehearsing with a dummy microphone on the table. Seated, left to right—Franklyn Granzow, Gertrude Williams, Peggy Jardine, Lawrence Jones, Dorothy Bartram, Marlyn Brown, Isabelle Ossuman, Catherine Collins. Standing, left to right—Frank McConnell, Walter Greenough, Ruy Granzow

fit for a Solomon to decide which is their best effort.

As assistant operator, Eugene S. Goebel, whom you often hear as "E. S. G." is an outstanding success. A great deal of experimental transmission has originated with him. He conceived, we believe, the experiment of broadcasting the singing voice of a person from one outlying place, to the accompaniment of music playing in another outlying place, the whole assembled and broadcast from still a third focal point—the broadcasting studio, using ordinary telephone circuits throughout. The experiment itself was a success, but due to the objection of the telephone company, it was laid aside, temporarily at least. Jean sings, and sings well. This is a recently discovered gift of a voice already known for its remarkably clear speaking tone.

Coming to the third of the operating staff, we introduce also the chap who does the motion picture review from WDAR—James A. Nassau. His initials are "J. A. N.," easy to remember, and so is he. "J. A. N." is the voice most often heard from the station's remote controls at the Stanley Theatre, Arcadia Cafe and elsewhere. "Jimmy" is notorious for his modesty; it explains why we have no photograph of him to illustrate this article.

To be an operator at a first-class broadcasting station requires varied and dissimilar abilities of the highest order.

The operator must first of all be a skilled technican, in this, the newest of professions, where skill today is based upon a groundwork of many months and years of experimental, rudimentary and apprentice work. He must be a gentleman and diplomat, for he meets all kinds of people, from the low to the high, from the ignorant to the scholarly. He must have a mind of a genius, working lightning-fast, for many a decision must be made in two seconds before an open microphone, and the result of his decision is heard by a thousand thousand ears. He must read, without stutter[illegible] or hesitation, a crumpled bit of paper [illegible]ving the names of musical compositions [illegible] original French, Italian, Russian, German, Hindustanee or Kaffir. These notes are handed him, ofttimes, while he is already telling the call letters of the station. And let him dare mispronounce Rachmaninoff, Saint-Saens, Tchaikowsky or Allah Akbar Vishnu!

With it all he must be debonair, smiling, precise and unhurried, for is he not the visible and audible symbol of the station?

All honor to the operators and announcers of the broadcasting stations. Give them readily of laurel wreaths to wear, for oft they will rest upon a fevered brow!

The work of a broadcasting station, especially those located in the larger cities, is chock-a-block full of romance and adventure. We know not of a more exciting, adventurous, interesting and thrilling avocation. One day a Richard Harding Davis-like person will arise from the ranks of the programming folks and tell the stories of the back-stage of broadcasting studios and offices. There is love and intrigue, there is villainy and sacrifice, there is heroism and heart-throb. But our space here is too limited to say other than attest to the facts.

When we come to consider the programming folks of WDAR we come upon an intricate organization. It is not a cog-like machine—such a thing is impossible in broadcasting. And a person who would well fit into a business organization necessitating a cog-like person is primarily unfitted for a broadcasting staff.

Do not misunderstand; programming is business, and it requires business methods. It obliges a comprehension of regularity and the mechanics of smooth functioning.

But with this, it demands the touch of genius, cosmopolitanism; diversified but not superficial knowledge; alertness to recognize opportunity and value; and an inexhaustible reservoir of inspired and fervid effort which we are accustomed to associate with the arts and artists.

Music in its various forms uses about 75 per cent to 80 per cent of present broadcasting schedules. For lack of space we will limit the discussion of programs to things as they are. The proportions of a broadcast program are much discussed, and could not be adequately treated except in a separate article—if then!

At WDAR, we divide our musical programs into two main types, classical and like music and popular and like music.

WDAR was fortunate in securing as its director of music, Mrs. B. F. Maschal, program director of the Matinee Musical Club, one of Philadelphia's—the world's—most noted and enterprising musical clubs. Under Mrs. Maschal's direction are prepared the programs of classical and like music. To her inspiration is due also the series of Opera Talks given each Monday through WDAR by Samuel Laciar, the well-known critic of the Evening Public Ledger, followed by selections from the opera. The opera selected is the one which is presented the next evening in Philadelphia by the Metropolitan Opera Company. Some of the best voices in the world have been heard in these little opera recitals from WDAR. Under Mrs. Maschal's (Continued on Page 43)

As the store's customers see the studio. An exterior view, showing the chairs arranged so that the customers may sit comfortably and listen to the concerts as received on a demonstration set and loud speaker

The RADIO KINDERGARTEN

This photograph through the courtesy of the Hahnemann Hospital, Philadelphia

LESSON FIVE

IN THE past sessions of this kindergarten of ours we have learned quite a little about the phenomenon which we call inductance. We have learned that this is one of the two most important phases of radio, the other important phase being the phenomenon which we call capacity or capacitance.

For all practical purposes, we may think of inductance as being some kind of a coil of wire, whether that coil be wound around a cylinder or in the form of a spiderweb around a wheel with spokes in it. Wherever we have a coil of wire of any shape, we know that we have inductance. Of course, a straight wire has a certain amount of inductance, but that is usually negligible and we are safe in keeping a mental picture of inductance as some kind of coil of wire.

We can also get an equally simple picture of the phenomenon which we call capacity if we will simply picture capacity as being some sort of condenser. In radio sets we have two most familiar forms of condenser—the fixed condenser which we use in various parts of the circuit and the variable condenser which is represented on our panel by a dial which we turn. When we turn this dial, one set of metal plates is revolved and interleaves with a set of metal plates which are stationary.

This form of variable condenser is quite familiar to all beginners in radio and equally familiar is the little fixed condenser such as we use across the telephones or across audio-frequency transformers or in the circuit leading to the grid of our tube and in this last case we call it a grid condenser.

Let us now inquire just a little bit into what a condenser really is and what this phenomenon of capacity or capacitance is and what it does.

Let us suppose that we have a long single wire aerial—say 200 feet long—extended above the ground. We know that this wire will have a certain natural or fundamental wave length. Suppose also that this wire is inclosed in some sort of material such as rubber, not for the purpose of insulating it, but merely to hold it together in case the wire inside should break.

Now let us suppose that in some way this wire does break exactly in the middle, leaving two pieces of wire, each one exactly 100 feet long.

Naturally your conclusion would be that each one of these pieces would have exactly the same fundamental wave length as the other one and that this wave length would be exactly half of what the fundamental wave length of the 200-foot piece of wire was.

But this assumption is not strictly correct. While the difference is very small indeed, it is quite possible to measure scientifically and to find that each one of these two halves of the original wire has a wave length a little more than half of the fundamental wave length of the 200-foot aerial.

This may seem almost like an impossibility, but further scientific investigations will show us a very interesting thing.

It will show us that there is an effect between the two ends of the wire in the middle which has an influence upon the faundamental wave length of each half. This is assuming that when the break in the wire occurred, the two wires remained so close together that you could scarcely get a thin piece of cigarette paper between them. If the aerial were receiving extremely short wave lengths, such as are being used nowadays, by the experimenting scientist, we would discover by proper instruments that considerable of this received energy was being transferred across this break in the wires and that to a certain extent the two wires were still in some mysterious way joined together so far as their response to radio waves is concerned. If, however, we are tempted to take advantage of this fact and to transmit along this wire the ordinary electric lighting current which vibrates at only sixty times a second, we would find that this does not pass through the break in the wire and that the break would stop the passage of the current.

Further scientific experiments would shows us a definite limit of wave length passing through this little condenser which is formed by the two ends of the broken wire. We would find in such a case as this that the wave lengths were extremely short.

Now suppose we were to take these two ends of wire and solder to each of them a metal plate about the size of a dime, still keeping the two surfaces of the dimes the same distance apart as were the two ends of wire originally.

Still further experimentation would show that we were now able to pass along this aerial and between the two surfaces a wave length a little longer than we were able to pass through the two ends of the wire alone.

Now let us assume that we have taken two sheets of tin, say eight or ten square inches each, and soldered them over the dimes, still keeping the two pieces of tin from touching each other, separating them with the same thin space as we had before.

We would now find that we could pass still longer wave lengths through them.

This would naturally lead us to the conclusion that the smaller the surfaces opposed to each other, the shorter the wave lengths which could pass through them, and the larger the surfaces the longer the wave lengths. Now we can do another experiment which is equally interesting and important.

Assuming that we still have the two pieces of tin, and assuming that they were of such a size that they would pass, let us say, a wave length of 150 meters, let us now pull these pieces of tin farther and farther apart. We will find as we separate them that the 150 meter wave length will

longer pass through them, and at a certain distance we cannot pass anything longer than 100 meters. As we separate them still farther, they will pass only shorter wave lengths, until they are so far separated that the electricity is no longer strong enough to have an effect upon the open gap.

All of this will lead us to this general rule, that the smaller the surfaces opposed to each other in a condenser, or the farther apart the surfaces are, the shorter will be the wave lengths which are able to pass through them, and, oppositely, the larger the surfaces facing each other or the closer together they are, the longer will be the wave lengths.

Does not your variable condenser in your radio set prove that this is so?

When you want to get signals from stations broadcasting on the shorter wave lengths, you turn the dial of your variable condenser down near the zero part, and if you will look inside of your set you will find that by doing this you have revolved the movable plates around until very little of their surfaces is opposed to the surfaces of the stationary plates. In other words, you have reduced the amount of surfaces opposing each other and have therefore reduced the wave length to which your receiving set will respond. If you wish to get the higher wave lengths, such as are used by Station KYW in Chicago, or Detroit, or Omaha, or St. Louis, or the 509-meter wave length in Philadelphia, or the California stations, you will have to move your condenser dial over toward the 100 mark. In other words, you will have to revolve the movable plates until they are almost entirely inside of and opposed to the stationary plates, thereby increasing the amount of surfaces which are mutually acting upon each other.

Nobody knows just exactly what happens in the space between the plates of the condenser when it is in operation.

The alternating currents of electricity, in radio vibrating all the way up as fast as a million and a half complete cycles every second, seem to stir up a state of strain in the ether between the plates and this state of strain on one plate, making it positive, immediately affects all of the electrons in the other plate, and the other plate becomes negative.

As the current reverses, and the first plate becomes negative, the electrons are immediately repelled from the other plate and it becomes positive.

In other words, whenever these alternations occur, the two plates or the two sets of plates of the condenser are always charged with the opposite kinds of electricity and a state of strain is set up in the ether between the plates and to a certain extent around the plates. When the potential strength becomes sufficient, the ether and the plates seem to be able to store up the electricity and become what we call charged. If we could leave them in this state by disconnecting the wires and then bring the wires close together at the ends, we would even get a little spark to jump across showing that the plates immediately discharge as soon as the potential is able to leap from one end of the wire to the other across the intervening air.

