

63
September, 1924



RADIO IN THE HOME

TWENTY CENTS

HENRY M. NEELY



In this Issue:

The
**INVERSE-
DUPLXED
NEUTRODYNE**

*Photograph by Underwood & Underwood
Through the courtesy of Telephone Maintenance Company, Chicago, Ill.*



It Will Bring in Stations You Never Heard Before

Reaching out through the ether—"fishing" for new stations in far away places—is a most thrilling game. To many it's more than half the fun of radio receiving.

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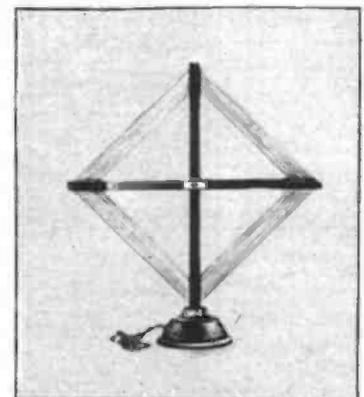
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TWENTY miles in a single night. That was the wonderful broadcasting achievement of Paul Revere as he galloped from village to village, waking the country-side with the cry, "the British are coming."

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In every part of the United States Crosley Radio Receivers are bringing in far distant stations clearly and distinctly. Up to the minute news, concerts, music, lectures, are yours to enjoy right in your home when and from where you choose if you own a Crosley.

Keeping always at the head of the procession in improvements and innovations, the Crosley Radio Corporation has made it possible for every one to possess the maximum efficiency in radio reception at the minimum cost.

The Crosley Trirdyn 3R3 illustrated below is, in the opinion of many experts, the best radio receiver ever offered to the public at any price. The experiments of over 200 experts have shown that in ease of tuning, sharpness of signals and nicety of calibration, the Trirdyn cannot be excelled. Local stations may be easily tuned out, even if very close to you, and far distant reception almost instantly brought in.

The Trirdyn 3R3, illustrated below, is a 3-tube set incorporating tuned radio frequency amplification, regeneration and reflex. It has been proven to give the efficiency of a 4 or 5 tube set. And yet it is priced at only \$65 without batteries, tubes and headphones. The Trirdyn Special, set in a special solid mahogany cabinet which is made to house all necessary accessories, may be had for only \$75.

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Crosley Trirdyn 3R3, \$65.00

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Crosley 50. A one-tube Armstrong Regenerative Receiver. Price, less accessories, \$14.50. A two-stage amplifier, Crosley 50-A, may be added to it for only \$18.00, thus making a three-tube set.

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Crosley 51-P. The Crosley 51 in compact leatherette portable case, completely self-containing, less accessories, at \$25.00.

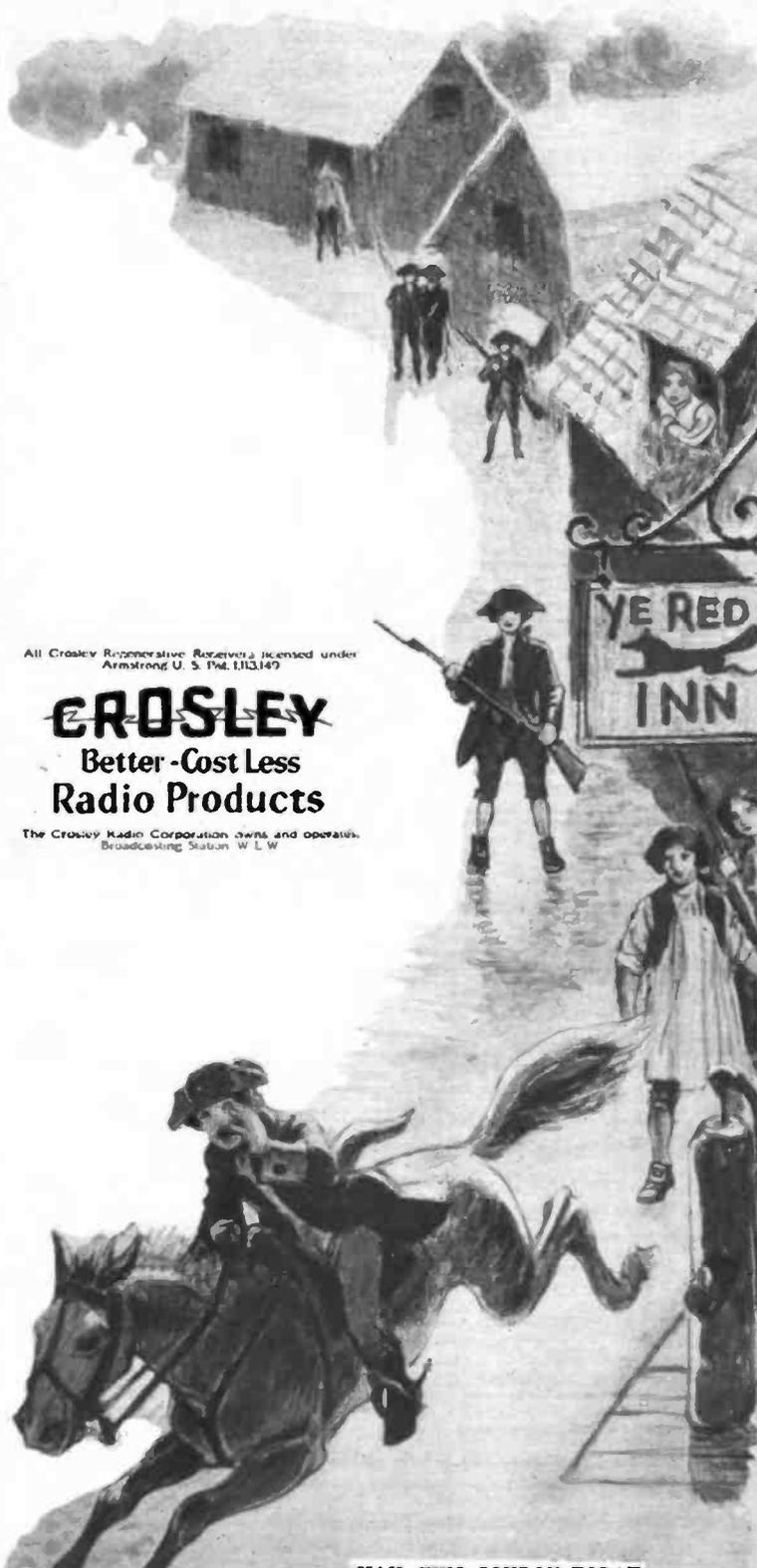
Crosley 52. A new Armstrong Regenerative 3-tube set assuring loud speaker volume on distant stations under almost any conditions. Price, without accessories, \$30.00.

Crosley X-J. One of the best known and most popular 4-tube receivers on the market. A radio frequency set at \$55.00 without accessories.

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Editorially Speaking

By

Henry M. Neely

WE ARE now entering upon another radio season and most of the talk throughout the industry is devoted to speculation as to what the tendencies of this winter are going to be. It seems to me that the coming winter bears every promise of being by all means the most interesting and probably the most profitable one that the radio business has yet faced. It seems to me

LOOKING AHEAD INTO NEXT SEASON'S RADIO that every evidence has pointed to the probability that this will be a season of manufactured sets rather than a season of parts buying for the hook-up fan.

There are several things that make me feel this way. In the first place, new circuits which really have any significance are becoming more and more rare. This is natural. The fundamentals of radio are now quite thoroughly known and the functioning of all types of apparatus in all possible combinations is no longer a mystery.

Here and there, I look for something along really significant lines, like the new system which Carl Pfanstiehl has just developed in Chicago, or the new Kenneth Harkness set, or the very fine possible modifications of the Grimes-3XP basic idea, but, even with such things as this coming along, there is no reason why this should deter the non-radio man from buying a set this fall.

Radio today is quite comparable with the automobile. You can buy any one of the standard cars and you will be certain to get excellent efficiency and satisfaction from it. The choice of the individual make will very largely be a matter of the personal equation and the satisfying of personal tastes—particularly the taste of the woman of the family.

Just as the woman is deciding today the particular style of body for the car her husband buys, so this winter the woman is going to be a very large influence in determining the set which will be purchased for the home.

Fortunately, radio has now advanced to such a stage that this choice, ignoring the technical aspect of the set, will not mar the satisfaction it will give to the family. Just so long as it is one of the well designed standard makes, it will deliver everything that can reasonably be expected from radio at the present time.

A year ago, the non-radio man who contemplated buying a set, used to go to some technical friend or else to his local dealer and have a set hooked up for him. He felt that in doing this he was saving money, but he very soon found out that other men, who went directly to the standard manufacturers were having more satisfaction and having less trouble with their sets than he was having with the one assembled for him in this haphazard way. I

believe that the day for such "bootleg" hooking up is very rapidly dying out, and I think that this winter is likely to see the last of it in any considerable degree.

Radio had to go through that preliminary stage, however. A year ago or two years ago it was regarded as little more than a toy and there was a very widespread skepticism as to its permanence, or its desirability even if it did become permanent.

Nowadays, however, radio is being broadcast by more and more substantial concerns, the smaller stations are gradually passing out of existence, the class of material being put on the air is becoming of greater and greater significance to the general public and radio has altogether ceased to have any of the aspects of a toy and is today just as much a part of the American home as is the Victrola or the piano.

Having reached this stage of dignity, it is perfectly natural that the attitude of the non-radio public should change and that such people should approach the possible purchase of a set with the same seriousness as they approach the purchase of a Victrola or a piano.

That is why the manufactured set is now moving much more rapidly than it ever did before and that is why I feel it is going to be the mainstay of the entire business as the years go on.

Parts and apparatus are not moving as fast as they did. This is pointed out by almost all of my correspondents in their monthly reports to me about trade conditions in their own cities. Manufacturers of apparatus are complaining about this. They are also accusing the newspapers and magazines of not devoting as much space as formerly to hook-ups, and they feel that we are deserting them and going over to the side of the manufacturer of the completed sets.

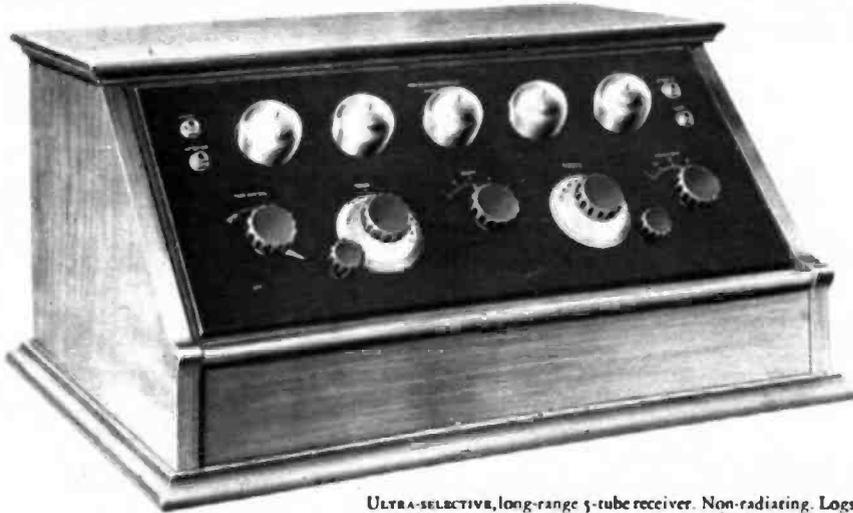
I can only say for the benefit of these manufacturers that a newspaper or a periodical is not run on such principals. We change our viewpoints with the changing of the field of activity with which our publications deal. If radio is unquestionably swinging from the hook-up business to the manufactured-set business, the editor of a radio periodical would be committing financial suicide if he did not go along with the trend of the market, because the market trend is governed entirely by the desires of the very people among whom he is trying to build up his circulation.

There is one phase of this situation which I think the manufacturer of parts has overlooked. I have already pointed out the fact that new circuits are rare and that in itself would limit the amount of space devoted to them.

But the most important thing is that the manufacturer of parts has had a practically free foot so far and he has so driven his merchandising campaigns that the fans who really care for hooking up new

(Continued on Page 32)





*The Royalty
of Radio*

ULTRA-SELECTIVE, long-range 5-tube receiver. Non-radiating. Logs accurately for tuning in any desired station at fixed settings on the dials. A special selectivity control is set to suit local conditions and need not afterward be touched. Slipping front panel for easier tuning—originated by Kennedy, now widely copied.

The new Kennedy Model XV

*for cutting through powerful local stations and bringing
in distance with volume—or operating on an indoor loop.*

HERE is the ideal set for the city dweller. An addition to the Kennedy line, specially designed to tune out big town broadcasting stations and reach the ones you cannot hear now. Suburbanites will like it, too—especially where nearby stations blanket out all chance of selecting other programs at a distance. A DX set supreme.

Highly selective—with remarkable simplicity of tuning. The number of tuning controls is reduced to

If you have any difficulty in locating a store where this set is being demonstrated, write for the address of a Kennedy dealer near you

two—you only have two hands! Accomplishes results with tuned radio frequency that were thought impossible until the Kennedy research laboratories created this new circuit. The volume of amplification is under perfect control.

Like all Kennedy models, the tone quality is superb. It is a musical instrument. For homes where an outdoor aerial cannot be put up, it brings in local programs on an indoor aerial or loop. *You can do wonders with this set!*

Standard Kennedy Models

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Enabled us to greatly reduce Eveready "B" Battery prices as of August 1st

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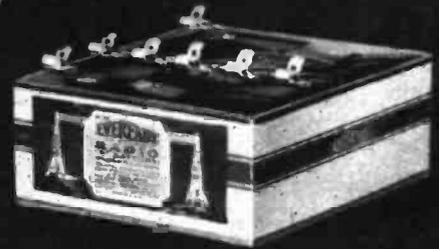
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Now - repower your radio set with fresh Eveready "B" Batteries

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New low price
\$4.75



RADIO IN THE HOME

Here's a Joke on Everybody

WHEN Mr. Grimes first joined our staff we promised you that as soon as he could get to it he would Inverse-Duplex the Neutrodyne circuit for you. We have kept him pretty busy ever since, developing the Grimes-SXP circuit so that the Neutrodyne seemed to have fallen by the wayside, so far as Grimes-ing it was concerned.

But we really hadn't forgotten it. Mr. Grimes told me some time ago that a Dr. Briggs, head of a boys' school in St. Paul, Minn., had been in touch with him and that we would soon have the Neutrodyne properly Grimes-ed.

So here Mr. Grimes is telling you about it, and on Page 13 Dr. Briggs is telling you about his part of it, and if you don't mind reading more of my stuff you'll find the joke of the whole thing in my article about it.

For, remarkably enough, I have found that once you Grimes the Neutrodyne it ceases to be the Neutrodyne at all. It performs exactly like a Neutrodyne, but—it's simply a four-tube Grimes-SXP circuit! H. M. N.

THE past year we have witnessed with more or less alarm the ever increasing number of high-power broadcasting stations. There is at present no limit to the number of such licenses that the Government may issue, and there appears to be no end to the number of enthusiastic organizations wishing to entertain the poor long-suffering public.

This, of course, has raised new difficulties, and many problems now confront us that were not dreamed of a year or two ago. The ether is rapidly approaching that state of radio saturation that might be mildly classified as "busy."

The main thing that worries most of us in this situation is the eternal problem of selectivity. To put on ten controls or not to put them on—that is the question.

It can be generally stated that the selectivity of a set is proportional to the number of its tuning controls, although this is not a hard and fast rule.

Then as the number of transmitting stations increases within the relatively narrow broadcasting band, the only relief seems to be in more selective receivers.

Two systems of tuning have been extensively tried and have generally proven in. One is the wave-trap idea and the other is tuned radio. Of these two, the tuned radio is by far the most positive and desirable. The wave-trap is simple and can easily be connected



David Grimes with the latest addition to the Inverse-Duplex family—the Grimes-ed Neutrodyne

Grimes-ing the Hazeltine

By DAVID GRIMES

Associate Editor "Radio in the Home"

to any type of circuit. One of its greatest disadvantages lies in the fact that it is a rejectory circuit and is therefore negative in its action. It will only reject one station at a time, meanwhile slightly reducing the volume on the stations desired. Furthermore, if more than one disturbing station is present it requires additional wave-traps, one for each interfering station. Each one is tuned to a different setting, depending on the wave length of the annoying station. It doesn't require much imagination to see just how complicated this would become.

By far the best system is the tuned radio principle—the scheme of tuning in the station you desire rather than rejecting the station not wanted. In this way, when greater selectivity is necessary, additional stages may be added, all stages tuning alike. Experience has shown that three tuning controls are about the maximum number. When the selectivity is increased beyond this, the set becomes too complicated for ordinary operation. Three controls, incidentally, meet most of the present receiving problems.

Past articles I have written on this subject have not recommended more than two tuning controls except in and very near high-power stations. I am afraid, in this regard, that I will have to back water.

Continued and extensive tests have shown conclusively that in many remote localities, interference is often experienced on a two-control set. Of course, my consolation is that a man who never makes a mistake never makes anything. I think I am about to make something or other because I have now made my mistake.

One reason for this misjudgment is the increased power used by the better broadcasting stations. Localities which were formerly classified as remote, are fast becoming relatively near.

They then start to experience the same interference problem as the nearby set. Tuned radio was the first form of radio frequency amplification. It is far from being new—it is as old as regeneration. It has been improved but has been little used the past ten years because there has been no demand for it. The selectivity "bug-bear" is a recent development.

Tuned radio started with Schloemilch and Von Bronk in 1913-14. They ap-

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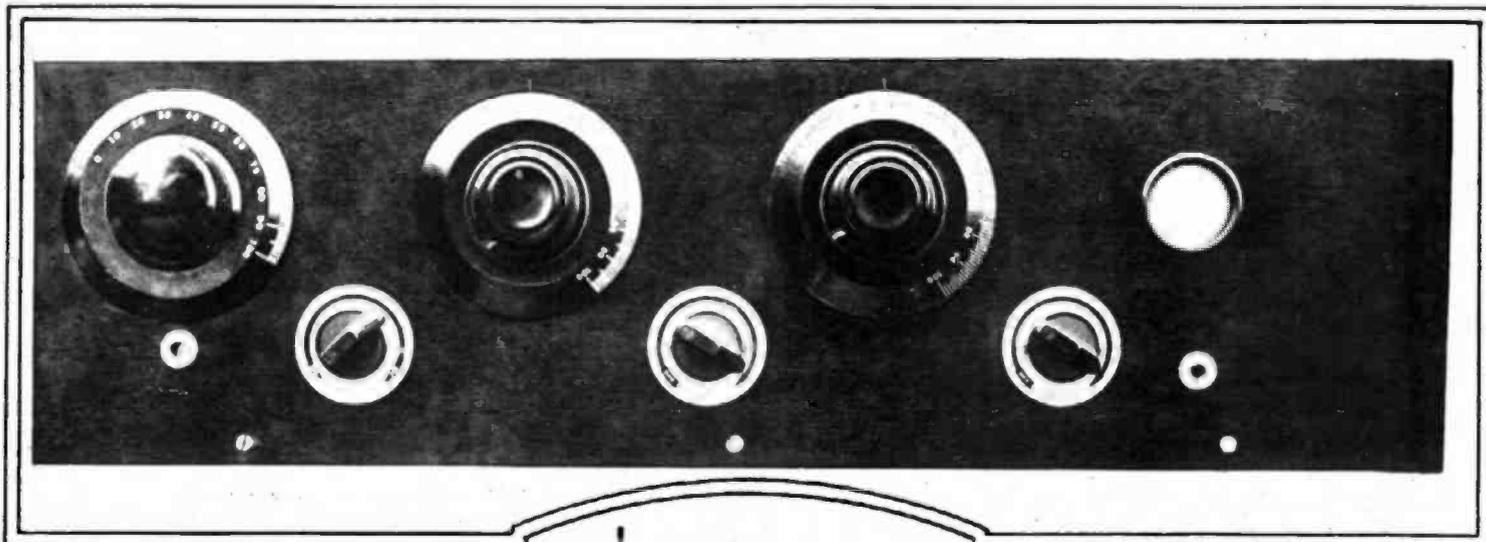
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RADIO IN THE HOME

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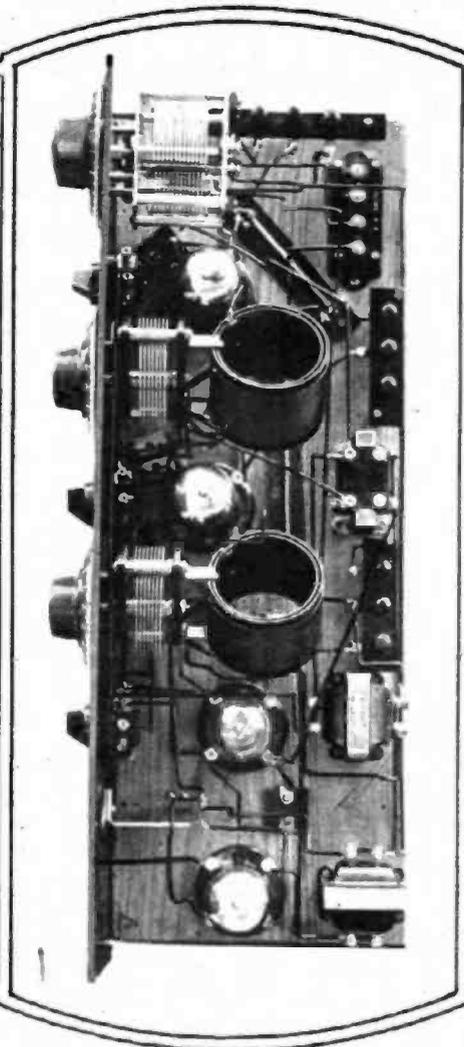
The panel, top and back views of the Grimes-ed Neutrodyne show how all the instruments are placed and wired

plied it to one stage only, and let it go at that. The reason for this seems to be the fact that "cascade" or successive amplification was not at that time clearly understood. It remained for De Forest and others to discover the use of two or more tubes working tandem.

About a year later, Alexanderson combined Schloemilch and Von Bronk's tuned radio with De Forest's cascade amplification and produced a series of tuned radio stages. This circuit had a great tendency to oscillate; so nothing much was done with it.

There being practically no demand at that time for this type of circuit, development work was accordingly slow. Chester W. Rice, then took up the work and disclosed for the first time, the source of these oscillations. This he did in a patent filed in 1917. In this patent he sets forth not only the source of oscillation but its remedy. He revealed the possibility of oscillatory feed back through the inherent capacity in the tube between the plate and grid. Since then, other developments, growing out of the Rice neutralizing system, have occurred. Perhaps the most widely known and one of the most successful, is Prof. Hazeltine's Neutrodyne.

The Neutrodyne system of tuned radio



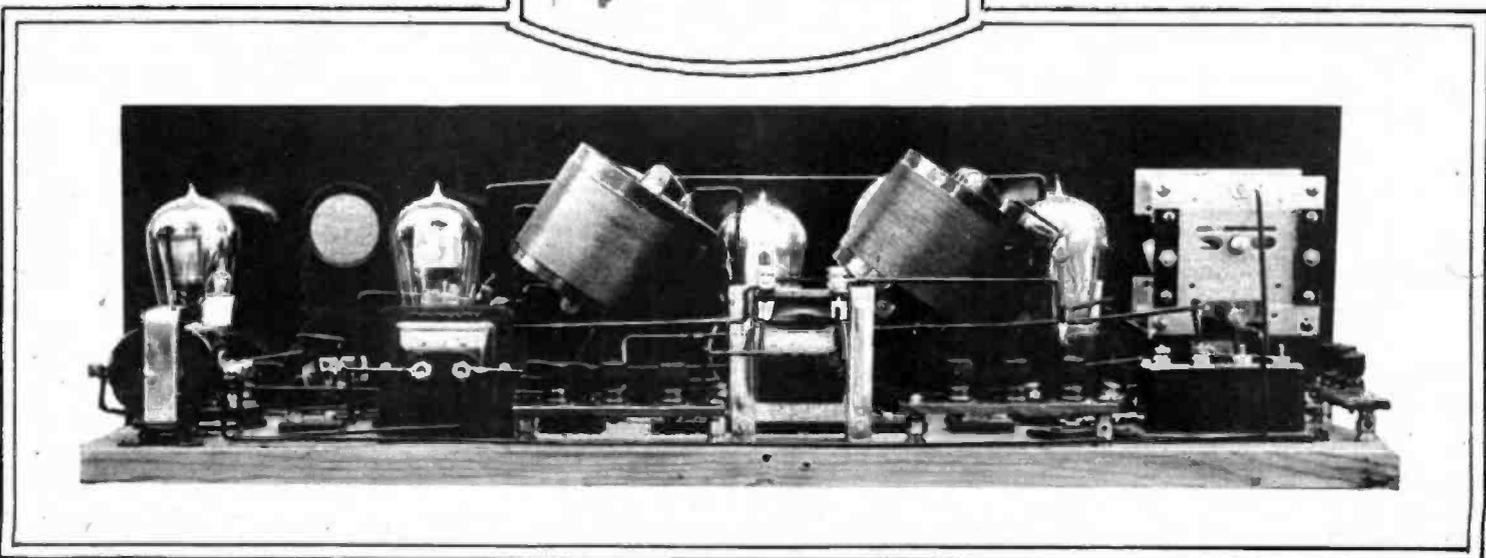
amplification was introduced to the public a little over a year ago and became popular almost over night. The reason for this is that it happened to be one of the first commercial sets to employ highly selective features and it came at a time when increasing numbers of broadcasting stations were literally swamping the air.

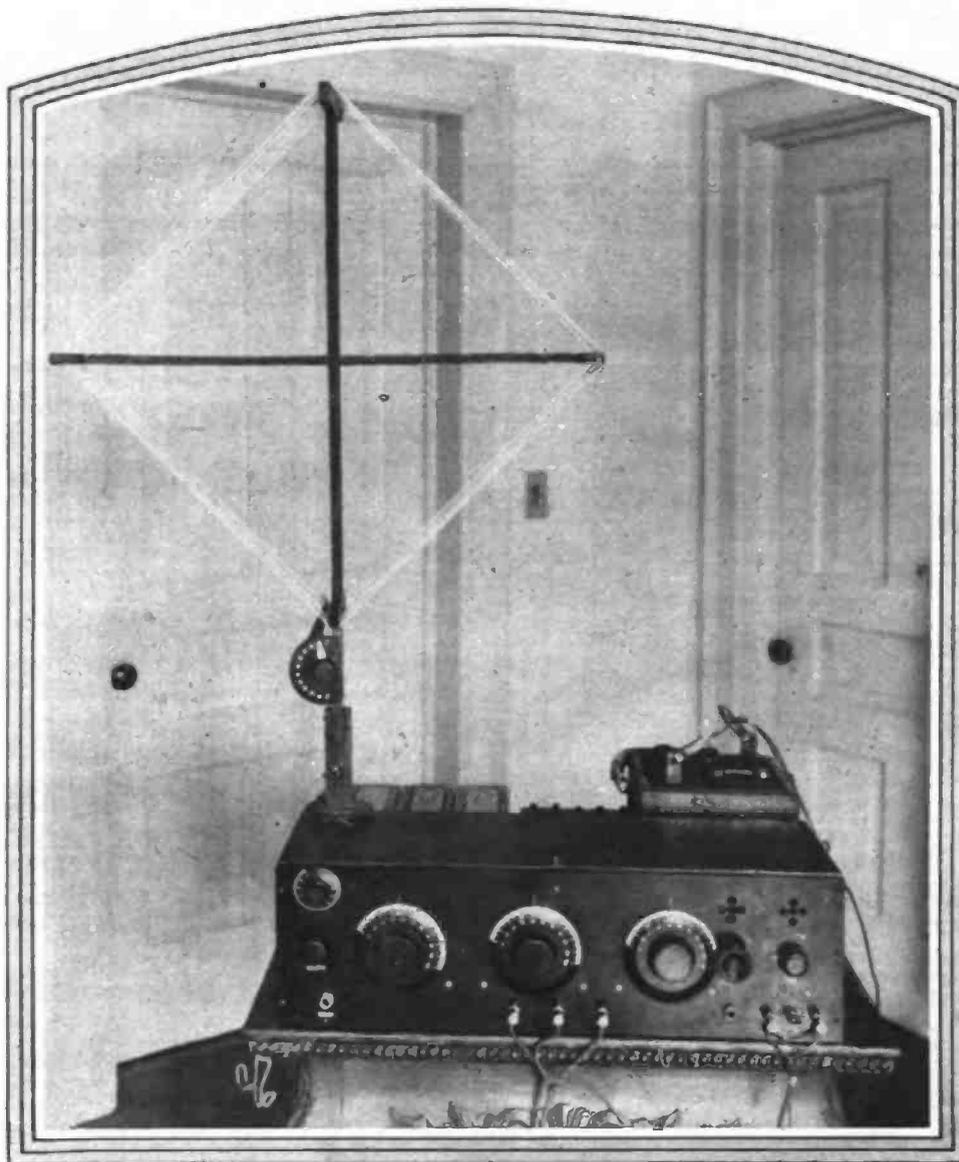
At the present time we still find it in public favor because it has proven to be a good tuned radio set. Other good tuned radio sets have recently appeared but due to the well known features of the Neutrodyne, and its great popularity, we have chosen it to be Inverse Duplexed.

