

August, 1924

RADIO IN THE HOME

TWENTY CENTS

by HENRY M. NEELY



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HAZELTINE

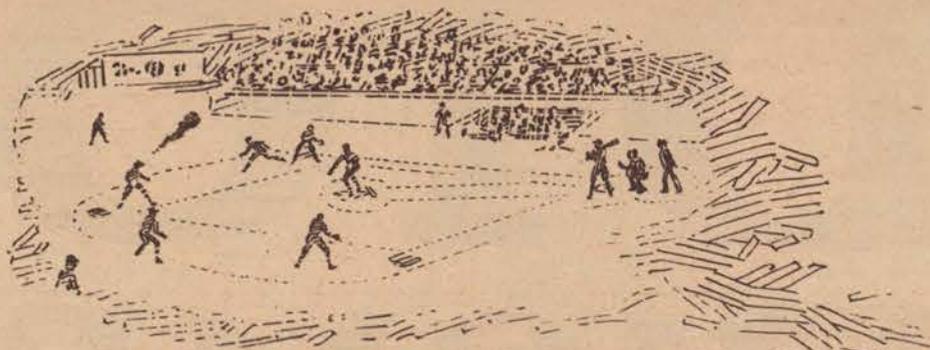
Authorizes Our Articles
on the

NEUTRODYNE

THE SANDMAN

Arranged and photographed by Harry S. Hood
Keith's Theatre Building, Philadelphia

**GRIMES
HARKNESS
NEELY**



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Music Master, with its rich, clear tone—unmarred by muffling, blast or distortion—will make radio a pleasure, such as you have never known before.

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THAT Crosley Radio Receivers have given complete satisfaction in the past is evidenced by the fact that, during the last twelve months, The Crosley Radio Corporation produced more receiving sets than any manufacturer in the world. That the new line of Crosley instruments, illustrated herewith, will give even better service is assured by the exhaustive tests to which each model has been subjected both in our laboratories and in actual use under all weather conditions.

Each Crosley Model is designed to give the utmost efficiency at the lowest cost. You may start with a small receiver and as you desire add to it to increase its range and volume.

Starting with the one-tube Crosley 50 for \$14.50 you can add the two stage Amplifier Crosley 50-A for \$18.00 and have a three tube regenerative receiver for \$32.50. Or to the two-tube Crosley 51 for \$18.50, if greater range is wanted, add the one stage Amplifier Crosley 51-A for \$14.00 thus making a three tube set for \$32.50. Or purchase the Crosley 52 a three tube regenerative receiver for only \$30.00.

You can pay much higher prices for radio receivers. But we have yet to find one at

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For selectivity, ease of tuning and nicety of calibration, this instrument has astounded radio experts wherever it has been tried. The other Crosley Models will give comparatively equal performances. No matter which you choose, the clearest possible reception from exceptionally long distance is assured you.

Before you purchase a radio receiver listen in on a Crosley. Compare its performance with any other instrument on the market. We know then that you will choose a Crosley.

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CROSLEY 50—A new one tube Armstrong Regenerative Receiver. We believe this to be the most efficient one tube receiver ever put on the market. Price \$14.50
Crosley 50-A, two tube amplifier may be added at \$18.00

CROSLEY 51—Two tube regenerative receiver, the biggest selling radio receiver in the world. Gives loud speaker volume on local and distant stations under average conditions. Price \$18.50
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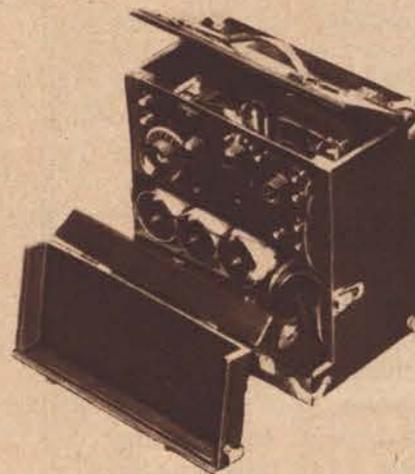
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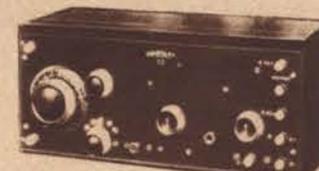
Crosley 50, \$14.50



Crosley 51, \$18.50



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Crosley 52, \$30.00



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

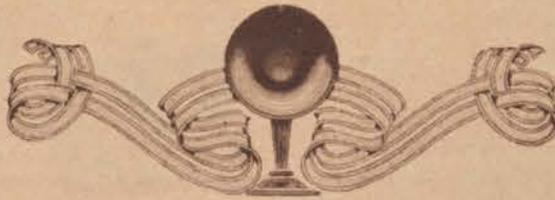
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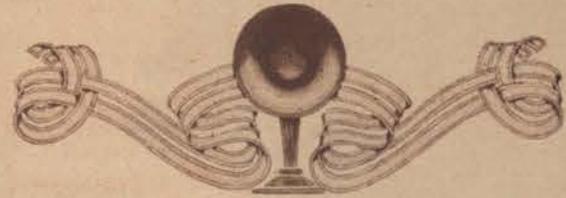
CROSLEY

Better - Cost Less
Radio Products





EDITORIALLY SPEAKING



Fewer But Better Broadcasters Are Vital to Radio

THE plan of the large electrical and radio companies to establish ten super-broadcasting plants in various sections of the country seems to have stirred up more opposition than its projectors expected. I notice that the American Radio Association in its recent announcements is quite bitterly fighting the plan, and I am rather sorry to see opposition coming from that quarter.

It seems to me that the inevitable development of the broadcasting situation is toward the elimination of the smaller and less efficient stations, and the concentration of broadcasting into a few large groups, amply financed, with adequate resources of material and talent, and with sufficiently solid foundations to guarantee their permanence.

We are suffering badly today from entirely too much broadcasting. If all of this broadcasting were good, I should not say that we are suffering, but the undoubted fact remains that really a majority of the stuff that is put on the air is little short of frightful and the kind of thing we would refuse to listen to if the so-called artists were to try to give the same performance in our own homes.

The project to establish ten super-power stations was revealed by Pierre Boucheron, publicity manager of the Radio Corporation of America, in a speech before the convention of the Associated Manufacturers of Electrical Supplies in Atlantic City. Mr. Boucheron outlined the plan for this immense chain of high-powered stations, and almost immediately the American Radio Association began to find objections to it.

I notice in one of the bulletins put out

By

Henry M. Neely

there will no longer be this lure and the radio industry will suffer.

Unfortunately this is the same near-sighted view of radio that most of the industry is taking. It seems to me that the whole industry is running around in circles. This is further shown by the fact that the Association is acting as a publicity medium for an esteemed contemporary in offering a prize of \$500 for the best solution of the problem, "Who Is to Pay for Broadcasting?"

I hate to disappoint all of the other competitors but I am going to win that \$500 prize right now. My answer consists of just five words, and they are as follows:
There is no such problem.

I am quite willing to admit that the people who are paying for broadcasting now—particularly the radio and electrical manufacturers—are very anxious to solve the problem of how to saddle some of the expense on somebody else. That, however, is quite a different question. Failing in any attempt to make others defray the expense of the broadcasting, these big companies will quietly go ahead and bear the expense themselves, but will even more quietly

AUTHORATIVE ARTICLES ON THE NEUTRODYNE

IN THIS issue of *Radio in the Home* we are printing the first of a series of articles which, to all intents and purposes, may be regarded as having been written by Professor L. A. Hazeltine, inventor of the famous neutrodyne circuit.

It was our hope that Professor Hazeltine himself would actually be able to find time to prepare for us an article for each month's issue of this magazine, so that our many readers who are interested in his circuit would have a regular source of first-hand information to guide them in their purchase and use of a neutrodyne set. Professor Hazeltine himself rather hoped that this arrangement could be made, but he has found the many demands upon his time so great that it was impossible for him to carry the plan through.

We have accordingly made the next best arrangement, and these articles will be written by J. F. Dreyer, Jr., chief assistant to Professor Hazeltine, who probably knows more about the neutrodyne circuit than any man in the world except Professor Hazeltine himself. These articles will all be written in collaboration with Professor Hazeltine, and Professor Hazeltine will read every one of them and give it his personal approval before it is sent to us for publication. It seems to me that the greatest

(Continued on Page 42)

by the Association that the main point made against the proposition is that the radio industry of today has been developed almost entirely on the lure of getting distant stations. The Radio Association fears that, with ten great stations almost blanketing the country as far as radio is concerned,

see that this expense is distributed pro rata among the public in the price of radio apparatus. I have not the slightest objection to this and I do not see why any listener-in should object. It is a perfectly fair and perfectly logical method of doing it. I myself am willing to pay a little extra for everything that I get in radio providing that extra payment means that broadcasting will continue and will also improve.

But there is one thing which is absolutely certain. That is, these big companies depend on

(Continued on Page 6)

RADIO IN THE HOME

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Build your Harkness Reflex With Genuine Radio Guild Parts

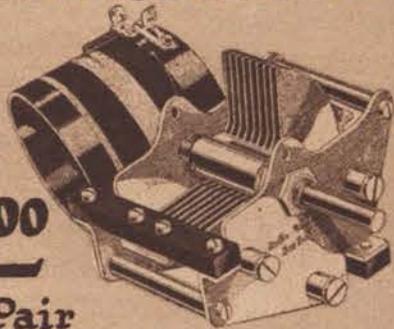
You can get cheaper imitations of Radio Guild parts for the Harkness Reflex, but don't forget they are cheap imitations and cannot give you the results you will expect. Only the genuine parts can and will give you the results. Ask for RADIO GUILD parts and see that you get them. Look for the Radio Guild Seal on every package. Don't be cheated!



35⁰⁰

Complete 2-Tube Kit

Flexoformers



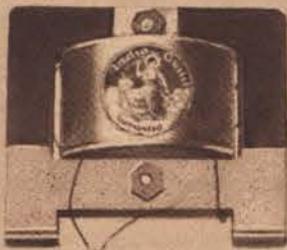
\$12⁰⁰
Per Pair

This Complete Kit Contains All Parts For 2-Tube Set

The parts in this Kit were designed by Kenneth Harkness, Chief Engineer of the Radio Guild, and are manufactured under his direct supervision. You may be certain, therefore, that the receiver you build with these parts will be perfect in every detail. You will find, too, that each part is specially prepared to simplify the work of construction. The panels are drilled; the terminals are numbered; the kit contains every necessary item—right down to the last screw. With only a screwdriver and a soldering iron you can put the whole set together in just a few minutes.