This is exactly what we do when we are using a spark transmittter such as most of the ships at sea are using. There, the condensers, which are very large affairs, are charged, and when the key is pressed down, a circuit is made and the condensers discharge and that is the sound we hear.

Inductance and capacity—coils and condensers. These two form the fundamental instruments in creating radio for us today. It is almost impossible to imagine one without the other and either one absolutely separately would be little or no use to us.

Now let us see if we can get an approximate picture of what these two phenomena are. The picture I am going to give you is a very rough one and scientists and radio engineers will scowl at it, but they have long since passed the kindergarten stage and they are able to go more deeply and accurately into things. We in the kindergarten do not have to do that; all we need is a general idea of what is going on in our set.

Let us say we are in an automobile. The driver puts on full speed at once and, ignoring the very possible consequence of stalling the engine, what happens?

The machine leaps forward, and as it does so our bodies go back against the seat and we are very likely to bump our heads as we go back with a resounding thump. We run along the road, gathering speed as we go, and suddenly in front of us there looms up a stone wall. The driver shuts off the engine without applying the brakes, but that does not stop us and we bump squarely into the stone wall.

What happens to you and me?

We do not stop, but go hurtling out over the front of the machine and spin a couple of dozen somersaults before we wind up, more or less damaged, at a full stop.

If you will think back you will see that our bodies have performed a very remarkable part in this mishap.

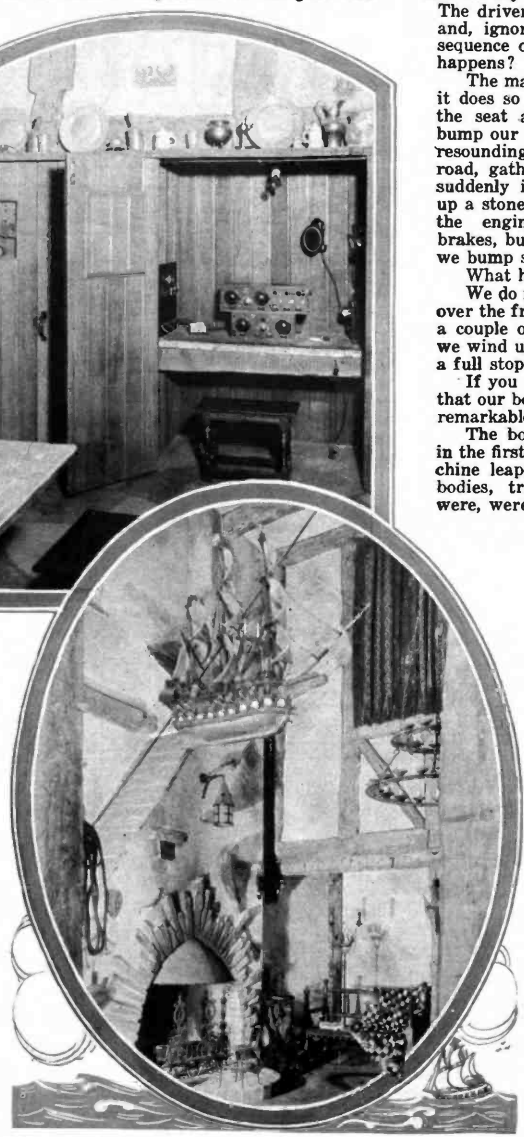
The bodies did not want to start in the first place and so, when the machine leaped out from under us, the bodies, trying to stay where they were, were thumped by the seat leaping forward, although we ourselves probably said that we fell backward against the seat.

Then, not having wanted to start at all, our bodies refused to stop when the machine stopped against the stone wall. We went hurtling out over the front.

This peculiarity of our bodies is what scientists call "inertia." It is opposition to starting in motion in the first place and then, after getting started, it is opposition to stopping.

Inductance, or coils, as we prefer to picture it, is the inertia of radio. As electricity enters a coil to curl around and around it, it opposes the motion at first, but, gathering headway, by the time it gets to the end it does not want to stop. It gathers momentum as it goes, and that is why the voltage of electricity grows greater and greater as it goes around a coil. In the same way, the momentum of our bodies in-

(Continued on Page 46)



Radio in the home of Laurence Fitch, of the First National Bank of Milwaukee, Wis. Here is a unique home which is a fit setting for radio. One can imagine sitting in front of this remarkably designed fireplace and listening to grand opera or symphony orchestras coming from a distance on the wings of the ether. The publication of these photographs is designed not only to make our readers want radio, but to make them envious of a man who can have a home so individual and so extremely artistic as this. The radio set is a Grebe. The photographs are by G. A. Brackett, University Building, Milwaukee.

Simplified Reflex *for* Real Quality

Front view, showing the variometer dial, crystal detector, rheostat knob and loud speaker alongside. There is a small loud speaker in the set also, just as a novelty. The control is simple, as there's only one "knob" to tune, and a list of the dial settings should be kept for reference to aid in picking up a certain station the second time.

By BRAINARD FOOTE

WHILE it is true that a great portion of the broadcast audience is more interested in hearing a faint chirp from Los Angeles than in enjoying the unequaled programs being transmitted from Philadelphia and New York, we must not forget those who want comfortable entertainment rather than ear-straining thrills. And while there are circuits especially designed for those far-reaching listeners, there is also a type of circuit which is ideally suited to the clearest and at the same time the most economical reception from broadcast stations nearer home.

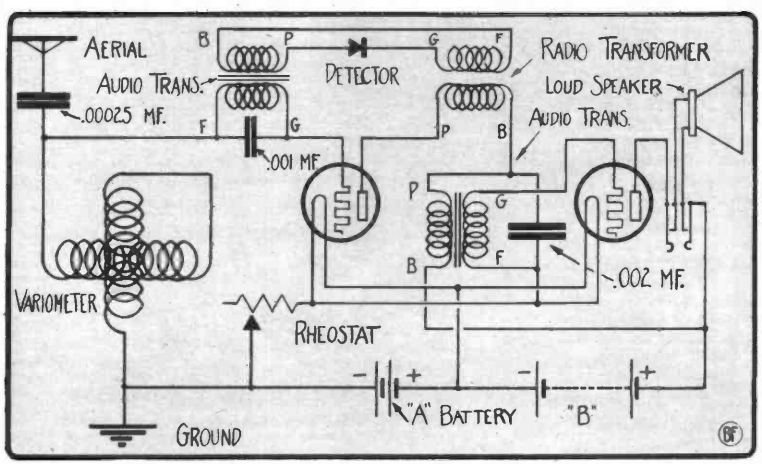
The remarkable faithfulness with which a crystal detector transforms pulses of radio energy into speech and music has long been recognized. And it is possible to retain this clear quality by using the crystal detector along with vacuum tubes which are employed for amplification alone. If, to a crystal detector, audio frequency amplification be added, we can greatly increase the volume of the broadcasting which the crystal can detect, so that our loud speaker will function. In order to improve the reception, and "boost" the feeble radio energy so that the crystal can perform its detecting function on a larger scale, it is necessary to amplify the impulses before they are detected, and to do this, we add a radio frequency amplifier. Hence, a circuit which combines radio and audio frequency, with a crystal detector, is one which bids fair to operate efficiently and amplify clearly.

ECONOMY

Since it is possible to use an amplifier tube to amplify at radio and audio frequencies at the same time, we may eliminate one tube from the set and save this considerable expense. And then, to increase the volume sufficiently to operate the loud speaker, we need add but one more tube as a plain audio frequency amplifier. There are circuits, it is true, where both tubes function at both audio and radio frequencies, but, except in the hands of a skilled and painstaking operator, they are prone to howl and squeal unmercifully. Hence, to be on the safe side, and insure a set which performs its work reliably, but one tube does double duty, and the second one confines its work to audio amplification alone.

Let us first examine the circuit in order that we may understand just how the set operates. The tuning is done by means of a variometer, with a fixed condenser in series with it to reduce its tuning range so that all of the broadcast frequencies may be received. With the average variometer, a wave length band of approximately 250 to 700 meters may be secured, although if the antenna be less than 50 feet in length, the top wave will be about 550. This, of course, includes all the frequencies used by broadcasting stations.

Since the set employs what is known as a "single circuit" for its tuning, it is not recommended for locations nearer than one mile to a broadcast station, and if there are two broadcasting stations with wave lengths less than about forty meters apart, the set had best not be chosen for situations nearer than five miles. This suggestion is made so that interference between WIP and WDAR, let's say, won't be experienced after the set is completed. However, it is really a simple matter to put a wave trap together if such a condition should arise, and in that way "blank out" the station whose program is not desired. A trap consists of a coil of wire and a variable condenser, costing about four dollars for the trap complete.



Circuit diagram of the reflex receiver. The first tube amplifies at radio, and then at audio frequencies, while the second one is a pure audio amplifier. The crystal detector insures clear detection—the tubes give volume and a moderate amount of distance

AMPLIFICATION

The use of but one tuning control simplifies matters and makes it possible to mark down on a card alongside the set the dial positions for all of the stations within range that it be simple

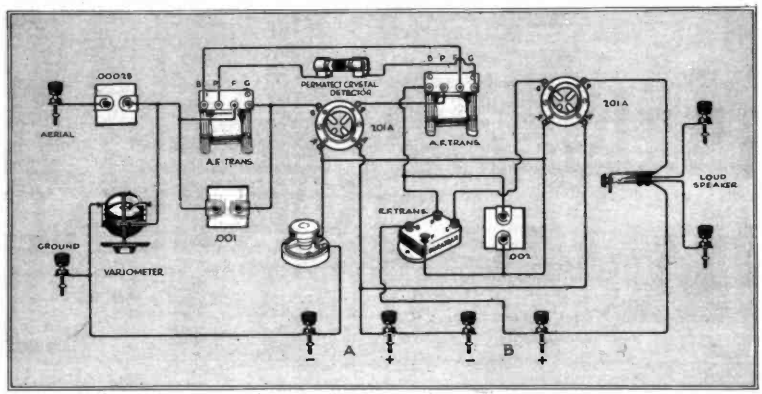
"tune" for a station when it is wanted. For instance, with the set illustrated the dial settings for the stations usually heard are as follows:

KDKA 22
WBZ 28
WDAP 34
WJAR 37
WGY 44
WOR 54
WDAR 52
WJZ 67
WEAF 80
WIP 90
WOO 90
WFI 52

Some of the stations noted above really come in the "DX" or long distance class, and as such cannot be heard regularly, although they do come in now and then. The one-control idea makes the set ideal for use by mother and dad, who may perhaps like to listen-in, but don't care to fiddle with tickler coils, hand capacity effects and the like.

The "input" to the radio frequency amplifier tube is made from the terminals of the variometer, and goes to the grid of the tube (through the by-pass .001 condenser) and to the negative side of the A battery. The plate circuit is completed through the primary winding "P" to "B" of the radio frequency transformer, and to the B battery. The second by-pass condenser, .002 mfds., is placed in circuit to permit the radio frequency current to shunt around the audio transformer, whose primary winding is inserted in the first tube plate circuit. Keeping in mind the fact that the current flowing is still radio frequency, though it has been amplified by the first tube, we may see that there will be transfer of energy to the secondary coil of the radio frequency transformer.