Correspondence drifting in to us regarding the Neutrodyne indicates a strong desire to reduce its rather excessive drain on "B" and "A" batteries. This otherwise successful circuit demands much from its batteries. It is somewhat analogous to the 12-cylinder motorcar that possesses tremendous power but travels but 4 miles to a gallon of gas.

But for the amateur who wishes to experiment, this drawback can be overcome. It is done by reducing the number of tubes through Inverse Duplexing, or, as H. M. N. calls it, through "Grimes-ing."

In this way, the radio and audio tubes are combined for best and most stable results. Thus two radio, a detector and two audio stages are obtained on three tubes. By adding a straight power audio tube making a total of four (Continued on Page 42)





The loop and set as it appears when completely assembled

JOHN De Q. BRIGGS, the writer of this article, is Head Master of the St. Paul Academy of St. Paul, Minnesota. He is a radio fan of the most ardent type, but he brings to his experimentation not the mere hit-and-miss method of most of us, but a solid foundation of scientific education which has enabled him, in inverse duplexing the neutrodyne circuit, to surmount difficulties which would have stalled those with less knowledge.

Prof. Briggs has been in close touch with Mr. Grimes both by mail and by personal visits during his development of this circuit, and I am particularly glad that he has worked it out so successfully because we have had many demands from readers that we give an inverse duplex arrangement of this very popular and efficient receiving system.

The author speaks of this arrangement as too difficult for the average novice. To offset this difficulty, we have worked it out in the new style of "XIP Wire-Ups" and they are given on the succeeding pages. This ought to enable any one to hook up the set. Then, if the delicate adjustment of the "neutrodons" proves too much for you, you can have that part done by some experienced man in your neighborhood.—H. M. N.

A YEAR ago I built with more or less success the first inverse-duplex circuit published by Mr. Grimes. I had good enough results with it to follow on through the various published changes in the circuit necessary to adapt it to the new 201-A tubes.

But, living only a few miles from a powerful broadcasting station, WLAG, and in a position where, when one end of my loop pointed anywhere near the eastern stations, the other had to point directly at WLAG, last fall I abandoned inverse duplexing for the more selective neutrodyne.

Having built a four-tube neutrodyne, I bought the materials for the five-tube set, intending to spend a pleasant Christmas vacation building that. It was the standard Fada layout, and when I had the sockets and neutroformers mounted on the panel and most of the battery leads in, I suddenly conceived the idea of trying a little Luther Burbank stunt, and cross-breeding it with the inverse duplex, in the hope of getting the selectivity of the neutrodyne combined with the wonderful purity of tone, freedom from interference and long-loop range characteristic of the Grimes system.

How I Inverse-Duplexed The Neutrodyne

By **JOHN DeQ. BRIGGS**

The results were beyond my wildest hopes. Wired up "haywire" on a temporary baseboard with most of the leads at least a foot long and the audio transformers jammed right in between the neutroformers, and with only the most casual kind of neutralizing, it came to life at once with the Philharmonic Orchestra from WEAf; and when, from my room in St. Paul, I had brought in KFI, Los Angeles, thirteen nights in succession on an 18-inch loop, using only three tubes, I decided that an inverse duplex neutrodyne was well worth building carefully.

The result was the set here described. It isn't a beautiful piece of workmanship, and it is no set for a beginner at radio to tackle for his first attempt, but it is simple enough for any experimenter who is capable of building a straight neutrodyne, and not only brings wonderful results, but has great

possibilities for any one who enjoys experimenting, and so far as I can find out, it hasn't been done before.

Perhaps it might be well to explain that I'm neither an engineer nor a radio dealer—though the home-made appearance of the set and the non-technical description may make the statement unnecessary.

The apparatus I used is as follows:

Two Fada single sockets.

One Fada double socket.

One Cardwell condenser, .0005 mfd. (This worked better than the condenser that appears in the photograph.)

Two Fada neutroformers.

Two Fada neutrodons (I am going to try replacing these with Chelton Midgets).

Some sort of radio-frequency choke coil.

A circuit-breaking jack for the phones and a filament lighting jack for the horn. Three

General Radio low ratio audio-frequency transformers. (These work splendidly.)

A CRL 400-ohm non-inductive potentiometer. (This may be omitted, but it makes a smoother volume control than the loop taps.)

Two 6-ohm rheostats.

A battery switch.

A "C" battery.

One Micadon .005 mfd., one .0025, one .0005 and two .001.

The loop jack is a Western Electric triple contact No. 159, and the plug in the base of the loop frame fits it. The tap-switch on the loop and the loop-rotating device are, as is obvious, home-made.

The vertical friction disc is cut from an old hard rubber panel, and the horizontal disc is fiber with a circular piece of the kind of soft rubber that is used to mend inner tubes cemented to it. It is not beautiful to look at, but it makes a very handy device for rotating the loop wires.

touching it, and is much more artistic than the old method of poking it with a stick.

The panel is 7x24, but really should be 7x26. An extra two inches would make the internal wiring much easier.

The two photographs give a fairly clear idea of the general arrangement. The home-made oak cabinet opens up completely so that one can easily make changes of adjustments. The oak strip behind the top of the panel is very desirable to keep the panel from bending and is, I think, a good thing even if you use bakelite. The "A" battery leads are all underneath the sockets. The other leads make no attempt to run in pretty, square-cornered paths—each heads for its destination by the shortest route.

The neutroformer connections, and in fact all the radio-frequency leads, should be as short as possible, but the other leads may be run all over the place without any apparent detriment.

Most of the wiring is bare No. 22 copper wire with spaghetti slipped over it. Most people are horrified at the idea of using anything smaller than No. 14, but the No. 22 is much easier to handle and it worked. Where there is a perfectly good binding post or lock nut I haven't looked for trouble by soldering, and this, incidentally, makes it easier to make changes later.

The queer-looking thing behind the loop-tuning condenser is an old Radio Corporation R F transformer doing noble service as a choke coil.

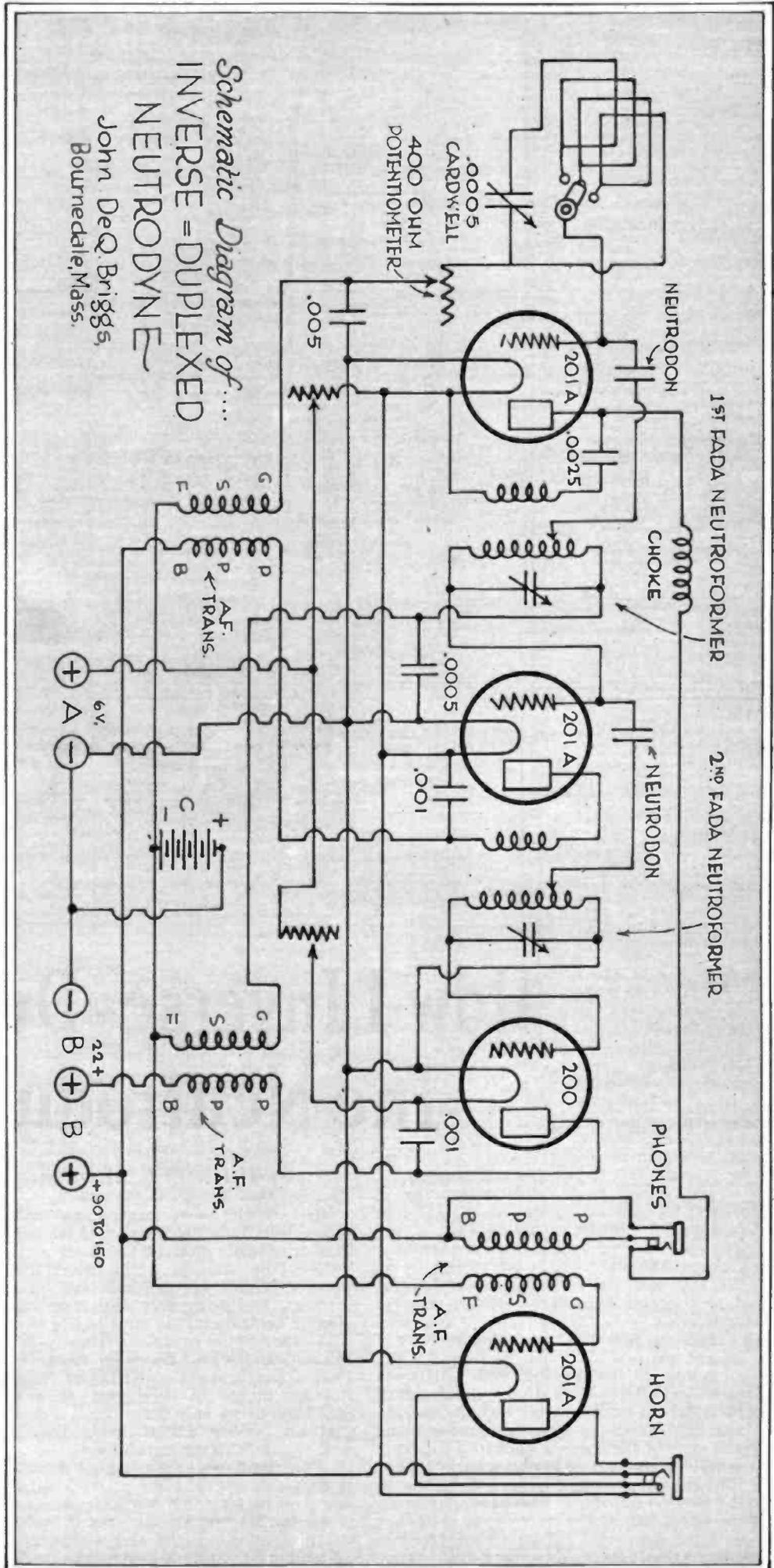
Looking into the back of the set from right to left, via the panel, we have loop, potentiometer, loop-tuning condenser, first radio-frequency tube, first neutroformer, second radio tube, second neutroformer, detector tube, last audio tube. Returning from left to right in the foreground, we have "C" battery, third audio transformer (almost under the "C" battery), first audio transformer, neutrodon, second audio transformer, another neutrodon and choke coil.

The photograph of the front of the set needs little explanation. Top, left, is the little loop-rotating dial. The right-hand rheostat controls all three 201-A tubes. The phone jack is at the left, the horn jack at the right. The little battery switch is from an old telephone switchboard. The "B" battery posts are in the center, plus 90, minus, plus 22. The "A" battery posts read minus 6, plus 6. The whole set, batteries and all, rests on a table 30 inches square.

The wiring diagram looks complicated, but doesn't present anything really difficult. The loop illustrated was made to work with a 13-plate Fada condenser. For the Cardwell the loop should have 15 turns, 18 inches on a side, or about 25 1/4 inches diagonal. The turns should be spaced 1/4 inch apart right across the frame—not as in the picture. This combination of loop and condenser will cover the broadcasting range very satisfactorily.

Ordinary No. 22 dcc. wire is all right, but the special commercial non-stretching loop cable looks better. It is not a bad scheme to put on a sixteenth turn with separate terminals (little Fahnstock clips are good) to which antenna, ground, or both may be attached. I have this, though I rarely use it, because the loop alone gives ample volume, and the antenna and ground not only destroy its directional properties, but bring in a lot of stuff one doesn't want.

In wiring the loop to the loop plug, the tip of the plug is connected to one end of loop, the middle ring to the center of the tap switch, and the upper ring to the other end of the loop. It is (Continued on Page 43)



By
H. M. N.

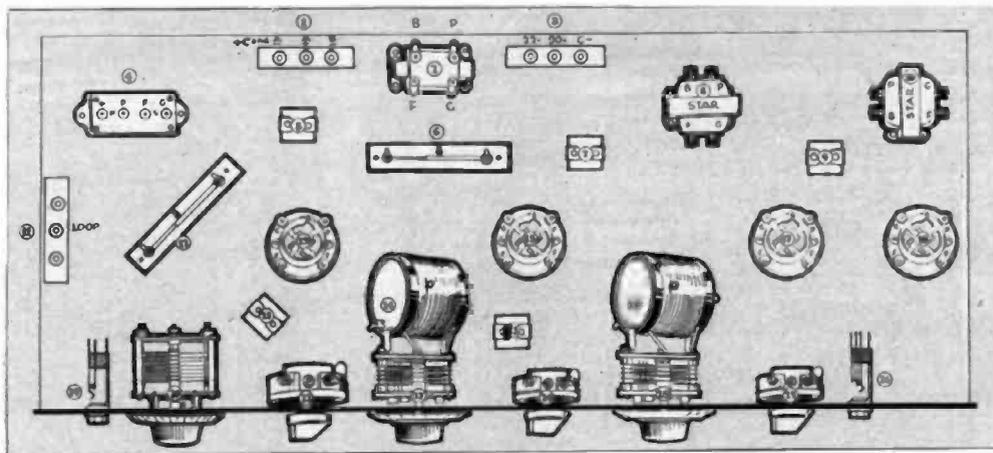


Fig. 1
The layout
of the
apparatus

3XP-Style Wire-ups of the Inverse-Duplexed Neutrodyne

Use 6-Volt Tubes Only

This circuit was designed only for tubes UV200 or C300 for detector (socket No. 17 in diagram), and tubes UV201-A or C301-A as amplifiers (sockets No. 13, 15 and 18 in diagram).

It may be possible to use other tubes than these, but it is likely to introduce complications as the constants of all the apparatus here given were figured for the 6-volt tubes specified.

We cannot undertake to redesign the circuit for other tubes, nor can we answer questions about its failure to function if any other tubes are used.

WHEN we first wired up this Grimes inverse duplex arrangement of the Hazeltine neutrodyne circuit at Station 3XP, I had not intended to write anything about it, believing that readers of this magazine would be much more interested in hearing the views of Mr. Grimes, the inventor of the inverse duplex system, and Professor Briggs, who arranged this in-

verse duplexing of the Hazeltine circuit.

It was, however, necessary for us to wire up the circuit at 3XP in order to verify this 3XP system of wire-ups, which has proved so surprisingly popular when we first tried them on the former Grimes-3XP circuit.

In drawing these diagrams, we take every possible method of checking up so as to avoid any error however small. As soon as we have all of the diagrams laid out on paper, we turn them over to a laboratory assistant and he, without seeing the original schematic diagram, actually wires up a set from these diagrams and we then test it out to be sure that everything is all right. If it is, we know there is no mistake in the diagrams and so we are safe in going ahead and printing them.

Consequently, it fell to my lot as head of the laboratory to put this set together and to work with it a great deal before Mr.

Grimes came over to Delanco, N. J., for his weekly visit to the laboratory.

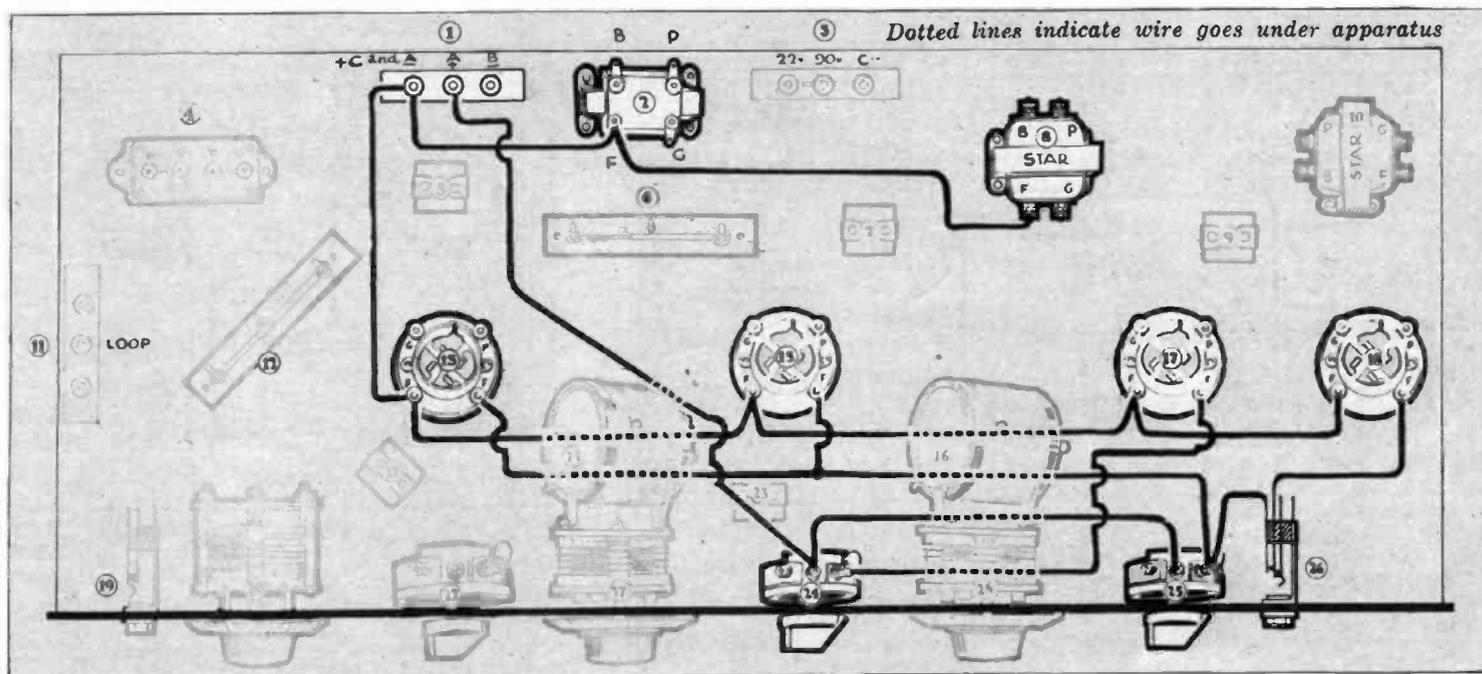
By that time, I was convinced that I was handling the best four-tube set that I had ever used. As a matter of fact, I found that I was handling a set which, with a loop aerial and a loud speaker, gave me every bit as good results as I had ever had on any nine-tube super-heterodyne which we had ever put together. This sounds as if I were talking in superlatives, but I venture to say that any reader who wires up this set properly and uses just the apparatus we used will be astonished by its results.

But what I started out to tell you was why I am writing an article about it when I had not intended to in the first place. It is simply because I find that we have run into a very good joke on both Mr. Grimes and Professor Briggs.

Both of them started out to inverse duplex the neutrodyne. Now let us first consider what the neutrodyne circuit is.

We are all familiar with tuned radio

Fig 2—The filament leads—13 wires



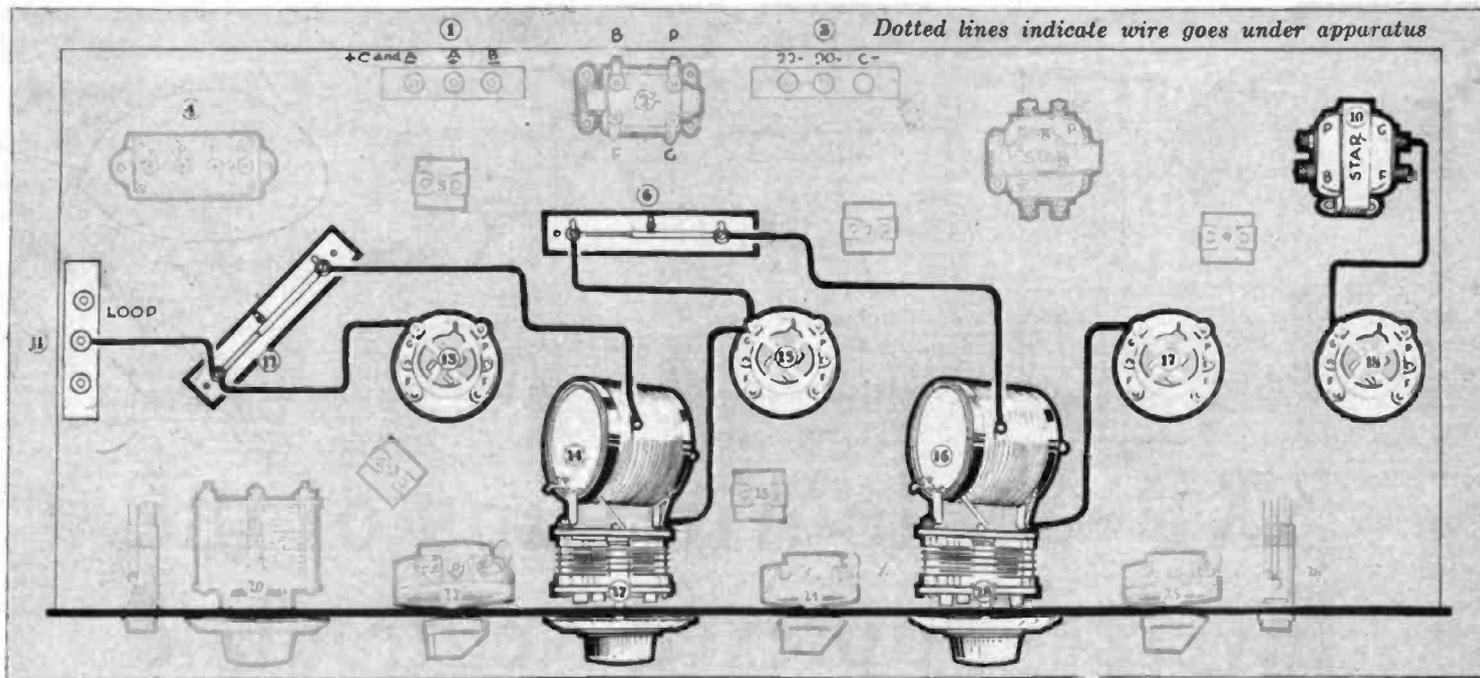


Fig. 3—Grid leads and Neuroformers—8 wires

frequency amplification in its various forms. The Grimes-3XP circuit was tuned radio frequency amplification with a crystal detector and there are many other sets which used tuned radio frequency amplification.

In most of these systems, the tubes have a tendency to oscillate and cause uncontrollable squeals which totally ruin reception. This was a condition which Professor Hazeltine faced and his solution of it was to introduce the little neurodons, or neutralizing condensers, which had the effect of stopping these oscillations of the tubes and therefore stopping the annoying whistle.

The Hazeltine system is based virtually entirely upon these neurodons. Any system which does not use these neurodons is a tuned radio frequency system but it is not a neurodyne system.

Now, in using this Briggs arrangement of the Grimes arrangement of the Hazeltine arrangement of the Rice-Alexanderson arrangement of the Schloemilch and Von

Bronk tuned radio frequency system—I think that gives credit to everybody concerned—I did not bother to balance the neurodons at first and yet I found I was getting astonishing results with the set.

Playing with it a few days, I began to readjust the neurodons and was surprised to find that it made virtually no difference how they were set. Then I began to puzzle this out mentally and came to a conclusion which surprised me as it will surprise everybody who was connected with the development of this set.

That conclusion was that the very process of using Mr. Grimes' system of inverse duplexing a radio frequency hookup, introduced enough resistance or capacity, or whatever it may be, to the circuit to prevent oscillation and to make it stable without the necessity of delicately balancing neurodons, which have always been the great

stumbling block to the amateur in trying to make a good neurodyne set for himself.

In order to prove or disprove this theory to myself, I summed up my courage and performed a major operation. I took a pair of side cutters and cut the wires connecting the neurodons so that they were entirely out of the circuit.

What was the result?

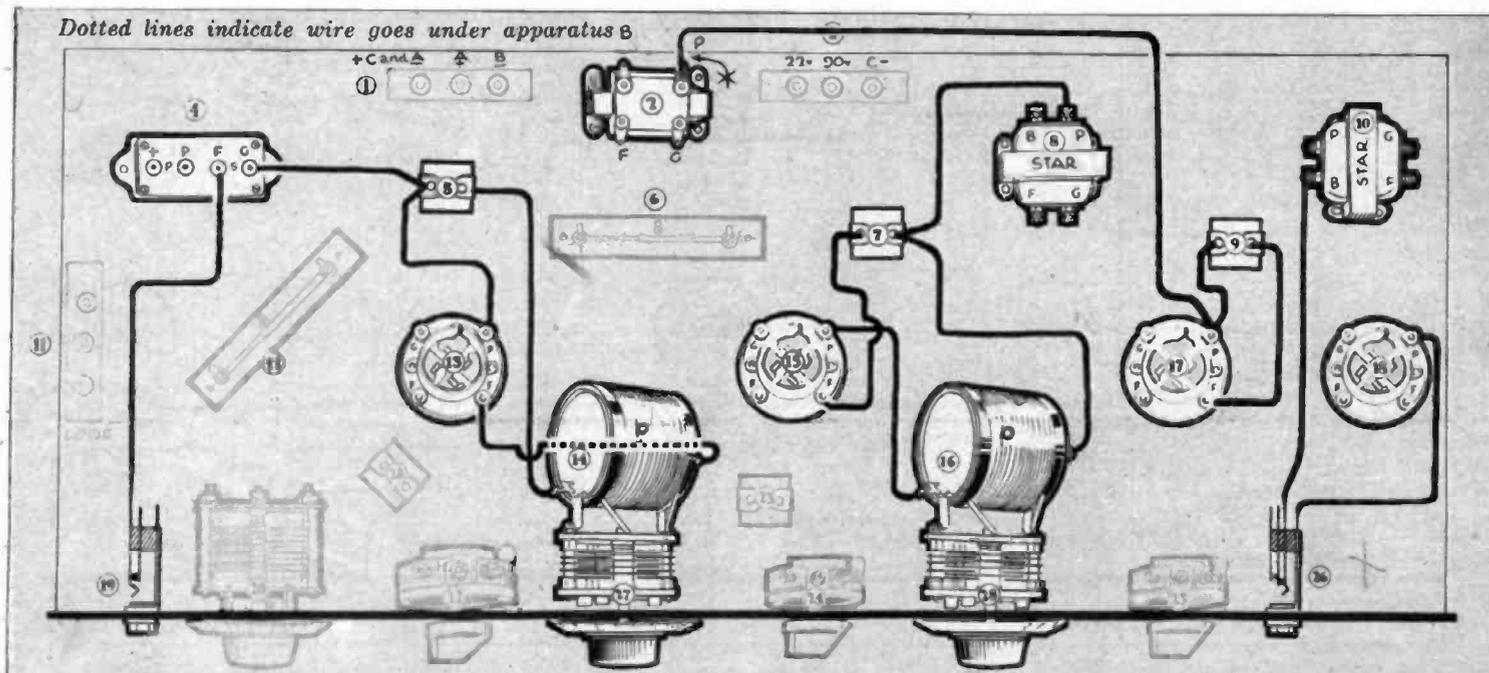
The result was simply that I got more signal strength and that the circuit functioned as well as ever.

Do you see what the conclusion is? Do you see the joke I am now playing on Mr. Grimes and Professor Briggs?

In other words, this system of inverse duplexing the neurodyne hookup, over which both of these gentlemen have labored so hard, has resulted simply in building a four-tube Grimes-3XP circuit and there is no neurodyne about it whatever.