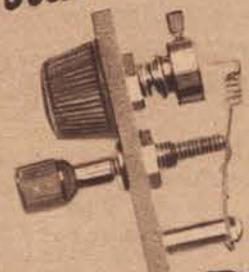
But be careful; don't let anybody sell you a bunch of cheap junk and tell you you can build the "Kenneth Harkness" Reflex with it. You can't, any more than you can build a Packard with Ford parts. Get the genuine RADIO GUILD parts and you'll save yourself real money.

Audio Transformer



\$4⁸⁵

Crystal Detector



\$2⁰⁰

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THE RADIO GUILD, Inc.,
256 West 34th Street, New York, N. Y.

RIH 8-24

Please send me your 36-page book with colored illustrations, photographs, wiring diagrams, blueprints of panel layouts and complete instructions for building the 2-tube Harkness Reflex, together with full descriptions of Radio Guild products, for which I enclose ten cents. Mail at once.

Name

Address

Editorially Speaking

broadcasting for their livelihood and therefore they are going to see to it that broadcasting continues to be popular no matter how much it costs them. The cost will be an excellent investment which will return a profit to them.

If you would change this problem into something like this—"Who is going to pay for a continuance of the more than five hundred stations that are in operation now?"—then I will say not only is the problem a very deep one, but that the solution is not at all desirable. I personally would like to see the Government withdraw licenses from more than half of the stations at the present time. It would be the best thing which could happen to the listener-in and to the radio industry at large.

Perhaps you may think that this statement is an exaggeration, but I think it can be supported from two viewpoints.

First let us look at radio as compared with such an industry as the phonograph. There are 14,000,000 phonographs in use in the United States at the present time. The highest estimate of radio that I have seen is 3,000,000, and I think that that is an exaggeration.

However, for the sake of argument, let us raise that estimate and assume that there are 4,000,000 radio sets in the United States today. That means that there are 10,000,000 homes that have not been "sold" on radio. Now who constitutes most of this 4,000,000 who have already been sold? Obviously the fan, the man who likes to hook them up himself or to roll his own, the DX hound who will sit up all night to get the rasping announcement of a cross-continent station. The majority of the present 4,000,000 do not have radio for its genuine entertainment or educational value; it is a hobby, pure and

(Continued From Page 4)

Consequently, nothing that you do in the broadcasting situation is going to alienate them.

And yet the entire radio industry instead of going after the 10,000,000 who are not yet sold, seems to be tumbling all over itself in a mad effort to resell the 4,000,000 people who are already thoroughly sold.

That is what seems to me to be pathetic and almost tragic short-sightedness. It looks to me like running around in circles and getting nowhere for the future. It seems to me the sensible thing for the radio industry to do is to concentrate on the 10,000,000 who are unsold, confident that the 4,000,000 who are already sold are going to stay sold no matter what happens.

Now, why is it that these 10,000,000 people have not yet been sold on radio? I think it is explainable on any of a number of reasons.

First—To most of them a radio set of today looks so complicated that they have neither the desire nor the ability to master its mechanism.

Second—The quality of reproduction furnished by a large majority of cheaper sets, and particularly of homemade sets is so unquestionably bad that they would not have it in their homes.

Third—With the multiplicity of present broadcasting stations, it requires a keen sort of skill to be able to tune in between to get the desired distant stations, and they

do not wish to spend the time necessary in acquiring this skill. In this phase of radio, we are taking the same position as would have been taken by the bicycle industry in the early days if they had made machines which could be ridden only by expert trick riders.

Fourth—There are so many broadcasting stations today that (Continued on Page 34)

THIS magazine is hard boiled in its refusal to print any of the reams of "canned" copy sent out by the publicity agents of various manufacturers. We insist that everything we use be exclusive to us. But every now and then some clever publicity man ships us something that hits us squarely between the eyes. This is the second time this person, Casey, has done it. If he keeps on we'll have to add him to our staff. Paste this poem in your radio log:

A Radio Pome

By ROBERT J. CASEY

*The man who named the sleeping cars and collars
And the man who christens every taxi-hack
Stood in silent introspection
As they eyed a new collection
Of the things that broke the dictionary's back.*

*"Wawatoosa!" "Skiddimunk!" and "Cleopatra!"
Said the Pullman namer swelling up with pride;
"Wave! Inductance! Duo-lattice
Curtate Epitrochoid that is"
Was what echoed in a husky voice replied.*

*"Chic!" and "Wavenrock!" "Van Herrold" and "Idilyo"
Said the collar man, "And others such as these:
'Kapitan!' 'De Luxe!' and 'Lancer!'"
But his poem brought no answer
'Microfarad," sighed the lackadaisic breeze.*

*"Let us sing the jolly dyne, the dyne dynastic.
Neutro, Plio, Poly, Io—quite a line
Dynes by scores and dynes by dozens
And their cousins! cousins! cousins!
An immortal mob—though not averse to dyne*

*Multi! Uni! Mono! Hyper! Super-Hel'ro!
Reflo! Geno! Radi! Telo! Dynish scions—
Mark the roster, friend—peruse it:
Ultra! Ano! Ampli! Whoosit!
And "Invited-Out-To!" Greatest of the dynes.*

*And the men who named the sleeping cars and collars
Turned away in saddened silence as they'd come
In the face of conversation
So above their oral station
They were wordless—speechless—hopeless—dizzy—dumb.*

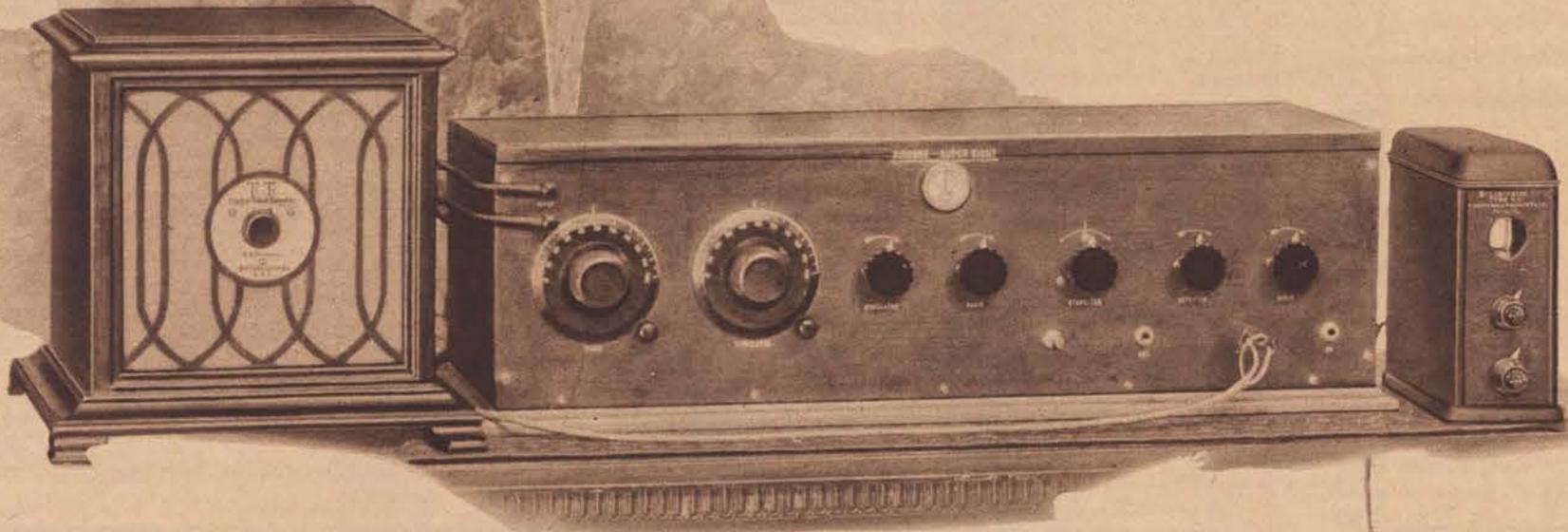
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simple, and very largely a mechanical hobby. I assume from this that the other 10,000,000 who are not sold are the kind of people who are not mechanically inclined but are desirous of having good entertainment and education in their homes. If they were not that kind, they would not have phonographs.

There is one thing certain in regarding the present 4,000,000; no matter what you do in radio, those people are sufficiently sold on it and are rabid enough fans to stay with you just so long as there is any radio.



TIMMONS - TALKERS



The Timmons Talker is delicate enough to reproduce the finest tone shadings; yet sturdy enough to render clearly the mightiest volume

Referred to for a couple of seasons past as "the most beautiful loud speaker in the world," the Timmons Talker has again been improved both in volume and clarity as well as appearance. Delicately moulded feet have been added as well as a beautifully designed top. The price, however, is the same—\$35. This is made possible only because heavy advance orders allowed us to go in for great production.

We spent several weeks experimenting with the diaphragm of the new Talker that the tones rich, round and full as they were, might still be made more natural. That we have accomplished this is shown by what Henry M. Neely, Editor of *Radio in the Home*, said when he heard the new Talker. "You have made a marvelous improvement," was his comment.

Now we ask you to hear the new Timmons Talker—in your own home, if possible. Also see how the Talker harmonizes with the other fine furniture in your home. It must be beautiful in its design, for in the recent contest by *Wireless Age*, sets with Timmons Talkers won two of the first three prizes. Your dealer carries Timmons Talkers. He will gladly give you a Timmons Talker folder, or we will send it direct.

The Timmons B-Limiter operates from your electric light socket entirely *without hum* and takes the place of your radio "B" Batteries on all tubes.

There is no changing of your set when you use the B-Limiter in place of "B" batteries. Just connect it up as you would "B" batteries and turn the rheostat to the voltages at which your tubes operate best. One of these rheostats regulates the soft detector tube voltage (up to 45 volts), and the other the amplifier tubes (up to 135 volts).

This voltage is constant—there is no dropping off as in "B" batteries when the batteries become weak. Also there are no cracking or frying noises *and no hum*.

The rectifying tube in the B-Limiter is the ordinary 201-A or 301-A type. One only is required. Except for this tube the B-Limiter comes to you complete ready to attach to your house current and operate your radio set.

Dealers are being supplied as fast as we can assemble and test B-Limiters. If your dealer does not yet have his allotment, he does have our folder "Eliminating the Radio 'B' Battery." Write to us if you wish us to send this folder direct. Please state whether you have alternating or direct current.

TIMMONS RADIO PRODUCTS CORPORATION
339 E. Tulpehocken St. Germantown, Phila.

TIMMONS B-LIMITER

It takes the place of the Radio "B" Batteries



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

eg

Eveready "B" Battery No. 772 for detector and amplifier. Connections at 22½ and 45 volts. Three Fahnestock Clips. Approximate over-all dimensions, 8¼ in. x 3¼ in. x 7¼ in.