Now detection takes place, the crystal performing the work. The audible pulses are a bit weak, though, and to "step them up," they are introduced into the primary winding of an audio frequency transformer.



With increased voltage, the audio pulses impinge upon the grid of the first amplifier tube again, and the tube amplifies them as an audio amplifier. They are audible and greatly amplified now, but instead of inserting our head phones just yet, a little more amplification of the audio variety has been decided upon, and hence, the primary coil of another audio transformer is placed in the plate circuit of the first tube. This transformer delivers its output to the other tube of the set, where speech and music are now strong enough to operate a loud speaker, if from a nearby station, and for head phone use, if from a more distant broadcaster.

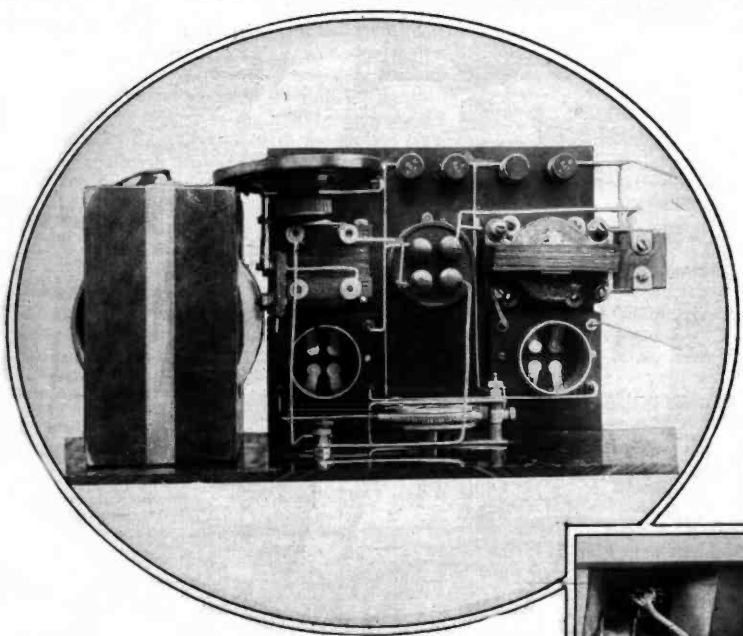
PANEL ARRANGEMENT

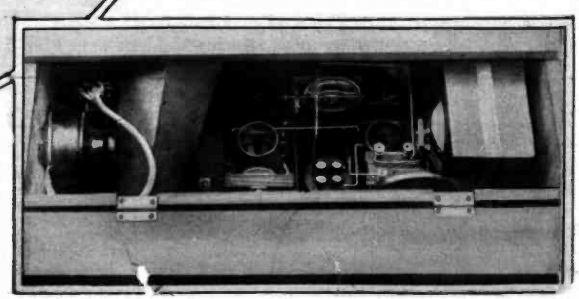
On the face of the panel, which measures 7x18 inches, there appears the following: Variometer dial, glass-enclosed crystal detector, rheostat knob, jack and a symmetrical design of apertures drilled through. The last named are for a small loud speaker which is mounted within the set. This novelty may be dispensed with, and the usual type of speaker employed, and in that case, the panel need be no longer than fourteen inches.

A list of the parts needed for the construction of the reflex receiver is as follows:

Panel and cabinet (as above)
.00025 fixed condenser
.002 fixed condenser
.001 fixed condenser
1 high ratio audio transformer
1 low ratio audio transformer
1 radio frequency transformer (preferably iron core)
2 standard tube sockets
1 variometer
6 binding posts
1 hard rubber subpanel 6x7 inches
1 6-ohm rheostat
1 double circuit phone jack
4 lengths bus bar for connections
Dial for variometer
1 crystal detector
Tubes and batteries

Some of the instruments chosen need special explanation. If panel mount sockets are picked, it is possible to fasten the subpanel to them with four 6-32 machine screws and thus facilitate the assembly. The crystal detector (Continued on Page 33)





Looking down on "the works." There aren't many parts for the outfit and it's therefore simple to put together. Rear connections avoid unsightly wires in front of the panel. A subpanel makes the assembly convenient and efficient. Looking from the rear, showing the arrangement of the parts and the installation in the cabinet. The loud speaker is of the type in which the sound is first projected towards the rear and then reflected outwards. This gains the advantage of a longer horn in smaller space

EDITORIALLY

E. L. Tyson, announcer and program director of WWJ

By HENRY M. NEELY

NOT LONG ago I was discussing radio with a skeptical friend of mine and asked him if he had not yet bought a receiving set.

"No," he answered. "Why should I? What good would a radio set do me?"

I have been thinking very seriously over that question ever since then because it seemed to me that the proper answer to it would be the best sales argument that the radio dealer could have for approaching his prospective customers who are not yet convinced that they should buy a radio set.

And the only way by which I could really arrive at a conclusive answer for him—the only way by which I could tell him what good a radio set would do him—was to sit down and ask myself honestly what good my own radio set had done me.

In order to answer this question, I have been going back in my memory over some of the things I have heard by radio during the past month or two. I have not picked out the general run of radio entertainment which can be had every time we light our tubes and put on our head phones or turn on our loud speaker. I have thought only of those things of prime importance—the kind of things which I would like to attend in person, but which, owing to considerations of time or distance or convenience, it would be impossible for me to attend.

And only a very cursory jotting down of those things which occur most readily to my memory in looking back on the past month or two proves to me that even this short period alone has justified every cent that even the most elaborate receiving set would have cost.

I am going to put down here a few of the things in the hope that it may suggest to dealers in various parts of the country the argument which they themselves can use in winning over that man or woman who uses the conventional excuse, "I am going to wait until radio is perfected."

This shows what rare treasures are being missed by the man who is waiting for that mythical day of perfection. When that day arrives, the automobile will be perfect, the Victrola will be perfect, all of the merchanical and scientific and economic problems of the universe will have been solved and there will be nothing left for you and me to do but lie down peacefully and die in order to take the next step into the more or less doubtful bliss of the heavenly choir.

In this list that I have jotted down, I have purposely omitted all entertainments that could possibly be considered in the aspect of distance reception. I am not putting the list here for the benefit of the man who wants to play radio golf; I am giving the dealer the suggestions for winning the very large class of people who want radio for its genuine value in home entertainment and home culture.

I have also eliminated the distant stations because I wanted to include only things that could have been received by anybody with any of the standard one-bulb sets. All of this that I am putting on my list could just as well have been received by a novice using a one-bulb regenerative set costing not more than $20, with a fair pair of ear phones and a tube working on a dry cell. In other words, this list of valuable entertainment and education does not require a fortune; it is almost free. It can be obtained with a set which will not cost as much as the most modest Victrola and there is no expense afterward of continually buying new records.

This list gives only the things that have been most easily heard in the Philadelphia district alone. Yet the Philadelphia district is not favored over and above other districts of this country. The same list, or at least a list equally attractive, could be compiled by an intelligent listener-in with a very moderate set in almost any section in the United States in any month of the year.

And now, think back five years and realize what a vast expenditure of money it would have meant to attend the things that I have heard by radio in, let us say, two months. Many of these things you will see I could not have attended even if I had had money, because they were in the nature of events which required influence to get invitations to them.

Any man who could put down in his diary the fact that he had attended such a series of events as this five years ago would have been envied by all of his followmen and he would certainly have been a most notable individual. And yet I am only one of thousands who have attended these same events in the past two months.

I heard Edward W. Bok himself tell about his

SPEAKING

Photograph courtesy of the Garod Corporation

$100,000 award for the best plan for world peace. I heard two of the most noted speakers in public life in this district also discuss this same award. I heard Edward T. Stotesbury, a partner in the firm of J. Pierpont Morgan, give a most illuminating and interesting address upon ing and the methods of financiers.

I heard Calvin Coolidge, President of the United States, make his inaugural address in the Capitol at Washington. A year ago we heard the Governor of our State make his inaugural address and heard the band play and the crowds cheer as the parade marched past him. A week ago I heard the Mayor of my city make his inaugural address and I heard the discussion between him and those sitting near him around the rostrum before the address—which is something I could not have done if I had been present in the Council Chamber myself.

I heard the Mayor and the new Director of Public Safety as well as some of the city's most brilliant leaders in a series of splendid addresses at a dinner given just before this inauguration.

I heard Walter Damrosch and his wonderful symphony orchestra play an all-Beethoven program in New York.

I heard another orchestra concert at which two of my great favorites were played—the Shubert Unfinished Symphony and the Bach violin concerto.

I heard the Choral Society of Philadelphia sing its annual performance of "The Messiah."

I heard the first act of Earl Carroll's "Vanities of 1923" direct from the theatre where it was played.

I heard a United States Senator give a most wonderful address upon respect for law and law enforcement.

I heard Secretary of State Charles E. Hughes deliver one of his most notable public utterances about our international relations.

I heard one of the country's most famous chemists give a surprising talk upon the reconciliation of modern science and religion.

I heard a famous Arctic explorer tell about the conditions with which he met in the far north.

I have had a complete drama every week, with the choice of two each week from two different stations, giving me my own selection of comedy or straight drama.

I heard Dr. Russell H. Conwell deliver his most famous address, "Acres of Diamonds"—probably the most notable bit of oratory of this past generation. I heard two of the performances of grand opera by the Chicago Opera Company direct from the stage—these two being the two that were perfectly satisfactory out of four which I heard. The other two were satisfactory in parts and even they were well worth hearing.

I heard the speeches made at the meeting in Carnegie Music Hall in Pittsburgh under the auspices of the American Committee for the Relief of German Children, and I learned more about present-day conditions in Germany from men who have recently been there than I could have learned in any other way.

Three times each week I have been privileged to hear the three best theatre orchestras that you can conceive of—the Capitol Theatre Orchestra in New York, the Stanley Theatre Orchestra in Philadelphia and the Fox Theatre Orchestra in Philadelphia.

There is not one item in this list that could not have been put down in the diary of the possessor of even the most ordinary one-bulb receiving set. There is no distance work here; there is no hint of radio golf because I am mentioning in this list only those things which I can get with fair regularity and with fair satisfaction.

Later on in the season, as the warm weather of spring begins to come, I will lose the regularity and satisfaction on some of these things and the real satisfaction will come only from the Philadelphia stations, but why should we quarrel with radio because it has its seasons?

Almost everything else has its season. The automobile, in spite of its almost universal use for the necessities of life, is really a seasonal thing with most of us who are not absolutely compelled to use it in the vile weather of the worst of the winter.

If we then admit that radio is not the ideal entertainment for the middle of summer, why should any one quarrel with us or why should this make any one skeptical of radio?