And as it stands it is, as I say, absolutely the best four-tube set I have ever handled, and I will go farther and say that I know of no set which I have used which brings

Fig. 4—The plate leads—14 wires



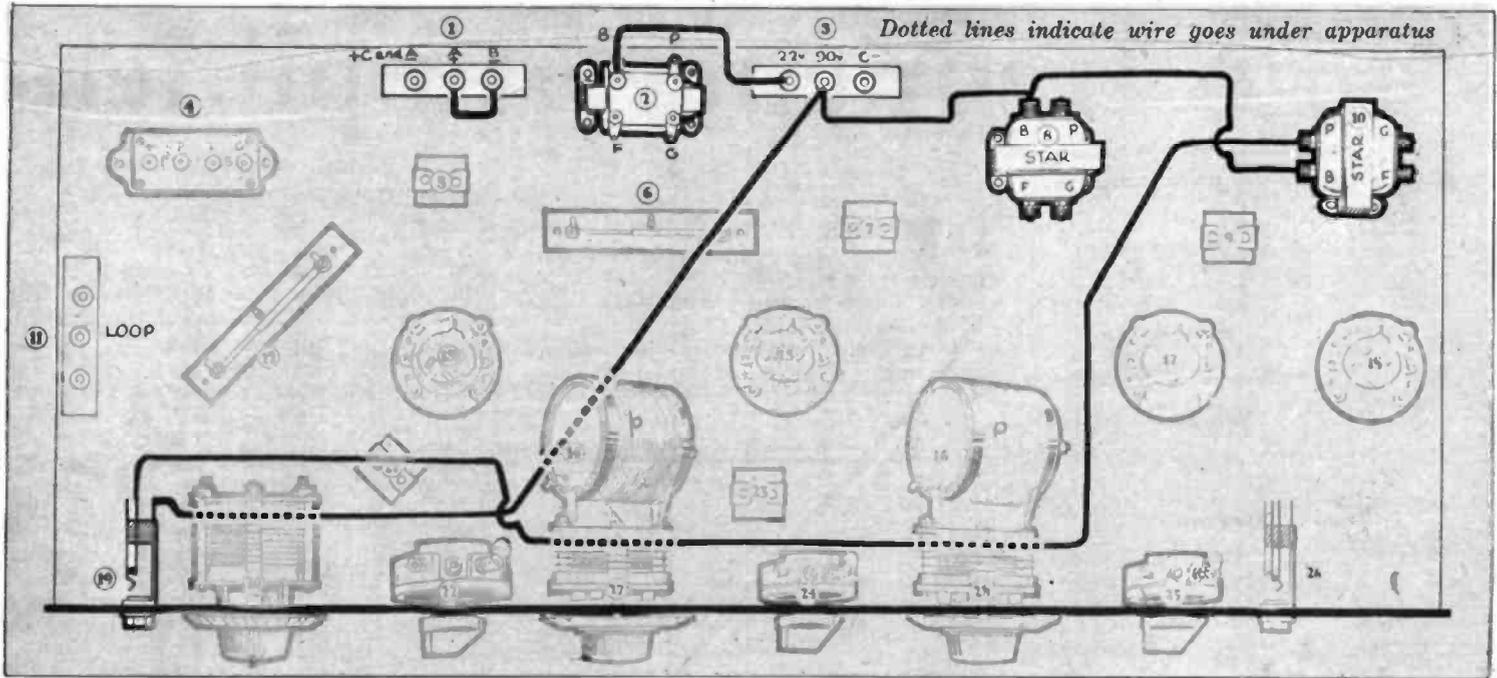


Fig. 5—B battery leads—5 wires

in more surprising results than this one does. Like all of our home-built inverse duplex arrangements, the set has one great fault—that is some people consider it a fault—and that is that on very strong signals the tubes will “overload.” This is inevitable with our present style of tubes, but I will let you in on a little secret. There will be another style of tubes especially built for reflex work within the very near future, and when they come out, these inverse duplex systems will be the ideal because they will then be free from this overload howl.

However, it is a perfectly easy matter to get rid of this howl in any of these circuits. In this particular one, there are several methods which are easily performed.

When you get a bad overload howl on this four-tube circuit, first drop down on the grid taps on the loop—that is, turn your switch or use your clip until the grid is taking its energy from only a few turns on the loop. Then smooth this out with the

potentiometer and if this does not clear up the howl entirely, after turning the loop in the best direction for signal strength, you can detune—that is, have the last dial slightly off of its maximum tuning point and you will find that this gives you a very excellent quality control of the whole set.

The power produced by this set is so great that on Class B broadcasting stations within 100 miles of you you will probably take your grid tap from only one turn of the loop.

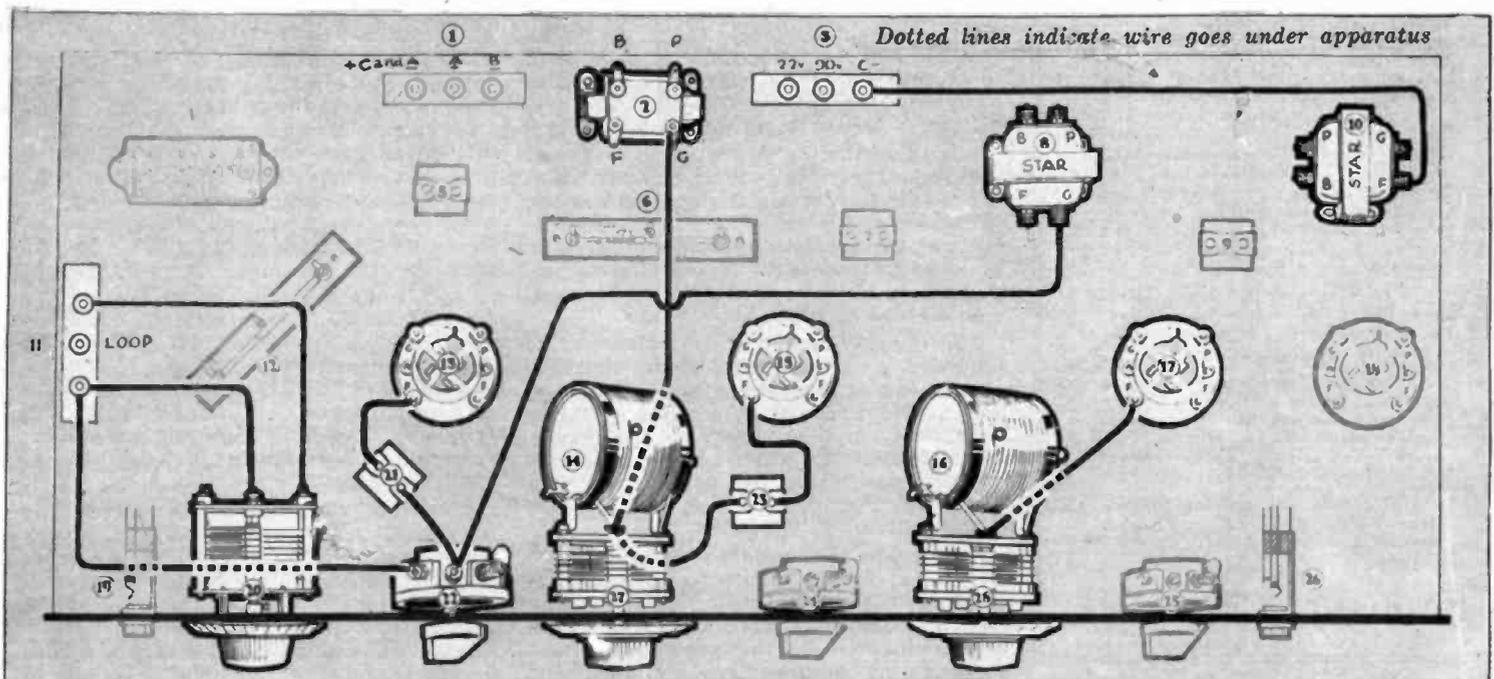
And now let me just give one word of warning to the reader regarding the building of this set. If you are going to follow Prof. Briggs' schematic diagram instructions, use exactly the makes of apparatus which he tells you to and exactly the values. If you do not you are going to run into trouble.

We faced that trouble deliberately at

Fig. 6—Loop and C battery leads—11 wires

Station 3XP, because I wanted to use other apparatus which was widely distributed among the radio dealers so that it could be bought by anybody anywhere and therefore there would be no excuse for any reader failing to follow instructions absolutely. If you do not happen to find the particular make mentioned in your radio dealer's store, you will find the manufacturers' advertisements for all of these parts in this magazine, and you can buy directly from them. Or look up Mr. Clarke's advertisement and have him do your shopping for you. I'll back Mr. Clarke.

The reason I am so particular to point this out is that the inverse duplex system is such a delicate one that the use of one piece of apparatus other than the one for which this particular circuit was designed may make it necessary for you to go to a good deal of experimenting in order to find the proper values of condensers and so forth to meet the particular constants of the piece of apparatus which you have substituted. Mind, the other (Continued on Page 34)



Radio Frequency Amplifiers

By KENNETH HARKNESS



KENNETH HARKNESS
(Associate Editor of
"Radio in the Home"
and originator of the
famous "Harkness
Reflex Receiver.")

Mr. Harkness has evolved an ENTIRELY NEW CIRCUIT which, he predicts, will create more furor among fans this season than his Reflex did last season.

The basic principle of the new Harkness circuit permits various applications. At the present time Mr. Harkness has designed as his first model a Three Tube Receiver with one stage of tuned radio frequency amplification, vacuum tube detector, one stage of reflex audio frequency amplification, and one stage of straight audio frequency amplification.

The main feature of this new system is its counteracting condenser which by an entirely new method of connection in the circuit permits simple and accurate control of self-oscillation in the radio frequency amplifying circuits. This method of controlling self-oscillation is entirely new and original and has many distinct advantages over other systems.

The second important feature is a novel arrangement for increasing or decreasing the sensitiveness of the receiver as may be desired. A small switch on the front of the panel when turned to the "local" position makes it impossible for self-oscillation to take place, considerably lowers the audibility of the receiver and improves the selectivity when receiving local stations. When this switch is turned to the position marked "distant," the sensitiveness of the receiver is enormously increased, while self-oscillation can be controlled by means of the special counteracting condenser.

In common with the famous Harkness Reflex the new Harkness circuit is extremely simple in design and inexpensive to construct.

There are only two wave-length controls, and the receiver is 100 per cent more selective than the Harkness Reflex, which was widely recognized as the most selective reflex receiver at the time of its development.

Full details and building instructions will be given in the October issue of

RADIO IN THE HOME

AMPLIFIERS, as used to aid radio reception, are divided into two main divisions:

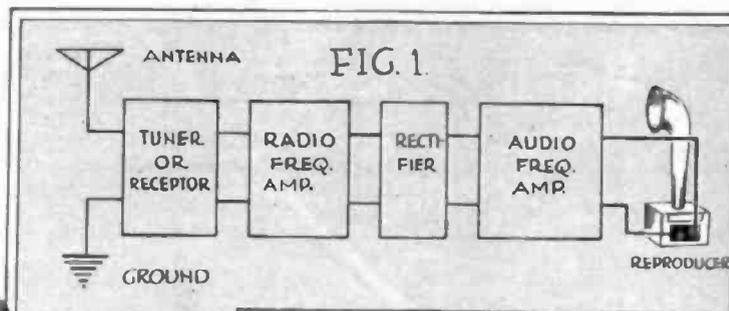
1. Radio-frequency amplifiers
2. Audio-frequency amplifiers

In last month's issue we discussed the underlying principles of audio-frequency amplifiers. This month we will explain the

thereby enabled to operate the rectifier. Without the radio-frequency amplifier these weak signals could not be detected.

3. *Rectifier*: The object of the rectifier is to convert the high frequency signal oscillations, induced in the receiving antenna and magnified by the radio-frequency amplifier, into currents which will produce audible sounds when they pass through the coils of a telephone receiver. It performs

this function by rectifying the high frequency oscillations, thereby producing a uni-directional current. The strength of this uni-directional current varies in accordance with the amplitude of the



function and operation of different types of radio-frequency amplifiers.

In order that the purpose of a radio-frequency amplifier in a receiving system may be clearly understood I show, in the illustration of Figure 1, the various divisions of a typical receiving system and briefly outline below the exact function of each division:

1. *Tuner or Receptor*: Radio waves induce in the receiving antenna an oscillating electromotive force (e. m. f.). The frequency of the oscillations depends upon the frequency of the waves, or, in radio parlance, upon the wave length. The frequency is always high—above audibility.

The function of the tuner is to adjust the receiving circuit or circuits to resonance with the particular signal oscillations to be detected, thereby permitting oscillations of the greatest possible amplitude to build up in these circuits and offering impedance to oscillations of different frequencies induced by other waves.

2. *Radio-Frequency Amplifier*: This amplifier is used to magnify the high frequency signal oscillations selected by the tuner. The instrument is called a "radio-frequency amplifier" because the oscillations induced in the receiving antenna alternate at "radio frequency," and it is these high frequency oscillations which are magnified.

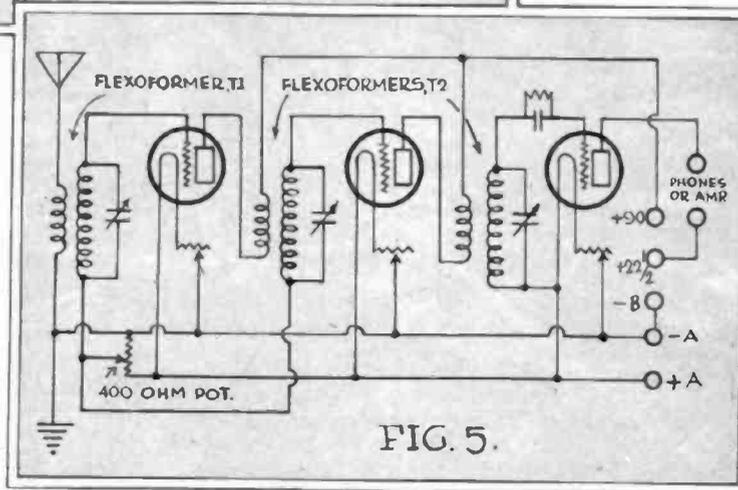
By means of the radio-frequency amplifier, signal oscillations are greatly strengthened and the sensitiveness of the receiving system enormously increased. Weak oscillations induced by the waves of distant transmitting stations are amplified and

high frequency oscillations, which, in turn, varies in accordance with the form of the sound waves produced by speech or music at the transmitting station.

If this uni-directional current is passed through the coils of a telephone receiver the variations in the strength of the current will cause the telephone diaphragm to vibrate and the sound waves will be reproduced. These variations, however, may be amplified before being passed through a telephone receiver, and the loudness of the reproduced sound can thereby be increased.

4. *Audio-Frequency Amplifier*: This amplifier is used to magnify the uni-directional current produced by the rectifier. The instrument is called an "audio-frequency amplifier," because the variations of the rectified current occur at an audible frequency, and it is these audio-frequency variations which are magnified.

5. *Reproducer*: The signals are finally reproduced by the sound waves created by the vibrations of a telephone diaphragm. The vibrations are set up by the magnified variations in the strength of the current which is passed through the coils of the telephone receiver. The sound waves themselves may be amplified by means of a horn or other acoustical amplifier. It will be



realized that the function of a radio-frequency amplifier is an important one and that the use of this type of amplification in a radio receiver greatly increases the efficiency of the system.

The operation of a radio-frequency amplifier is based on exactly the same underlying principles as the audio-frequency amplifier. In each case the "relaying" characteristics of vacuum tubes are utilized to magnify varying voltages and currents. These principles were outlined in last month's issue.

In common with audio-frequency amplifiers, radio-frequency amplifiers are divided into three main classes, the classifications being made according to the arrangement used for repeating the oscillations from tube to tube, viz.:

1. Resistance-coupled amplifiers
2. Inductance-coupled amplifiers
3. Transformer-coupled amplifiers

As we explained last month, the resistance-coupled a. f. amplifier is practically obsolete, but this type of amplifier has certain advantages when used for magnifying radio-frequency currents.

It is the only type of amplifier which can be used to magnify signals over a very wide range of frequencies without changing any of the apparatus in the circuits. A resistance-coupled amplifier can be designed to amplify signals from about 2000 meters to 20,000 meters. This feature makes it rather useful for commercial work, and on shipboard for the reception of long-wave signals over a wide range of frequencies.

offers to the flow of current in the circuit. The effective resistance or reactance of any given capacity is inversely proportional to the frequency of the current; that is to say, if the frequency is high the reactance is

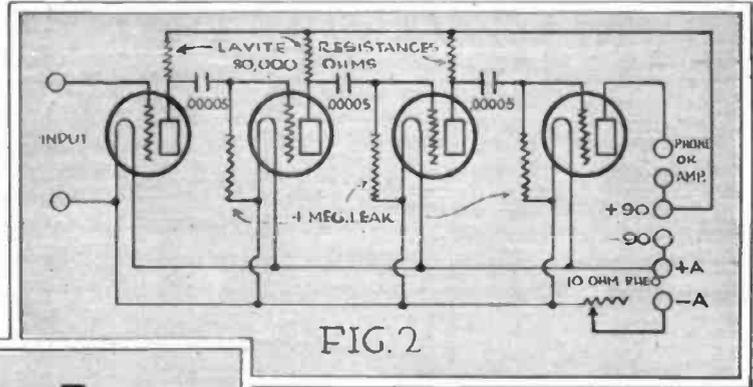


FIG. 2

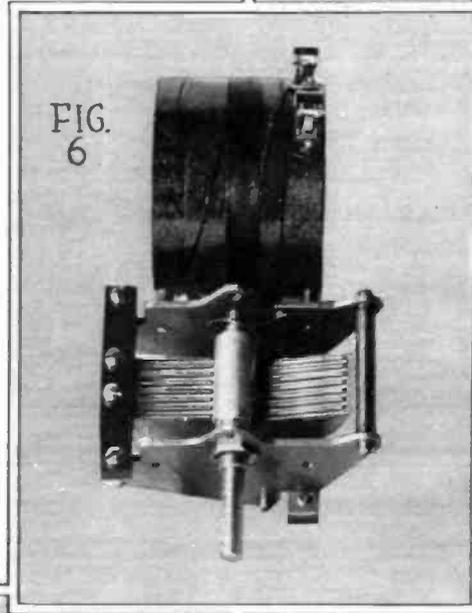


FIG. 6

ohms, because the currents have a low frequency; but in a radio-frequency amplifier the reactance of the same capacity may be as low as five or six thousand ohms.

Other apparently small capacities, such as the distributed capacity of coils, the internal plate filament capacity of the tubes, the capacity between the wires connecting the apparatus, etc., similarly affect the impedance of the plate and grid circuits of a radio-frequency amplifier. The effect of these capacities is to render difficult the setting up of high voltages across untuned circuits of the amplifier; consequently it is difficult to secure voltage amplification, which is the object of the amplifier.

The resistance-coupled amplifier is particularly unsuited for the magnification of the extremely high frequencies of short waves as the circuits are untuned and the low reactance of the tube capacities to high frequencies renders voltage amplification almost impossible. If a resistance amplifier with four or five tubes is used to magnify the high frequency oscillations of a 200-meter wave, it is conceivable that the voltage finally impressed on the last tube may be even less than the voltage impressed on the first tube. The amplifier, of course, would then be useless.

The resistance amplifier can successfully be used for wave lengths down to as low as 800 meters if special tubes are employed with very low internal capacity (particularly between the grid and filament), and if great care is taken in the construction and wiring of the amplifier.

The De Forest tube has the least capacity of any tube at present easily obtainable

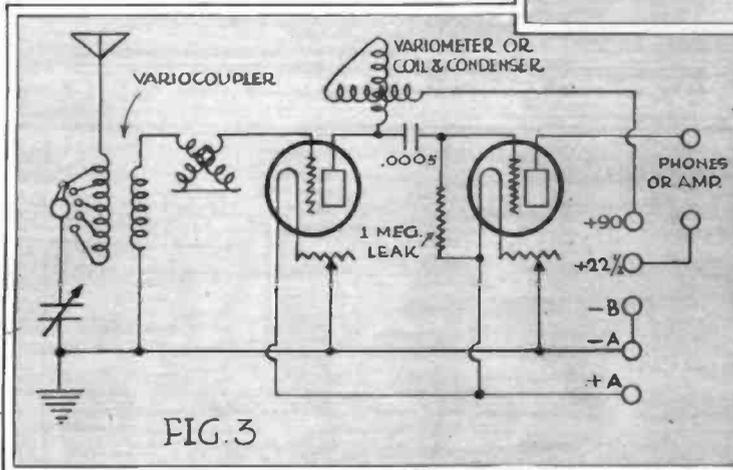


FIG. 3

proportionately low, whereas if the frequency is low the reactance is proportionately high.

For instance, in an audio-frequency amplifier the reactance of the capacity formed between the grid and filament of one of the tubes is from one to two million

The resistance amplifier, however, is almost useless for the amplification of short wave signals and the reasons for this should be clearly understood, as the same difficulties are invariably encountered in designing a short wave radio-frequency amplifier of any type.

The voltage amplification of a short wave radio-frequency amplifier is never as great as that of an audio-frequency amplifier, nor is it as great as that of a long wave radio-frequency amplifier. This does not mean that the amplification of short waves is impractical. It merely means that the apparatus employed must be very carefully designed and the amplifier constructed to ensure the maximum possible amplification.

The great obstacle to the amplification of short waves is the low reactance of even small capacities in the circuits to these high-frequency currents. The "reactance" of capacity in an A. C. or oscillatory circuit is the effective resistance which the capacity

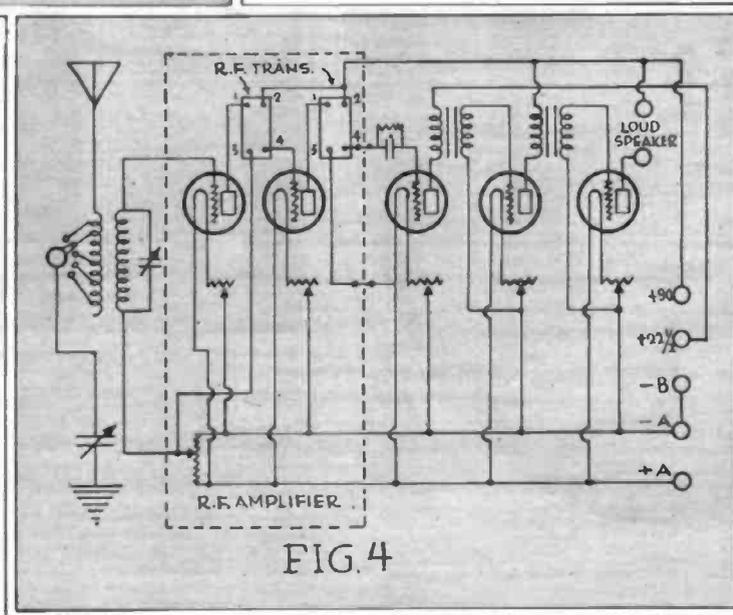


FIG. 4

in this country; the Meyers tube, manufactured in Canada, also has very low internal capacity and is particularly suitable for use in a resistance-coupled amplifier. French tubes are not so easily obtainable, but are ideal for the purpose.

A carefully constructed resistance-coupled amplifier using any of these low capacity tubes is an extremely serviceable instrument to the commercial radio operator as it

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KFNF JUST FOR OLD-FASHIONED FOLKS



Top—"KFNF—known for neighborly folks," says Henry (Henry Field), from the station which he owns and operates at Shenandoah, Iowa. Henry and "Mike" are great friends
 Above—At the organ is Miss Hazel Simmons. In the foreground, Miss Hope Field, and in the background, her sister, Jessie
 Oval—Perched on the chair like a bump on a log is John Henry Field, age 7, perhaps the youngest radio announcer in the world. Mr. Field permits John Henry to make the formal announcements—provided it isn't near bedtime

By WILLIAM H. GRAHAM
Radio Editor, The Omaha "World-Herald"

FAR away from the hustle and bustle of city life and tall buildings one will find KFNF, the radio station of the Henry Field Seed Company at Shenandoah, Iowa.

Tucked away in the hills of Southwestern Iowa, in the veritable garden spot of the country, is Shenandoah. Truly, it is a little city of big things.

First, although it boasts a population of only slightly more than 5000, it has the largest seed and nursery companies in the United States. And second, it is the smallest city in the country supporting such a large radio transmitter and furnishing nightly programs (Mondays excepted) almost exclusively from local talent.

Two years ago folks living outside of Iowa probably did not know Shenandoah was in existence, but today only those who do not have radio sets are perhaps ignorant of such an illuminating fact.

Thirty years ago, the U. S. census report probably would have made a listing like this: "Shenandoah—population 2—Mr. and Mrs. Henry Field." Henry—as he prefers to be called and as he is known to the town-folk—was just a young fellow then, trying to make a living in the world. Shenandoah had fertile ground and, armed with a market basket, the young man eked out a livelihood by selling vegetables in the surrounding country. He liked the business—farm and seed cultivating—and he kept at it until now his place of business ranks favorably with the four largest seed companies in the world.

And then KFNF was born.

Folks laughed at Henry when he suggested a radio station. "They cost a mint of money and are intended only for the big cities," argued those who tried to discourage him. But he was determined and thirty days after the townspeople had gotten over the thrill of his first announcement, KFNF was on the air!

The very first night Henry gave his neighbors and the rest of the world something to think about when he announced the policy of his station.

"This is to be a station where old-fashioned music is to predominate," he an-



Top—A general view of the working part of KFNF studio. Mr. Field is at the microphone

Oval — Here he is folks! Uncle Frank Comstock, who wields a mean bow in the old-time fiddling numbers from KFNF. Uncle Frank is 69, and has fiddled something like 500 numbers this season by radio

Bottom — A view of the studio at KFNF



nounced. "I believe there are enough of us in the world old-fashioned enough to enjoy old-fashioned tunes and the old-fashioned hymns. We are going to give you music you heard around the old family organ before jazz was thought of."

And Henry has kept his word. Today KFNF is famous as being the one radio station in the United States featuring old-fashioned music, talks and things. Henry has other ideas about operating a station. His studio rules read something like this:

"No child prodigies allowed.

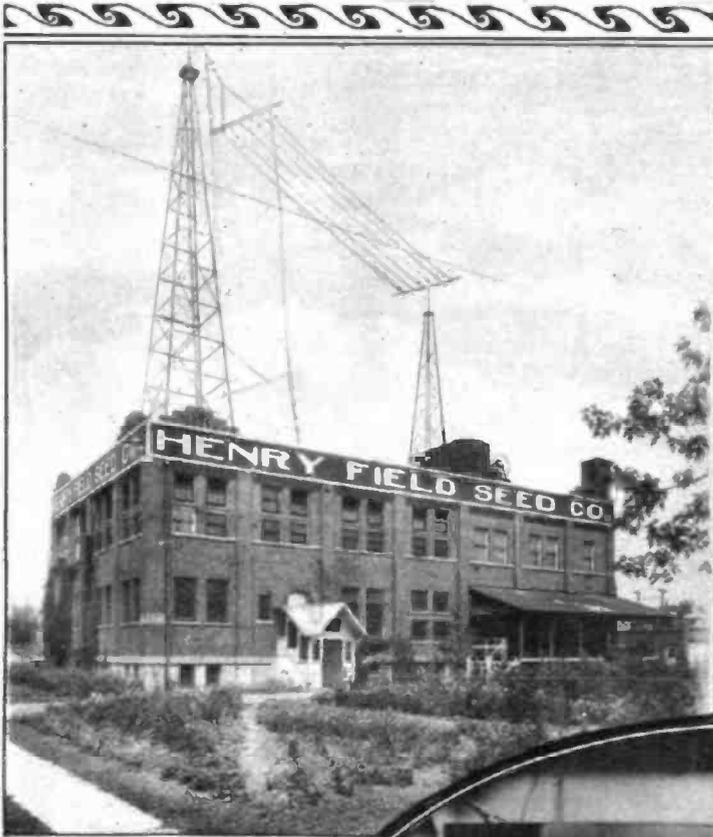
"We reserve the right to pull the plug on any speaker who gets mean or tiresome. Five minutes is the limit.

"Dedications only in rare instances.

"Jazz music that is too jazzy—barred. (We to be the judges.)

"We like to have you in the studio but you must be quiet."

Surrounding the Field station are many acres of land devoted exclusively to the cultivation of flowers. These include too



many varieties to catalogue, but when talent from nearby towns go to Shenandoah to appear via KFNF, Mr. Field gives them the freedom of these gardens.

"Just help yourselves," he will tell them. "Take all you can carry."

The same rule applies to all visitors, but Shenandoah folk are excepted, as they generally have all the flowers in their own front yards they can use.

There's such an air of freshness about KFNF. In the city studios one finds dress suits, stiff-bosomed shirts, baby grand pianos and that sort of thing. At KFNF you see the typical country barefoot boy playing about, the old-fashioned foot-pressure organ, artists in their shirt sleeves sawing away at a fiddle and girls with honest-to-goodness natural complexions.

"This radio idea first struck me after I bought a receiving set," explained Mr. Field. "At every station I heard those raggy, jazzy tunes, the screaming of the cornet and the thunderous clashes of the jazz-intoxicated drums. Don't folks really tire of this sort of music? I thought. Especially those of us who were brought up in the quiet of the farm.

"I wrote to many stations trying to get them to put out more old-fashioned music but they only did it occasionally. Then I decided to do it myself.

"How much did your station cost?" many friends ask me. My answer is 'plenty, but not too much.' It's worth every cent I've invested in it. It's worth it to my business and to Shenandoah.

"In the busy season we employ between 300 and 400 in the seed house and there is

enough talent to furnish a program every night. It is surprising, too, how many people want to know how to grow flowers of various sorts and how best to care for their vegetable gardens and lately, in our regular noon-day programs, I have been giving five-minute talks on these subjects. Our responses are from all parts of the United States. You'd be surprised how many people really want to hear these nature talks and old-fashioned music."

A "welcome" sign in big letters hangs above the entrance to the KFNF studio.

"Why keep them out when it is so in-

teresting and entertaining?" asks Mr. Field. "We've enlarged our studio to twice its previous size to accommodate the audiences. Everybody's welcome."

On Sunday afternoons, when KFNF broadcasts a religious service, hundreds of Shenandoah folk and farmers from miles around gather at the Field Seed house. Those who cannot be accommodated in the studio are taken care of in various parts of the building, where loudspeakers are set up. As many as 500 have been entertained at one broadcast in this manner.

KFNF is a 500-watt, Class A station, capable of reaching most of the United States under favorable conditions. The wave length is 266 meters.