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WHERE table or cabinet space is limited, use this new vertical 45-volt Eveready "B" Battery No. 772. It has the same long life, the same steady high power as the horizontal Eveready 45-volt "B" Battery, but because it stands upright it takes less than half the table space.

Tables and most battery cabinets have more headroom than floor space. This battery is built in recognition of that fact. It fits the Radiola Super-Heterodyne cabinet perfectly.

Many multi-tube receiving sets use a "hard" detector tube which does not require fine adjustment of "B" voltage, so the new Eveready Vertical 45-volt "B" has but three plainly marked terminals, negative, plus 22½ and plus 45 volts.

Standing upright to save space, made of large, powerful cells to last longer, here is the battery you've been looking for.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, Inc., New York—San Francisco
Headquarters for Radio Battery Information

Canadian National Carbon Co., Limited, Toronto, Ontario

If you have any battery problem, write G. C. Furness, Manager, Radio Division, National Carbon Co., Inc., 120 Thompson Ave., Long Island City, N. Y.

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Radio Batteries

-they last longer



No. 767
"B" Battery, 45 volts
Variable taps
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Storage "A"
Battery



No. 766
Eveready "B"
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No. 7111
Eveready Radio "A"
Dry Cell
Specially manufactured
for use with dry
cell tubes



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

No. 764
The Space
Saver
Vertical
22½-volt
"B" Battery

RADIO IN THE HOME

This article has been read and approved by Professor L. A. Hazeltine



Professor L. A. Hazeltine, inventor of the famous neutrodyne circuit

THERE are in use today probably more neutrodynes than any other high-grade receiver. The remarkable popularity of this relatively new circuit has been due to the fact that a receiver employing it has a great many advantages over the older types. One may ask what are these advantages and how are they attained in the neutrodyne.

The answer is that, first—the neutrodyne is quiet. It takes the minute electric currents from the antenna, amplifies them and translates them into the audible signal which you enjoy from your loud speaker or your head phones. It does not introduce any local noises or squeals which annoy you and perhaps your neighbors also. Even when the operator is inexperienced, there is no possibility that the selection you wish to hear will be prefaced or interrupted by ear-piercing shrieks.

Furthermore, the neutrodyne is selective enough to discriminate between any two broadcasting stations operating on properly separated wave lengths, unless the user is located very close to a powerful station.

Also the neutrodyne is sensitive. Under favorable conditions, coast-to-coast reception with it is not uncommon. It may be said, with a fair-sized antenna, the utmost of amplification is attained. That is, any signal which is louder than the ever-present static may be heard. In other words, sufficient amplification is obtained so that if a signal is above the "noise

level," it may be heard on the neutrodyne.

Another advantage which appeals to many is the fact that the separate controls are absolutely independent. This makes it possible to record dial settings for each different station. Then at any future time this same station may be immediately picked up if it is on the air by setting the dials at the previously recorded points.

Among other less-important features the amplification is attained with a minimum of distortion. All this is done by utilization of the advantages of tuned radio-frequency amplification without regeneration.

Prior to Professor Hazeltine's invention, these things could not be done because of an action known as "feed-back." That is, in a receiver which attempted to use tuned radio-frequency amplification, it was found that some of the amplified energy was fed back through the tubes. This caused objectionable regeneration and oscillation (squealing). For this reason, this highly desirable form of amplification was discarded by most radio engineers. Professor Hazeltine, however, developed the method now bearing the name "neutrodyne," which prevents this undesirable feed-back.

This receiver (in its most common form) utilizes two stages of tuned radio-frequency amplification, detector, and two stages of audio-frequency amplification. The latter may be accomplished with separate tubes, or else one of the radio-frequency tubes may be used again

The Neutrodyne

1—Its Installation and Operation



By J. F. Dreyer
Engineer, Hazeltine Research Corp.

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by the reflex method. It is the purpose of the writer to describe how to install such a receiver properly, and how to operate it in order to obtain the best possible results.

The first thing to be considered is the location of the receiver. It should be placed on a suitable table or cabinet as near as possible to the window where the antenna enters, and to a radiator or other place where a good ground connection may be obtained.

It is best to have the antenna lead wire approach the set from the left. If it must approach the set from the right, it should be kept well away from the receiver. The reason for this is, that due to the great degree of amplification energy is actually fed through the air from the last coil and condenser to the antenna lead. This feedback may cause objectionable regeneration which, if present to a sufficient degree, will be noted by squealing of the receiver when a station is tuned in.

If the difficulty cannot be removed by shifting the position of the antenna lead, it should be shielded. A convenient method for doing this is to connect one wire of a twisted pair (lamp cord) to the antenna post and the other to the ground post. The proper wire of the pair may then be joined to the antenna itself, while the grounded wire is left free. This latter junction should be made at some distance—say six feet from the receiver.

The type of antenna should be chosen with the following considerations in mind. It has been said that the cheapest form of amplification is a good antenna. This of course is not always true. For a suburban or country dweller no reason ordinarily exists for not having a good outdoor antenna. It should be as high as possible and no longer than 100 feet including the lead in. A single wire properly insulated and protected by a grounding switch or lightning arrester is ideal for reception of distant signals. The size of wire is of no great importance electrically, but should be such as to provide sufficient mechanical strength.

The city user many times must be content with an indoor antenna. The best type for the neutrodyne is a single wire hung clear of the walls and ceiling and thirty or forty feet long. Sometimes this

wire may be concealed behind the picture molding, but this practice is not recommended because of the prevalence of metal lath in the walls. The close proximity of metal lath to the antenna materially decreases its efficiency.

If the antenna must be concealed it is often better to use a fine insulated wire

underneath the carpet or rug. In many cases the best antenna available is the electric lighting circuit. This is especially true in steel-frame structures. Several forms of well-insulated plugs are now on the market by which the lighting circuit may be safely connected to a radio receiver. When the lighting circuit is used in this way as an antenna, no lighting current is taken from it. If it is desired to hear programs only from local broadcasting stations, it may be found satisfactory to omit the antenna entirely.

Particular attention should be given to the ground wire. It should be short. It should be fairly heavy and connected securely to a good ground clamp which is fixed to the radiator or water piping system.

The conventional neutrodyne receiver, employing four or five UV-201A tubes, requires a six-volt storage "A" battery of at least 50-ampere hours capacity and "B" batteries totaling 90 volts. These "B" batteries should be of the large type and of the best quality. It does not pay to buy cheap "B" batteries since they run down so quickly.

It is desirable that the batteries be located near the set, so that long leads are not necessary. It is very convenient to have a box provided with a sheet lead or rubber tray for the "A" battery, and large enough to contain the "B" batteries and the battery charger also. This box may be mounted on casters so that it can be readily moved to allow for inspection, and also for dusting and cleaning the floor. The Lady of the House will greatly appreciate this.

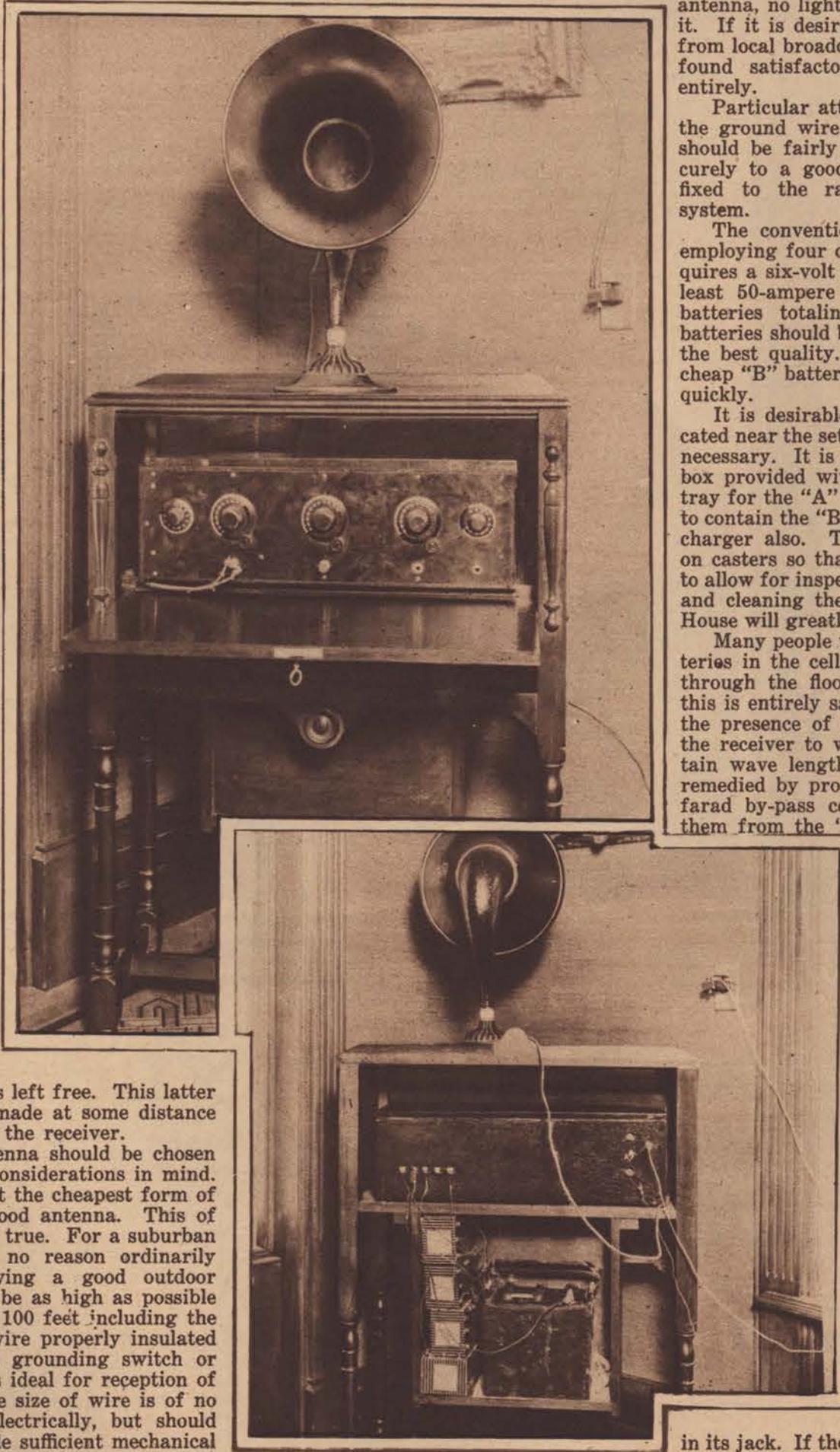
Many people would rather have the batteries in the cellar with leads running up through the floor. In almost every case this is entirely satisfactory, but sometimes the presence of long battery leads causes the receiver to whistle and squeal on certain wave lengths. This may usually be remedied by procuring several one microfarad by-pass condensers and connecting them from the "plus B" and the "plus B

detector" binding posts to either the plus or minus "A" battery posts. These connections should be made right at the receiver. The best connection may be determined by trial. If only the "A" battery is at a distance, as is often the case, a similar condenser connected between the minus and plus "A" battery binding posts on the receiver usually eliminates the trouble.