Those of us who are normal human beings are fairly well satisfied to do without so much radio in the summertime. We have our automobiles and our motorboats, we have our tennis and our golf and our baseball, we have our swimming and our canoeing and our walks and rides in the country, and we have the beauty of blossoming nature and the green grass and the (Continued on Page 37)

How to Figure Your Aerials

By HARRY N. FARIS
Of the Kellogg Switchboard and Supply Company

EXPERIENCE has shown that with the average receiving set best results are obtained only when the aerial has a proper capacity value for the 309 to 546 meter wave length band now assigned to the higher power broadcasting stations.

Experience has also shown that a single 7-strand horizontal wire 30 feet above the ground and 150 feet long, including a vertical lead-in to the set, gives almost ideal results.

But, since the length and height of aerials is governed by local conditions, it is rarely possible to duplicate this ideal condition and it therefore becomes highly important to be able to duplicate the performance of the ideal aerial with such different combinations of length and height as local conditions may require and the publishing and explaining of proper formulae and rules for such figuring is the purpose of this paper.

First of all, we might state it has been experimentally determined that the performance of the single wire aerial, 30 feet high and 150 feet long, including lead-in, can be duplicated very closely with a two-wire aerial 90 feet long, a three-wire aerial 75 feet long, or a four-wire aerial 64 feet long. These two, three and four wire aerials should have a spacing of not less than two feet and three feet is preferable for the two and three wire aerials.

Because of its simplicity, strength and neat appearance, preference should be given to the single wire aerial and multi-wire systems should be resorted to only when horizontal length is limited or to utilize great available height.

From the formulae hereinafter given it will appear that the single wire aerial is preferable up to 35 feet in height. From 35 to 45 feet the two or three wire scheme is better. From 45 to 55 feet, four wire aerials should be used, and while the formulae herein will furnish the proper length for four-wire aerials, higher than 55 feet above open ground, such aerials are not advisable and should not be constructed for broadcast reception.

Starting with our single strand aerial 30 feet high and 150 feet long, including lead-in, what length should be used where conditions limit height to 20 feet? Many have assumed that because the aerial is lower it should be made longer "so as to catch" the same amount of current, but a trial shows it impossible to get proper results with such an aerial. Even when it is cut back to 150 feet it still will not function properly.

Many have then reasoned that since the aerial is only two-thirds as high possibly it should be only two-thirds as long and have cut back to 100 feet, only to find the aerial still too "fat," and not until it has been reduced to slightly less than 70 feet will the receiving set function as it did on the 30-foot aerial 150 feet long. Patient experimentation will likewise show that for reduction of height from 30 feet to 20 feet the two-wire aerial must be shortened to approximately 40 feet and the three and four wire aerials to slightly less than half their former lengths.

By these experimental results we have demonstrated that in this matter Nature is faithfully observing her favorite law of "inverse squares" and, although a two-wire aerial, because of limited spacing, does not become twice as "fat" as a one-wire aerial, each of the combinations when lowered attains its former capacity value only when its length has been shortened to correspond with the reduced square of its height.

Thus, squaring the height of the 30-foot aerial we have 30x30 or 900, and squaring the height of the 20-foot aerial we have 20x20 or 400, and since the square of the height has been reduced from 900 to 400 the length must be reduced in the same ratio, and completing the proportion, we have 900:400:: 150:67, so that, as already determined experimentally 67 feet is the proper length for the lower aerial. By further inspection we note that in the case of the single strand aerial, both at the 30-foot and 20-foot levels, the proper length is one-sixth of the square of the height. Likewise, in the case of the two-wire aerial the proper length is one-tenth of the square of the height. Also in the case of the three-wire aerial the proper length is one-twelfth of the square of the height and with the four-wire aerial the proper length is one-fourteenth the square of the height. Since the law of inverse squares and the actual results correspond so closely we are justified in assuming that the coefficients—or rather the divisors—of 6, 10, 12 and 14, for 1, 2, 3 and 4 wire aerials respectively, will hold with sufficient accuracy over all reasonable ranges likely to be employed in practice.

We can reduce this to simple mathematical rules to find the proper lengths:

Single wire—square the height; divide by six; subtract length of lead-in.

Two wires—square the height; divide by ten; subtract lead-in.

Three wires—square the height; divide by 12; subtract lead-in.

Four wires—square the height; divide by 14; subtract lead-in.

In the foregoing it is assumed that the lead-in, which should be brought down as nearly vertical as possible, is equivalent to the same number of feet of horizontal aerial and, where the lead-in from the near end of the aerial to the set is short as compared with the aerial itself, this assumption is sufficiently accurate for practical purposes.

In the case of multi-wire aerials the assumption still holds approximately correct if a single wire lead-in is used. In the case of an extremely short multi-wire aerial, the assumption of a long lead-in being equivalent to the same amount of horizontal distance would not be correct, but such aerials are not advisable and need not be further considered.

The foregoing shows how to determine the proper length for any kind of aerial for a given height, but, since it is the horizontal distance that is some times fixed, while height is variable, it follows that we must determine how to place any style of aerial of given length.

This problem will be more involved and since the lead-in, which we have assumed as a part of the length, is also a part of the height, it is at once apparent that the solution must be algebraic and that it will involve "quadratics." So, to get the proper height:

For single wire—from the length of tract height of set (Continued

SO MANY inexperienced people buy or build fine sets, install them and fail to get results. Then comes the demand "WHY" and the assertion that there has been a swindle.

Poor aerial, poor ground, poor phones—any one of these will ruin the results of the best set ever built. Be SURE of your head phones—that they are really efficient. Be SURE your earth connection is a good ground, in the electrical sense of the word. And be SURE your aerial is right.

A reliable trade mark or name will insure the performance of your phones; the following article will insure you an efficient aerial, but only experiment will guarantee your earth connection. I shall later print articles about earth connections and counterpoises.

The following methods of calculating the best height or length for your aerial will give results that may surprise you. They surprised me. I took down my old aerial, put up one figured according to Mr. Faris' formulae and the result is—I'm printing the article so you can all get the full benefit of it.

H. M. N.

High Schools Organize for Service to Fans

By HARRY H. PITTS

THE first real contest conducted by the I. R. A. A. in the Philadelphia district has come to a successful conclusion. The prizes have been awarded to the individual winners and the schools. A special mass-meeting was held, which was attended by the boys' parents and an added audience who were interested in the doings of the association. A dance and a general good time followed, after the winners had been congratulated and pledged themselves to do better in the next I. R. A. A. contest.

The boys are interested in such contests, as is evidenced by the increasing membership of the association directly after the contest. Clubs are forming in the following States of the Union:

California, 2.
New York, 20.
Maine, 1.
Florida, 1.
Illinois, 3.
Indiana, 1.
Michigan, 1.
New Hampshire, 2.
New Jersey, 3.
Pennsylvania, 18 (outside of Philadelphia).
South Dakota, 2.
Virginia, 2.
Washington, 1.
Wisconsin, 1.
Ohio, 1.

This response has come, although we have only scratched the surface of our publicity campaign.

The ingenuity and initiative of the average high school boy is a dynamic force which, if properly focused, can accomplish great ends. The average student, eligible to the I. R. A. A., has completed about ten or twelve years of school, and his mind is very active and receptive. Radio broadcasting is only several years old, but many of the high school boys have been tinkering with receiving sets ever since they could understand any technical matters. This means that many of them have spent years in the radio game and understand it thoroughly.

The association is capitalizing this seemingly intangible asset by organizing the boys into "trouble shooting gangs," set construction gangs and installation gangs. These gangs will be instructed in any details they lack, and each individual boy will be presented with a certificate after he has successfully passed an examination given by men expert in the radio game. The certificates will be classified, i. e., certificates to the individual expert on one-tube sets, two-tube sets, etc. The public can then rely on the individuals who carry these certificates.

Many fans hear of a new hook-up and proceed to buy the parts, all the while ignorant of the result, the nature of the set and its requirements. After spending many valuable hours assembling their purchased parts they cannot even get a perk out of the completed set. They spend six or seven hours trying to locate the trouble, and finally give up in despair, bitter against radio and everything connected with it.

This is the cue for the high-school boy to step on the scene of action and in a jiffy the trouble is located and in comes a DX station with great clarity.

For a few cents the fan could have saved the six or seven hours of wasted time and effort and another radio fan would be satisfied, which is one of the association's ultimate aims.

The trouble shooting gangs will not only deal with sets put together by the fans, but will be a part of the whole organization. For example, the set construction gang will receive an order for a set and fill it quickly and efficiently. The installation gang will install the set and see that it works before leaving.

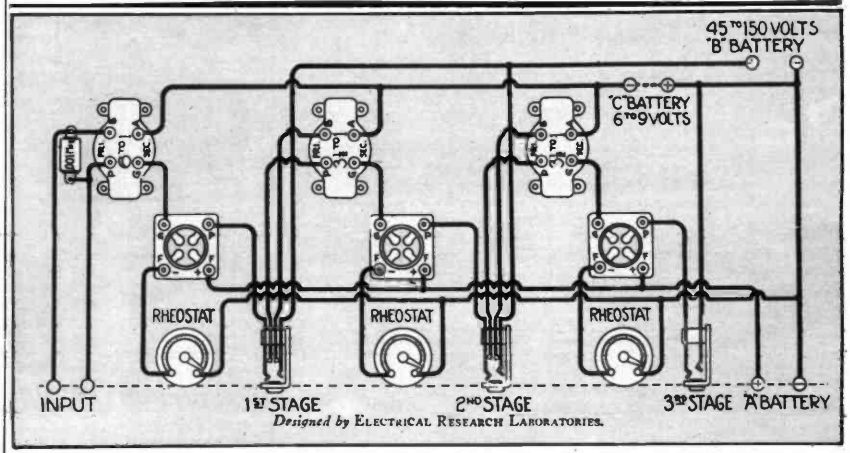
This, indeed, is where most manufacturers stop. The most important part of the commodity has been omitted, and that part is service spelled with a capital "S."

The trouble shooting gang, at a small charge, will keep the sets in good working condition and the radio fan owning a set constructed by a boy belonging to the I. R. A. A. knows exactly where to look for help.

Service is an open sesame to any manufacturer and the sooner they will realize a stabilized and seasoned market for the radio manufacturers adopt this word in their sales products. Not a free service, but

(Continued on Page 46)

Two and Three Step Amplifiers



Designed by ELECTRICAL RESEARCH LABORATORIES.

By W. H. FARR

Radio Engineering Staff,
Electrical Research Laboratories,
Chicago

AUDIO frequency amplification, one of the greatest factors in making radio reception so popular, has now reached the stage where three steps of amplification can be used without hopelessly distorting the signals. This is due to the great improvement in the last year in the construction of the audio frequency transformers.

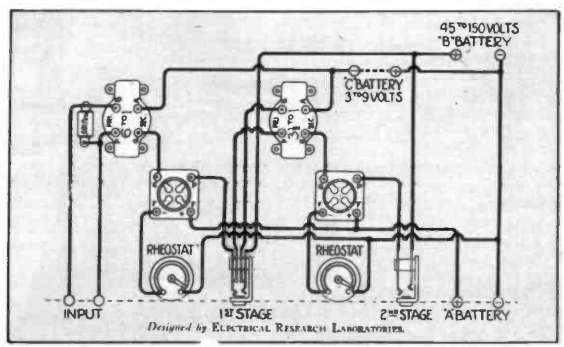
Without audio frequency amplification the satisfaction and convenience of the loud speaker would be unknown and a receiving set would have to be equipped with a head set for every member of the family. In fact, no set is considered complete nowadays without two or three steps of audio amplification and some type of loud speaker.