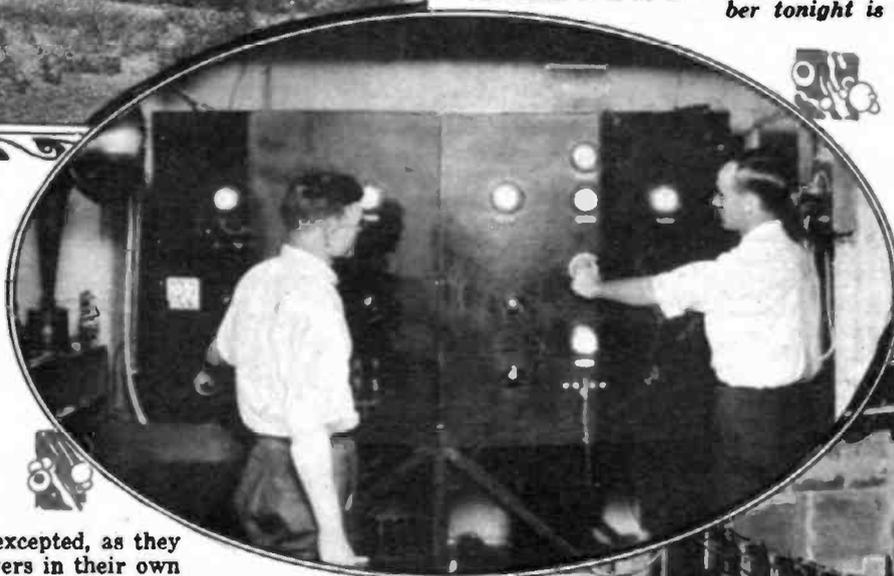
The power is supplied by Willard storage batteries, 2000 volts in one block. There are 1000 battery units of two volts each. The rate of charge is about equivalent to the rate of discharge, hence, for every hour of broadcasting, the batteries must be charged this length of time.

At 7:30 every night, except Monday, if you tune to the 266-meter wave length, you are going to hear:

"KFNF at Shenandoah, Iowa. The Henry Field Seed Company station. Henry, himself, announcing. First number tonight is 'Turkey in the Straw,' by Uncle Frank Comstock, old-time fiddler. Get your partner. Are you ready? Let's go!"

A good deal of Henry's friendly, old-fashioned personality gets across the air and a lot more of it gets into

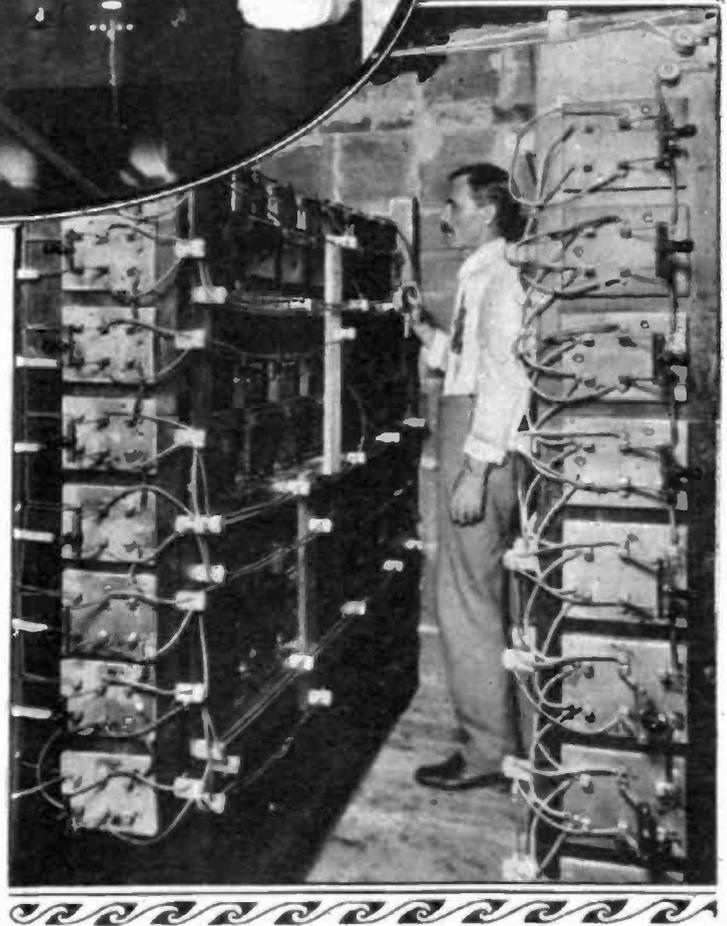
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Top — General view of the administration building of the Henry Field Seed Co., Shenandoah, Iowa, the home of KFNF

Oval—Eugene Whittaker (left) and Howard Greenwald, at the transmitting apparatus of KFNF. Whittaker is the licensed operator and Greenwald is assistant announcer

Right — A view of several sections of shelves of two-volt batteries which supply the power for KFNF. They are Willard batteries



The Children's Hour for the Radio Child

By VERA BRADY SHIPMAN

THE radio children of today who listen in each evening to the bedtime story from some favorite station think little of how these stories began to be told. They put on the earphones and listen in at exactly the right time and hear all about Peter Rabbit, Reddy Fox and the Green Meadows. They are old friends.

But how did these stories and storytellers become popular? Who told the stories in the beginning to the child at twilight, bringing a world of mystic charm to the child heart?

Just before bedtime is the children's hour. Longfellow, the Children's Poet, wrote to his own daughters his famous poem, "The Children's Hour." He told of that hour "between the dark and the daylight, when the night is beginning to lower." As his daughters listened to his poems and stories, we have accepted that name for the story hour in every home when "grave Alice and laughing Allegra and Edith with golden hair" listen to bedtime stories.

The beginning of American folklore may be traced to that genial soul in Atlanta, Ga., creator of the old Negro character, "Uncle Remus," who told rare tales, humanizing animal life, to the boy at his knee.

It was the late Joel Chandler Harris, the Southern newspaper and magazine writer, who gave to the American child the first glimpse of its own folktales. It was something about "Brer Fox and Brer Rabbit"—they were brothers all—and these tales crept into the reading pages of magazines and between the covers of books and were translated into foreign languages, until the whole child world knew and loved "Uncle Remus."

Harris wrote in a vein of esthetic beauty. His stories were fanciful bits of lyric prose. His mantle of companionship covered every child.

Born in 1848, and living his entire life within the smell of printer's ink, Harris married, when young, a woman who was his perfect life companion. Fleeing from their early home in Savannah to Atlanta to avoid the yellow fever scourge which was gripping the coast cities, Harris later joined the staff of the Atlanta Constitution, and remained with them for twenty-four years. He retired in 1900 to devote his time to magazine publication and until his death in 1908 published Uncle Remus' Magazine. All the world joins Georgia in revering the memory of Joel Chandler Harris. The Uncle Remus Memorial Association of Atlanta has purchased his homestead on Gordon street, "The Wren's Nest,"



Peggy Albion, director of the Children's Hour of WRC, at Washington, D. C., and her small son

and what was formerly his "Snapbean Farm," and is keeping it intact as he left it, through his devoted wife's co-operation. In the room in which he died you can see his typewriter, his broad-brimmed hat and hat-brush, his swivel chair and queer turtle cuspidor (relics of newspaper office days). Over his desk hangs the autographed photo of his Hoosier friend, James Whitcomb Riley.

After Uncle Remus had passed on and had left a big lonely heart in the American child, some years later two newspapermen devoted their time to writing children's animal stories which they christened the "Bedtime Stories." And it is coincidental that these two men in different cities began the same kind of work, and while they have developed the same kind of stories, their characters are different and the ideals behind the stories are distinct.

It was in 1910 that Howard R. Garis began writing children's stories for the Newark Evening News. He created "Uncle Wiggley"—the rabbit who wiggled his ears and who lived in a world of his own. "Uncle Wiggley" is threatened with the punishment of pinching his ears if he does not behave. He walks with a crutch and his trademark is a rabbit's track. Uncle Wiggley stories were created to make the child happy, to send him to bed with a smile. Entertainment was the first factor and their value as animal craft was a development of popular favor.

Rabbits hungrily ate sandwiches, but "Uncle Wiggley" believed in eating lettuce and carrot sandwiches, for what rabbit would eat ham? He lived in a hollow stump bungalow and wore a fur coat which nature gave him. Garis' idea of

humanizing the rabbit originated with a neighbor child asking for stories of nice old rabbits who live in houses like ours, only different, and who have little boy and girl rabbits and who wiggle their ears and their noses. And from this suggestion the daily bedtime stories and volumes of books of Uncle Wiggley became a reality.

In the same year Thornton W. Burgess, of Springfield, Massachusetts, wrote children's stories of nature. While they have never met, their correspondence substantiates Uncle Wiggley's previous birthday.

Burgess, born on the Cape Cod coast, learned early to love and understand nature. Trying to belong to the business world, he gave up in despair and turned to the more congenial work of writing. Many long years were gradually followed by prosperity until today Burgess books are best sellers in child literature.

It was after several years of struggling magazine work that Burgess wrote a group of stories of Old Mother West Wind and the Little People of the Green Meadows and Forest and sent them to his little five-year-old son who was visiting his grandmother in Chicago.

In the fall of 1910 these



The "Dream Daddy" of song and radio fame, Harry Ehrhart, of WDAR, Philadelphia

were published in book form—the beginning of Burgess nature stories. But not until February, 1912, did he begin publishing the well-known bedtime stories, telling of the adventures of the animals they all loved and sometimes feared.

Burgess stories are always instructive. If Peter Rabbit has an adventure, Peter generally learns something from the result. Sometimes he teaches the other dwellers of the Green Forest. War thrift, fire prevention and visual education in animal lore are subjects of some of the stories.

At his home in Springfield, Burgess writes daily, and, contrary to many writers, does not rewrite. His friends are among the notable naturalists of the country who appreciate in Burgess the exactness of detail and correct environment in all his stories.

While "Uncle Wiggley" entertains the child who laughs at his whimsical antics, Burgess' stories are full of educational experiences. Both are beloved by children and always find ready readers and listeners.



The late Joel Chandler Harris, of Atlanta, Ga., creator of "Uncle Remus," and the early stories of American nature folklore

Photo by courtesy of Francis Price, of Atlanta



Thornton W. Burgess, of Springfield, Mass., creator of the famous bedtime stories of nature
Photo by Bachrach

The first stories of Peter Rabbit as a character were written by an English woman and copyrighted, but America's Peter became an identity with Garis and Burgess—and such incentive as "Uncle Remus" and his "Brer Rabbit and Brer Wolf"—who have developed the idea into an epic of American childhood.

WJZ, the Radio Corporation station at New York City, has featured the nightly bedtime story with a weekly appearance of certain notable story tellers. Both Garis and Burgess have been on the air from WJZ, Garis on Saturdays and Burgess on Mondays. When they are unable to tell stories in person, their stories are read over WJZ. Both series, syndicated in newspapers, have been immensely popular over the country and bedtime story tellers from various stations frequently feature them.

"Uncle Bob" Wilson of KYW, the Westinghouse station at Chicago, sometimes reads the daily Burgess story from the Evening American, and then chats with his radio children, urges them to remember their rubbers and to be polite to their elders, and sings them some Dream Daddy lul-

labies. Hundreds of letters poured into KYW recently, missing Uncle Bob when he went to New York to make records of his stories and songs.

An interesting story teller who is developing the creative in the child is Peggy Albion, director of the Children's Hour at WRC, at Washington, D. C. Marietta Stockard Albion, a trained kindergarten, with a working laboratory of one small boy who devours her stories, has urged the listening children to send her original stories and verse. The best of these are read on the air on a certain night of every week.

On one night, Peggy Albion reads or tells the children poetry. On another night the stories are of adventure, and on another night of

folklore. Big boys respond to her stories as well as little boys and frequently come in slyly to see what she looks like. Flappers write love notes and mothers send thanks for a child reinterested in reading through the radio Children's Hour.

When WDAR of Lit Brothers, Philadelphia, was searching for a name for their bedtime story teller, their musical director, Mrs. Maschal, suggested "Dream Daddy,"



Chris. Graham, otherwise "Uncle Wip," WIP's bedtime story man

and the title has remained—one of the cleverest on the air. A popular song writer made Harry Ehrhart famous overnight for "Dream Daddy" with its dedication to Ehrhart of W D A R sold thousands of copies.

"Dream Daddy" came into the story period as a radio operator with a war record of engineering. That was at Station WIP, Gimbel Brothers, in Philadelphia. Ehrhart there first became famous as "Uncle Wip."

Then, when W D A R opened, Ehrhart was secured to take charge of the new station, but he could not keep away from the kiddies he had learned to love and so he became "Dream Daddy."

He carries the children on the imaginary dream train each night. "Toot, toot" and away they go, and only good children are privileged to take the trip. The Jack and Jill Club, Santa Claus helpers at holiday time, are aids to good behavior. Saturday's personal visits and report cards passed upon, all bring "Dream Daddy" into a strong personal contact with the radio child.

It is remarkable how the telling of these bedtime stories gets under the skin of those who do it. Mr. Neely, editor of this maga-



"Uncle Bob" (Walter Wilson), of KYW, Chicago, a favorite bedtime story teller on the radio

understand it, but somehow, now that my regular time has come, I miss those kiddies more than I ever thought that I should. Somehow it doesn't seem right that I should be away from them."

When Ehrhart left WIP, he confronted the management of that station with probably the most serious problem it has ever faced. Ehrhart's voice and personality had become so very thoroughly known to the kiddies of the radio audience all about Philadelphia district that it was a grave problem whether an announcement of the change should be made or not. Finally it was decided to put in a substitute Uncle Wip, but to say nothing whatever about the different personality.

Chris. Graham, one of the favorite tenor singers from that station, was chosen as the new Uncle Wip, and it is doubtful if any man in radio ever faced a harder job than did Graham in trying to substitute for the familiar voice and personality which had made Uncle Wip so much beloved.

Letters in childish scrawls poured into the station reproaching Gimbel Brothers for trying to foist a bogus Uncle Wip upon the kiddies. So numerous were these complaints that several conferences were held to de-

(Continued on Page 30)

zine, who was director of Station WIP at the time Harry Ehrhart changed over to WDAR, tells me a story which well illustrates this. "It was at the time that we broadcast the inauguration of Governor Pinchot directly from Harrisburg by remote control," said Mr. Neely.

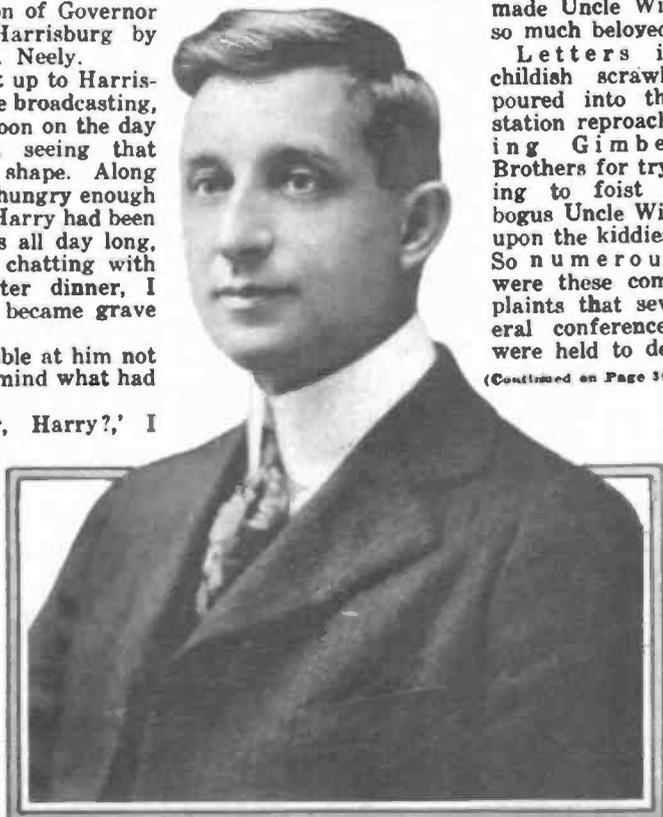
"I took Harry Ehrhart up to Harrisburg with me to help in the broadcasting, and we had a busy afternoon on the day before the inauguration seeing that everything was in proper shape. Along about six o'clock we were hungry enough to hunt for a restaurant. Harry had been in the very best of spirits all day long, joking and laughing and chatting with everybody but, right after dinner, I noticed that he suddenly became grave and almost downcast.

"I looked across the table at him not quite able to make up my mind what had happened.

"What's the matter, Harry?,' I asked. 'You don't seem like yourself.'

"Well, Neely,' said Ehrhart, 'I'll have to tell you the truth. As soon as it began to get dark this evening I began thinking of my kiddies and I realized that I was not going to talk to them tonight. Maybe you can't

Uncle Wip, and it is doubtful if any man in radio ever faced a harder job than did Graham in trying to substitute for the familiar voice and personality which had made Uncle Wip so much beloved.



Howard R. Garis, of Newark, New Jersey, creator of "Uncle Wiggle" bedtime stories



Jean W. Hight, the "Sunny Jim, the Kiddies' Pal," of Station WFI

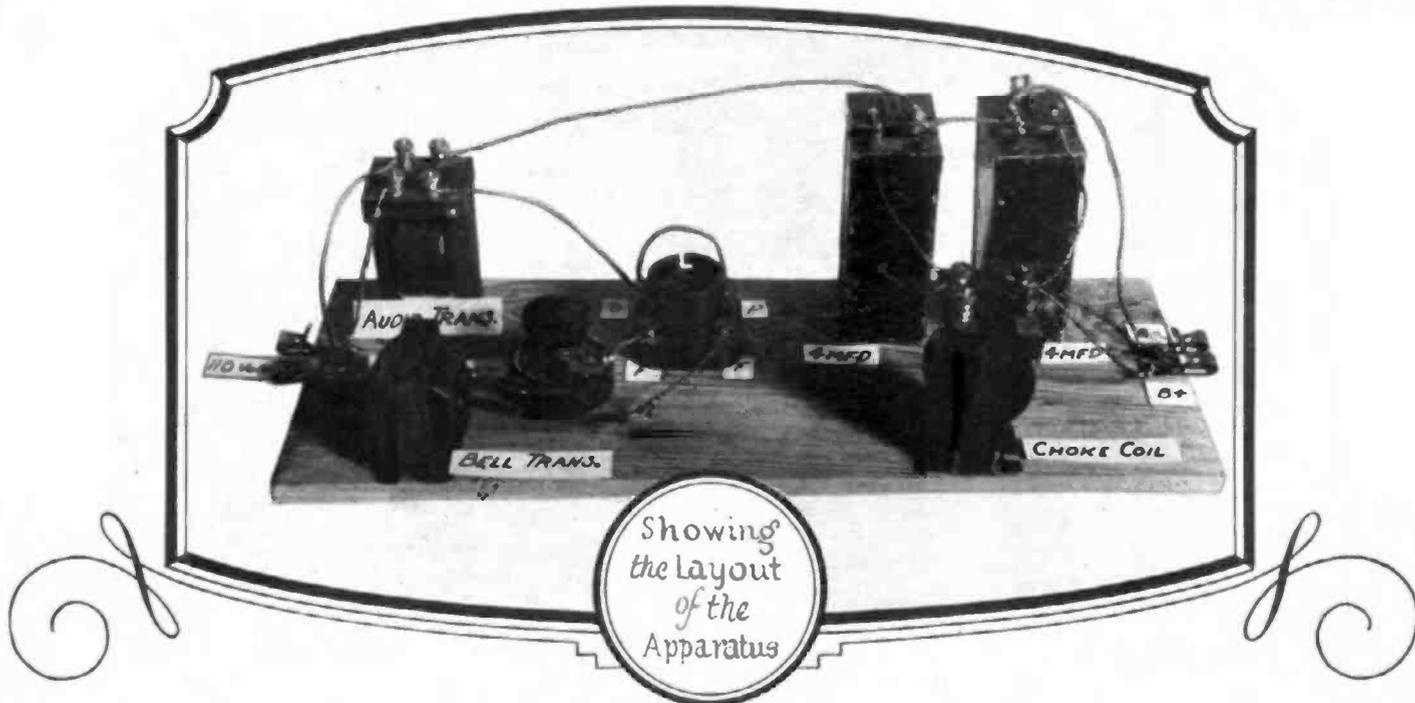


Plate "Juice" from the Lighting Socket

THERE is most unmistakably a growing popular demand that scientists shall devise some method of doing away with both "A" and "B" batteries. Several battery substitutes are now being placed upon the market and they are working very satisfactorily in many localities. Here is one which the average amateur can make for himself. It will work efficiently in virtually every place with the possible exceptions of those antiquated design and construction that it is impossible to smooth out the "ripple." I believe this winter is going to see a great expansion of the "B" battery substitute idea, but I also wish to call attention to the very interesting letter from Mr. M. B. Sleeper which appears on the next page. H. M. N.

By BRAINARD FOOTE

of us cannot use the lighting supply so easily. With 60-cycle alternating current, the current changes its direction 120 times every second, first flowing one way and then the other. Should we apply this current as it comes to us for the "B" battery, the loud speaker would give forth a stentorian roar caused by these periodic reversals of current.

The problem, then, is to permit the current from the line to go in one direction

only and to make it so steady and smooth that it is practically as good as current drawn directly from a battery. To accomplish this we require:

1. A "rectifier" for permitting current to flow in one direction only, and
2. A "filter" for smoothing out the irregularities in the current.

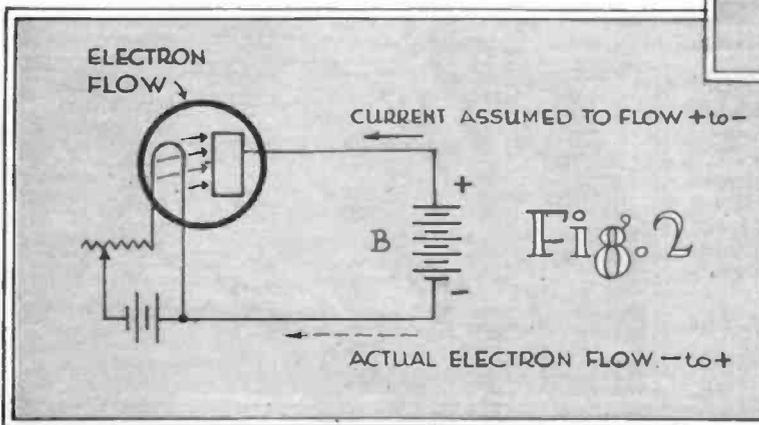
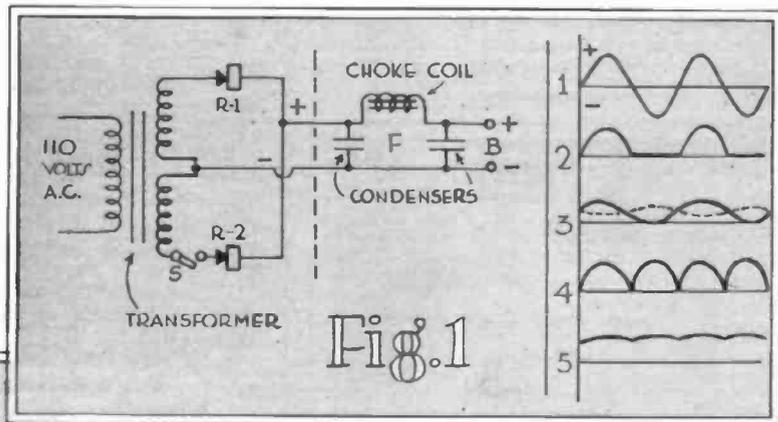
A schematic rectifier hookup is given in Fig. 1 to the left of the dotted line. There is a double transformer or transformer with one primary coil and two equal secondary coils. The voltage secured on the secondary is exactly in proportion

UNDoubtedly the most serious item of expense for the upkeep of a radio set having three tubes or over is the high voltage battery for the plate circuits. With a four or five tube receiver employing 90 volts of "B" battery, new batteries are bought so frequently that the annual outlay for "B" batteries commonly exceeds \$45.

Almost every layman asks, after a short experience with his set, why the necessary current can't be drawn right out of the lamp socket just as he gets current for his electric toaster and vacuum cleaner.

This can be done very simply when one's home is wired for direct current; but inasmuch as direct current for house lighting is seldom found and then only in the business districts of large cities, most

The standard circuit for getting direct current from an alternating supply source, using rectifiers and a filter to smooth out irregularities in the output current. Curves at the right show how the A. C. is altered



How the vacuum tube operates as a rectifier. Current within the tube can only flow when the plate is charged positively and electrons flow only from filament to plate

to the relationship between the number of turns of wire on the primary and secondary coils. If the primary coil has 200 turns of wire and a voltage of 110 is applied, a secondary coil having 400 turns would give a voltage of 220, or just double.

Each of the secondary coils is made large enough to give sufficient voltage not only to supply the "B" voltage of the radio set, but also to compensate for various losses of voltage that are incurred during the process of rectification and filtering. The rectifier itself may be a chemical device, a vacuum tube or any other "one-

way" carrier of current. The symbol ordinarily used for a crystal detector is used also for a rectifier, since the crystal is the simplest form of rectifier. Letters R-1 and R-2 represent two rectifiers, but we shall first consider just one of them, R-1, and leave switch S open.

Graph No. 1 of Fig. 1 is the customary representation of an alternating current, which increases in its pressure or voltage to a maximum, then decreases to zero, reverses itself and increases to another maximum pressure in the opposite direction. Above the line is positive and below is negative. The rectifier allows only the positive impulse to get through and "kills" the other one, resulting in a current as in No. 2, which consists of a succession of im-

we close the switch S and get R-2 working also, the current at the left of the dotted line has a voltage curve like No. 4. Then the same filter system will smooth out the irregularities very easily and give a curve like No. 5. The rectifiers work alternately—when R-1 is passing current, R-2 is idle, and vice versa. It's a sort of "push-pull" arrangement.

Nevertheless, it is not essential that we use both rectifiers. If we use only one of them, but make the filter circuit about twice as large in both capacity and in inductance (large condensers and bigger choke coil), a practically direct current can also be produced, and it will be like the dotted line of graph No. 3. This scheme effects a great economy in rectifiers, too.

"B" BATTERY ELIMINATORS NOT SO ECONOMICAL SAYS M. B. SLEEPER

EVIDENTLY there are two sides to this question of the economy of taking plate current from the electric light wires rather than from standard "B" batteries.

In the July issue we announced the new Timmons "B" Liminator and declared that such devices were an inevitable development of the immediate future both on the score of economy and convenience.

Now comes a letter giving the other side of the question—as far as the economy is concerned, at least. The letter is from M. B. Sleeper, long known as one of the most popular and authoritative writers on radio and the author of a long list of fine radio books, as well as present publisher and editor of Radio Engineering Magazine. This analysis of the actual costs of the two systems is a viewpoint that had not occurred to me, and I think my readers will find it of considerable interest.

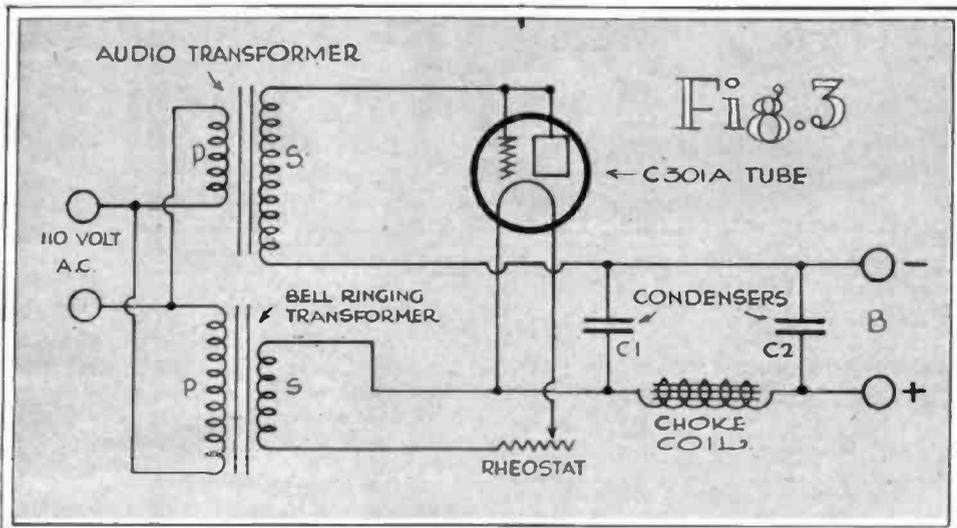
H. M. N.

Dear Mr. Neely:

I have been wondering for a long time just what developments would take place in the plate voltage supply business, up to the present time a matter of building B batteries, but now also that of making battery substitute devices or, as I hear them called nowadays, "current tap" devices.