After having installed the set with antenna and batteries, the user should insert the tubes. It is a wise precaution to disconnect the "B" battery temporarily and ascertain if the tubes light with rheostats turned on and the loud speaker plug inserted

in its jack. If they do, the "B" battery may again be connected.

The least "microphonic" tube should be selected for the detector unless a special (UV-200) tube is used for that purpose. To test for this attach the loud speaker and tap the detector tube (Continued on Page 43)



A typical neutrodyne installation with a Music Master horn, and a Ducon plug in the electric light socket for aerial and ground

Audio Frequency Amplifiers

By KENNETH HARKNESS

Chief Engineer, the Radio Guild

I AM glad to have a man of Mr. Harkness' standing come out in print and call resistance-coupled amplification "obsolete." We have had a lot of propaganda about this system lately. The newspaper radio sections have been largely to blame for this, although some of my most esteemed contemporaries have permitted their writers to assure readers that resistance-coupling assures perfect quality of reception. It doesn't. In fact it is quite the reverse. We have tried all kinds of resistance amplification at Station 3XP, and we have never heard one that could compare in quality with even the second-rate audio transformers now so plentifully on the market.

This tradition of the "quality" of resistance-coupling arose in the days when little was known about the science of designing and building audio-frequency transformers. In those days resistance-coupling undoubtedly gave the best quality. But with the development of the fine transformers now on the market resistance-coupling was left far behind, and today it is so hopelessly outclassed that it should be allowed to rest at peace in its honorable grave.

H. M. N.

different systems of audio-frequency amplification may be helpful to the readers of *Radio in the Home*.

The function of an audio-frequency amplifier in a radio receiving system is to increase the audibility or loudness of a detected signal. The amplifying tubes take no part in the actual conversion of the energy induced in the receiving antenna into currents which produce audible sounds when they pass through a telephone receiver. The latter function is performed by the rectifier of the system.

The incoming signal oscillations are rectified by the crystal or rectifying tube, as the case may be. The variations in the strength of this rectified current have the same audible form and frequency as the sound wave produced at the

transmitting station. If this rectified current flows through the coils of a telephone receiver the diaphragm will vibrate, and if the telephone is held to the ear, the vibrations of the diaphragm will be "heard."

A much louder sound, however, can be produced by impressing the variations of the rectified current on the input circuit of an audio-frequency amplifier. The variations are greatly magnified, and if a telephone receiver is included in the output circuit of the amplifier, the vibrations of the diaphragm are much more pronounced

I HAVE noticed recently a number of articles in the radio publications giving considerable publicity to the resistance-coupled audio-frequency amplifier. The writers of these articles seriously advocate the adoption of this old-fashioned system in preference to the transformer-coupled amplifier now in general use.

There is, of course, absolutely no comparison between the efficiency of these two types of amplifiers. The amplification produced by a two-tube transformer-coupled amplifier is usually greater than that obtainable with a four-tube resistance-coupled amplifier.

It occurs to me, however, that since serious consideration is being given to an obsolete system of audio-frequency amplification, an explanation of the operation of

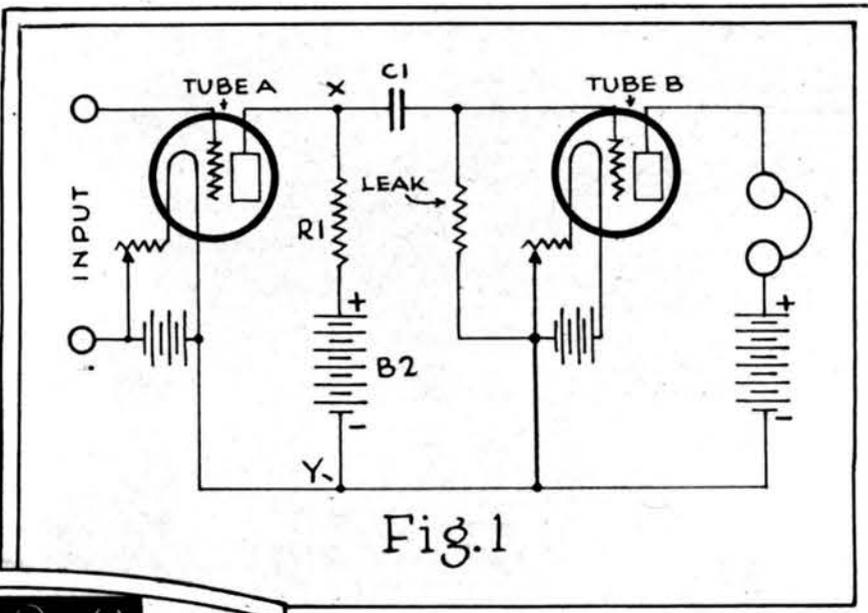


Fig. 1

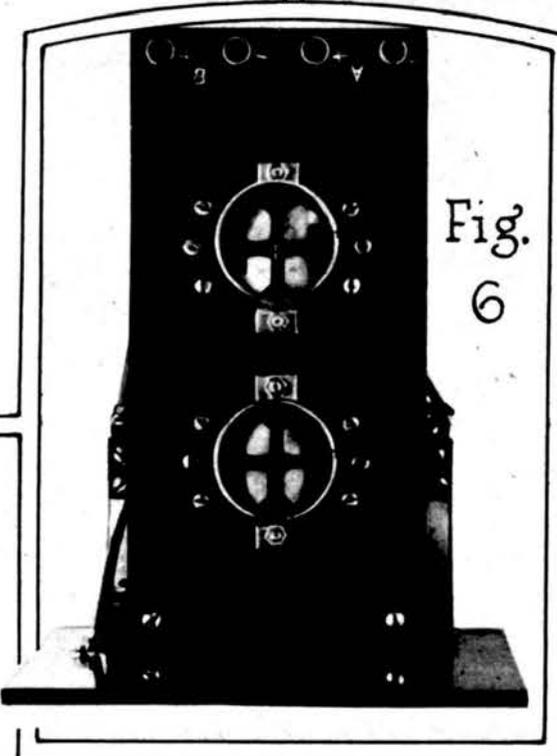


Fig. 6

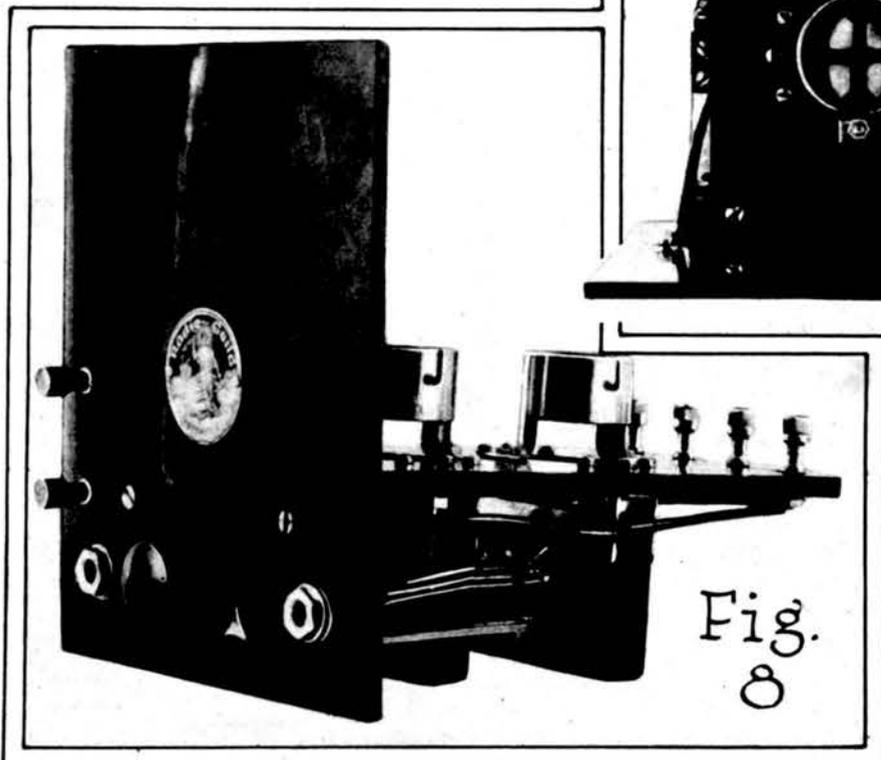


Fig. 8



and a much louder sound is produced.

The operation of any amplifying system is based upon the relaying characteristics of the three-electrode vacuum tube. It is impossible actually to magnify energy, but by a relay system we can make a small amount of energy control a large amount of energy from another source.

This is what takes place in the vacuum tube. A small variation of the grid potential produces a large variation of the plate current. The grid and plate circuits, however, are separate and distinct. The energy in the plate circuit is not supplied by the voltage impressed on the grid; the latter voltage merely controls energy in the plate circuit supplied by the plate or "B" battery.

The amplification which can be obtained with a single vacuum tube is, of course, limited; but just as one relay may be used to operate a second relay or any number of relays in succession (each relay multiplying the amplification effect of its predecessor until, finally, a large amount of energy is controlled by a small initial force) so vacuum tubes can be used to magnify the permutations of electric current.