Most up-to-date receiving sets have the audio amplifying apparatus built into the same cabinet with the tuning apparatus. A very convenient arrangement, however, is to use a separate audio frequency amplifying unit, either built into a cabinet or on a panel. This can be attached to whatever type of receiver you are using, whether it be a crystal set, single tube regenerative, Reinartz, Flewelling, Ultra Audion, etc., and thus produce results equal to the more elaborate and expensive sets with self-contained amplifiers. The ideal arrangement is to have separate jacks for each stage, which enables the operator to employ just enough amplification to get the necessary volume he wants.

It is the purpose of this article to give a few pointers and cautions to the fans who contemplate building audio frequency amplifiers, either as a separate unit or as an addition to their present receiving sets. Hookups for an audio amplifying unit are given in Figures 1 and 2. A three-stage amplifier as shown in Figure 2, will amplify the output of a crystal set or non-regenerative single tube set up to full loud speaker volume, while the two-stage amplifier, shown in Figure 2, will be amply sufficient for any type of single tube regenerative set. The amplifier unit can be operated from the same A batteries as the receiving set, provided, of course, that tubes are used which operate on the same voltage. However, the amplifying circuit requires much higher plate voltage than a detector circuit, which will necessitate the use of additional B batteries.

When the amplifier is built as a separate unit, the phone terminals of the receiving set are connected directly to the input terminals (P and B) of the audio amplifier. A very convenient method is to equip the input of the amplifier with a cord and plug by means of which it can be plugged into the phone jack of the receiver in place of the head phones.

When adding audio amplification to any type of regenerative set it is advisable to connect a fixed condenser of .001 mfd capacity across the primary terminals of the first transformer, as shown in the diagram. This acts as a by-pass for the radio frequency currents flowing in the plate circuit and thus assists the regenerative action of the tube. It will be noted that the diagrams show a separate jack on each stage. This permits the use of more or less amplification as desired. If for any reason these jacks are not used, connect the "P" terminal to the socket direct to the "P" terminal of



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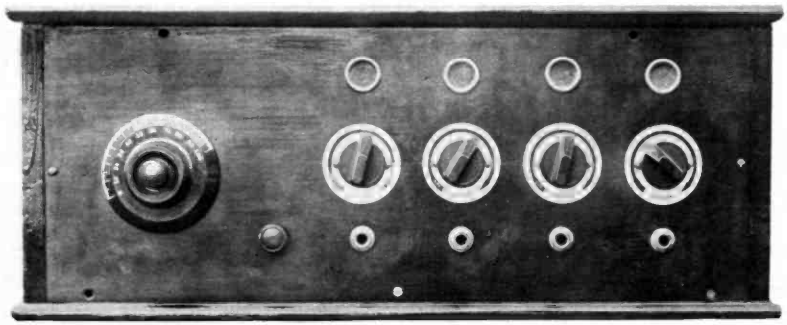


The "Levin Singletrol" Circuit

By MOE LEVIN

THE circuit I am about to describe is not one of those freak circuits which claim wonders and when given a good trial prove to be ordinary affairs.

This is a combination of various circuits so constructed that it has only one control, yet it gives the results of some of the more complicated ones. It is so simple that even a child can operate it. The features are simplicity, ease of control, great volume, facility in tuning in DX, and it does not depend on a good aerial, as it will operate on ground alone, within several hundred miles. For local, all that is necessary is to attach to the ground wire.

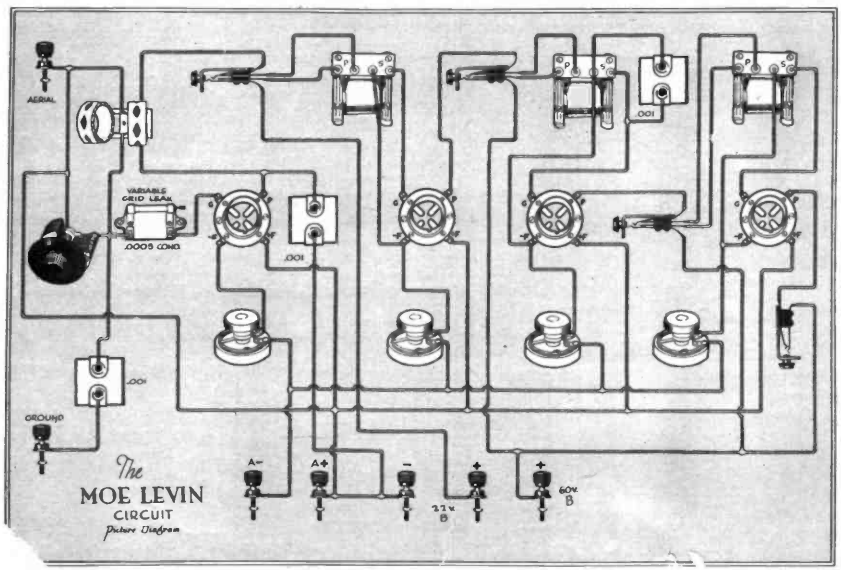
A SHORT time ago we published the Levin No-Aerial Circuit, and many of our readers reported fine results with it. Now, Mr. Levin comes to us with this new circuit which can be used with either aerial or ground alone. I have played with his set a good deal out at Station 3XP, and I personally agree with what he says about it. There are only a few things to add. Using both aerial and ground, you will pick up whatever sixty-cycle hum there is in nearby lighting or power lines. At Station 3XP this hum was so bad it completely drowned the concerts. With aerial alone, attached to the ground binding post, there was no trace of this hum and distant stations came in strong. With ground alone, attached to aerial binding post, the signal strength was diminished, but the hum was also entirely eliminated. If there are no lighting or power lines near you, you will probably get still better results using both aerial and ground.
H. M. N.

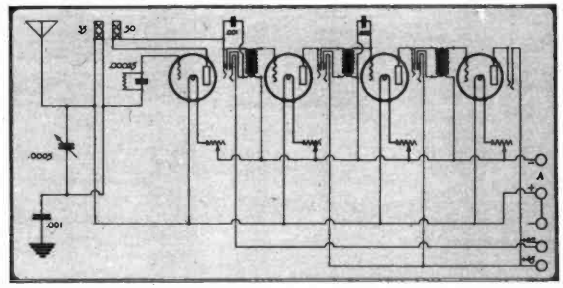
Although the diagram shows four tubes, it can be used with only one tube, but in using the four tubes the distant stations come in very loud on the loud speaker. In the August issue of this magazine, I described a circuit employing a split variometer which proved very successful, but I can say without hesitation that this new circuit is far superior and the builder will not regret it.

The operation is very quiet and therefore a third step of amplification can be added without the use of separate B batteries or using a C battery. However, I feel it is important to use the same transformers that I recommend, although other may do almost as well.

PARTS NEEDED

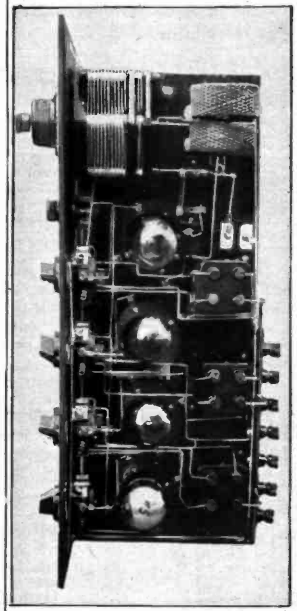
1 7x18 panel and cabinet
4 Standard sockets
3 Rheostats (30 ohms)
3 Double jacks
1 Rheostat with vernier (6 ohms)
1 Single jack
1 Panel mounted A battery switch
7 Binding posts
1 Dubilier .00025 grid condenser with pocket to receive grid leak
1 Durham variable grid leak





3 Honeycombs, 35-turn, 50-turn, 75-turn.
2 Single honeycomb mountings
2 .001 Micadon fixed condensers
1 .002 Micadon fixed condenser
3 Pearlco audio transformers, 3 to 1 ratio
1 UV200 tube
3 UV201-A or 301-A tubes

Mount the honeycomb coils inside the cabinet behind the variable condenser. They should be mounted close together, as they need not be varied. All the tuning is done with the variable condenser.



Above is a view of the Levin "Singletrol" circuit looking straight down on the baseboard. Below is a view looking down from the rear and showing the mounting of all the instruments

I want to impress upon the builder the importance of using good material. Do not use a cheap or defective part and think that it will do temporarily. Sometimes just a poor jack or a shorted condenser will cause the set not to function, although it may be wired correctly.

Better let it take a little longer, and do it right. When the set is completed and does not work, you have either made an error, or some part is defective. Do not blame the hookup.

This circuit has been tried out by various people and I have had very good reports on it. However, in several cases I had complaints. In each case I found something wrong either with the wiring or some defective part.

Make sure that the coils make good contact in their mounts. If they do not, try shaking them a little or moving them up from their mounts.

First try the detector, and if that works O. K. work on the next tube, and so on.

Regardless of how the set works, try reversing the leads of the tickler (the wires running to the plate and to the phones) and see which way works better. One way the tube hisses and the other way the tube will oscillate. The latter is the correct way.

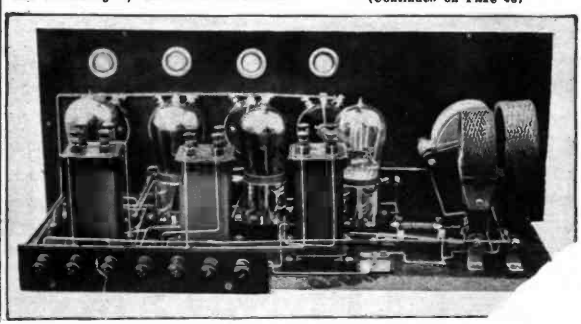
As to the coils, it is almost impossible to say exactly how to place them as that depends on the aerial and ground used. However, I think that a 35-turn in the primary and a 50 or 75 turn in the tickler is about right. If the tube does not oscillate when using a 50-turn in the tickler, replace it with the 75-turn. Also try reversing the coils, as in the case of using it without aerial.

Using ground alone I use a 50-turn in primary and 35-turn in tickler. This can best be found out by experimenting.

Greater selectivity can be had by using just the aerial alone. In that case attach it to the ground post. In fact, I use it that way myself.