Last night this question was answered for me in an evening spent with Mr. Furness, of the National Carbon Company. This morning I got a copy of the July *Radio in the Home* and I hasten to pass on to you some information that Mr. Furness gave me, for I notice a statement on page 4 to the effect that it is scientifically wasteful and uneconomical to have 110 volts in the house and then go out and buy expensive batteries. I haven't anything to say about A batteries because, I think you will agree, the two problems are quite individual. As to the plate voltage supply, however, here is something that I think will interest you:

A careful analysis of correspondence



The actual wiring of a "B" supply unit operated on 110 volts A. C. Standard parts are used throughout and the filter is so effective that only one rectifier tube is necessary

Pictorial diagram for the supply unit. The rectifier tube is lighted by A. C. through a bell-ringing transformer, while an ordinary audio-amplifying transformer supplies the high voltage

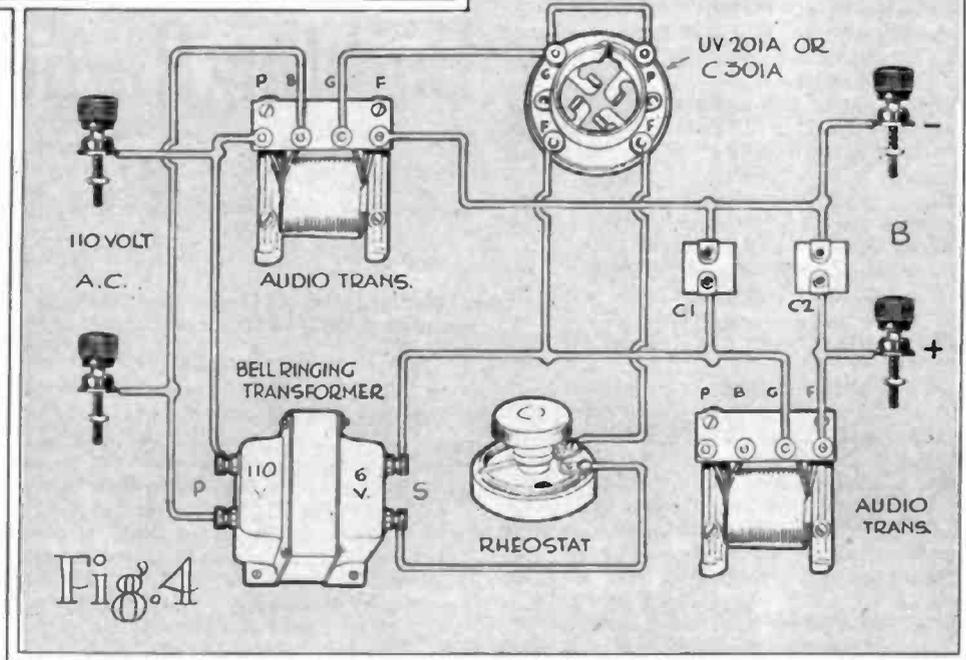
pulses, all of which are in the same direction. Passing to the right of the dotted line we come to the filter part of the circuit. It consists of two very large fixed condensers and a "choke coil" consisting of an iron core with a few thousand turns of wire wound on it. The filter system acts just like the flywheel on a gasoline engine. If it weren't for the flywheel's inertia, the engine would turn over in a succession of "kicks" or jerks, but with the flywheel the action is made practically smooth and steady.

Graph No. 3 (the full line) shows what happens to the current after it passes through the filter.

The choke coil tries to prevent any sudden increase or decrease of current just as the engine's flywheel prevents sudden speeding up and slowing down of the crankshaft. As a result the voltage cannot rise quite so high as it does to the left of the filter, nor does it fall so low.

The condensers have a slightly different stunt to perform. While the voltage is high the condensers are charged up to the highest voltage point. As the voltage decreases again the condensers give off this charge and help in this way to keep the outgoing voltage fairly uniform.

So far, we have rectified only "one side" of the 110-volt incoming pressure. When

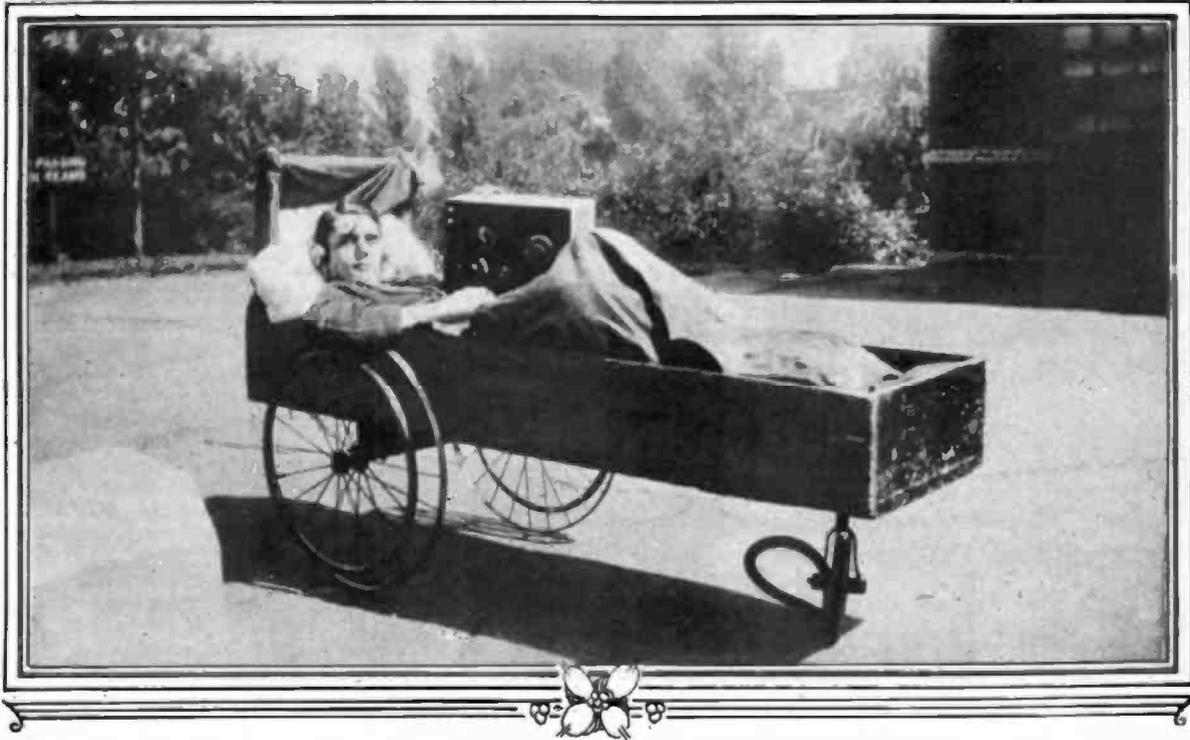


The actual rectifying medium for our use is nothing more than an ordinary vacuum tube, preferably a C-301-A or a UV-201-A, although other tubes will do quite well, too. Fig. 2 will help to explain how it operates.

Leaving out the grid for the time being, let us consider the filament lighted, as usual, by a battery, and a high voltage from a "B" battery applied between the filament and the plate in the usual way. We know that the filament gives off (Continued on Page 26)

shows that a fair value of 500 hours can be taken as the activity of a radio set per year. This means one hour and a half of use every day throughout the year, but there are negative periods, particularly during the absence of a family from home, which must be deducted, so that, you will see, plenty of allowance is made for the evenings when the radio set works overtime.

The life of well-made equipment depends principally on obsolescence. At the present time two years is (Continued on Page 25)



ONE OF THE MOST REMARKABLE MEN IN RADIO

This is W. Francis Goodreau, Contributing Editor of "RADIO IN THE HOME." Mr. Goodreau has been bedridden for years. He does all of his studying, experimenting and set building flat on his back, and in spite of his physical handicap has worked himself up among the ranks of America's most popular and successful radio writers.

Building Radio Sets that Work

By W. FRANCIS GOODREAU

in testing tubes. If the test proves the tubes are defective, discard them and purchase new ones.

NOTE: Any fan who uses three tubes or more in his set ought to have a testing outfit of his own. He can easily build one at a cost of not more than \$5. Complete instructions were given in my "Radio Kindergarten," on Page 6 of the June issue of this magazine. No expensive measuring instruments are necessary and no technical knowledge is required beyond the simple directions given there.

H. M. N.

Whenever you purchase new parts to use in a new receiver test each one. No matter how good they are supposed to be, and no matter who makes them, test them just the same. Once in a while even the best makes of parts will prove defective.

This does not mean that these parts are no good, but simply that a defective one has slipped by the inspectors at the factory, or the instrument has become defective through handling in shipment. No matter what caused the trouble, if you find that the part is defective, return it to your dealer at once. *Never attempt to fix these yourself unless you are willing to stand the*

WITH the publication of one of the many articles on how to construct a radio receiving set, the writer usually receives quite a few letters like this:

"Dear Sir: I have built your receiver as described in your article, using the parts named by you, and hooking it up wire for wire and it doesn't work. Will you tell me what is the trouble?"

Yes; just like that.

Well, there are many things to cause trouble, even if you have used the best parts and have hooked it up wire for wire. Because a set is hooked up properly doesn't mean it is always going to work. Nor does the fact that it doesn't work mean that the circuit is at fault.

I think you will take it for granted that any circuit described in a reliable magazine will work, that it has worked for some one and with proper care will work for any one else who will build it.

I am going to try to outline for you in this article as many of the causes of failure to operate as I can, hoping that in doing so, I may help you to get in good working order a set that does not function.

First—and most important is the matter of *defective tubes*. This I think causes more trouble than anything else. The set constructed of the finest parts, and with the best of workmanship, cannot work as it should with defective tubes.

This does not mean that the tube must have a burnt-out filament in order to be defective. Many tubes light up O. K., but either no signals are received, or at the most very weak signals are received. If you have looked everywhere for the trouble and cannot find it, take your tubes to your dealer and ask him to test them for you. If he has no testing outfit, go to a dealer who has, and buy all your new tubes from this dealer and insist on having them tested.

Some time ago most dealers were without testing outfits, but with the great competition among radio stores at present, you will find that a good many dealers are not overlooking any chances to secure customers, even if it does mean free service

loss should you make the instrument worse. You cannot in all fairness expect a dealer to replace an instrument you have tinkered with, even if it was defective when you purchased it.

A few suggestions as to methods of testing parts will be useful right here. To test any kind of coil that has a continuous winding—that is one having no taps on it, such as honeycomb coils, etc.—get your phones and a dry cell. Connect one terminal of the dry cell to one end of the coil to be tested, connect the other cell terminal to one of your phone tips, then touch the other phone tip to the other end of the coil.

You should hear a "click" in the phones. Should no "click" be heard, it means that there is a break in the wire somewhere in the coil. This test can be used for any kind of coil, variometers, etc. included.

To test a tapped coil, proceed as before, but in this case touch each one of the taps with the phone tip. You should hear a "click" as each one is touched. If you do not hear it, it may mean that there is a break in the wire, or should it fail only at one or more taps it means that there is not a good connection to those taps.

Variable and fixed condensers are next on the list. If you can avoid doing so, never use anything but a good low loss condenser. It doesn't pay. You cannot expect good DX with a condenser that is absorbing most of the energy before it ever reaches your tube. Remember, you hear signals only when they are strong enough to operate your detector. It matters not how many stations reach your set; it's the ones that operate your detector you hear.

Troubles usually found in variable condensers are: first—short circuit. This is easily found because you can hear the plates scraping as you turn the dial. Second—loose connections. Third—no connection on rotor or stator.

Some types of condenser have friction connections on the rotor and sometimes these do not touch the shaft. Look for trouble here right away if you are using this type and seem unable to locate the trouble in your set. Fixed condensers are

subject to short circuits also. Try the same test on these you did on the coils. If you get a "click" this time then it means that the condenser is shorted. Discard it if you are unable to locate the short circuit. Watch out for loose connections here also.

Grid leaks also cause trouble. If you are using one of the variable leaks, and find that it has no effect on the operation of the set, you may take it for granted that it is defective. If you find that when you turn it it does affect the set, causing it to tick, sometimes fast, sometimes slow, then you may know that it is working O. K. Don't forget to adjust it so that there are no ticks heard.

Rheostats also cause trouble at times. Always be sure that you are using the proper resistance rheostat for the tube you have. If you find that the tube lights up bright as soon as you turn the rheostat on a trifle and you are unable to reduce the light without turning it completely out, you are using a rheostat the resistance of which is too low for the tube.

If you were using a 6-ohm rheostat, with a battery of $4\frac{1}{2}$ volts on a UV199 or C299 you would have just that trouble. The remedy would be to use the proper rheostat. This can be found by referring to the circular which came with the tube. These are put there for your information and not to help in packing the tube.

Should you find when turning on the rheostat, the tube lights and then, as you turn it more, it goes out, and then as you continue to turn it the tube lights up again, it means that the sliding arm is not making proper contact with the wire of the rheostat. Troubles with the carbon-type rheostat should be called to the attention of the maker.

Sockets: Here is usually where we find a lot of trouble. Mostly poor connection from socket to tube, or else loose contacts on the socket. Before using a new socket make sure the contacts are clean and bright. Sandpaper them if you have to, but get them clean. Also make sure the contacts are tight. If you don't they are very apt to work looser when you are working on them, and on most of them the only way you can really tighten the contacts is by removing the sockets from the set, and if you have already soldered several wires to the socket, it's quite a lot of work to do over. Play safe; tighten them before you put them on the set.

Audio-frequency transformers give trouble, too. The most common ones are loose or broken connections. Sometimes there is a break in either one of the windings. Test the primary and secondary coils with the phones and battery as you did the coils in the tuning unit. If everything is O. K. then try reversing the leads on the primary. If that doesn't help, try revers-

ing the leads on the secondary. I would like to say right here that in the first place you should have purchased transformers on which the connections were plainly marked. You will save yourself a lot of trouble by doing so.

Jacks are next on the list. Here is where a great deal of trouble occurs at times. Never purchase anything but the best jacks. Make sure they have good insulation and good contacts. Look for trouble in double circuit jacks caused by failure of all the springs to make good contact. If you get

one on the top and one on the bottom of the next jack. Keep them all alike.

Also do not forget that when you connect a wire from the "B" battery to either the top or bottom of the double-circuit jack, the blade next to this must be connected to the post marked B plus on the next audio transformer. Also when you connect a wire to the top or bottom connector of this same jack leading from the plate circuit of the tube, do not forget that the blade next to this is connected to the post marked P on the audio transformer.

Phones: Use the best phones you can afford. It is not wise to purchase cheap phones. If you are using jacks and plugs on your set, make sure that the positive terminal of your phones—the one with red woven in the cord—is connected so that when placed in the jack this positive terminal will make contact with the jack blade which is connected to the "B" battery. This is important.

Batteries "A" and "B": Always be sure your batteries are in good condition by testing them quite often. Keep your storage "A" fully charged. Replace your dry cells if your signals are getting weak. Do not use run-down "B" batteries. Weak signals will result from using weak batteries.

Antenna: Whenever it is possible, use a good outdoor antenna. Use good insulators on each end. Use stranded wire, preferably with each strand enameled and thus all insulated from each other. If possible have antenna and lead-in in one piece, or at least make sure the lead-in is well soldered to the antenna.

Ground: Make your ground wire as short as possible. Use heavy wire for your ground wire and fasten to a water pipe with a ground clamp. Do not merely wrap the wire around the pipe. Scrape the pipe clean, fasten the ground clamp to the pipe, and solder the wire to the clamp.

Lightning Arrester: Purchase a good arrester. Look out for trouble here. If you are getting weak signals, look for a short circuit from antenna to ground through the arrester. Hook

up your set without it, and if signals come in O. K., then connect arrester; and if signals are weak there is a short circuit.

Wiring: Here is where a great many fans fall down. They cannot—or will not—do a good wiring job. This does not mean that you must use buss bar and make nice square corners; oh, no, indeed. The shortest distance between two points is a straight line. Square corners in your wire make a pretty looking set, but your wires are much longer than they would be had you used other wire. You may use square wiring on your set and have it look well without any sacrifice of efficiency, provided you plan your set so the wires will run as direct as possible. When build-

(Continued on Page 32)

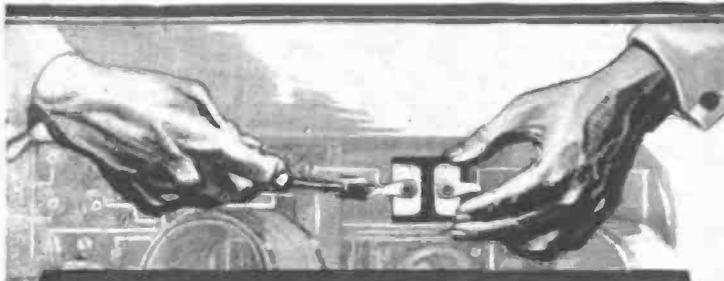


The Radio Set Goes With Her

Portable sets have now reached the stage of development where they are really portable—aerial, batteries, loud speaker and all. Here is one of the models which are becoming increasingly popular as all-around sets, equally well adapted for home, travel, vacation—everywhere. The set in this particular picture is a Telmaco Acme Type P-1

good signals from the detector, but nothing from the audio amplifier, and have been unable to locate trouble, take a look at the jacks and I think you will find it there.

It is a good idea when building a set with jacks that you have all the positive wires coming direct from the "B" battery to either the top or bottom connectors of the jacks. Do not put one on the top con-



Nine out of ten sets use MICADONS

Nine out of every ten sets made use Micadons—the standard fixed radio condenser. Set builders choose them for many reasons.

The Micadon is a Dubilier product: hence supreme in quality and efficiency. They can be obtained in accurately matched capacities and the capacity is permanent.

Micadons are easily installed, equipped as they are with extension tabs for soldering and eyelets for set screw assembly. They are made with type variations to meet every possible requirement.

For the best results use Micadons.

Dubilier

CONDENSER AND RADIO CORPORATION

Guarantee

Every Brandes Product is sold subject to the approval of the purchaser. If for any reason you are not fully satisfied, if you think it does not fully come up to our guarantee that it is better than any other at the price, return it to your dealer within ten days, and he will immediately refund the full purchase price.

He will not ask any questions. He will take your word, if the product does not meet with your approval. You don't have to prove anything to him.

This guarantee really amounts to a free trial.

Frederick Westcott
President

A 10-year-old pledge

More than a million and a half Brandes Radios and Table-Talkers are today doing valiant service! With each sale this time-tried guarantee assumes new strength and meaning. It is an old pledge that bespeaks the unlimited confidence of the manufacturer in his products—a confidence based on the continued acceptance of Brandes products by an alert public.

Brandes

The name to know in Radio



Plate "Juice" From the Lighting Socket

(Continued From Page 25)

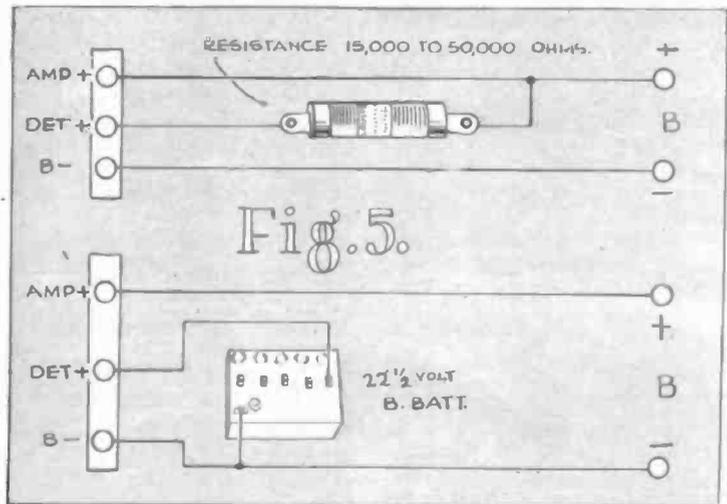
electrons which are attracted to the plate because the electrons are negative particles of electricity and the plate is charged positively. Yet current is assumed to flow from positive to negative, and that is confusing when we definitely know that the electrons go the other way.

The plus to minus assumption was merely an unfortunate error made many years ago when there was no possible way to tell just which way current does go. But it makes no difference whether we consider it to go one way or another since the results are the same.

If, instead of the "B" battery, we connect the secondary of the transformer of Figure 1 to supply the high voltage, there will be pressure first one way and then the other. Since the filament is heated and can therefore give off electrons, while the cold plate can give off none, the current only flows when the alternating current happens to charge the plate positively. Thus the vacuum tube is a really

Western Electric or American Electric or any other good make of telephone condensers may be used in the filter circuit. C-1 and C-2 should be at least four and preferably six microfarads each to eliminate the A. C. "hum." As a rule, it will be best to purchase two mfd. condensers (six of them) and connect three in parallel for the six mfd. on either side of the choke coil. The choke is merely the secondary of an audio transformer, and the secondary winding of the Federal or of the General Radio is suitable. The primary winding is not used at all. And please remember in ordering the condensers that the figures are for whole microfarads without the usual decimal points and zeros in front of them.

On page 18 is a photo of the assembled unit, showing how the parts are laid out and illustrating how different makes of condenser may be combined, if necessary, to get a sufficient capacity each side of the choke. A flexible cord and separable plug are



With a hard detector tube a series resistance reduces the plate voltage for the detector. With a soft detector, either a good variable resistance of about 100,000 ohms maximum may be used, or a separate small "B" battery provided instead.

perfect rectifier, although, of course, it has its limitations as to the strength of the current which may be passed across the little river of electrons in the tube. Still further to increase the current we connect the grid right to the plate so as to increase the rectifying area. Thus the tube is really only a "two-element" tube, with grid and plate acting as a larger plate only.

Figure 3 gives the actual connections of the "B" battery substitute, Figure 4 showing them in picture form. The circuit is simplicity itself, and products which can be bought anywhere are used all through, so that no one may have difficulty in getting the parts.

The transformer for the high voltage is an ordinary audio-amplifying transformer, and I can recommend either the General Radio or the Federal 65 transformers for the purpose. To light the filament of the rectifier tube, we use a bell-ringing transformer, which can be had at electrical supply houses for about a dollar or a dollar and a half. A 30-ohm rheostat controls the brilliancy of the tube—the output winding of the bell transformer being designed for 6 to 8 volts.

used to make connection to the 110-volt A. C. lighting socket, while two binding posts serve for the outlet "B" plus and "B" minus. A five-tube receiver may be easily supplied with plate voltage by the single rectifier tube.

The expense of operating the device is almost negligible. The audio transformer takes less current than the bell-ringing transformer, and even the latter are permanently connected across the 110-volt line because they take so little current that they do not even operate the light meter. So there will be nothing worth mentioning added to the electric light bill, even though the set be used all day every day in the year.

With the necessary parts obtainable for about twenty dollars or thereabouts, a most gratifying saving in cost may be effected. Then there is the convenience of always having a good voltage supply "on tap" whenever it's wanted. It can't run down or wear out, either.

Besides this, there's another peculiarity about the "B" battery substitute which makes it superior to batteries in a safety way. It can be short-circuited for a long time without endangering anything in the unit

W O R K R I T E

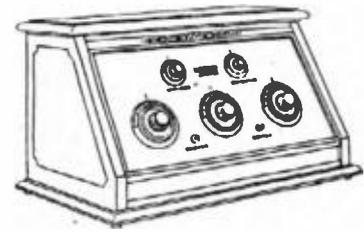
R A D I O

S E T S

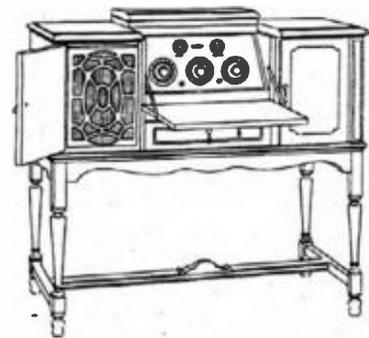
W O R K R I T E



WorkRite Radio-King, a five tube (2 radio amplifier, 1 detector and 2 audio amplifier) super neutrodyne receiver. Beautiful mahogany cabinet, 22 in. x 20 in. x 14 in. This set operates with outdoor or indoor aerial and is highly selective. Long distance stations come in full and clear on the built-in loud speaker. Complete except tubes, batteries and aerial wire . . . \$220.



WorkRite Air-Master, same as Radio-King except without built-in loud speaker. Mahogany cabinet 21 in. x 14 in. x 14 in. Without batteries and loud speaker, tubes or aerial, \$160.



WorkRite Aristocrat, a most beautiful mahogany console model 42 in. x 40 in. x 20 in. This set employs the same super-neutrodyne receiving apparatus. The cabinet contains a built-in loud speaker and space for A and B batteries. Not only a wonderful receiving set but also a charming piece of furniture. Complete except tubes, batteries and aerial . . . \$350.

True radio enjoyment

AFTER the first thrill of radio, the real enjoyment comes from the consistent ability of your set to get the program you want—to tune out local stations—to bring in music even from far distant stations with clear, true tone on the loud speaker.

In WorkRite super-neutrodyne sets you find all of these qualities as well as freedom from any whistles or howls. These sets are built into beautiful mahogany cabinets with matched mahogany panels and dials, and have many new and exclusive WorkRite refinements.

WorkRite sets—quality instruments in every way—are built to give their owners long years of true radio enjoyment.

*See these sets at your dealer, or write
for the new illustrated literature*

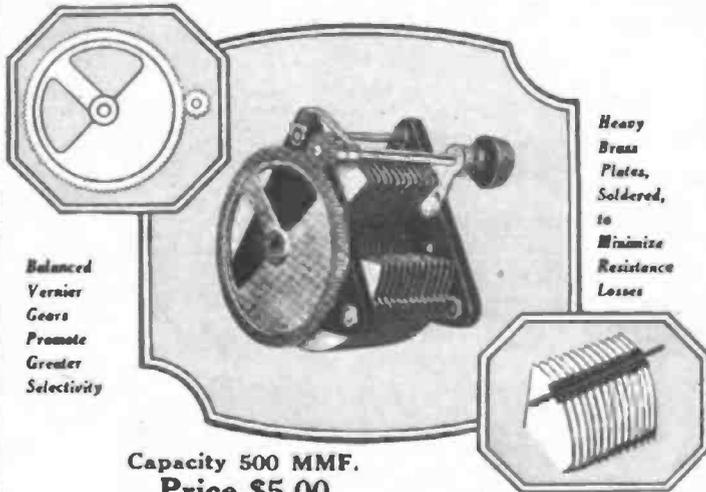
The WorkRite Manufacturing Co., 1808 East 30th St., Cleveland, O.
New York City, 1023 Knickerbocker Bldg. : Chicago, 536 Lake Shore Dr. : Los Angeles, 239 So. Los Angeles St.

WORKRITE

SUPER NEUTRODYNE RADIO SETS

Licensed under Hazeltine Patent
Nos. 1,450,080—1,489,228

Designed for PRECISION



Capacity 500 MMF.
Price \$5.00

The outstanding feature of a General Radio condenser is PRECISION.

PRECISION in a variable condenser gives you the *sharp tuning* and *low losses* which mean *greater selectivity, signal strength and range.*

Balanced ratio gears with accurately machined teeth provide a *perfect vernier adjustment.*

Heavy brass plates of the rotor and stator groups are correctly spaced and *soldered*, thereby reducing resistance losses to a minimum.

This method of soldering makes the whole condenser assembly more rugged and assures the perfect alignment of plates which keeps capacity values constant.

Type 247-H 500 MMF. with vernier. . . \$5.00

Type 247-F 500 MMF. without vernier. . \$3.25

For sale by good dealers everywhere

GENERAL RADIO CO
Cambridge, Mass.



Write for new folder "Quality Condensers"

or in the set. The filaments of a 201A or WD tube can even be connected right across the "B" outlet posts without burning out the tube.

This may seem strange when it is realized that the output voltage is normally about 120. But the rectifier can only deliver a certain amount of current, this being insufficient to burn out a tube. The instant the tube filaments are connected across the "B" terminals, the voltage falls almost to zero and does not harm the filament.

Hence, screwdrivers, pliers and odd wires can be dropped into the radio set without doing any damage to the receiving tubes. This wouldn't do at all with the usual "B" batteries connected.

In Figure 6 are given two ways to use the "B" supply with a receiving set having three to five receiving tubes. In case a "hard" detector tube is employed, the upper connections may be employed. To the amplifier the connecting wires run straight over. To cut down the voltage for the detector tube to about 45, a series resistance such as is made for transmitting tube grid leaks is just the thing, or other types of resistance not over 50,000 ohms which are designed for resistance coupled audio amplification will do equally well.

When a soft detector like the UV200 or the C300 is preferred, it is perhaps simplest to retain a small "B" battery of 22½ volts for this one tube, getting the high voltage for radio and audio amplifiers from the A. C. unit as before.

If one prefers, a variable resistance having a range of about 25,000 to 100,000 ohms may be used according to the upper circuit of Figure 6. The resistance, however, will need careful regulation, and since readjustments of tube filaments or cutting in and out of amplifier tubes changes the output voltage somewhat, such a scheme is rather bothersome although perfectly workable. In the case of using a high resistance for the detector tube and where the "Det. 'B'" post hasn't a by-pass condenser, it will be necessary to shunt a condenser of about .002 mfd. across the "Det. 'B'" and "B" binding posts.