The amplifier of a radio-receiving system, therefore, usually consists of two or three vacuum tubes arranged so that a varying voltage impressed on the grid of the first tube will produce a similar and undistorted variation of the plate current; this variation of the plate current must then produce a varying voltage between the grid and filament of the second tube. If the amplifier has three tubes, the amplified energy released in the plate circuit of the second tube must similarly impress a

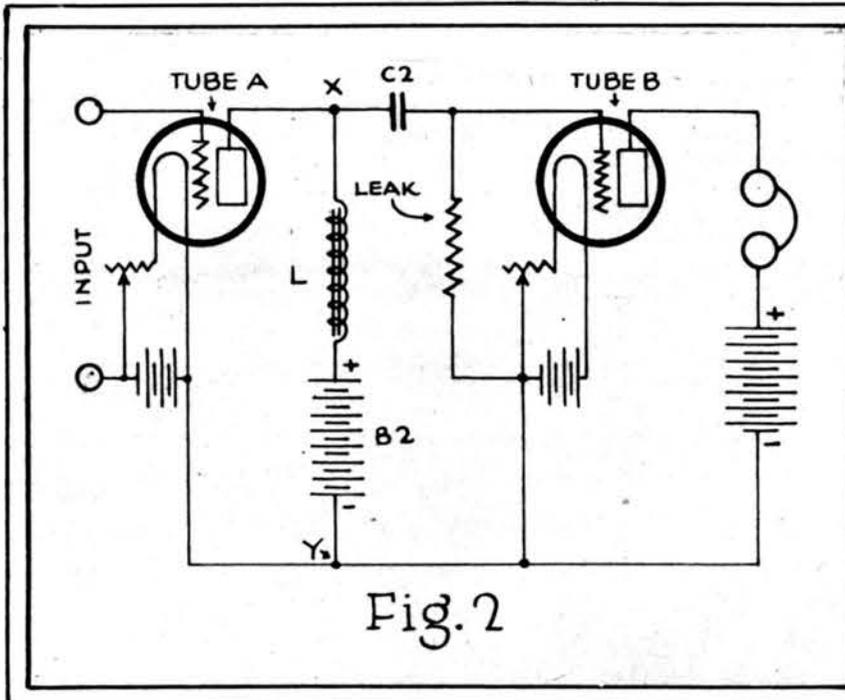


Fig. 2

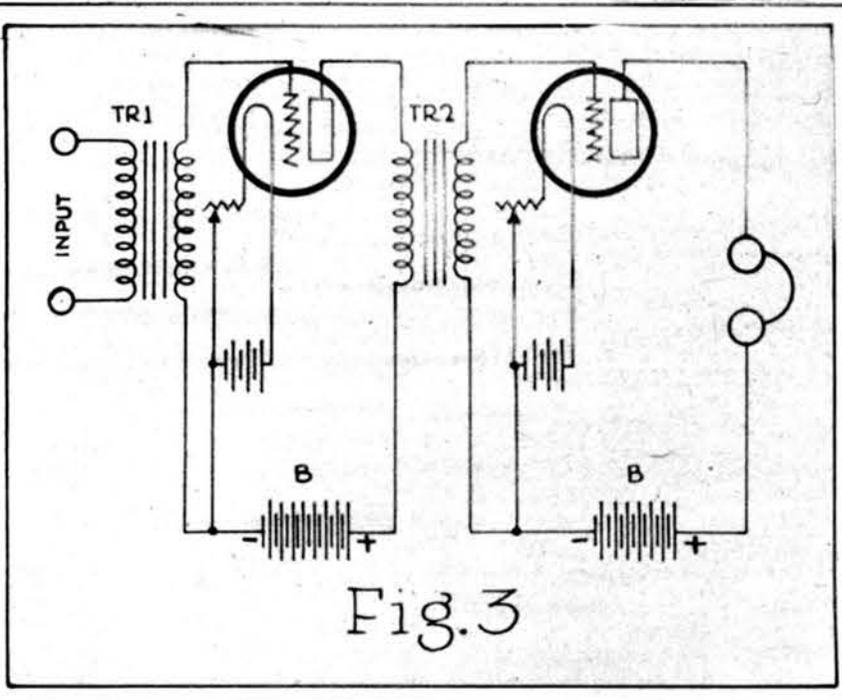


Fig. 3

magnified voltage on the grid of the third tube.

It is evident that some device must be used to repeat the amplified variations from one tube to the next, and according to the arrangement used for this purpose, amplifiers are divided into three main classes, as follows:

1. Resistance-Coupled Amplifiers.
2. Inductance-Coupled Amplifiers.
3. Transformer-Coupled Amplifiers.

In the resistance-coupled amplifier a high resistance of the non-inductive type is used to repeat the variations from tube to tube. Figure 1 illustrates the underlying principles of the system. The varying voltage to be amplified is applied across the input terminals, connecting to the grid and filament of the first tube. The object of tube A is then to produce a varying voltage across the points XY of its external plate circuit, the resistance R1 being the repeating resistance. This voltage must be similar in form to that impressed on the grid and as much larger as possible. The amplified variations are then applied between the grid and filament of the second tube as shown. The capacity of C1 is inserted to prevent the steady voltage of B2

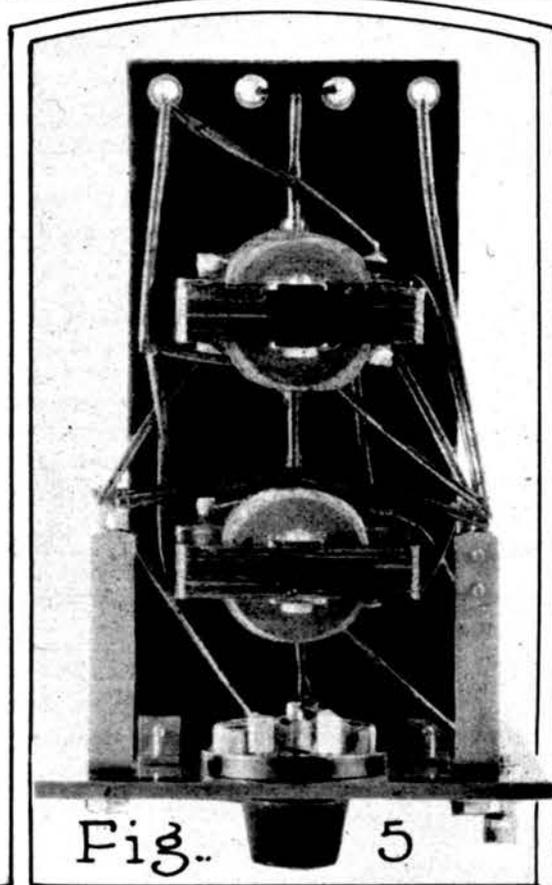


Fig. 5

from affecting the grid of the second tube. Only the variations in voltage are impressed on the grid through the capacity C1.

The operation of this amplifying system may be briefly explained as follows:

The resistance R1 is a constant value. If the current through R1 changes, the potential drop across R1 also changes. "Potential drop" is the term used to define the difference of voltage which exists between the two ends of a resistance connected in an electrical circuit.

Variations of the grid voltage will produce variations of the plate current passing through R1. Therefore, if variations of voltage are impressed on the grid of the tube A, a varying difference of potential will be produced across the resistance R1, as the current through this constant resistance changes. The resistance of B2 being low, it follows that a varying difference of potential will be produced across the points XY.

The amount of amplification produced by the tube A is measured by the extent to which a given variation of grid voltage changes the potential difference across the external plate circuit. For instance, if a change of grid (Continued on Page 36)