In tuning, turn on the detector rheostat almost full, and work the condenser dial until a whistle is heard. That is the sign of a station. Slowly turn down the detector until the whistling disappears and the signal comes in clear. Try varying the

(Continued on Page 46)



may be of the conventional style, but the crystal chosen deserves special mention. If the zincite-bornite combination is available at the radio supply house, it makes the best detector, inasmuch as it is so stable that it will "stay put" for weeks once the proper adjustment has been found.. Galena is sensitive, no doubt, but the amplified radio frequency current will soon "burn" the surface and spoil it for further work. It becomes increasingly difficult to locate a sensitive point as the surface becomes more and more oxidized. In fact, one can often note a slight "spark" between the surface of the mineral and the cat-whisker when a station in town is being received and the jazz band strikes a loud "crash." The most satisfactory crystal next to the double type just mentioned is iron pyrites—a yellowish smooth-surfaced mineral popularly termed "Fool's Gold." This is readily obtainable, although sold under varying trade names, and may be easily recognized by its surface and color. This requires a moderate pressure and not too fine a cat-whisker. The fixed crystal known as Permatect also functions well in such a circuit.

The UV201-A is the correct storage battery tube for the set and will give unusually good results for the loud speaker. If two of these tubes are operated from 6 dry cells connected in a double bank of three so as to give 4½ volts, results will be slightly inferior to those obtained with the storage battery, and the batteries will yield about 90 or 100 hours' service. It will be seen that both tubes are operated from the same rheostat, and this is the reason for the selection of a 6-ohm resistance instead of the higher ohmage often suggested for the UV201-A tube.

The WD11 or 12 operates quite well, using two ordinary dry cells in

Simplified Reflex for Real Quality

(Continued From Page 25)

parallel as the A battery. The UV-199 is slightly superior for volume and DX, however, since it is a tube which is better for radio frequency amplification than the WD type. Two dry cells in series form the A battery for these. It should be understood, however, that the loud speaker will only operate when the most powerful and nearest station is being received, and it is doubtful if the loud speaker will work at all over distances greater than ten miles with the dry cell tubes. The 201-A's or 301-A's are the "best bet," anyway.

The assembly can be fairly well seen from the top view of the receiver. At the left is the variometer. Next comes the socket for the reflexed tube, with the high ratio transformer right in back of it. To the left of this transformer the little "Graham-Cracker" by-pass condenser is visible, with its edge up. In back of this transformer, the .00025 fixed condenser is placed, although the one shown doesn't look "fixed." It is the Dubilier 3-plate mica variable condenser which was used in the outfit to determine just what capacity was right, and the .00025 size fills the bill This is the antenna series condenser.

Above the center of the subpanel the rheostat is in sight, with the radio frequency transformer in back of it. It will be noticed that all the binding posts are placed along the rear of the subpanel, and this is done to eliminate unsightly wires from the front of the set. Antenna and ground posts are out of sight underneath the antenna series condenser. At the right, the socket for the audio tube is situated, with the low ratio transformer placed in such a manner that the grid lead is only a matter of a half inch or so. The two leads straying off toward the right connect to the outer springs of the double circuit jack, into which phones or a loud speaker may be plugged, and to the center springs of which the inside loud speaker is connected. This feature, however, is nothing but a novelty, and probably will be omitted in most cases.

The reader may be interested to know the names of the parts which are in sight, and it is a good plan for the radio enthusiast to become acquainted with manufactured apparatus so that he may recognize them in other sets or in the stores. The variometer is of unknown origin—its commendable features being an absence of shellac, the use of large wire to insure low resistance and consequent sharp tuning, rear leads to reduce hand capacity effects, and a rugged manner of assembly.

The sockets are Fada panel mount type. Any socket which has a thick base and straight sides on the base may be panel mounted, too. It is merely necessary to drill two holes with a No. 33 drill into the socket base, and tap the holes with a 6-32 thread. Two 6-32 flat head machine screws, about one-half inch in length, then may be screwed through from the front of the panel to form a secure support.

The high ratio transformer is of the customary vertical "WD" type, and while not of the best quality, is well suited to the amplification of low-power energy released by the crystal. The R. F. transformer is a Rasla, and two other well-known makes which are successful in this reflex set are the Erla and the Acme. The low ratio is a General Radio transformer and the rheostat is the Cutler-Hammer. The makes of parts chosen for the circuit are not important so long as the parts are of good construction, and what is even more essential, of good radio-wide reputation. Panel and subpanel are Radion, which is supplied in the sizes mentioned.

In making the connections, it is not necessary to use the soldering iron where a strong binding post is provided. For joining the sections of bus bar, a well-tinned soldering iron is needed, hot enough so that the solder melts easily and adheres to the tip of the iron. Just the least touch of No--Korode paste is applied to each joint before the iron is applied, and each joint should be wiped clean of paste or black spots after cooling to avoid corrosion months after the set is completed.

Besides the 6-volt storage battery, two 45-volt large size B batteries are wanted. These are connected in series, so as to apply 90 volts to the plates. It is advisable to make all other connections and determine whether the tubes light properly before the B battery is joined. This is a safety measure and one which ought to be observed with every set, as burned-out tubes are the penalty for a wrong connection of the B battery.

The aerial should be a single wire about 100 feet long, with an insulator at each end and a porcelain tube to insulate the lead-in as it enters the window. A ground clamp makes connection to the water pipe, and "bell" or annunciator wire is just the thing

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Must the Broadcaster Pay for Music?

(Continued From Page 8)

broadcasting stations for advertising their activities, attractions, etc.

Would it be fair that one branch of public amusement should pay a fee, and a competing branch be relieved of any obligation to pay?

The unprecedented development of radio in its popular aspects would not have been possible had it not been for music. But one thing can be broadcast—sound. And but few types of sound are entertaining, and the principal one is music. Music, then, is the foundation upon which the popular structure of radio is erected; music is its very lifeblood. Music it must have, and, if its programs are to command maximum interest, new music, in a constant, unending, unremitting stream.

But it is naively proposed that it shall contribute nothing whatever to this source of material, absolutely vital to its success, except such contribution as shall result in revenue earned from other sources by reason of the advertising given through the operation of broadcasting.

It is as though one demanded admission to a theatre because one intended, if pleased with the entertainment, to tell one's friends and urge them to patronize it, and upon that theory to refuse to pay for a ticket.

But the other sources all recognize the validity of the creator's claim to compensation; the dealer in music pays him for his product, the maker of rolls and records pays him a royalty on every contrivance manufactured—and, too, thousands of establishments operated for public amusement also pay him royalties for the right to use his works.

But radio would be forgiven of any payment, radio would enjoy the free and unrestricted right to appropriate the material for which others pay, to its own use, merely because in its own opinion, it so enhances the sales of other musical products. Granted that it does enhance such sales, and to greater extent even than all other media, that still does not justify its dodging its own responsibilities.

Nearly two hundred millions of dollars' worth of radio receiving apparatus will be sold in this good year of 1924 by the manufacturers thereof. There are estimated to be in excess of three millions of "listeners-in" now. Manufacturers of apparatus are uniformly behind with their orders. All of this gigantic enterprise; all of these millions of people, rely for the success of their enterprises and the entertainment afforded the listener upon the charity of music makers and performers.

What there is of argument or difference between the broadcasters and the music makers is based solely upon the expectation of the former that they should be permitted to appropriate to their use and profit the works of the latter without any consideration whatever.

Now then, there are literally hundreds of thousands of noncopyright and unrestricted songs and compositions that they can use without any accounting to any one. Yet they prefer to use—almost demand that they shall be permitted to use—the relatively few works of the members of the American Society of Composers, Authors and Publishers. Why? Obviously because it is those works that are in demand. If they are in demand, if the "radio" audience wants them, if by their use a maximum return is accomplished by the station, if they contribute a real value to radio, is is not fair that their owners should be reasonably compensated?

There have been injected into the controversy some insinuations that the American Society of Composers, Authors and Publishers constitutes a "music trust." As I have stated, its members control relatively few works in comparison to the entire field of music, and in no sense is the organization a "trust." It does not deal in music in any form; the courts have decided that it is not a "trust," the Federal Trade Commission reached a like conclusion, and there is plenty of music for any purpose which it does not control, available for unrestricted use.

So, too, have statements been made insinuating that the publisher is the principal beneficiary. Nothing could be further from the truth. The publisher, technically, and in order to meet business conditions, is customarily the proprietor of the copyright, but he is an element in the society simply because of that technical condition—the activities of the organization are exerted in behalf principally of the composers and authors, the real creators of the product upon which the entire industry of public amusement, including broadcasting, must depend for maximum success.

No greater force could be built up for the encouragement and development of American music than the society. Its doors are wide open to every composer and writer of musical works, it bars none whose product has reached a state of merit or quality which justifies recognition. It rewards in a practical way, in dollars and cents, musical genius. It should be encouraged by the very men who oppose its operation, for they are the men that depend, in the last analysis, upon success by these writers in their efforts.

When the Constitution of the United States was written, in troublous times indeed, the fathers of the country then incorporated the provision for patent and copyright; the laws of the country enacted pursuant to the constitutional provision have safeguarded these rights; they are typical of civilization, they make for culture, for the welfare of humanity, for happiness.

The song and music writers of America will not recede from their position as to the broadcasters; they have been supported by the United States Courts in the justice of their contentions, and they intend to assert their rights.

They intend to be fair and just always, to render "unto Caesar that which is Caesar's," to give the broadcasters due thanks and credit for such favors as they may do these men, but they will not be silent when their lawful rights are infringed for the commercial benefit of others.

In conclusion, it should be said that many of the broadcasting stations have recognized and compensated their rights by securing their license publicly to perform their works; and that other stations, feeling that the time is not ripe yet to make the operation of broadcasting pay its own way, simply refrain from using the works of these men. It should also be said that the society has licensed to use the music of its members entirely free of any charge, all bona fide public service stations, such as those operated by universities, school legitimate research and experimestations, etc., its requirement the shall be paid applying only to commercial stations.

Lots of Volume With This Three-Circuit Coil

(Continued From Page 17)

variable condenser and the rest of the circuit. The photographs will clear up any problems that this description may leave in your mind.

The tuning of this set is extremely simple and any novice can learn to handle it within half an hour of starting operation.

Once you have turned on the tube almost to the hissing point—and with most tubes you will find best operation just a shade below this hissing point—you move the rotor around until you begin to get the unmistakable signs of regeneration. This is a slight sound like the passing of a breeze through the trees, and this sound will continue. If you get it up to a groan or a whistle, you know you have gone too far with your rotor. Just keep the pleasant breezes blowing through the trees and you will know that your set is in a sensitive condition.

Then move the variable condenser around and every here and there you will get the little whistles or squeals that means that you are on the carrier wave of a station. When you get there, move your condenser slowly until you get to the spot in between two whistles where the whistle is at a minimum and then see if you cannot get it out altogether with the little Midget vernier condenser.

If this does not remove it, move the rotor of the coil for a little closer coupling and if this increases the whistle instead of diminishing it, move it a little the other way until the whistling stops and the signal comes in.

While you are moving this rotor, you may get a click and then dead silence. This means that you have moved the rotor around too far and that there is no longer any regeneration in the set and the set is not sensitive. In this condition, you will hear local broadcasting stations, but the tuning will be so broad that you cannot possibly get them out.