In hooking up the plug to the lighting socket, it is best to remember that the bulbs of the receiver should be turned on before the plug is put in or before the socket switch is closed and to pull out the socket plug BEFORE the tubes in the set are turned off. This precaution prevents the condensers in the rectifier and filter unit from ever getting a charge up to about 350 volts, which they will get if no current is being drawn.

As an experiment, disconnect the high-voltage wires, hold them by the insulation, but don't touch the copper and push the plug in for a moment or so. Then pull it out and touch the "B" wires together. A nice fat spark will jump between them as the condensers discharge.

This would constitute a severe "kick" if taken on the hands by accident, but the actual current isn't very great and it is not dangerous—merely uncomfortable! The condensers, if good ones, will hold the charge for fifteen minutes or longer.

"B" power from the socket is bound to be universally used in a short time, and for sets using five tubes or more, and especially for super-heterodynes, the "B" unit forms the most economical, certain and convenient source of plate voltage that may be devised.

"B" Battery Eliminators Not So Economical, Says M. B. Sleeper

(Continued from Page 23)

about the maximum allowance. Therefore, a permanent installation of any kind for supplying B battery voltage has a useful life of approximately 1000 hours. The only practical equipment which I have seen, serving as a substitute for B batteries, is that in which rectifying tubes are employed the life of which is only 400 hours according to the claims made by the manufacturers of these tubes. Good devices take two tubes. Therefore, four replacement tubes must be used over a period of two years, making the tube cost 1.6 cents per hour of operation.

Suppose the device is of an inexpensive character, selling for perhaps \$40.00. The obsolescence cost is then four cents per hour. Here is an expense of 5.6 cents an hour. The current consumption, on the other hand, should be so small that, for practical purposes, it can be neglected, although it will bring the total cost to at least six cents per hour.

On the other hand, a 5-tube receiver using 201-A tubes can be operated on the new Eveready superpower B batteries at a cost of three and a half to four cents an hour. This assumes that no C battery will be used. Radio set owners are gradually learning of the economy effected by the C battery, so that a man who knows how to get most from his batteries will cut the cost considerably below four cents. With UV-199 tubes or three 201-A tubes the expense is further reduced.

So, you see, it is not scientifically correct to recommend the battery substitute or current tap on an economic basis, particularly because of the high initial investment, which is not as easy for the average pocketbook as the occasional purchase of dry cells.

The real value of the current tap is in its convenience, particularly when it is built into a complete receiving set. In fact, there will be a large volume of sales, unquestionably, in current tap devices; for, once the public discovers the convenience of the plug-in arrangement, the more expensive outfits will have to use them.

At the same time, there is no question of B batteries versus eliminators, for each one has its own particular field of usefulness. The man who cannot afford the current tap device must use B batteries because they are more economical. The man who can make a fairly substantial outlay for the matter of simplicity will buy the battery substitute.

It may be argued that a current tap device is no more expensive than a storage battery and charger, and the plate voltage supply can be considered as an added feature which does not increase the manufacturing expense. There we come back to the question of obsolescence, however, for it may not be long until we have tubes operating with alternating current as a filament heater, directly from the supply line. Then the battery substitute will be useful for the voltage supply only.

So, you see, we must argue for these devices on their actual merits and only merits at the moment, for even now it is impossible to tell more than a year ahead what the next year will bring.

Cordially,
M. B. SLEEPER.



New Models BRISTOL Radio Receivers

*Incorporating the Patented
Grimes Inverse Duplex
System*



Watch for further
announcements
in all leading
Radio publica-
tions.

Improved Bristol
Audiophone Loud
Speaker—gives greater
volume, is more sensi-
tive and still maintains
the round, full tone and
its distinc-
tive free-
dom from
distortion.



Ask for Bulletin No. 3017-Q

Manufactured
by

The Bristol Co.

WATERBURY, CONNECTICUT

*Grimes System Insures Natural
Tone Quality*

KFNF—Just for Old-Fashioned Folks

(Continued From Page 18)

the literature sent out from the station. Here's a part of one under the heading "General Information"—

"All parts of the building and plant are open to visitors at all times and you are cordially invited to come and see us. We are pretty busy sometimes, but never too busy to visit and show you around. The broadcasting plant is owned and

seeds or radio. Ask for the songs you want and we will try and give them to you. 'We strive to please.'

"And be sure and tell your friends where to find us on the radio dial and send in their names for our radio list to receive this and other announcements.

"We enclose a couple of return post cards which we hope you will fill out and return to us at different times when you feel moved to do so. We are trying to run this station to please our listeners and your report will be of great help to us in deciding on the character of programs, for naturally we will specialize on the kind that seems most popular with our listeners as judged by these reports. So you can get the kind you want by praising it.

"If you specially like any certain singer or player or speaker, be sure and mention them in the reports and the cards will be passed on to them. It is the only way they have of getting applause.

"The return envelope is for you to use in sending in a seed order or a letter reporting on the programs. We will be glad to have either or both, especially both.

"Do you have trouble to get us? If you do it is probably due to your machine not being adjusted for short wave lengths. The thing to do then is to try a shorter aerial. Also try hooking a small fixed condenser of about .0005 capacity between the ground wire and the set. On most standard makes of sets we come in between 10 and 20 on the dials."



Henry, himself, and "Samanthy"

operated by the Seed Company and is under the personal direction of Henry Field, but is meant to be used for the general good of Shenandoah and Southwest Iowa.

"The programs will be devoted mostly to entertainment and educational features and will specialize on old-fashioned music.

"Write for free seed catalog and copy of our magazine, 'Seed Sense.' This magazine is free to our customers and gives valuable suggestions on garden and farm and spotted pigs and everything else under the sun. You'll like it.

"Write us any time about either

The Children's Hour for the Radio Child

(Continued From Page 21)

termine whether it would be best publicly to admit the substitution. Almost everybody connected with the station was under the impression that the substitution was doing harm, but Ellis A. Gimbel, Jr., who then was in charge of the broadcasting, insisted that childish memories were short and that the previous Uncle Wip's personality would soon be forgotten and



Only six of the Field kids are here—there are eleven altogether. The photograph shows Henry himself, and Mrs. Henry and, from left to right, the youngsters are Jessie, Georgia, Ruth, John Henry, Mary and Letty. Of the five not shown—all older—Frank and Faith are married, Philip and Josephine were at school when the picture was taken, and Hope was working at the seedhouse and didn't get back in time for the snapshot. Most of this family are familiar to the audience of KFNF.

*Now! Use your electric light current
in place of Radio "B" batteries*



TIMMONS B-Limiter

From the very beginning of radio, everybody felt that "B" batteries would some day be replaced by your electric light current.

—But how to do this has been the problem.

In the Timmons Laboratories, engineers worked on this problem. Then, in the early part of the year, their first apparatus was carried about the country and tested on various lighting systems. Results were tabulated.

The experiments continued. Refinement after refinement was made. A change here—a new theory. Then, new grouping of parts. And finally—Success.

"B" batteries had been eliminated from radio, and the name of the new apparatus suggested itself—B-Limiter.

In addition to eliminating "B" batteries, the B-Limiter gives you accurate control over all plate voltages, detector and amplifier. Music is sweeter and the voice more natural.

no changes necessary

The Timmons B-Limiter operates on any radio set without changes. Just put it on in place of "B" batteries, and screw the plug into the alternating current (110 volt, 60 cycle) electric light socket.

Dealers are being supplied as fast as B-Limiters can be assembled and tested. Meanwhile, we will be glad to send our folder, "Eliminating the 'B' Battery."

new Talker improvements

The dealer from whom you order your B-Limiter also carries Timmons Talkers. There are two types, Adjustable, \$35, and Non-Adjustable, \$18.

Following our policy of improving our products whenever possible, we have changed the diaphragm of the A-type Talker. Even in sets of tremendous volume, tones are perfectly clear, rich and natural. Also we have added further to the appearance of the A-Type Talker by fitting it with a beautifully designed top and finely molded feet.

But how these Talkers—the most beautiful in the world—in your own home, on your own set, is the best place.

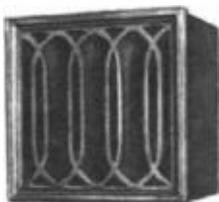
Let the Timmons B-Limiter operate your radio set at the same time. For it's on the loud speaker particularly you will appreciate how clear the B-Limiter makes radio.

Ask your dealer for a Timmons Talker folder, or we'll send it direct.

Timmons Radio Products Corporation
330 E. Tulpehocken St.
Germantown, Philadelphia, Pa.



Type A Adjustable.
List, \$35.00



Type N Non-Adjustable.
List, \$18.00

TIMMONS TALKERS



100,000 Square Feet!

Devoted to the DeLuxe Exhibition of the Very Newest in Radio

Models Circuits Developments Accessories

Assembled by the Manufacturers for Your Observation

First Time in America!

Representative Displays by Famous Manufacturers of

**England, Italy, France
Belgium, Switzerland, Austria**

Direction of

U. J. HERRMANN and JAMES F. KERR

Graham could make himself just as popular.

Mr. Gimbel's shrewdness and good judgment of his public was soon proved. Mr. Graham went bravely ahead with his Uncle Wip stories and roll call, and it was not long before it became very evident that the entire following of kiddies had transferred their affections to him. His annual kiddies' day at Willow Grove Park now has more than repaid him for the unpleasantnesses of the first few weeks and he now has a tremendous following of his own.

And Ehrhart, meanwhile, has performed the miracle of creating Dream Daddy and becoming even more popular than he was before.

If Joel Chandler Harris could come back today and watch a million children of America listening in to radio bedtime stories, it would make his heart glad. He would probably have Uncle Remus tell Little Boy that "Brer Fox wouldn't get the radio child, no, suh, 'case he was a good chile listen' in."

And I wager that enterprising WSB, The Atlanta Journal, would have "Uncle Remus" broadcasting a bedtime story about "jes what Brer Rabbit did next."

Building Radio Sets That Work

(Continued From Page 22)

ing a set don't just slam the parts in anywhere they seem to fit. Plan the set so that it will look well, but most of all plan it so that the wires connecting each part will be as short as possible. If your set is to be permanent, solder all connections. If you are trying out a new hookup, scrape your connecting wires clean and tighten them as much as possible to the posts that they are connected to.

Well, I guess I've covered 'most everything that would cause trouble in your set. At least I've tried to.

And now, look at this article. It covers eight full-size typewritten pages and took quite a while to write.

But should I try to answer in full the letters I receive similar to the one I have outlined, I should have to repeat everything I have written here. Imagine twenty-five letters like that—and it is not uncommon to receive that number. How long will it take me to write them?

So please have a heart when you ask for help. Please do your part by checking these things mentioned here. Then if you are unable to make it work, write and explain in detail what your trouble is. Those who

write articles on how to build sets are *always* willing to help you, but it is almost impossible to locate your trouble by reading a letter like the one I have included in this article.

If this article has helped you in any way, won't you please write to me, in care of the editor and tell me just how it has helped you? I thank you.

Editorially Speaking

(Continued From Page 4)

circuits are already very thoroughly overstocked with all kinds of apparatus and is no longer necessary for them to buy anything new in order to try another circuit. All they have to do is to go to their closet or their attic and bring half a dozen variometers and half a dozen variable condensers or anything of that kind which is needed.

The hook-up fans are very much oversold. There is not a day goes by that I do not get letters from readers telling me of the various kinds of apparatus which they have on hand and asking me which particular type to use in a particular circuit.

Many of these fans are so thoroughly stocked that they could almost start a small radio retail store themselves.

You cannot attract the money of these people by advertising new parts unless these parts are on a radically different idea or contain features so entirely new that their interest is aroused sufficiently to test them.

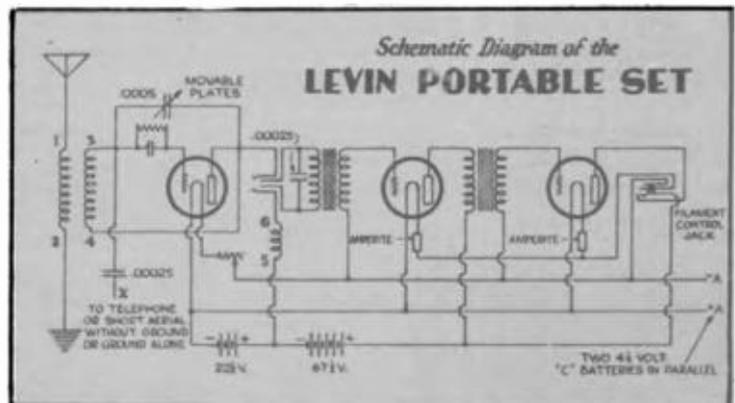
It seems to me that everybody is manufacturing variable condensers or loud speakers or variometers or variocouplers or some of the standard apparatus which has been on the market so long.

These people come out and, instead of offering anything radically new, simply make the same old claims for their apparatus that have been made for apparatus of similar type ever since it has been on the market.

Manufacturers will place advertisements of a new variable condenser in the magazines and will then suddenly withdraw them, claiming that the magazines have no "pulling power." That is where the manufacturer is wrong. The trouble is that his advertisement has no pulling power, because it is merely offering to add to an already overstocked market just another variable condenser making the same claims for itself, or just another loud speaker claiming to give "perfect reproduction," or just another coil claiming to

(Continued on Page 44)

Correction in Levin Circuit



Moe Levin calls our attention to the fact that the diagram of his portable set printed on page 29 of July issue contains one very vital error. It shows the left-hand connection of the second tube going down to the

plus B battery line. This is unfortunate. Of course the connection should have been made to the plus "A" battery line and should not go to "B" battery at all. The correct hookup is given above.

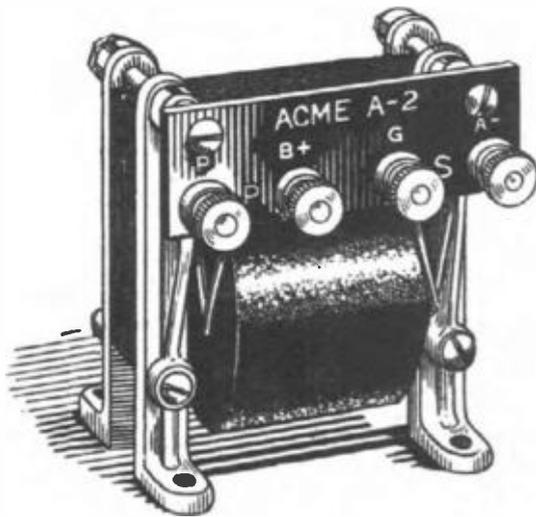
No matter what the circuit

*An ACME Audio Transformer
makes it better*

WHETHER you have a neutrodyne, superheterodyne, regenerative or reflex, the addition of the ACME A-2 Audio Frequency Transformer makes it better.

Send 10 cents for 36-page book, "Amplification Without Distortion," which tells how to get it. It also shows you how to get the distant stations loud and clear with "Reflex," the circuit which gives more, tube for tube, than any other.

ACME APPARATUS COMPANY
Transformer and Radio Engineers and Manufacturer
Dept. 133, Cambridge, Mass.



ACME A-2
—for volume

ACME

~ for amplification



\$4.00 COD SPECIAL INTRODUCTORY PRICE

For a limited time only, and to introduce this new and superior Storage "B" Radio Battery to the Public, we are selling it for \$4.00. Regular Retail Price is \$6.00. You save \$2.00 by ordering NOW. A finer battery cannot be built than the **World Storage "B" Battery** (12 CELLS - 24 VOLTS).

To ten million homes with Radio Sets and to countless millions of prospective purchasers the World Storage "B" Battery brings a new era in the history of battery economy and performance. It is a battery that gives you the most for the money with the least for power and can be recharged at a negligible cost. And you need it for your radio.

A Superior Battery Equipped With High Capacity 21 1/2 in. x 1 1/2 in. plates and plenty of acid solution. Extra heavy glass jars allow ready observation of charge and prevent leakage and evaporation of acid. It holds its charge, holds its acid, and resists corrosion. You will find this battery a boon in long distance traveling. It does away with a great many noises on a line between stations. Mail your order today.

SEND NO MONEY

Just state number of batteries wanted and we will ship day after day. **EXTRA OFFER:** 4 batteries in cases - 100 volts, \$12.00. Pay Expressman when receiving batteries. 1 not credit returned for cash in full with order. Send four order \$10.00 and we will ship.

WORLD BATTERY COMPANY
Makers of the famous World Radio "A" Storage Battery
1219 S. Wabash Ave., Dept. 24, Chicago, Ill.

SAVE \$2.00 BY ORDERING NOW!

3XP-Style Wire-Ups of the Inverse-Duplex Neutrodyne

(Continued from Page 13)

piece of apparatus may be just as good as that which we used, but it is not a question entirely of quality in this matter, but rather a question of exact balancing of all of the apparatus, one against another.

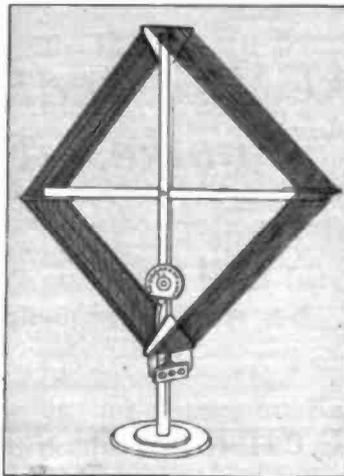
Therefore, we spent weeks, after choosing the makes which we thought would be most easily bought in the greatest number of places, in solving the problem of getting exactly the proper values of the other pieces of apparatus.

And so, as we found this so much trouble, we must insist that you use exactly the makes and types of apparatus specified in our list or else we cannot undertake to solve your problems for you. In other words, if you substitute a different audio-frequency transformer, or a different make of neutroformer, or different condensers, you are there introducing into the circuit a value which we have not used and which we cannot calculate, and it is not fair to ask us what the other values should be to meet the one which you are introducing. It would require a great deal of our time—time which is of considerably more financial value than the cost of the exact make of apparatus which we are specifying.

If you will use exactly what we say, if you will exactly follow the wiring given in the three pages of 3XP-Style Wire-Ups, and if you will read Mr. Grimes' article, Prof. Briggs' article, and all the way through this article you will be sure to get results. If you do not, you may be certain that you have made some mistake. That is why I am adding to our 3XP-Style Wire-Ups a new feature which I think will be of particular value to every one and that is the checkup list which will accompany these diagrams.

After you have wired up your set, get some one to read these checkup lists to you, and as he reads the beginning and end of each wire, you should trace that wire on your set and see

that it actually is where it belongs. I do not see how any errors can creep into sets if all of this is done according to instructions. We have gone to more trouble than we have ever taken before to make the instructions for building this set the most



The loop has 14 turns of wire, spaced 3/4 inches apart and is 21 inches on a side. Each turn is tapped and the taps lead to the tap switch, which, in turn, is connected to the center binding post, or grid, on block 11, diagram No. 1.

The two outside turns of the loop connect to the two outside binding posts on block 11, diagram No. 1.

complete possible and far more exhaustive than anything we have ever hitherto tried. We would very much appreciate a word from you if you think we have succeeded. If you find



This Radio Battery Has "Over Twice The Life"

THE Burgess Radio "A" is exclusively a radio battery, designed especially for service on the "A" or filament circuit of dry cell vacuum tubes.

In Radio service it has over twice the life of the ordinary No. 6 ignition battery... costs approximately the same... has a rapid recovery to high voltage after short periods of rest... practically no voltage is lost when not in use.

Replace your worn out "A" battery with a Burgess. Compare the service in your own set under any and all conditions. Then let your experience guide you in your future purchase of Radio "A," "B" and "C" batteries; there's a Burgess Battery for every radio purpose.

"ASK ANY RADIO ENGINEER"

BURGESS RADIO BATTERIES

BURGESS BATTERY COMPANY

Engineers - DRY BATTERIES - Manufacturers FLASHLIGHT - RADIO - IGNITION - TELEPHONE
General Sales Office: Harris Trust Bldg., Chicago
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Branches:
New York Boston Kansas City Minneapolis
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Every Question ANSWERED for only \$1

At last you have under one cover a Complete Radio Handbook



JUST OUT 514 PAGES

Compiled by HARRY F. DARE, I.E.

Formerly with the Western Electric Co., and U. S. Army Instructor of Radio

Technically Edited by F. H. DOANE
100,000 ALREADY SOLD

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IT EXPLAINS: Electrical terms and circuits, antennas, batteries, generators and motors, electron (vacuum) tubes, every receiving hook-up, radio and audio frequency amplification, broadcast and commercial transmitters and receivers, super-regeneration, codes, license rules. Many other features.

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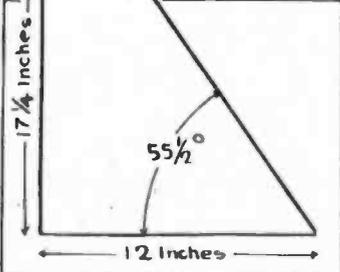
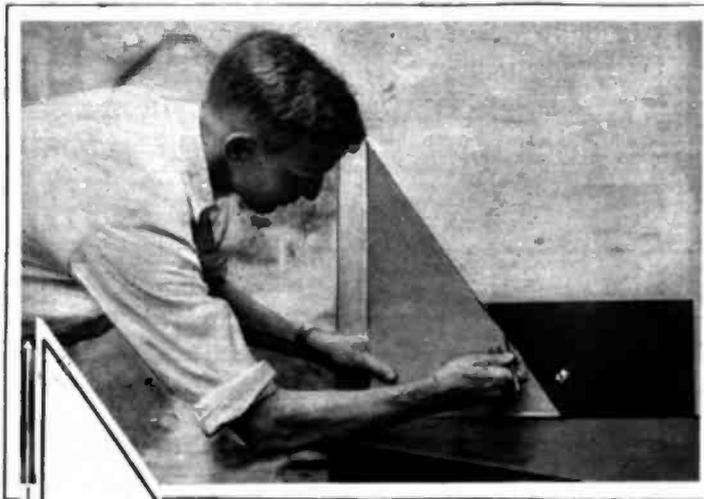
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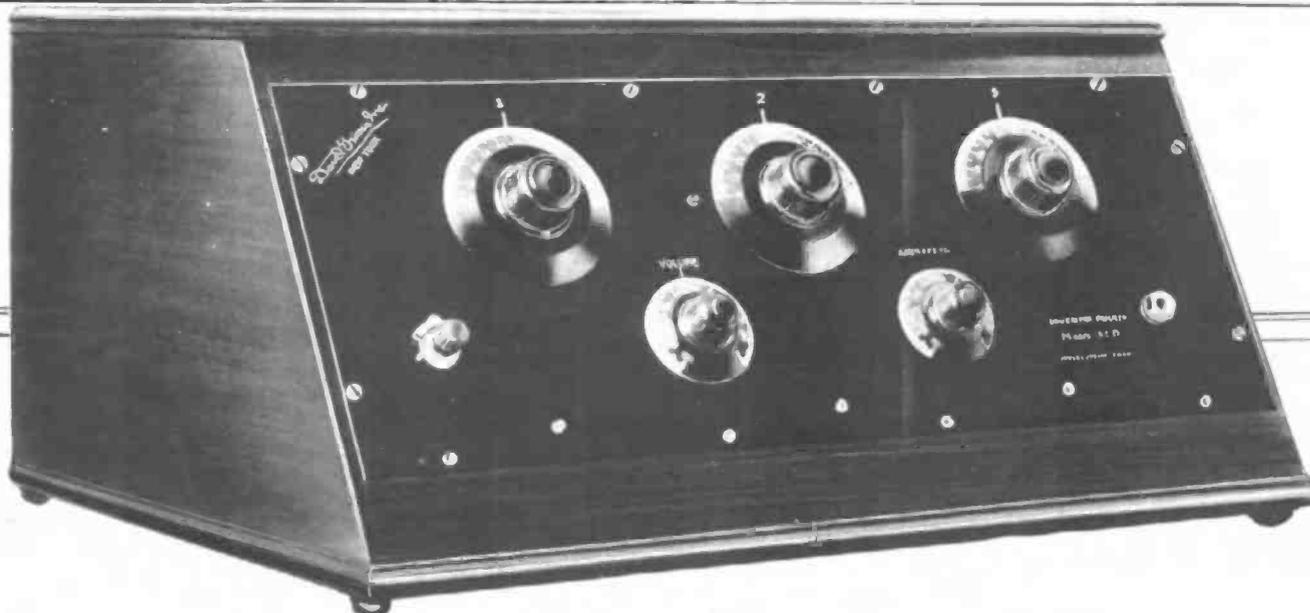
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With the cardboard triangle, it is easy to scribe the proper 55 1/2 degree angle for mounting the neutroformers.

To the left is a diagram of the right-angle triangle with a base of 12" and a height of 17 1/4". This gives an angle of 55 1/2 degrees—the correct angle for mounting the neutroformers



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Announce the New Inverse Duplex Type 3-XP Official Laboratory Model

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The 3-XP model is considered ahead of its time in various features that make for simplicity and efficiency.
Mahogany cabinet (English Brown), hand-rubbed finish; A and B batteries contained within the cabinet.

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7 x 10	7 x 30	14 x 18
7 x 12	7 x 48	20 x 24

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that we are wrong in any way or that our new method is confusing, we would equally appreciate your telling us so and telling us why. It is only by such suggestions as this that we can make this magazine what you want it to be.

You will see that there are several differences between our circuit and that given by Dr. Briggs. In the first place, he speaks of a loop plug having three contacts and a special loop jack having three contacts. This will be ideal if you are able to get that plug and jack in your dealer's store, but they are not very widely on sale and so we consider it better to use a strip of bakelite with three binding posts on it to take the place of the three contacts of the jack which he speaks about.

Another change which we made is I think really important. Prof. Briggs shows his "C" battery connected to all three of his amplifier tubes. Now, he may have been able to get good results with that, but if he did I think it was more good luck than good management. "C" batteries should never be used on radio frequency amplifier tubes. They are almost certain to interfere with the quality of signals received and the efficiency of the set.

Consequently, in our 8XP-Style Wire-Ups, we have taken the "C" battery away from the reflexed tubes and use it only on the last tube which is a straight stage of audio frequency amplification.

It was also necessary for us to change the values of all of the bypass condensers because we used different apparatus from that used by Prof. Briggs. You will have to do the same thing if you use different apparatus from that which we used. And, as I say, it is not fair to ask us to puzzle that out for you. If, however, you insist upon using other things, let me say so far as the audio frequency transformers are concerned that the first one should not have a ratio greater than three and one-half to one, and the second and third should be of the ratio of three to one.

Let me also urge you, no matter which one of these two diagrams you follow, to use a separate "B" battery for your detector tube. This is a good thing in all cases of inverse duplex. It is a perfectly easy thing to do because the minus connection of the detector battery and the minus connection of the amplifier battery both go to the minus "B" binding post. Then the plus connection of the detector battery goes to the 22 1/2 volt plus "B" binding post and the plus connection of the amplifier batteries goes to the high voltage binding post for "B" battery. In other words, the two negative connections are common, but the amplifier battery is hooked up "around" the detector battery.

We have also changed Prof. Briggs' connection between the "B" battery and the "A" battery. As he has his diagram, he connects the minus "B" to the minus "A." He has done this, I imagine, because he has inserted the "C" battery in the grid leads of all of his amplifier tubes. But as we have changed that and inserted the "C" battery only in the last audio amplifier, we also changed back the minus "B" connection to the usual method. This is wiring minus "B" to plus "A."