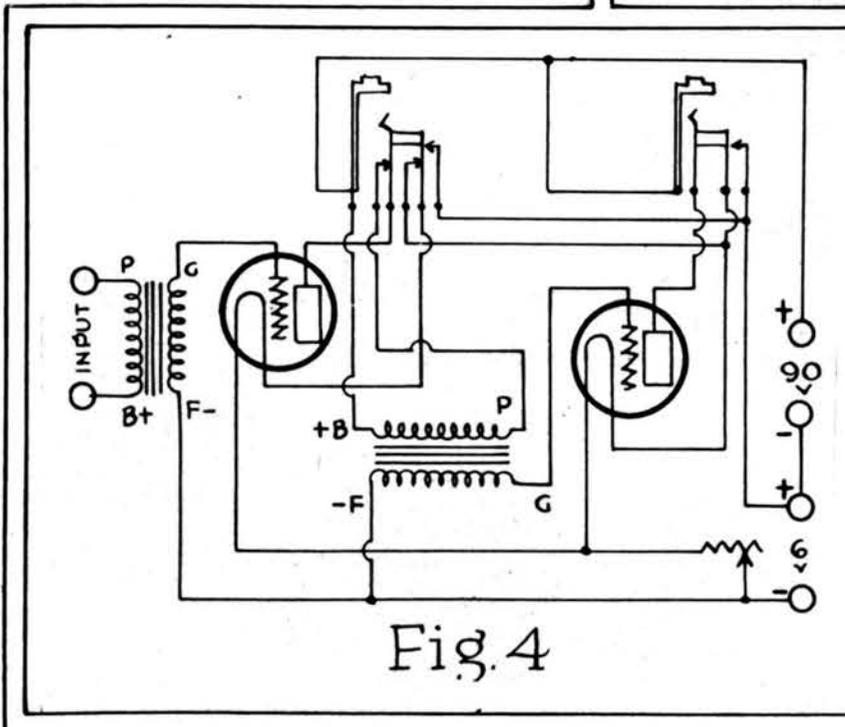


Fig. 4

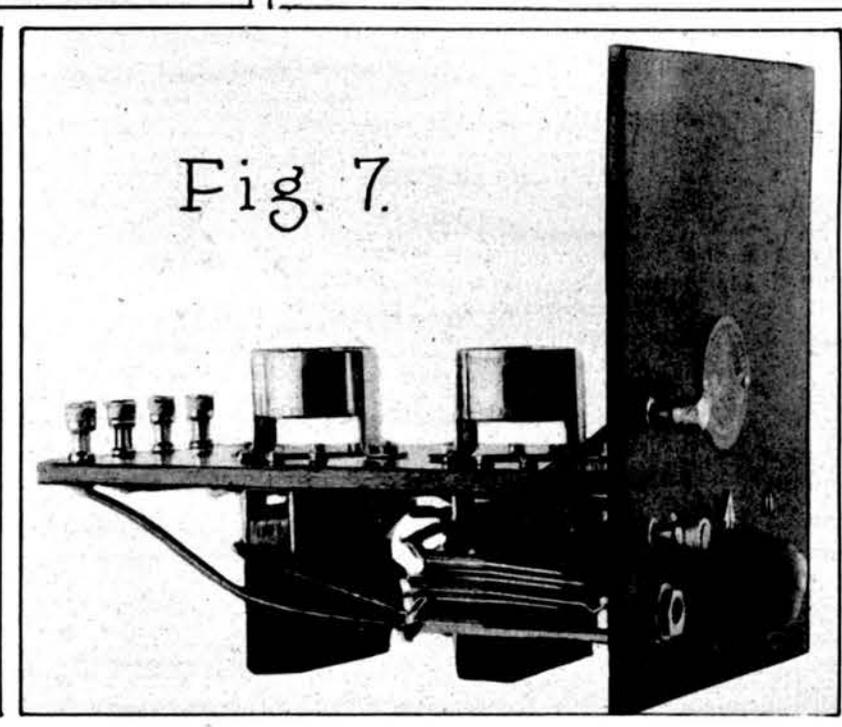
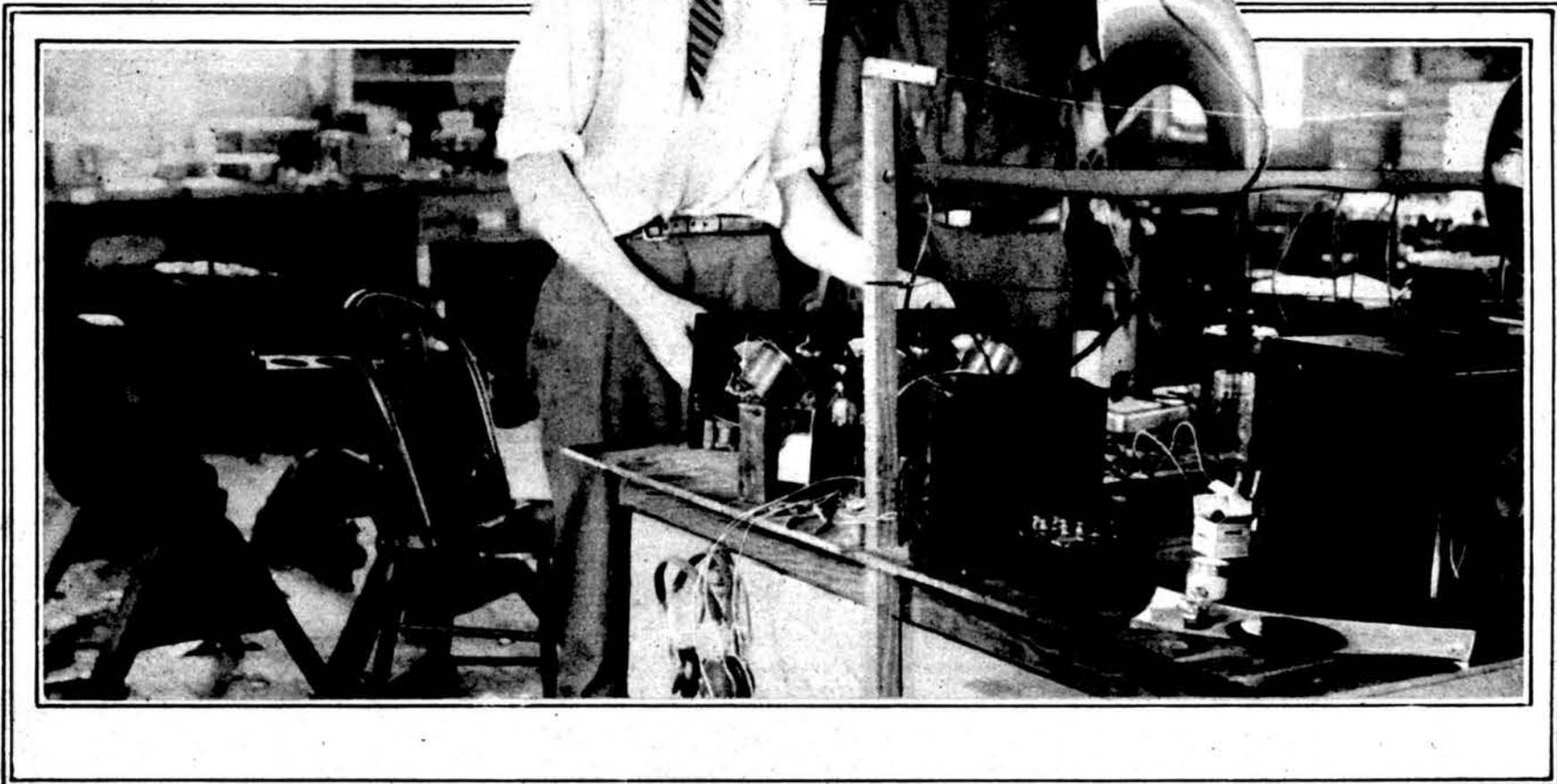


Fig. 7

David Grimes and Merrill Neely testing the Grimes-3XP Circuit in the laboratory of Station 3XP, Delanco, New Jersey



Neutroformers in the Grimes-3XP

CONSIDERABLE effort was exerted in last month's issue in working out the simple wiring procedure of the Grimes-3XP Inverse Duplex Circuit. This was the outgrowth of many cases of trouble where the "fan" had no conception of how to wire a set properly. H. M. N. worried over the situation so long that he at last spent several days studying just how he himself actually wired it. The result is his "ghost system" of drawings showing only the wires to be connected in each operation.

The whole scheme appealed to every one who saw it, with the result that it was worked out in several combinations of the Inverse Duplex. It is now in use in two radio factories with great success. This almost assures us that it will find immediate favor with you. The system isn't complete in all its details, but a little more experience will iron out the best method of presentation. Perhaps the "fans" will come to our assistance once more.

In hooking up this set from these diagrams at Station 3XP, we tried a new stunt which proved to be exceedingly valuable, and we are passing the tip along to you because it is applicable to the hooking up of any new set.

We came across a new kind of wire called Celatsite which comes with different color insulation already upon it. We get a number of lengths in five different colors—brown, yellow, green, red and black. As you will notice from the diagrams last month, there are seven steps in hooking up

By **DAVID GRIMES**

Chief Engineer, the Sleeper Radio Corporation

this circuit, and these five wires gave us a different color wire for each of five steps. For the sixth step we used ordinary bare copper wire and for the seventh step we used tinned bare wire.

This gave us seven totally distinct colors of wire, and in checking up afterward all we had to do was to look at the color of a wire and we knew exactly what circuit it was in. This is a very valuable advantage in checking up on a new hookup and it helps to make the location of trouble easy. Incidentally, this Celatsite is very easy to work with as it is soft enough to bend easily yet stiff enough to keep its position once it is put in place.

The ghost sketches were designed so as to indicate the construction of the radio transformer coils. They consist of the standard honeycomb coils with primary windings placed around the outside. These can be easily built, as pointed out in the June issue. The number of turns on the honeycomb, of course, will depend on the size of your tuning condenser. The average 23-plate size will require about 55 turns.



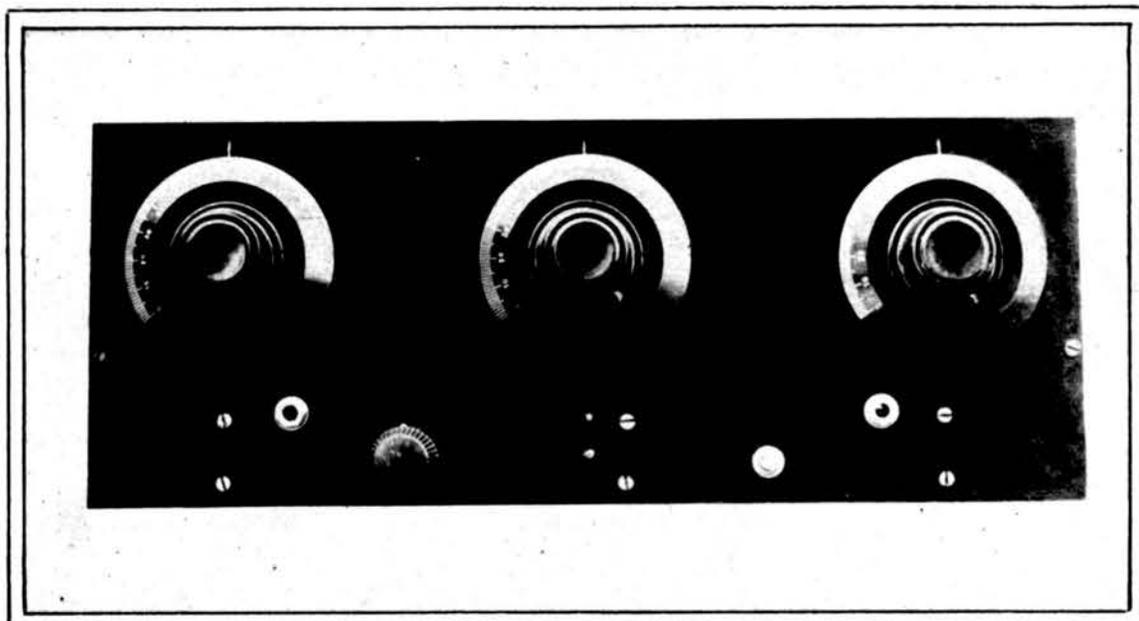
The number of turns on the primary will run from 8 to 12, probably 10 being a good average all-around number.

At the present time there are no standard honeycomb coils of the 55-turn size; so it will be necessary to obtain those having more turns and then unwind to the proper value. Certain "oversize" 23-plate condensers will cover the broadcast range with but 50 turns on the honeycomb coil, and coils with 50 turns are standard. It is very easy to determine whether or not your coil and condenser will give you all of the broadcast wave lengths. A 455-meter station should be found between 50 and 55 on a dial having 100 divisions in one-half turn. A 326-meter station should be found between 20 and 25 on the same dial. The other wave lengths will be found about as follows:

Wave length	Dial
326 meters.....	25 to 25 degrees
360 meters.....	30 to 35 degrees
405 meters.....	40 to 45 degrees
455 meters.....	50 to 55 degrees
492 meters.....	65 to 70 degrees

The actual size of your condenser and coil will change these readings slightly. If the various stations are all found too high on the dial, it will be necessary to add a few turns on the honeycomb coil. If the stations are below the positions indicated above, remove a few turns.

You will have to wind on the primary yourself. The above inconvenience, combined with the fact that the honeycomb



The Grimes-3XP Circuit makes an attractive panel layout.

coils are not available in some sections of the country, led us to make a study of other possible plans for constructing the tuned radio transformers. The honeycomb or duo-lateral coils were chosen only because of their compactness and their resulting small magnetic field. The smaller the area of a tuned coil, the less is the possibility of its feeding back into other coils or parts of apparatus in the set.

It is well known that the "pick-up" ability of a loop aerial is proportional to its area. A loop aerial is nothing more or less than a large coil. Therefore, the tuned coils in the set act as small loops and will tend to pick up energy from surrounding wires and apparatus. The larger those coils, then, the more pick-up is present and this, combined with the increased tendency to feed back, naturally causes great trouble. Experience has taught us that it does not pay to wind tuned radio transformers on larger than three-inch tubing.

A recent issue of *Radio in the Home* showed the construction details of such a tuned radio transformer and the article by Kenneth Harkness in the June number gave some pointers on the coils wound on tubing. Mr. Harkness rather discouraged the idea of one winding his own, but our general experience has been that, while many encounter difficulties, most of them are soon located and corrected.