The more highly regenerative the adjustment of this set is, the sharper the tuning becomes and at the proper point the tuning is so sharp that you can eliminate even a local staiton by means of the little vernier condenser alone.

Let me only add to what I have already said about the use of the various tubes in this article that I have had very satisfactory loud speaker operation with only one 201-A or 301-A tube, putting 90 volts of B battery on the plate. This was at Delanco, N. J., fourteen miles away from the broadcasting stations. With the same tube, I received the signals from KDKA in Pittsburgh, more than 200 miles away, sufficiently loud for them to be fairly audible on the loud speaker, though the volume would not have filled a room. It was, however, very clear and distinct and the volume was sufficient for three or four people sitting around the loud-speaking horn.

This was, you must remember, on one tube only and without any amplification or any reflexing of the circuit.

This is a very remarkable record for any radio set and it only proves once again that the regenerative circuit is by no means a dead letter, but that it is becoming more and more live every day.

Grimes Designs New Coil for His System

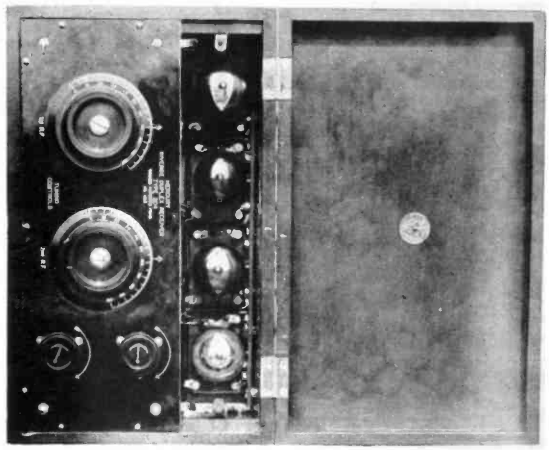
(Continued From Page 15

should not be mounted too close together and should be at right angles to each other. The values of the by-passing condensers are not to be taken as final. Fortunately these are not critical and the values given have been found to give excellent results in the vast majority of cases. Their value depends on the audio transformers used and therefore, if any difficulty is experienced from howling, it is wise to try juggling the values of these by-passing condensers.

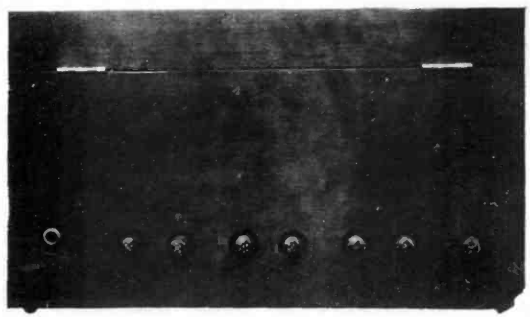
Another precaution necessary is the prevention of radio feed-back or regeneration between the loop and the tuned transformer. If proper steps are not taken, the tuned transformer will act like a tickler coil in a regenerative set and whistle back into the loop when the loop is in certain positions. This is easily overcome by what is known as shielding. It will be necessary to shield either the entire set or the tuned transformer. Shielding of the entire set is accomplished by lining the enclosing box with thin metal or tin foil. It will only be required on five of the six sides. The side containing the controls does not have to be shielded. This shielding is all connected together electrically and is then connected to the positive filament lead. The other shielding possibility is that of enclosing the tuned transformer in a small box whose sides are lined with metal or tin foil. Perhaps an easy thing to try is a tin can large enough to house the coil or tuned transformer. The can should be electrically connected to the positive filaments. The coil should be so mounted in the can as to be well separated from the actual metal. No top on the can is necessary.

Of course, in using the third step of audio amplification, shown in the diagram it will sometimes require a separate B battery for the detector. Three stages of audio and a detector from the same set of B batteries will often result in a howl when the detector is turned on to full brilliancy. A separate small 16 to 22 volt battery

(Continued on Page 45)



This is a top view of the Grimes two-control set in its commercial form as made for a loop aerial
Photo courtesy the Mercury Company



In the commercial set all of the connections are made on the bottom of the instrument as shown here

Editorially Speaking

(Continued From Page 27)

brilliant flowers to attract us out of our houses.

And at night, instead of sitting in a stuffy room listening to anything, we much prefer to go out under the moon and the stars and breathe in the fresh air of nature while the weather is mild and makes this possible.

Will you ask your skeptical friend what other phase of human activity would enable him to attend such a brilliant series of functions as I have attended in the past two months with my little radio set?

Will you ask your skeptical friend—in case he does not think these things are worth while—what under heaven he does think worth while?

Will you ask him how, in the light of any such admission as that, he can claim to be an intelligent human being or a good citizen if he does not value the opportunity to improve his mind with a moderately priced instrument that will bring such education and entertainment right into his own home for him and his wife and his children?

Will you ask this skeptical friend of yours if he waited until the automobile was perfected before he bought one—or if the Victrola was perfected before he bought one—or if the typewriter or the sewing machine or the player-piano or the vacuum cleaner or any one of a thousand and one other things was perfected before he bought?

There is not one of these things which is perfected yet. There is scarcely a man today whose office is equipped with typewriters who did not invest his good hard earned cash in typewriters in the old days when we had to lift the cylinder every time we wanted to look at what we wrote. The typewriter is not like that today. And yet, in the old days, the typewriters he bought were worth the money that he paid for them and he himself will admit that they were a fine investment.

Is this skeptical friend of yours still driving the same car which he first bought? How many cars do you suppose he has bought since that initial experiment of his in automobiling? Does he think that the automobile of today is perfect? Does he not believe that it is going to improve year after year and that he himself is going to invest in new models as they come out and as his finances permit?

And yet he has bought this typewriter and he has bought this automobile and he has bought this Victrola and these other things, satisfied that even as they are they are well worth their cost in adding to the happiness and the comfort of his life and he is quite willing to invest more money in the future in the new models as they are developed.

Radio today is absolutely like that. It is a perfectly satisfactory thing, within reasonable limits just as it is, and the man who is going to wait for its perfectioin is going to lose the privilege of attending just such brilliant lists of events as this every two months just so long as he does without his radio set now.

The great companies who are interested in radio today are making marvelous plans at the present time for the extension of this already wonderful broadcasting service. The things that are being prepared by the Radio Corporation of America, the American Telephone and Telegraph Company, the Westinghouse Electric Manufacturing Company, the Electric Company, the Na- tion Company, the Crosley and all of the other interests that are in back of and supporting radio, are making my radio set more and more valuable and today I would not take $10,000 in cash for it if I were sure that I could not get another one to take its place.

I mean exactly that. My radio set is worth $10,000 to me and I am a poor man. It is worth that to me to have it rather than to do without it and it should be worth the same amount or more to any other man who values such opportunities of improving his mind and growing in culture.

* * *

NOT long ago I read a letter in a Philadelphia newspaper complaining of "the menace" of single-circuit sets which reradiate their squeals and howls and canary bird songs into your receiving set and mine. It had a very amusing follow-up this last month through the ether.

One night, while I was listening to WJZ, the Radio Corporation's broadcasting station in New York, I bumped into a Boy Scout affair in which the speaker came to the microphone and began to talk to the Boy Scouts about the curse of reradiating regenerative sets.

He put it pretty strongly and he spoke about the Scouts' "good turn" which they are supposed to do every day and he gave them to understand that the best good turn they could do for the public at large would be to junk their regenerative sets and go out with a gun after all the regenerative sets which they knew about.

The funny part of it to me was that this man gave this speech from the broadcasting station of the Radio Corporation and they are the biggest manufacturers of regenerative sets in the world and are the owners of all patents and licenses for the building of such sets.

I fancy that the speaker did not tell the officials of the station what he was going to talk about when he went up to the microphone, or else I think his speech might have been censored.

As a matter of fact there are two sides to this campaign against the reradiating sets. How are you going to persuade people to junk reradiating sets when nine out of every ten listeners-in do their listening on a set which reradiates?

The so-called "campaign of education" which certain magazines and newspapers are making such a fuss about ought not to have for its object the total elimination of regenerative sets because regeneration is the simplest and most efficient method of getting broadcast concerts.

If they want to educate the public, these brilliant editors ought to devise some easily constructed little piece of apparatus that can be added to the present regenerative set to prevent reradiation. It can be done. I'm not going to tell you how because—well, frankly I have not finished my experiments yet—but it can be done and easily done. Brainard Foote gives a suggestion in his article on the short waves on page 38 of this issue.

There is no doubt about it that reradiation is proving to be one of the most awful nuisances of present day radio. Out at our house we almost break our New Year's resolutions about swearing eight or ten times during the evening, but we must remember that all these owners of regenerative sets went into the game in good faith and that we in this country did not have the con ense that they showed in Engl on at the

(Continued on

Have You Heard the Short Wave Lengths?

By BRAINARD FOOTE

RADIO never stands still. Not a day passes but marks the birth of a development, an improvement, something better than we have had before. And with the ever-increasing army of broadcast listeners, the changes come more and more rapidly because of the much greater number thinking and planning for radio's betterment.

Some use this as an argument for staying "out of the game until radio sets are still further improved," but such may be likened to those who don't buy an automobile because improved automobiles are bound to come!

So far as the listener is directly concerned, it is probable that the greatest benefits have come in the way of remarkable strides in the economy and efficiency of vacuum tubes, the simplification of set operation, the mechanical excellence of the larger part of manufactured instruments and the widespread improvement in the quality and also the clearness of broadcast programs.

The most recent developments which are certain to assure far greater scope for radio as a utility have been short-wave transmission, the amateur transatlantic tests and the decrease in the numbers of interfering receiving sets.

Every one has noticed how much better the selectivity seems to be in the neighborhood of 300 meters than it does up around 500. KDKA, WCBD, WBZ and dozens of others can be tuned in and out with comparative ease, while on the higher wave lengths, it is almost impossible to "duck" in between local broadcasters using wave lengths between 400 and 500 and hear out-of-towners without interference.

As a matter of fact, the selectivity is really the same, and the answer to the question is to be sought in the fact that a given change in capacity or inductance of the receiver causes a far greater change in the frequency on short waves than it does on long waves.

Ever notice that the "frets" on a mandolin are farther apart on the low notes than they are on high ones? The cause is exactly like the frequency situation in radio. A little confusion may exist as to the relation between wave length and frequency—which are so dependent upon each other. A long wave length means a low frequency, while a short wave length means a high frequency.

If the waves are a mile apart, not so very many of them can go past a given point in a second, but if they are quite close together, of course a great many go by in the second. In other words, if the waves are close together (short wave length) they pass one's aerial very frequently, and we have a "high" frequency.

Now then, to dig a little deeper, why is it that tuning seems sharper the shorter the wave lengths are? Since the waves travel along 300,000,000 meters (186,000 miles) in every second, only a definite number of [illegible] of any stated length will go given point in a second. If the wave length is 500 meters, exactly 600,000 waves will get by in a second. At 400 meters, a shorter wave length, more waves pass per second, and the frequency is 750,000 "cycles." At 100 meters, the frequency is 3,000,000 and at 200 meters, it is 1,500,000 cycles.