There is another reason for making this change and that is the thought that many readers may like to use a push-pull or a power amplifier as their last step. As the standard connection for the power amplifier is minus "B" to plus "A," the use of such an amplifier hooked up to Prof. Briggs' diagram would immediately short circuit the batteries. Therefore we have changed this circuit to make the hook-up the same as the standard push-pull amplifiers, and in this way the two can be hooked together and a push-pull amplifier can be plugged into the first jack, if the experimenter



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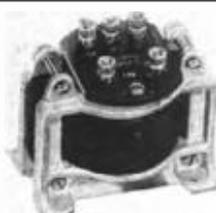
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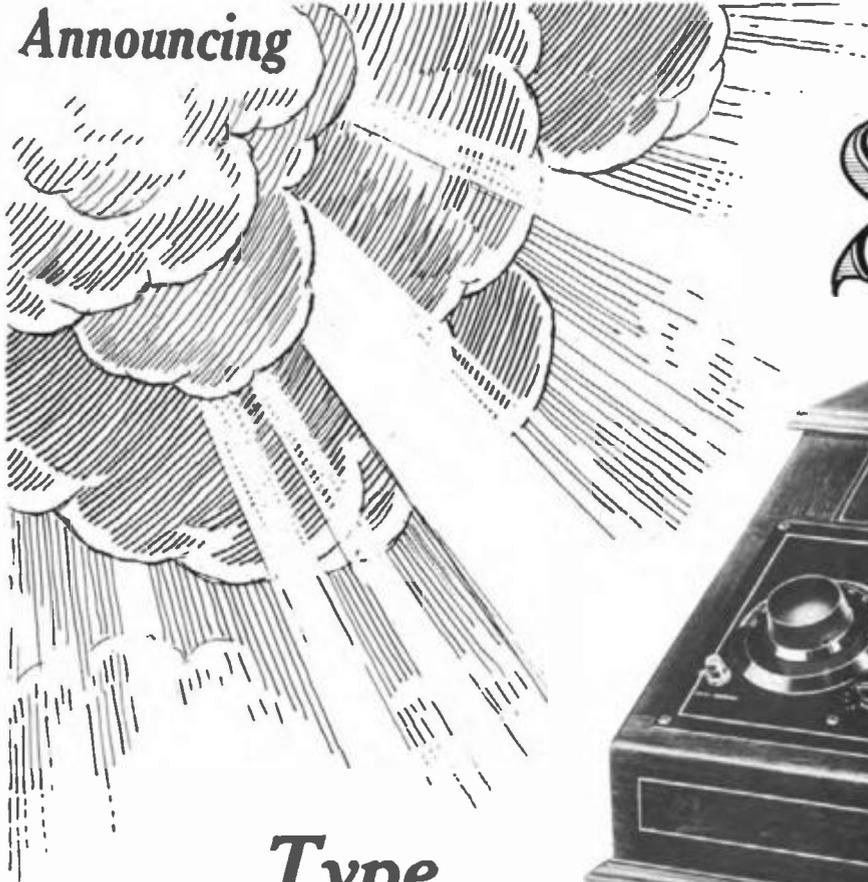
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Sets heretofore were limited by type of aerial which might or might not work in your locality. The Monotrol, Type 54, however, works on an aerial, or aerial and ground, on any kind

of loop or, for local reception, on the ground alone.

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To gain the selectivity of two stages of tuned radio frequency

you were heretofore obliged to tune with three separate dials. The Monotrol, Type 54, accomplishes this with one tuning dial, but has three stages of tuned radio frequency.

To get equal quality on both high and low frequencies—well, you simply could not do it heretofore. You can and do with Type 54, Monotrol.

More Worth While Improvements

The Sleeper Rectifier eliminates the noisy detector tube. Then there are the Doehler die-cast frame—the double-spring sockets suspended on airplane rubber, the new type of intensity control, the simplification and coding of wiring, the beautiful cabinet of inlaid African Mahogany with panel etched in bronze and many other features which you must see and

bear to note the difference and to appreciate.

So mechanically and electrically RIGHT is the Monotrol that it is sold with a positive guarantee of "satisfaction or money back." It costs you nothing to compare this new type Monotrol in every way with every former standard found in set or in reception. Your dealer will be glad to place it in your home on trial. Be prompt to get in touch with him.

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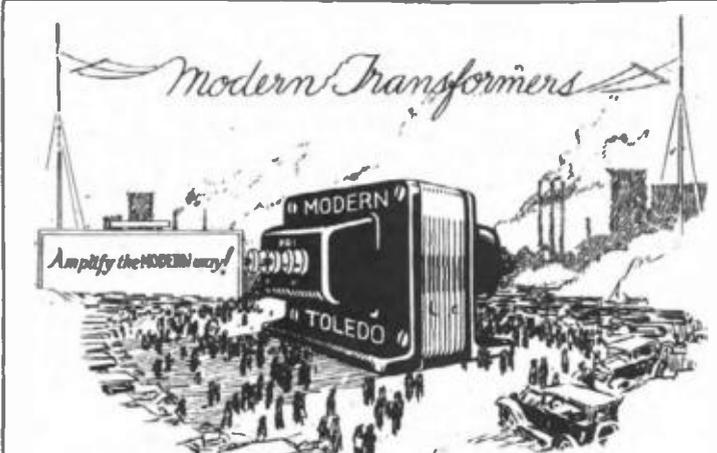
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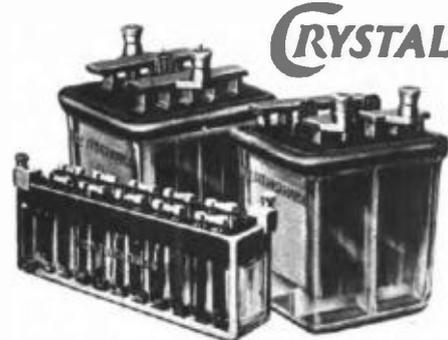
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prefers that system. I doubt very much whether a push-pull amplifier could be used in addition to the last stage of audio as the audio amplification obtained by four tubes of this set alone is just about the limit possible. Still, push-pull or power amplifiers certainly have features which recommend them and they can be used with this set by plugging them into the first jack and thus not using the last stage of audio frequency amplification of this set.

Prof. Briggs speaks of shielding the cabinet to keep the loop and the neutroformers from feeding into each other and causing a howl. This is undoubtedly sometimes necessary, particularly if you are going to mount your loop on top of the cabinet. We found, however, that shielding broadens the tuning considerably and we are not able to do the extremely fine separating of two close stations which can be done without the shield.

We believe it is better to put the loop about two feet away from the set and use leads long enough from the loop to take care of this distance. Frequently, when this feed back into the loop produces a bad howl, it is possible to reverse the loop—that is simply turn it around through a half circle, or else reverse the leads on the two outside loop binding posts.

Many amateurs have a great deal of difficulty in mounting neutroformers at exactly the correct angle. There seems also to be a great deal of difference of opinion as to exactly what this correct angle should be.

I have heard many persons claim that it should be 60 degrees and others claim that it should be 57 degrees. We have measured the angles in the best neutrodyne sets which we have had at Station 3XP and we find that the standard is 55½ degrees.

Now, in order to get an angle of exactly 55½ degrees, the average fan thinks that it is necessary to have an "angle protractor" and this is true, but fortunately we have such a thing at 3XP and so we have used it to devise a very easy method by which any amateur can lay out his own angle for the mounting of these neutroformers.

Simply draw on a large piece of cardboard a base line exactly twelve inches long. Then, using a square, erect from the left hand end of this base line a perpendicular line and make that perpendicular line exactly 17¼ inches high.

Then with a long rule, draw a line—the hypotenuse—connecting the upper end of the perpendicular to the right hand end of the base.

You now have a triangle in which the angle at the lower right hand end of the base is exactly 55½ degrees. And, by cutting out this triangle of cardboard, and fitting it under the neutroformers, or laying it on your panel, you can draw a line exactly 55½ degrees for the mounting of your neutroformers.

I have said that in our own particular set, we found the neutroformers of no importance whatever. You, however, in building your set may possibly find that you will get better results by making it a genuine neutrodyne and for that purpose you will have to balance the neutroformers.

This is the stumbling block over which most of the would-be neutrodyne makers in the amateur ranks tumble. I know of no better instructions for this particular part of the circuit than those contained in the booklet got out by the F. A. D. Andrea Company and furnished with their kit under the title of "How to Build Hazeltine Neutrodyne Circuit Radio Receiver." This is a copy-righted book but with the permission of the author, Mr. Stark, I am here publishing the part of the instructions dealing with the balancing of these neutroformers.

On diagram No. 4 in these 3XP Wire-Ups, you will notice that the plate connection of audio frequency

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SUMMER NUMBERS OF RADIO IN THE HOME
JUNE—1924

Harkness Tells About His Reflex.
The New Grimes 3XP Inverse Duplex.
Re-Radiation Receivers.
"Factory" Refinements in Home-Built Sets.
How to Become a DX Sharpshooter.
A Novel Loop Tuner.
Description of Station WGN.
Simple Hook-Up for Testing Tubes.

JULY—1924

Harkness Writes About Self-Oscillation.
Trouble Shooting in the Grimes 3XP.
"Factory" Refinements in Home-Built Sets.
Levin's New Coil Makes a DX Portable.
R. F. and the Goodreau Split Variometer.
New Testing Outfit for Dealers.
What Size Grid Leak Shall I Use?
Description of Station WLS.
Static Causes.

AUGUST—1924

The Neutrodyne—Installation and Operation.
Audio-Frequency Amplifiers.
Neutroformers in the Grimes 3XP.
The Grimes "Selector."
A Tube That Eliminates the "A" Battery.
Description of Station WLAG.
Correct Aerial Insulation.
25 cents per copy, or start your subscription with any of these issues.

RADIO IN THE HOME
608 CHESTNUT ST., PHILA., PA.

transformer number 2 is indicated by a star and an arrow. This is to show the place where you disconnect the wire and insert your telephones in series in that line to do the balancing of the tubes. With this in mind, I quote here from the booklet:

"Completely remove from its socket the first radio frequency amplifier tube. Now readjust all three neutroformer dials carefully until the signals again come in at their loudest. Now take the tube you removed from the first radio frequency socket and place a small piece of paper over one of the filament contact pins so that it will remain in position when the tube is again inserted in its socket.

"Placing the tube back in its socket will connect the plate and the grid of the tube in the circuit but will not allow its filament to light as the small piece of paper over the pin prevents contact. With the tube back again in the socket with the filament unit, signals will undoubtedly still be heard in the phones. The strength of these signals can however be varied from loud to weak by moving the brass tube of the first neutrodon or the one placed at the left on the baseboard. This adjustment should be made to a point where the signals are very weak or disappear entirely and no sound is heard.

"Now by entirely removing the tube from its socket, signals will come in loud. Immediately replacing the tube in the socket (with the paper still in place) the signals will disappear or be very weak. This is the desired condition, and the neutrodon condenser after being carefully adjusted to this minimum signal point may be permanently fastened by soldering the brass tube to the brass clamp in the center.

"This covers the neutralizing adjustment for the first radio frequency tube. Identically the same procedure is followed out with the second radio frequency tube, having all other tubes including the first radio frequency tube in their sockets and lighted but putting the paper over the contact pin of the second tube and adjusting the second neutrodon while the second radio frequency tube is in its socket and with its filament unit. It is important when adjusting either neutrodon that all three neutroformer dials should be adjusted for maximum signals before final neutralization adjustments are made.

"The neutrodon condenser as will be noted has three terminals. Ordinarily, the connections are made at the two terminals at each end. Sometimes, however, one can not seem to obtain a good minimum in this way. Then it is recommended that one of the connections of the neutroformer be made to the center terminal. This gives a greater capacity range to the neutrodon and by proceeding with the adjustment of the above a good minimum can be obtained."

And now let us give our attention to the wiring-up diagrams and get to work putting this set together.

Diagram No. 1 simply shows the layout of all of the stuff on the baseboard and the panel. If you will refer to the photographs, you will see the actual pictures of how we did this.

Place all of the material on the baseboard first and then place all of the material on the panel before you fasten the panel to the baseboard. It is also wise to do as much of the filament wiring as possible before fastening the panel to the baseboard because some of the filament wires run in a way which makes it extremely difficult to do any soldering after the panel is made fast. It is best to run the filament wires, fastening them to the apparatus which is on the baseboard, measuring up carefully by holding the panel against the baseboard and leaving loose ends exactly where they will come when the panel is attached. Then, after the panel is screwed on, you can do the

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Grimes and his famous Inverse-Duplex System

are found exclusively in "Radio in the Home." David Grimes is one of our Associate Editors and writes for no other publication.

soldering on the rheostat and other apparatus on the panel. Do the same thing with the fixed condensers nearest the panel.

First we will give a complete list of all of the parts as shown in wire-up No. 1. Referring to the numbers given on that diagram, the list follows:

List of Apparatus for Grimes-ed Neutrodyne

- 1 3 Eby ensign binding posts on Radion strip
- 2 Type 41 Jefferson transformer
- 3 3 Eby ensign binding posts on Radion strip
- 4 Acme R2 radio frequency transformer
- 5 Dubilier micadon condenser .0025 m.f.d.
- 6 Fada neutrodon
- 7 Dubilier micadon condenser .002
- 8 Jefferson "Star" transformer
- 9 Dubilier micadon condenser .002
- 10 Jefferson "Star" transformer
- 11 3 Eby ensign binding posts on Radion strip
- 12 Fada neutrodon
- 13 Any standard socket
- 14 Fada neutroformer
- 15 Any standard socket
- 16 Fada neutroformer
- 17 Any standard socket
- 18 Any standard socket
- 19 Patent No. 62 jack
- 20 National DX condenser, .0005 m.f.d. or any other high-grade condenser of same capacity.
- 21 Dubilier micadon condenser, .001 m.f.d.
- 22 Patent type 88 or other good potentiometer 400 ohms or more.
- 23 Dubilier micadon condenser .0005
- 24 Patent type 85A rheostat 6 ohms
- 25 Patent type 85 rheostat 20 ohms
- 26 Patent type 65 jack.

The panel should be Radion or Formica and should measure 7 inches high by 24 inches long. The baseboard was a piece of 3/4-inch dry wood from an old packing box and its dimensions were 8 1/2 inches deep by 23 inches long. This leaves enough of the panel overlapping to give room for screw holes when the set is put in the cabinet.

A baseboard of this size makes the instruments somewhat crowded and it would probably be better to have the baseboard 10 inches deep if you can get a cabinet to fit that size.

So; now that we have all of the apparatus laid out, let us proceed to wire the set up step by step, checking up with the following lists for each step as we do it. Once more I am very strongly recommending the new wire known as Celatsite which is making a bigger and bigger hit with me the more I use it.

We first used different color Celatsite for wiring in each step. For those who care a great deal about appearance, however, all of these different color wires may not look well in the finished set although different colors unquestionably do make it considerably easier to check up on the wiring. Still, if you are quite confident that you can check up, I can only say that we finally finished the set using all brown Celatsite and the result looked like a million dollars. This Celatsite wire comes with the very finest grade of spaghetti already attached to it.

Here then are the checkup lists step by step to accompany each diagram in the 3XP-Style Wireups:

Diagram No. 2; Filament Leads

- 1 From A minus binding post block Number 1 to negative filament connection on socket number 13
- 2 From negative filament on socket 13 to negative filament on socket 15
- 3 From negative filament on socket 15 to negative filament on socket 17
- 4 From negative filament on socket



The Aristocrat of Amplifiers

Quality in Radio is no less marked than quality in people. The resistance coupled amplifier is a quality product.

DAVEN COMPLETE AMPLIFIER KITS

- 3-Stage\$13.50
- 4-Stage\$17.00

Kits Without Sockets and Condensers

- 3-Stage \$8.50
- 4-Stage\$11.00

Read "Resistors, Their Practical Application in Radio Reception." By Zeh Bouck. Price, 15c.

Also read "The How and Why of Resistance Coupled Amplification." Price, 10c.

These booklets may be obtained from your dealer.

DAVEN RADIO CORP.

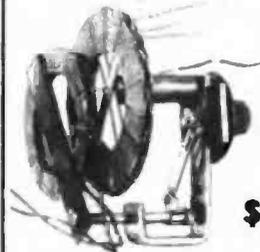
"Resistor Specialists"
9-11 Campbell St., Newark, N. J.

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TUNING UNIT



\$5.00

GET THAT DX STATION

Pfanstiehl designed and manufactured the first pure, no loss inductance coil that made the success of the Reinartz circuit possible. He has now developed a unit using two of these inductances with smoothly-variable coupling.

This unit has been included in a popular commercial set all through the year 1923, and its success has led to many imitations. That is the best proof of its superiority.

THIS UNIVERSAL TUNING UNIT

can be used in the most popular circuits of the present day. Try it in your own favorite hookup and note the difference.

At all good dealers, or direct on receipt of purchase price.

PFANSTIEHL RADIO SERVICE CO.
Highland Park, Ill.



INSTRUMENT TESTED

201A Style, 5 volt, .25 amperes

Read the guarantee furnished with every Atlas Tube:

"This Atlas Tube has been individually instrument tested and is guaranteed to give entire satisfaction. If unsatisfactory for any reason whatever, it may be returned within a period of thirty days to the manufacturer or to the dealer from whom it was bought, provided the filament has not been burned out.

"Dealers are authorized by the manufacturer to make replacement or refund (in such cases) whichever may be desired by the customer.

Atlas Instrument Tested Tubes are guaranteed to function efficiently in Radio, Neutrodyne, Superheterodyne, Radio Frequency or any of the circuits which require highest efficiency in tubes."

At best dealers or direct from us. Mail orders promptly filled. **\$4.00**

SPECIAL OFFER—With each tube ordered from this advertisement we will, on request, include individual chart showing characteristic curve.

DEALERS and JOBBERS—There is satisfaction as well as profit in handling ATLAS TUBES, the best tubes to be sold on merchandising principles affording full protection and satisfaction to your customers.

Write or wire for proposition.

THE R-S-K COMPANY

Ellicott Square Buffalo, N. Y. Caxton Bldg., Cleveland, O.

Eliminate soldering
With This New
Radio Tool



The Rance Combination Pliers made to our specifications by H. HARKNESS, maker of fine tools. Nickel chrome-plated steel. For a lifetime of hard use. Price \$3.50.

GET away from the mess of soldering. Use the Rance Radio Pliers with its specially designed pins. This new feature forms wire ends into perfect loops that fit accurately over standard binding posts, and make cleaner, better connections. Sets wired in this efficient way look neater and work better. Electricians and mechanics find these pliers indispensable.

Mail the coupon today and we will send you further details or the pliers. Complete instructions with each pair.

Dealers and distributors will be interested in our sales plan.

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Rance Corp., 41 E. 42d St., New York. Please send me:
 Descriptive Folder free.
 The Rance Radio Pliers for which I enclose \$3.50.
 Name
 Address
 Dealer's Name

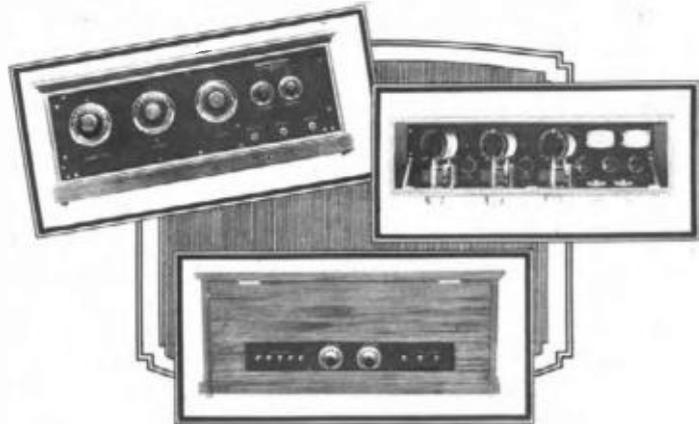
- 17 to negative filament on socket 18
- 5 From A plus on binding post block number one to center connection on rheostat number 24
- 6 From center connection on rheostat 24 to center connection on rheostat 25
- 7 From right-hand connection on rheostat 24 to positive filament connection on socket 17
- 8 From the right-hand post on rheostat 25 to the top blade of jack 26
- 9 From next to the top blade of jack 26 to positive filament on socket 18
- 10 From right post on rheostat 25 to positive filament on socket 15
- 11 From positive filament on socket 15 to positive filament on socket 13
- 12 From negative A post on block 1 to negative filament of transformer 2
- 13 From negative filament on transformer 2 to negative filament on transformer 8

Diagram 2—Grid Leads and Neutrodons

- 1 From center post on binding post block number 11 to left-hand connection of neutrodon number 12
- 2 From that same left-hand connection of neutrodon number 12 to grid of socket 13
- 3 From right-hand connection on neutrodon 12 to tap on neutroformer coil 14
- 4 From left-hand connection on neutrodon number 6 to grid of socket 15
- 5 From grid of socket 15 to stator connection on condenser number 27
- 6 From right-hand connection of neutrodon number 6 to tap of neutroformer number 16
- 7 From stator binding post of variable condenser number 28 to grid of socket number 17
- 8 From grid of socket number 18 to grid binding post of transformer number 10

Diagram No. 4—Plate Leads

- 1 From top blade of jack number 19 to filament connection of radio frequency transformer No. 4
- 2 From grid connection of radio frequency transformer number 4 to left-hand connections of fixed condenser 5
- 3 From that same left-hand connection of fixed condenser 5 to plate connection of socket 13
- 4 From the right-hand connection of the fixed condenser 5 to the upper contact of neutroformer 14
- 5 From lower contact of neutroformer coil number 14 to positive filament of socket 17
- 6 From plate connection of transformer 2 to plate of socket 17 (This is where phone should be inserted to balance neutrodons)
- 7 From plate connection of socket 17 to left-hand connection of fixed condenser 9
- 8 From right-hand connection of fixed condenser 9 to positive filament of socket 17
- 9 From plate connection of socket 15 to upper contact of neutroformer coil 16
- 10 From positive filament of socket 15 to left-hand connection of fixed condenser 7
- 11 From right-hand connection of fixed condenser 7 to lower contact of neutroformer coil 16
- 12 From right-hand connection of fixed condenser 7 to plate connection of transformer 8
- 13 From next to the bottom blade—



The photographs show the Formica front panel, Formica base board and Formica back panel used in the Stromberg-Carlson Neutrodyne set

For more distance and more volume, Use more Formica!

DESIGNERS and builders of sets incorporating radio frequency amplification—neutrodyne, super-heterodyne, and reflex—have found that the best possible parts will give far less than maximum results unless the greatest care is taken to prevent current leakages.

They are using Formica front panels, Formica baseboards for mounting the instruments, and in some cases Formica back panels for the battery terminals. The remarkable new Stromberg-Carlson Neutrodyne set is an example of what can be accomplished in this way.

There is often a difference that means loud speaker volume on stations that would otherwise come in only on the phones; it means logging new DX stations that would have been impossible before.

Insist on Formica. It won't warp. Binding posts won't loosen up because the material cold flows. The insulating quality is certain and uniform—and the finish the best there is.

Dealers who wish to give real service to their customers are urging the use of Formica base panels in these sets.

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FORMICA
Made from Anhydrous Bakelite Resins
SHEETS TUBES RODS

TUNE HIM OUT!
Just a touch—and it's done.

Goodman Coils, in their beautiful mount, are an ornament to any panel. Their sharp tuning is a joy to any radio fan. They can be used in any of the standard hook-ups, and improve them all. Diagrams given in our pamphlet. Send for one. **\$6.00** and P. F. on one pound

L. W. GOODMAN
Manufacturer
Draxel Hill, Pa.

There is only one **GENUINE** EBYS Binding Post

"with Tops which Don't Come Off"

EBYS Posts are scientifically designed, beautifully finished and their price is right.

This is our Foreign post which can be furnished either plain or engraved in twenty different markings.

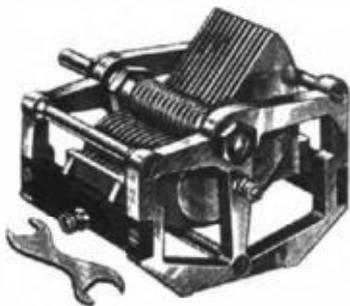
EBYS Are Binding Posts PLUS

H. H. EBYS MFG. CO.
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HARKNESS REFLEX

The circuit that put efficient radio within the reach of all. All developments of this system are now found exclusively in "Radio in the Home."

KENNETH HARKNESS is one of our Associate Editors and writes for no other publication.



No matter what circuit you use this "Lifetime" Condenser will improve it.

The finest condenser ever built by Bremer-Tully!

We guarantee that you will find more advanced features, more vital improvements, more essential advantages, in this Bremer-Tully "Lifetime" condenser than in any other.

In recent weeks radio authorities all over the country—men familiar with all the latest models of condensers—have examined, tested and proclaimed this Bremer-Tully "Lifetime" Condenser to be without equal.

It is unquestionably the most efficient condenser ever designed. It successfully meets all the most exacting tests. No matter what circuit or set you use this B-T "Lifetime" Condenser will im-

prove it and give you better results than ever before obtained.

Examine it at your dealer's. Note the adjustable bearing. Pigtail Connection, real straightline wave length, an exclusive method of die casting of unquestioned superiority, and many other B-T features. Send for the Bremer-Tully "20-Point" folder that explains why we guarantee this condenser to be the best obtainable.

"LONDON TO HONOLULU"

as reported by Chicago Tribune with the **NAMELESS CIRCUIT**

Have you built yours? Write for full information.

BREMER-TULLY MFG. CO.
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Every Night's a SILENT NIGHT

IF YOU'RE USING A COAST COIL, Absolutely cuts out local stations. A wonder for distance. Get a Coast Coil and really enjoy radio. If your dealer hasn't any, ask him to get one for you.



\$7.00

Sold with a Guarantee. Examine it at your dealer's.

COAST COIL

Feets Radio Corp., Phila., Pa. Makers of Famous Feets Crystals



Precise neutralizing for R.F. circuits

THE compact, leak-proof, moisture-proof construction, and the amazingly smooth, easy operation of MAR-CO neutralizing condensers work wonders in all Radio Frequency circuits.

Perfect neutralizing of tube capacity is customary—not exceptional—after you put in MAR-CO.

NEUTRALIZING \$1.25
CONDENSERS

MAR-CO

PRODUCTS

the one with the crook in it—of jack number 26 to B battery binding post on transformer 10

- From lowest, or frame, connection of jack number 26 to plate connection of socket 18

Diagram No. 5—B Battery Leads

- From plus A on binding post block number one to minus B on same block
- From middle blade on jack 19 to plate post on transformer 10
- From lowest blade, or frame, on jack 19 to plus 90 volt post on binding post block number 3
- From plus 90 volt binding post on block 3 to B battery binding post on transformer 8
- From B battery binding post on transformer 8 to B battery binding post on transformer 10
- From 22 volt binding post on block 3 to B battery binding post on transformer No. 2

Diagram No. 6—Loop and C Battery

- From rear post of binding post block number 11 to stator connection of variable condenser number 20
- From front post on binding post block number 11 to rotor connection of variable condenser number 20
- From front post on binding post block number 11 to left-hand connection of potentiometer number 22
- From center binding post on potentiometer number 22 to right-hand connection of fixed condenser number 21
- From left-hand connection of fixed condenser number 21 to negative filament on socket 13
- From center post of potentiometer 22 to grid binding post on transformer number 8 (the right-hand connection of potentiometer is not used at all in this circuit. The potentiometer is simply used as a rheostat and is a series resistance.)
- From rotor connection of variable condenser number 27 to grid binding post on transformer number 2
- From rotor binding post on variable condenser number 27 to left-hand connection of fixed condenser number 23
- From right-hand connection of fixed condenser number 23 to negative filament of socket 15
- From minus C binding post on block number 3 to filament connection of transformer 10
- From rotor connection of variable condenser 28 to negative filament of socket 17

Grimes-ing the Hazeltine

(Continued From Page 3)

tubes, excellent long distance loop operation is possible.

This loop is a feature that is not possible on the ordinary Neutrodyne employing 5 tubes. If more amplification stages are used it can be done, but then there is all the more reason for Inverse Duplexing.

Sometime last winter, Mr. Briggs, of St. Paul, called on me down in New York and told me of his encouraging results with Inverse Duplexing the Neutrodyne for loop operation. He outlined several symptoms of trouble and I proceeded to give him a few suggestions arising from my own experience.

He tried these with success and has written up this information for you. It was forwarded to "Radio in the Home" when the call went out for articles on Grimes sets built by the readers. In order to check up every detail, a similar set was built at 3XP

LOOK

For the Famous
THE ACOUSTICAL AMPLIFIER
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Variable Grid Leak

At all dealers or postpaid
Fits all sets, home made or factory built. Snap a DURHAM in place of present fixed leak. Send for Folder H.

Satisfaction Guaranteed

DURHAM & CO., Inc.
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Burned Out or Broken
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Including
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RADIO TUBE EXCHANGE
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Latest Development in
RADIO
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\$5 Easy Monthly Payments

The season's biggest sensation, Carl Franke's improvement over Neutrodyne, Super, Radios, etc. Fully regenerative. Brings new degree of musical quality, stability, and simple operation. Send magazine orders. Accessories included.

Write Today for FREE Trial Offer!
Write quick and get our special price offer with 5 week's trial, and our payments 1, 4 or 6 tubes.
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Watch for



Imported
LOUDSPEAKER
TYPE W

announcement in the September magazine, new in principle, new in shape, new in quality of reproduction. Price \$27.50.
Made by the makers of the famous N & K Head Set, Model D. 4000 ohms, price \$8.50.
TH. GOLDSCHMIDT CORP.
Dept. RH-3, 15 William Street, New York

The Traffic Cop
of the Air

He arranges in orderly fashion the mass and tumble of Broadcasting Stations that are seeking entrance to your set and brings 'em in, one at a time, so you can enjoy them! Never tune, but nearly always increases volume. Add a Ferbend Wave Trap to your set and "Police" your reception. Regulate the Traffic!

Guaranteed to tune out any interfering station. The price is 25¢. (Shipping to make parcel post \$1.25, U. S. and a few extra states). If you prefer, send cash to full with order and we will also pleasure yourself. Send no new order today.

FARBEND ELECTRIC COMPANY
22 E. South Waco St. Chicago, Ill.

with such astonishing results as to instill enthusiasm even in such "hard-boiled" hearts as H. M. N. and I have. The selectivity was as sharp as a razor and the quality, volume and distance were astonishing for loop operation.