For those not familiar with the articles mentioned, a brief description is in order. The coils are wound on a 2½-inch section of 3-inch insulating tubing—three pieces

of tubing in all—one for each transformer. On the tubing at one end is wound about ten turns of wire, which forms the primary winding. Next to this is wound another coil of about 50 to 55 turns of wire, constituting the secondary. It doesn't make much difference whether the wire is size 22, 24 or 26. Usually about No. 24 double cotton covered wire is employed for this purpose. It is not a matter of life or death if the coils are wound with other sizes. It will merely change slightly the number of turns necessary to cover the wave length range with the 23-plate condensers. Double cotton insulation should be used rather than single cotton or silk.

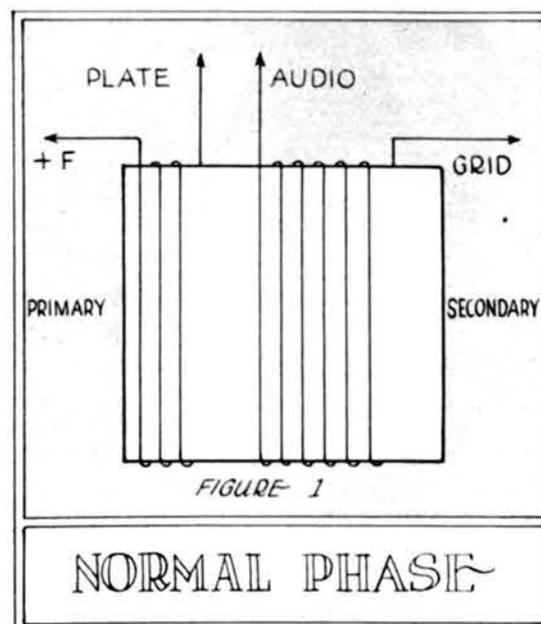
Coils of the above description were wound up and installed in the Grimes-3 XP in place of the honeycomb coils. It was found on turning the set that it oscillated quite badly. On the honeycomb transformers it had been stable. The fact that it was a radio oscillation was easily determined by the rules outlined in the July issue of *Radio in the Home*. In the first place, a noise similar to an air hammer was heard. This was only present when the three tuning condensers were set for the same wave length. Removing the aerial did not stop or overcome the effect but merely shifted the position of the first condenser necessary to produce it. With these symptoms, it naturally could be nothing else but a radio oscillation.

The causes of radio oscillation are always due to radio feedbacks of one sort or another. This means that upon substi-

tuting the large radio coils for the smaller honeycomb design, a feedback was experienced. It was assumed that this was undoubtedly due to the larger area of the tubular coils feeding back and picking up to a much greater degree than the smaller honeycomb coils. Great precaution was therefore taken to place the three radio coils at exactly right angles with their centers on the same straight line. This adjustment reduced the air-hammer effect virtually to zero. The larger area of the new coils had made exact mounting necessary, while the honeycomb coils could be rather carelessly placed. (See photograph of Grimes-3XP set in June issue.)

Not being able to mount the coils with sufficient accuracy completely to eliminate the feedback, a practical and simple change was made to quiet the set. The secondary winding of the second radio coil was connected in a reversed manner.

By referring to Figure 1, it will be noticed that the connecting wire running to grid from the tuned coil usually starts from the end of the secondary winding farthest from the primary. The plate circuit on the primary connects with the end of the primary nearest the secondary. With

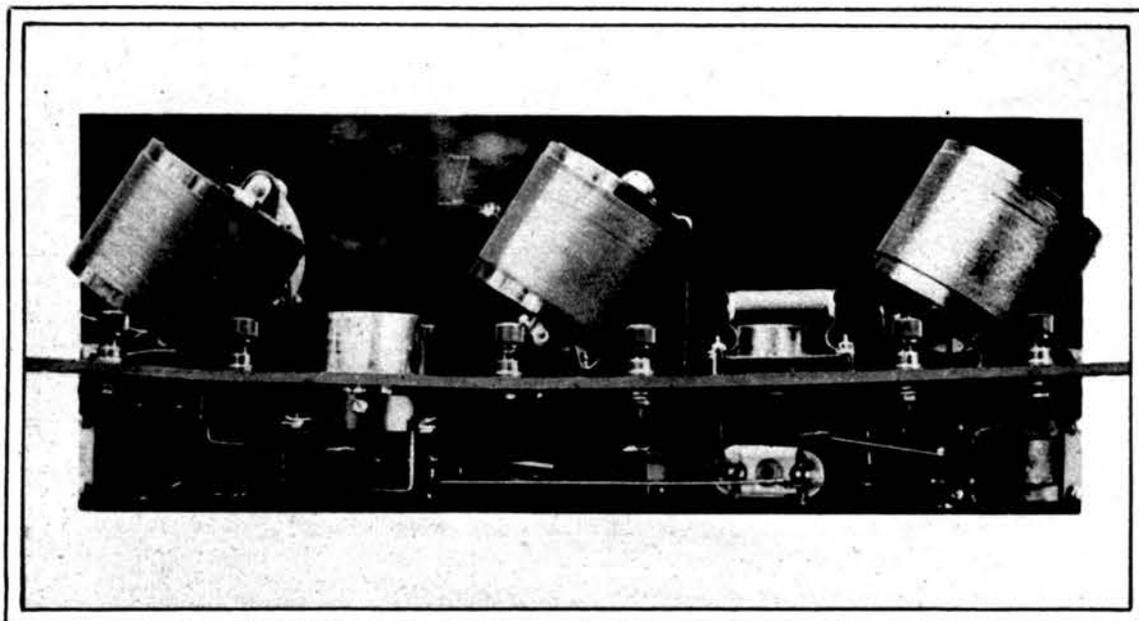


the two coils wound in the same direction of rotation, the above connections are called "normal phase." To connect the secondary in "reverse phase," merely means to connect the grid to the end nearest the primary. Figure 2 shows the coil with this reversal. This reversal, together with the proper alignment of the tuned coils, eliminated the radio oscillation.

To complete the tests on this particular angle, it was decided to try three standard neutrodyne coils or neutroformer units. These, as you know, mount on a panel at about a fifty-seven-degree angle. This is easily done and places the coils in a favorable position for preventing feedback. It is just as effective as mounting them at right angles and somewhat easier. So the three neutroformer units were substituted in place of the tubular coils. Also we placed them further apart than usual, which proved a great advantage.

The set worked ideally with no oscillation of any kind. There was, as expected, a slight "overload" howl when exactly tuned to a powerful local station. This

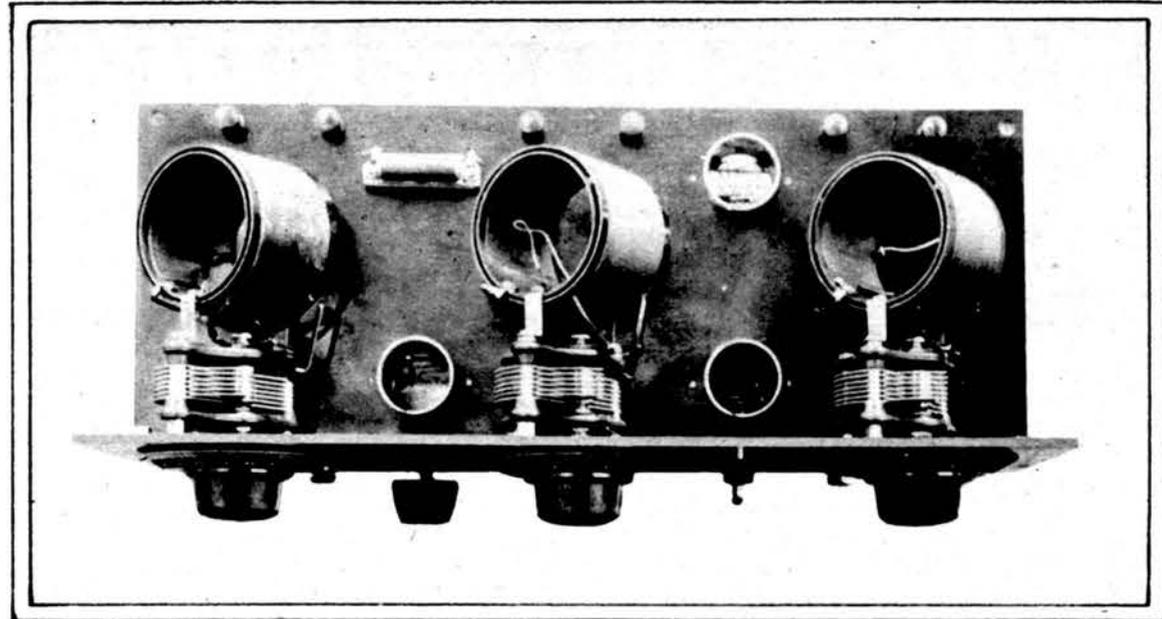
A view from the back showing the angle of the neutroformers



could be overcome by slightly detuning the condenser in the crystal circuit. There was found to be no need for the neutrotons or neutralizing condensers as employed in the Hazeltine circuit, and so they were not connected. A further investigation of this showed that the neutroformers used had only six turns on the primary windings. Perhaps this explains their lack of oscillation even without the neutrotons. They were made by Fada.

These data caused us to add ten more turns to the primary of the radio coil connecting to the crystal rectifier. This greatly increased the efficiency of reception on weak signals and is to be recommended if you desire to experiment. Increasing the primary turns on the other two coils increased the signal strength also, but tended toward oscillation beyond ten turns. Increasing these turns from six to ten is also suggested for those interested in experiment. If you care to add more turns, it will be necessary to incorporate the neutrotons, which require rather delicate balancing.

Good results were obtained without adding the extra turns. In fact, the selectivity was somewhat better before the primary turns were changed.



Looking down from the top, you see no wires to gather dust.

slightly, the howl was stopped. The actual value of the by-pass radio condensers across the secondary audio windings depends on the type of transformer used. The average value is .001 mf.

MR. KLEINBERGER FINDS 3XP CIRCUIT A GOOD ONE

It has been very encouraging to get so many letters from experimenters telling how interesting they have found this circuit. Many of these letters contain suggestions which have been extremely valuable, and we are trying out as many of them as we can.

Here is a letter from the designer of the Kleinberger coil—one of the most popular tuning units in the district around Philadelphia:

PHILADELPHIA, July 17th, 1924.