In order that we have as little interference as possible, stations are not permitted to use frequencies which are too close together. Should the frequencies be too close, every so often a wave from one station will "hit" the receiving aerial at exactly the same instant as a wave from the other station, and the result will be a "howl" or whistle which has a pitch corresponding to the number of times per second that two waves come in at exactly the same instant.

This has often been noticed between WDAR and WOR and also between WHN and WDAP, whose wave lengths are rather close together.

Hence, frequencies are assigned so that this "beat note" isn't bothersome—the reason being that its frequency is so high that the human ear can't detect it. It's often there just the same, but as long as we can't hear it, we don't object.

The usual separation between frequencies, to be on the safe side, is about 20,000 cycles. In other words, if one station is permitted to use 600,000, the next lower frequency (longer wave length) can't be closer than 580,000.

Perhaps this may all seem beside the point, but we're just getting to it.

Referring back to the broadcasting wave lengths, we find that there are just 150,000 cycles' difference between 400 and 500 meters. This means that there may be no more than about seven stations transmitting at the same time between these wave lengths (dividing 150,000 by 20,000).

But, for a grand surprise, try the same thing between 100 and 200. Since there are 1,500,000 cycles' difference there, we may have as many as seventy-five stations on the air at the same time without interference.

Think what this will mean in the days to come when radio will be used to an almost inconceivable extent both commercially and privately. And if there is so much difference between ordinary broadcasting and waves near 100 meters, how about between 1 meter and 100 meters? Here we find that no fewer than 14,850 stations may get along harmoniously together.

What a vast field this opens up for the future! How much it means in the extension of radio to purposes hardly dreamed of today! What a simplification of apparatus it entails!

As a pioneer in the commercial development of the short wave length, great credit is due the Westinghouse Electric and Manufacturing Company.

KDKA has been broadcasting for several months on 100 meters and conducting some highly interesting experiments. Few listeners, up to the present, have been "in on them," but any one within 600 or 800 miles of KDKA may easily pick up that station's broadcasting with a single tube outfit of unusual simplicity.

KDKA's 100-meter work is done at the same time as regular evening transmission, and the program holds for both 100 and 326 meters as a rule. There are other tests going on, too, which are most interesting. At present a representative of the Metropolitan-Vickers Electric Company, of Manchester, England, is at KDKA running some tests with his own company, and the broadcasting is being successfully received in England. Certainly the volume from KDKA's 100-meter set is as good as can be had on 326, and to me it seems much more steady and even stronger than on the higher wave length.

The most satisfactory single tube receiver may be quickly assembled. The grid circuit is tuned by a coil of thirteen turns of No. 20 wire on a four-inch diameter, shunted by a 9 or 11 plate variable condenser. The rotor plates MUST be on the filament side, for hand capacity is more serious on the higher frequencies. A vernier is highly desirable, and the type which varies the dial in preference to one which moves an extra plate is to be preferred.

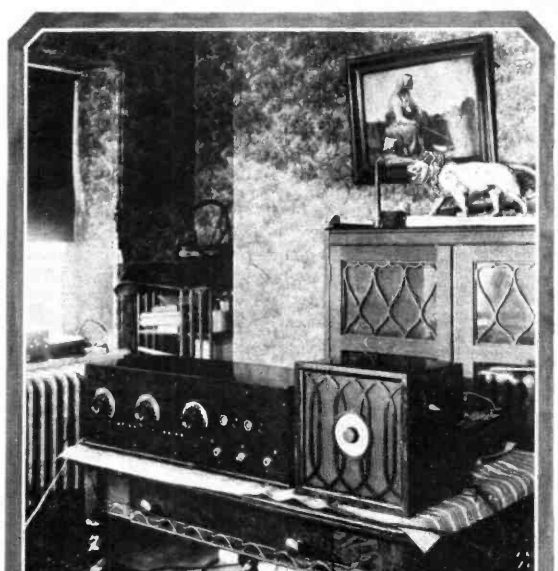
The plate circuit is also tuned and employs a similar coil, at right angles to the other one, wound with eleven turns of wire and shunted by a similar condenser. Six to ten turns of wire are fastened together in a three-inch diameter "ring" and placed near the grid coil as an untuned primary. It doesn't help to tune it, and the regular antenna will do.

The small coil is connected between aerial and ground. The range of this little outfit will be between 90 and 175 meters. A phone condenser is also needed. A dry cell tube is just the thing, and the set can be rigged up on a board in little time.

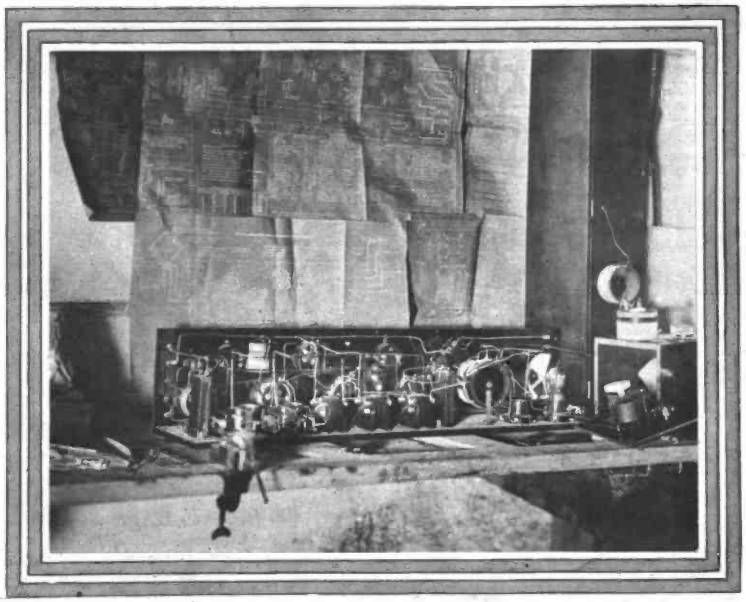
Plenty of fun is in store for any one who listens to KDKA on 100 meters and to the tests from that station when the call used is the experimental 8XF. There are also a number of American amateurs in the same vicinity, most of them using code, however.

As another highly satisfactory use of short waves, the recently completed amateur tests between Europe and America should be cited. When it is considered that the power employed by American amateurs who succeeded in establishing two-way contact with friends in France and England was no greater than 50 watts, and that the commercial stations handling radiograms with Europe employ power as great as 100,000 watts, the achievements of the American and for amateurs are truly wonderful

The first actual contact lished between French Deloy, Nice, and 1MO, F



Radio in the home of Wm. C. Ames, 6003 P[illegible] avenue, Philadelphia, Pa. The set is a home-made Neut[illegible] with a Timmons Talker



After you solve the intricacies of Mah Jong, you will be able to tackle the intricacies of these blue-prints and this array of apparatus

with the SUPER-HETERODYNE

commendable and thorough, the lower right-hand corners bearing the signatures of the various dignitaries associated in the plot, who each and every one had passed upon them and had given them their O. K. by attaching their signatures, still quite a few errors slippped by. For instance, the two coils "L" and "Ll" of the oscillator coupler were shown connected, when as a matter of fact they have not been on speaking terms for some time, as evidenced by later appearing diagrams.

Some condensers were marked .0027 in preference to .00027, which is now considered more in keeping with the Parisian mode. Data relative to the C battery and kind of lamps employed did not seem to approach the standard set down by Daniel Webster in his classical novel.

However, I must say, leaving all hilarity aside, that the blueprints, outside of the errors, were elegantly done and most imposing. They were very thorough and carried out in the most minute detail. We are all liable to error and I really think the designer did exceptionally well to get through his task without more defects presenting themselves.

We had heard of four of these superheterodynes having been constructed without success and we wondered whether or not it might not have been just this little slip which has had something to do with the failure to perform.

Approaching the serious, let me say right here that the data furnished with this particular outfit is most complete, and after the errors are eliminated the affair should work out satisfactorily, if not otherwise.

Running along now to the various units, we find that the excellent instruction book accompanying the outfit with a $2.00 ticket, lays stress upon testing out each piece of apparatus before setting it up. This may seem superfluous as the individual units are all new and fresh from the factory. Having been through this thing before we concluded the above to be good advice and accordingly proceeded to carry out the plan.

Out of four variable condensers we found two "shorted"—plates rubbing. One we were able to straighten out, the other was returned and we received a duplicate without any quibbling on the part of the dispensers of the set. Let me say that we have had no trouble in having defective parts replaced. Our principle difficulty lay in getting a rise from any letter asking for information. Three letters brought one reply after a wait of three weeks. Of course, this is part of the "service." Our only object in citing these instances is to give the reader an idea of about what he must expect in case he desires his set in a "hurry." As our Louisville friend says, "Make your own time allowances."

After the condensers, we turned our attention to the radio frequency transformers, type 1716. Out of six we found one broken and two with open secondaries. These were sent back and after a most annoying wait of over six weeks we succeeded in getting them from another source. We have reason to believe, however, that the inability to supply these transformers was not due to any fault of the dispensers of this knock-down set. The hunt for these 1716 transformers was a prolonged and tiresome one and held up the completion of the second set for over six weeks. Radio shops all over Philadelphia and New York were appealed to without success. The transformers apparently were not being released by the manufacturer for some reason best known to themselves.

We are told that "All Gaul is divided into three parts." The word is misspelled. The "u" should be replaced by another "l." Regardless of the number of parts, the whole circus seems to be controlled by a select few. Uncle Sam appears to have discovered this fact recently.

Tripping along, we next turned our undivided attention to the four large by-pass condensers. One of these we found "shorted" between lug and metal housing. This was easily corrected. One 'phone jack needed a slight adjustment to allow of proper contact with the inserted 'phone plug and one lamp socket was defective. Aside from these defects, any one of which would have Daughertyized the completed set, we found everything in good trim.

From the above you can readily see that you will save yourself much annoyance by following the advice to test out each part before proceeding with the hooking-up process.

Having satisfied ourselves that all was in readiness, we proceeded to place the parts as indicated upon the diagram. Here was a long box into which we were to put all this debris and wire it up. How in the name of William Jennings Volstead were we going to get inside this box to work? The instruction book did not say, so after much deliberate thought our son came to the rescue and suggested we take off the bottom of the box. How practical! Who would have thought of such a thing but a young son. We would advise every one to have a young son sticking around even though he does play with the grid leaks and drop them inside the condensers and takes the ammeters, tacking them on his express wagon for speedometers.

Well, we removed several screws and took off the bottom of the box. Easy. Next we attached the panel to this board and, strange to say, we found it just the exact length of the board. For once something fitted perfectly. This encouraged us immensely, so we lighted another cigar, gave the parrot an extra stroke on the back, and during the excitement of a retaliatory bite knocked a perfectly good tube off the table and destroyed its bias completely. Keep all parrots away, as they do not enthuse. The various pieces of appa-

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