The photographs and drawings in Mr. Briggs' article are very clear; but just a brief introductory word of description is in order. The set employs two stages of tuned radio amplification, a tuned detector and three audio stages. The tuning to the first tube is also the tuning to the loop. This loop acts as not only the aerial or pick-up device, but also serves as the tuning inductance in the grid of the first tube. This accounts for the set using only two neutroformers in place of the conventional three.

The same symptoms of trouble as outlined in the July issue of "Radio in the Home" in connection with the Grimes-3XP circuit still hold true for the Inverse Duplex Neutrodyne and it is recommended that that article be read again when testing Mr. Briggs' arrangement.

Radio Frequency Amplifiers

(Continued From Page 15)

permits him to amplify, at radio frequency, all wave lengths from 800 to 20,000 meters without changing the amplifier in any way. Figure 2 gives the circuit of such an amplifier and suggests suitable values for the apparatus. The repeating resistances should be non-inductive and have as little capacity as possible; lavite resistances are the most efficient. In constructing an amplifier using this circuit, the tube sockets, grid condensers repeating resistances and grid leaks must be arranged so that the length of the wiring between these parts is at an absolute minimum.

The effects of distributed capacity prohibit the successful operation of an untuned inductance-coupled radio-frequency amplifier over a wide range of frequencies. Each repeating inductance coil, with its distributed capacity, forms an oscillatory circuit with a resonant frequency within the range of frequencies covered by the amplifier. A signal with this resonant frequency is amplified well, since the oscillations set up across the repeating inductance are a maximum at this frequency, but the amplification of other frequencies is very poor.

It is possible, however, by actual tuning of the external plate circuit of each amplifying tube, to operate efficiently a "tuned impedance" amplifier based on the principles of the inductance-coupled system. In this way the maximum possible amplification can be obtained for any wave length within the range covered by the tuning of the circuits.

The diagram of Figure 3 shows the circuit of a practical application of this system. We show this circuit because many readers, possessing standard tuned plate regenerative receivers, can easily change their receivers to use this circuit, thereby adding a stage of radio-frequency amplification with only a slight rearrangement of their present apparatus and a few inexpensive additions.

In this circuit a variometer is shown for tuning the plate circuit of the radio-frequency amplifying tube. An inductance coil, shunted by a good variable condenser is equally efficient.

The distributed capacity effects which prohibit the operation of an untuned inductance-coupled radio-frequency amplifier must also be overcome in the transformer-coupled amplifier. It is possible, however, to construct an efficient transformer-coupled radio-frequency amplifier operating over a limited range of frequencies without actually tuning the plate or grid circuits of the amplifier.

Figure 4 shows the circuit of a complete receiver in which such a transformer can be used in the radio-frequency amplifier.

In a receiver using this method of radio-frequency amplification, it is imperative that a very selective tuner be employed as the radio-frequency amplifier is by no means selective; in fact, it is designed to be non-selective.

A highly efficient transformer-coupled radio-frequency amplifier can be constructed by providing the plate and grid circuits of each tube with a variable tuning element with which to adjust the various circuits to the same frequency as the incoming signal oscillation. Unfortunately, however, it is not possible to use more than one stage of radio-frequency amplification by this method as the tuning adjustments become too numerous.

It is possible, however, to effect a compromise and construct a two-stage radio-frequency amplifier in which only the grid circuits are tuned to resonance, the plate circuits being made "aperiodic." The circuit of a receiver using this method of radio-frequency amplification is given in Figure 5. The voltage amplification of this system is remarkably good and the selectivity is excellent.

Figure 6 is a photograph of a radio-frequency transformer and condenser unit which is suitable for use in this circuit. The unit is the Harkness Flexformer, designed for the Harkness Reflex circuit, which uses the same type of tuned radio-frequency amplification as the circuit of Figure 2, Page 14.

How I Inverse-Duplexed the Neutrodyne

(Continued From Page 10)

tapped about every two turns. Moving this tap-switch toward one end or the other (you soon find out which) cuts down the volume on powerful stations and prevents overloading the tubes. Changing this switch makes a slight change in the dial reading of the antenna tuning condenser. The potentiometer is used as a series rheostat, one post being left blank, and it does exactly the same thing as moving the tap-switch. It really acts as a vernier.

Cheap paper condensers should not be used, since a short-circuited by-pass condenser throws the whole "B" battery into the filament circuit.

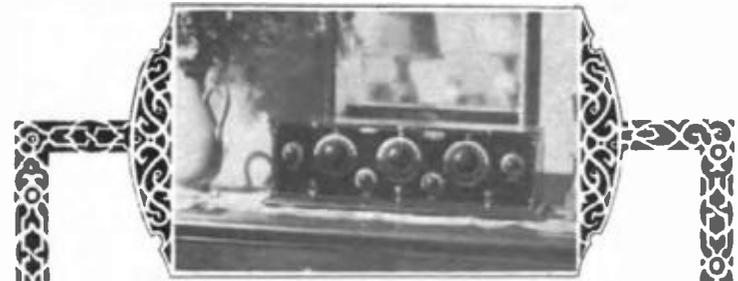
For use with the phones only about 66 volts "B" battery are necessary—in fact 45 volts work fairly well. But you can get wonderfully clear and pure loud speaker results with about 150 volts, regulating the volume and quality by changing the "C" battery voltage for the best tone. Up to about 90 volts no "C" battery need be used.

This outfit doesn't begin to eat up "B" batteries the way regular neutrodyne does, and uses only about half the plate current used by a super-het. For purity of tone and for freedom from interference it has those two excellent circuits backed off the map. You would never know that Continental code had been invented, and can use phones on this set when there is so much static that either of the above-mentioned sets is simply out of the running.

Every time I turned the loop in certain directions I promptly got a noise like a fire department Klaxon. Then I wrote to Mr. Grimes, and he told me that of course the neutroformers would feed back into the loop when it was anywhere near parallel to them. They certainly did.

So I shielded all six sides of the cabinet inside with stiff sheet copper. It was an awful job when the set was already built, but it would not have been hard at the start. When this shielding was all grounded to the A plus, the Klaxons were no more, and not only that, but the tap-switch could be carried at maximum most of the time with great increase in volume.

Neutralizing the set is done in the usual way, as described in the Fada



Plus Clearness



Priced at \$115.00, 1000 tubes and accessories, the XL-5 represents a wonderful value in a fine receiving set. (West of the Rockies \$120.00.)

Reputable radio jobbers and dealers will be interested in a detailed description of the A-C Dayton XL-5. Our sales plan is an attractive one. Write for complete information.

GUARANTEED WITHOUT RESERVATION

Here is a new receiving set—designed as all fine sets, to give volume, selectivity, distance and simplicity of operation—but PLUS one feature that marks its superiority—CLEARNESS OF RECEPTION.

The A-C Dayton POLYDYNE XL-5 is a super, five-tube receiver that will enable you to honestly enjoy your favorite programs without the annoyance of interference and distortion. The XL-5 receives the finest orchestral and vocal music exactly as played, with perfect clarity of modulation.

True radio enjoyment will be yours with this new receiver. Its mechanical refinements have resulted in a beautiful set, one that will fit the arrangement and decorative scheme of any room in the home.

Your radio or music dealer will gladly demonstrate the A-C Dayton XL-5 for you. Ask to see it—to hear its remarkable clearness of reception. Write for the name of the nearest dealer.

THE A-C ELECTRICAL MFG. COMPANY
DAYTON, OHIO
Makers of Electrical Devices for Over Twenty Years



P. W. AIRKORE SUPER EIGHT

Identically the same as tested by Henry M. Neely

Our Transformer is the heart of the AIRKORE Super Eight, absolutely prevents distortion and results in sharp tuning. Set of four transformers, including panel layout, base board layout and circuit diagram..... \$25.00

Complete package of parts, including everything necessary to build your Super Eight identically as illustrated by Mr. Neely. Drilled engraved panel, base board and all parts ready to put together, even including the solder.. \$85.00



PHILADELPHIA WIRELESS SALES CORP.
133 N. 11th Street, Philadelphia, Pa.
Formerly 1633 Pine St., Philadelphia

RADIO PARTS FREE

Do you need any parts, tubes, or batteries; a loud speaker or a complete set?

We will send them to you in exchange for subscriptions to RADIO IN THE HOME.

Tell us what you want and we will tell you how many subscriptions you will have to secure to get it free.

RADIO IN THE HOME, 608 Chestnut Street, Philadelphia, Pa.

on. They will sell entirely on performance, but the advertising must be particularly carefully worded and made particularly attractive to the woman before the prospective customer will even feel interested enough to go to his dealer and have a demonstration.

The demonstration is today the necessary precedent to a sale of a set or a loud speaker. Claims made in advertising will not sell either of these instruments.

The manufacturers of such things would do well in preparing their advertising copy for the coming season not to go over the same old ground which has been gone over so frequently in the past, but to map out some new kind of appeal that will arouse the interest of a man who is going to buy a set and that particularly will arouse the admiration and envy of the woman in whose home it is going to be used.

I am glad to hear from correspondents in a number of cities that the better class dealers are now making arrangements to sell radio sets on time payments. I said over a year ago in an editorial that radio would never be a competitor of the Victrola or the piano until the time payment plan of selling was very widely distributed.

The average American family does not have two or three hundred dollars lying idle in bank without knowing what to do with it.

On the other hand, the average family can quite comfortably finance the expenditure of two or three hundred dollars for a really desirable addition to the home provided the retailer will make the arrangements usually made for payments in monthly installments.

This, I feel, is the problem which will have to be faced and correctly solved this winter.

Technically, we have all that we need to offer to the public; what we need to offer them now is a merchandising plan which will place us upon the same basis as the merchandising plans of other industries which have an intimate touch with the American home.

Who'd Be an Editor?

THERE is an old tradition that the mark of a great editor is an unerring instinct for printing the right thing at the right time.

If it is really a criterion, then, as a great editor, I would make an excellent hod carrier.

Last month we printed an article about Station WLAG, and just at the time we went to press—when it was too late to change anything—the failure of Cutting & Washington, and the closing of Station WLAG was announced. That meant that our August issue came out with a very wonderful article about a station which was no longer in existence.

In our April issue, we printed a fine story about Station WJAZ, in Chicago, and just about the time everything was being engraved upon the rotogravure cylinders of our press, WJAZ passed out of existence and changed hands.

Much the same thing happened in the March issue when we carried a fine story about Station WJAX, of Cleveland, which was then operated on the building of the Union Trust Company. No sooner had we closed up all of our forms when nothing could be changed than Station WJAX moved and the article that we printed was a splendid description of an outfit which was no longer in existence.

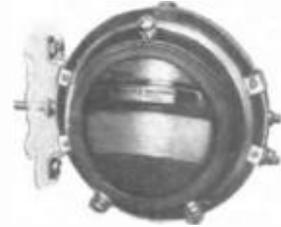
And yet some people say that the life of an editor must be an easy one.

H. M. N.

For Better Reception



Patent Applied for



Select with a
Variable Clarifying Selector

A new aerial tuning device, based on correct fundamental principles. Consists of a variable aperiodic primary and a fixed secondary to be shunted by a .0005 mfd. variable condenser. Actually permits control of coupling and selectivity. Used wherever a variocoupler, fixed coupler, aerial variometer or tapped coils are employed. *ETW:mater tape.*

LIST \$7.00

Amplify with a
VT25 Variotransformer

A variable radio-frequency transformer, amplifying equally throughout the entire broadcast range. Its extreme efficiency delivers results equivalent to two stages of fixed radio-frequency transformers, plus an added selectivity control. May be used with any tube available on the market, but is especially recommended with UV-201A and UV-199 tubes.

LIST \$8.50

For AMPLIFICATION, SELECTIVITY and CONTROL, build the Lloyd C. GREENE CONCERT SELECTOR, as described in the August "Radio in the Home." Send for our free diagram-booklet.

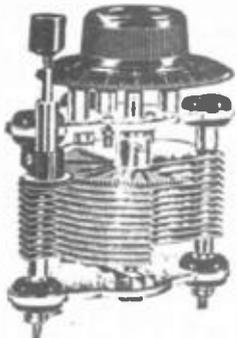
Jobbers; Dealers—Send For Our Latest Trade Sheet

LANGBEIN & KAUFMAN

High Grade Low Loss Tuner Specialties

654 Grand Avenue (Dept. R) New Haven, Conn.

The NEW Heath Non-Dielectric Condensers



OLD-fashioned dielectric end plates (insulating material) which waste condenser efficiency just as leaky piston rings waste gasoline, completely discarded in the new HEATH CONDENSERS. Grounded end-plates of aluminum entirely do away with the old difficulties of dielectric loss and warping of plates. No shielding necessary. All metal, except for the small pieces of hard rubber in the end plates which separate the rotor from the stator plates. Therefore extraordinarily rigid—Minimum Loss.

Permanently FLAT Plates

The well-known Heath process of stamping rotor plates makes the new HEATH an instrument of lasting accuracy.

HEATH Sockets

with the Exclusive Shock Absorber Feature

Bakelite base into which phosphor bronze, self-cleaning contacts are securely embedded. Binding posts are slotted hexagon nuts. HEATH Standards of material and workmanship. Price 75c each.

Micrometer Geared Vernier

Ordinary adjustments reduced by separate geared adjustment to hair-breadth distinction. The most highly perfected vernier so far developed.

HEATH Bakelite Dials

Specially designed easy grip-knob, beautifully proportioned, highly polished and clearly incised. Brass bushing centered by precision machinery to positive accuracy for perfect balance. Made in 2 inch, 3 inch and 4 inch diameters. A typical HEATH product

No. 101—2-in. dial for 1/4-in. shaft, 80c
No. 102—3-in. dial for 1/4-in. shaft, 85c
No. 103—4-in. dial for 1/4-in. shaft, 90c

Write Today for Literature

HEATH RADIO & ELECTRIC MFG. CO.

205 FIRST STREET, NEWARK, N. J.

Canadian Distributors: Marconi Wireless Telegraph Co., Montreal, Canada.

Stands Guard Over Them All

For every type of radio battery—"A" and "B"—dry or storage—there is a Sterling Pocket Meter to tell you that danger lurks or all is well.

You can use either a Sterling voltmeter and Sterling ammeter or a combination Sterling voltmeter.

Regardless of anything else, you can feel absolutely sure that Sterling Meters tell nothing but the truth. They pledge reliability and by virtue of their right resistance never overdrain the battery under test.



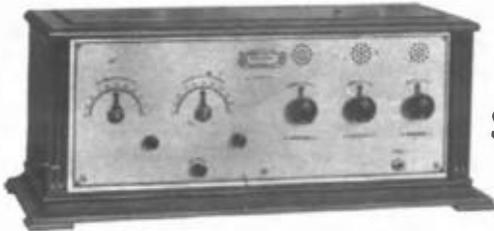
THE STERLING MANUFACTURING COMPANY

Dept. J
2831-53 Prospect Ave.
Cleveland, Ohio

Sterling POCKET METERS

Astonishing Performance for the Price!

Four-Tube
\$75



Five-Tube
\$120

Goldcrest Cleartone Radio Sets in four and five tube sizes will give you more volume, more distance and more selectivity than anything offered at anywhere near the price. You will find that on the average you must pay 40 per cent more to get sets that equal them.

Examine the materials and you will find them the best—good condensers, moulded sockets, Formica base panels—and neat, accurate and clean-cut wiring.

The high-grade mahogany cabinets and brass panels give them the finest possible appearance.

Jobbers and Dealers: Test the Cleartones and your own Judgment will tell you it offers a wonderful selling opportunity.

Model 60.....	\$60.00	Clear-O-Dyne Model 71,	\$90.00
Model 61.....	75.00	Clear-O-Dyne Model 72,	135.00
Model 62.....	120.00	Clear-O-Dyne Model 80,	120.00
Clear-O-Dyne Model 70	75.00	Clear-O-Dyne Model 81,	190.00

THE CLEARSTONE RADIO COMPANY, Cincinnati, O.

Reason No. 1 for specifying

RATHBUN

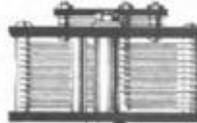
SINGLE-HOLE MOUNTING

SUPERIOR CONDENSERS

The only Condenser that requires the drilling of just ONE hole. You can't spoil the panel. No possibility of mounting screws pulling plates out of alignment. All types of "RATHBUN" Condensers (except the No. 3 Plate Vernier) are interchangeable in the same hole. Alterations in the circuit are thus made extremely easy. "RATHBUN" Condensers incorporate every possible improvement so far developed by scientific research in the principles of Variable Condensers. Minimum amount of pure Bakelite used, consistent with strength, to insure low dielectric loss. No current through bearings. In Combination Types, vernier and main rotor shafts absolutely independent, impossible for one to move the other. Non-magnetic material used exclusively.

There is no such thing as a Condenser being just as good as a "RATHBUN" without these important advantages.

FOR YOUR PROTECTION



Look for this moulded seal appearing on every original Single Hole Mounting, Low-Loss, unconditionally guaranteed Condenser.

Prices on 3 to 43 Plates types—\$1.00 to \$6.00



RATHBUN MANUFACTURING CO., INC.
JAMESTOWN, NEW YORK

For Your Super— faultless coupling!



Housed in beautiful bakelite cases, exactly similar, are these two All-Americans of characteristic high quality: a sharp-tuned Air-Core Transformer which filters out a 10,000 meter wave, and a Coupler which enables the oscillator to deliver a remarkably uniform output.

Type R-120 Filter Transformer.....\$6.00
Type R-130 Short-Wave R. F. Coupler..\$5.00

Known and relied upon everywhere for splendid intermediate-frequency amplification, the All-American "Long Wave" gives maximum results at all wave lengths from 4,000 to 20,000 meters.

Type R-110 Long-Wave Transformer...\$6.00

The new RADIO KEY-BOOK—Just Out—Hook-Ups—Helps—You'll be surprised! If you haven't ordered yours, send 10c—coin or stamps.

RAULAND MFG. CO., 2666 Coyne St., Chicago
PIONEERS IN THE INDUSTRY



ALL-AMERICAN
AMPLIFYING TRANSFORMERS
Largest Selling Transformers in the World



KELCOIL

The Wonder Tuning Coil
Most-Talked-About Coil on the Market

THIS IS THE ORIGINAL AND ONLY KELCOIL

DISTANCE—VOLUME—CLEARNESS
SIX DOLLARS

SELECTIVE  **SENSITIVE**

Philadelphia, Aug. 3, 1924.
 Myra Radio Products Corporation, Philadelphia.
 Dear Sirs:
 No doubt you have seen my name in the Philadelphia papers in the past year. This was due to the success which I had in using a 3-circuit coil in a radio receiving set. This coil was a Philadelphia-made coil when I used it, and is now being made in New Jersey. This coil gave me very good results and I was pleased with it and used it up until about two months ago. At that time I tried a Kelcoil in a set and have been using it since that time and it has surpassed the first coil by far.
 I do not know whether it would interest you or not, but I have been able to hear the West Coast about 16 times in July, and have received letters verifying my hearing these stations in the month of July. The letters I have received to date are from three different Los Angeles stations, Oakland and Seattle, Wash.
 The Seattle station I heard was the first time I had heard this station. I expect to hear the West Coast and have verifications from there more in this month than I did in July, and if you are interested in seeing these verifications I will bring them to you.
 It has been very interesting for me to build a set and use this coil and receive these stations, as I have tried all circuits, from crystals to 8-tube qubers, and I find some very interesting things in all these different sets I try, and also find the sets work differently by using different parts to make these sets, but at the present time I think I have found the right combination and it is working fine, after rebuilding and trying different condensers, coils and transformers to get true reproduction of voice and music.
 Hoping this letter will be of some interest to you, I am,
 Yours very truly, (Signed) Wm. H. Kleinberger.
 Known in conjunction with the Kleinberger Circuit.
SYCO RADIO PRODUCTS CORPORATION
 440 Drexel Bldg. Philadelphia, Penna.
 FOR HOOKUPS AND WIRING SEND US TWENTY-FIVE CENTS MAILING EXPENSES



FADA

Improves the 5-tube Neutrodyne

YES, sir! We've made it better in every way. Improved its looks, improved the circuit, eliminated unnecessary detail in making, and incorporated the latest and best ideas in Neutrodyne efficiency. Letters from ten thousand FADA boosters have helped us work out the new and improved FADA 5-tube Neutrodyne. We've put all binding posts in the rear, simplified the wiring and beautified the panel arrangement. Two stages of radio frequency, detector and two stages of audio frequency amplification (using the new FADA Audio Transformers) make this new FADA Neutrodyne about the best looking and most dependable radio

receiver anyone can make. Your dealer sells the new FADA knock-down set of Neutrodyne Receiver Parts No. 169-A for \$72. Look for it in his window. With every one goes the new and enlarged edition of

"How to Build FADA Neutrodyne Radio Receivers"

This is the latest and most up-to-date 76-page text-book on Neutrodyne. 38 pages of pictorial description, 44 illustrations, 30 pages of receiver trouble shooting in general and a fine, big, full-size picture wiring diagram. This picture wiring diagram alone is worth the price of the book. Book sold separately on receipt of price—use coupon below.

F. A. D. ANDREA, INC., 1581 JEROME AVENUE, NEW YORK



F. A. D. ANDREA, INC.
1581 Jerome Ave., N. Y.

Gentlemen: Enclosed find 75 cents, for which send me the new FADA book, "How to Build FADA Neutrodyne Radio Receivers." R

Name.....
Street or R. F. D.....
City.....
State.....



The Tube *means* Music or Noise

All Radiotrons now
reduced to \$4.00

It isn't a genuine WD-11
unless it's a Radiotron.

It isn't a genuine WD-12
unless it's a Radiotron.

It isn't a genuine UV-199
unless it's a Radiotron.

It isn't a genuine UV-200
unless it's a Radiotron.

It isn't a genuine UV-201-a
unless it's a Radiotron.

Buying anything but the best in vacuum tubes is like trying to run a car on gas that is half water. In radio, everything, in the end, depends upon the Radiotrons. You can put perfectly good Radiotrons in a poorly made set—that's true. But the point is that the very finest receiver made can be no better than its tubes. This is

no new or startling announcement. Everyone knows it. And that's why, at the radio counter, you see each man pick up a Radiotron, and look at the base for the word "Radiotron" and at the glass for the "RCA" mark. For best reception—real music—nothing short of the best in tubes will do.

Radio Corporation of America

Sales Offices:

233 Broadway, New York

10 So. La. Salle St., Chicago

433 California St., San Francisco, Cal.



This symbol of
quality is your
protection.

Radiotron

REG. U. S. PAT. OFF.

DISTANCE covered in record time while all the world wondered. News received in one part of the country only a few weeks after it was sent from another. That was the pony express.

Today, news, messages, entertainment—all are instantly brought from all over the land right to your home by the Pony Express of the air—Crosley Radio Receivers. New York hears California. Florida listens to Hawaii. Texas converses with Mexico. North Dakota keeps touch with the MacMillan expedition at the North Pole. Such are the daily performances of Crosley Receivers. They are told by hundreds of unsolicited letters from happy users.

At bringing in distant stations in a clear, enjoyable manner, Crosley Instruments, each in its own class, have proven themselves unexcelled. Yet they are the lowest priced radio receivers ever offered.

For satisfactory results, real radio value, you can't beat a Crosley.

Listen in on a Crosley Before You Buy

For Sale by Good Dealers Everywhere

THE CROSLY RADIO CORPORATION

POWEL CROSLY, JR., President

1060 Alfred Street

Cincinnati, Ohio

with
Three
detector
speaker volume

For Tubes Add 2-.

Prices Was.

All Crosley Receivers...
under Armstrong U. S. Pat. 1
The Crosley Radio Corporation
operates Broadcast Station



MAIL THIS COUPON TODAY

The Crosley Radio Corporation,
1060 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

NO
4

... REDUCE
YOUR OPERATING
COSTS ON HEAVY
CURRENT SETS

NEW!

Eveready Heavy Duty "B" Battery.
45 volts. Three Fannedstock Clips.
length, 8³/₈ inches; width, 4¹/₈
inches; height, 7³/₈ inches; weight,
3¹/₂ pounds.

New low price, \$4.75

"B" Battery No. 770

Service

... *New Eveready*

... the following general cases:

... sets operating at 90 volts or more, having
... without a "C" Battery, and all sets having five
... ore tubes, with or without a "C" Battery.

... all power amplifiers.

On all sets that pull heavy currents from the "B" Battery.

Under the above conditions, the *New Eveready Heavy Duty*
45-volt "B" Battery will give much longer service than the
45-volt "B" Battery of usual size.

If your receiving equipment falls under any of the above
classifications, you can make a big saving in "B" Battery costs
by using this *New Eveready Heavy Duty* 45-volt "B" Battery
No. 770. Buy it and you get the biggest battery value on the
market to-day!

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery Information
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Radio Batteries

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No. 7111
Eveready Radio
"A" Dry Cell
Specially
manufactured for
use with dry cell
tubes



Eveready 6-volt Storage
"A" Battery

No. 766
Eveready "B"
32 3/8 width. Six
Fannedstock Spring
Clip Connectors

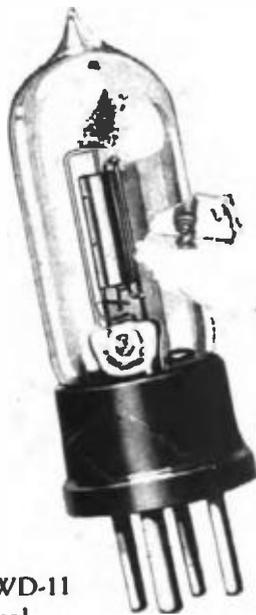


No. 772
Vertical 45-volt, large
size "B" Battery

No. 771
Eveready "C" Battery
Clarifies tone and
prolongs "B" Battery life



No. 764
Vertical 25 1/2-volt
"B" Battery



Radiotron WD-11
The ideal
dry cell tube.



Give Radiotrons *for Christmas*



This symbol of
quality is your
protection

It isn't a genuine WD-11
unless it's a Radiotron.
It isn't a genuine WD-12
unless it's a Radiotron.
It isn't a genuine UV-199
unless it's a Radiotron.
It isn't a genuine UV-200
unless it's a Radiotron.
It isn't a genuine UV-201-a
unless it's a Radiotron...

Take a peek into any radio fan's set—and you know what to give him for Christmas. Note the type of Radiotron he uses. Go to any radio store—and when you buy, look for the name RADIO-TRON and the RCA mark. Then you are sure to be giving him *genuine* Radiotrons. And mighty sure to be giving him the gift for a Merry Christmas.

Radio Corporation of America

Sales Offices

233 Broadway, New York

10 So. La Salle Street, Chicago, Ill.

28 Geary Street, San Francisco, Cal.

Radiotron

REG. U. S. PAT. OFF.



Natural tone quality
wonderful volume with a FADA Neutrola.

IN THE "Neutrola," FADA has produced a radio receiver that possesses every essential to your complete enjoyment of radio. It is a new and better designed five-tube Neutrodyne set, refined to give the most faultless reproduction of music and voice. You can, without exaggeration, imagine yourself in the very presence of the musicians and artists.

Selectivity is but one remarkable feature of the "Neutrola." With powerful local broadcasting stations operating, the "Neutrola" cuts through them and brings in outside stations, hundreds of miles away, on the loud

speaker with minimum interference.

The "Neutrola" cabinet is of genuine mahogany, inlaid with a lighter wood. A decorative grill covers the built-in loud speaker, and a drop desk lid hides the panel when the set is not in use. The "Neutrola" is fitting company to the finest furniture in the home.

In addition to the "Neutrola" there are other FADA Neutrodyne receivers in sizes and styles to meet every desire; three, four and five tube receivers in plain and art cabinets at prices ranging from \$75 to \$295, each extraordinary in results; each a remarkable value.



F. A. D. ANDREA, INC., 1581 JEROME AVENUE, NEW YORK

FADA
Radio

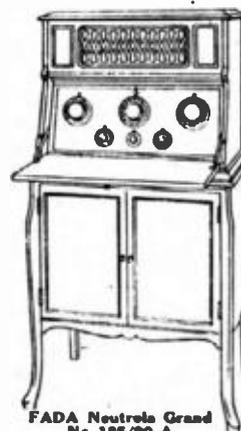
FADA Neutrola
Five-tube FADA Neutrodyne, with self-contained loud speaker. Genuine mahogany, artistically decorated with wooden inlay. Ample space for all batteries and charger. Drop desk lid that hides receiver when not in use. Price (exclusive of tubes and batteries) \$220.




FADA "One Sixty"
No. 160-A
"The receiver that has taken the country by storm." The best known of all Neutrodyne. Four tubes. Price (less tubes, batteries, etc.) \$120.



FADA Neutro Junior
No. 190
Three-tube Neutrodyne. A wonderful performer. Price (less tubes, batteries, etc.) \$75.



FADA Neutrola Grand
No. 185/190-A
The five-tube Neutrola 185-A, mounted on FADA Cabinet Table No. 190-A. Price (less tubes, batteries, etc.) \$2