My dear Mr. Grimes,

Following your request to your readers who try out the Grimes-3XP circuit, I will give you my experience with this set, which, by the way, took me the best part of two hours to hook together, after getting together the parts needed from my stock which I had on hand. First I located three R. F. transformers which I had wound about a month ago to be used in a tuned R. F. circuit. These were wound on 2 3/4-inch diameter formica tubing, 40 turns on secondary and 12 turns on primary, using No. 24 D. S. C. on secondary, and No. 18

D. C. C. on primary to be tuned with 23-plate condenser.

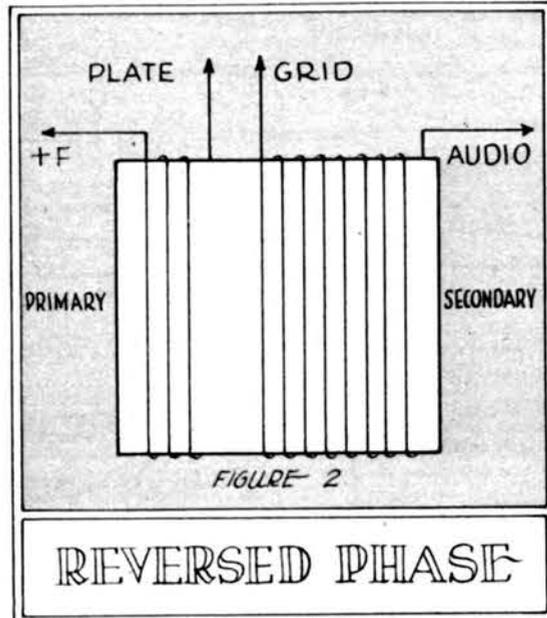
Then I had on hand three Continental 23-plate condensers, and used two Kardon transformers, 4 1/2-to-1 ratio, and one General Radio transformer.

I had plenty of fixed condensers on hand. Only in one case I had to make a .0005 from a .0002 and a .0003. The crystal I had on hand was a "Rasla" fixed detector and it answered the purpose O. K.

Then came the wiring. For this I used a rubber-covered No. 18, such as the Western Electric uses in its power amplifier; the condensers I mounted on a panel which I have been using for testing different circuits, and I had a hard time finding a place to drill more holes in it, but succeeded in doing so.

Well, after almost two hours I had it finished and set it up and put the tubes in the sockets, and as the wiring was O. K. and no blowouts, I plugged in the speaker. I was using a four-wire aerial 37 1/2 feet long, and local came in loud enough to knock the hat off your head and clear as a bell. Then I changed over to a 100-foot single-wire aerial and the load was too great for the tubes, but I put 216A tubes in the sockets, and the speaker, which is a 518W Western Electric, was just big enough to carry it right.

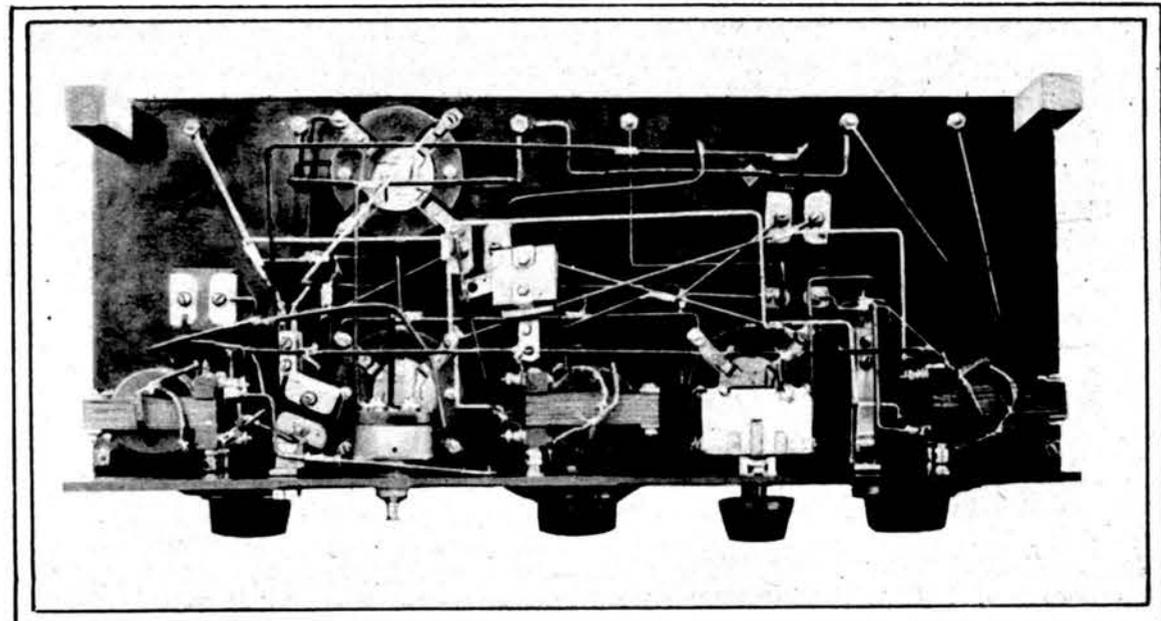
Then I tried the loop, which is a ten-turn loop which I have been using on a super, and I found that by using the resistance as you call for (Continued on Page 42)



It is thought, with the above suggestions, that most of you will be able to build up a reliable and efficient radio-frequency circuit for use on your Grimes-3XP set. The distance range of this set will naturally depend on a good crystal rectifier and a good radio-frequency circuit. With this working properly, the rest is fairly easy. Most of us have had considerable experience with audio circuits and troubles in these fail to baffle us.

The Grimes-3XP set shown in the photographs uses three Federal audio transformers—Type No. 226. These are assembled so that the primary terminals are reversed from ordinary practice. This reversal caused howling when three stages of audio amplification were used. Some types of audio transformers do not work well beyond the second stage. However, with the reversals of primary and secondary connections, as indicated below in Figure 3, and by increasing the by-passing condensers on the secondaries,

All of the wiring is done underneath the panel with a different color Celatsite wire for each circuit



The RADIO KINDERGARTEN

LESSON ELEVEN

CORRECT AERIAL INSULATION

By HENRY M. NEELY

IN THIS lesson of our radio kindergarten, I want to get away from the more theoretical part of radio and show how the theories which we have already discussed can be applied in a very practical way to enable each amateur to get the best possible results from a radio set.

We have already discussed insulators and insulating materials, and we have learned that an insulator is merely a material which offers so high a resistance or opposition to the flow of the electrical current that virtually no current at all goes through it.

In this lesson I want to apply this theory to the proper installation of an aerial for most efficient use. The high resistances which we shall discuss are the aerial insulators, and we will learn what is the best method of placing these insulators so as to bring to the receiving set the maximum amount of the precious radio currents we

where the horses are all side by side. Now when we connect resistances in series, the total resistance in all of them is found by adding the individual resistances together.

When, however, we connect them in parallel we have a rather more complicated mathematical problem to solve. To speak of it in technical terms, the total resistance of a number of resistances connected in parallel is "the reciprocal of the sum of the reciprocals."

For those of you who are not mathematically inclined, let me say that the reciprocal of a number is simply the fraction made with the figure 1 above the line and the number itself below the line. In other words, the reciprocal is one divided by the number.

Therefore, if we have two or more resistances in parallel, the first thing that we do is make fractions of them by placing the figure 1 above each resistance value and adding these fractions, which gives us the sum of the reciprocals, and then we take the result of that and divide it into the figure 1, which gives us the reciprocal of the sum of the reciprocals. This sounds perhaps a little complicated, but I think any one with ordinary knowledge of mathematics will be able to master it.

Now, with that understood, let us go ahead in our consideration of the aerial.

As a general rule resistance in a receiving circuit is undesirable and very much to be avoided.

There are exceptions to all rules, however, and there is at least one place where resistance is not only desirable, but absolutely essential; and the higher the resistance the better the results. I refer to the insulation of the antenna.

Since the amount of energy intercepted by the receiving antenna, even from the most powerful local broadcasting station, is so minute as to be almost infinitesimal, it stands to reason that we must conserve what little we have.

Other things being equal, the greater the amount of surface the aerial contains, the greater will be the amount of energy picked up from the passing broadcasting wave.

Since this will give greater volume from the same station, many radio fans, realizing this, have gone to the trouble of erecting a multi-wire antenna; that is, an aerial consisting of two or more parallel wires. To their great disappointment, however, they may have found that the results obtained did not warrant the trouble and expense involved, for the signal strength was very little, if any, above what it was with their single-wire aerial.

The answer is usually easy! Insulation—or rather, the lack of a sufficient amount of it.

Let us examine the average radio fan's installation of a four-wire, flat-top antenna. It is illustrated in Figure 1. Here we have four wires stretched between two cross pieces and insulated from the cross pieces by means of eight insulators. If our insulators were perfect this article would not have been written. However, an insulator is simply a name given to any material that offers great resistance to the passage of

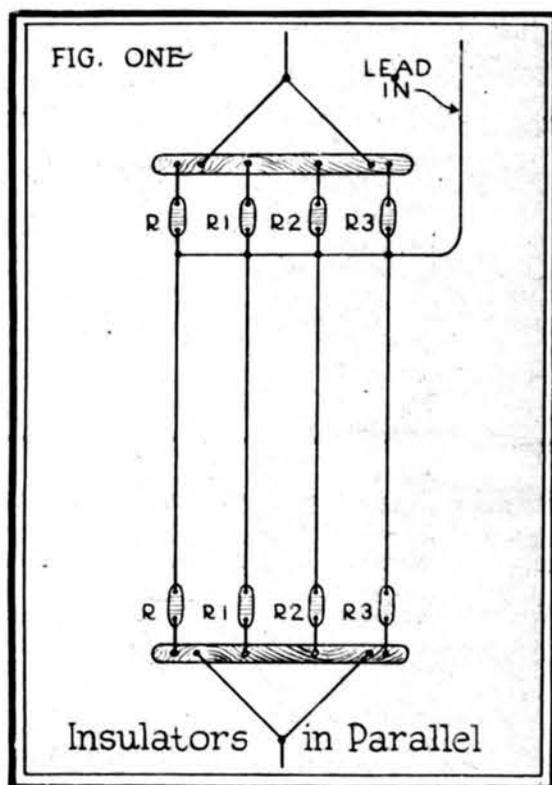
electricity, and to be a perfect insulator, the resistance of the material must be infinity. This it is impossible to obtain as all materials conduct electricity to a greater or lesser degree.

Since an insulator is simply a resistance of high value it is bound by its very nature, to obey the laws governing resistances, and the two mathematical formulas I have spoken of are the result.

Suppose, for simplicity's sake, we had four resistances each measuring 20 megohms and we connected them in parallel as shown in Figure 1. The following rule would then apply:

$$\frac{1}{1/20 + 1/20 + 1/20 + 1/20} = 5 \text{ megohms}$$

In other words, by using four resistances of exactly the same value in parallel, we find that the total resistance is only one-fourth of the value of one resistance.



want to transform into music and speech.

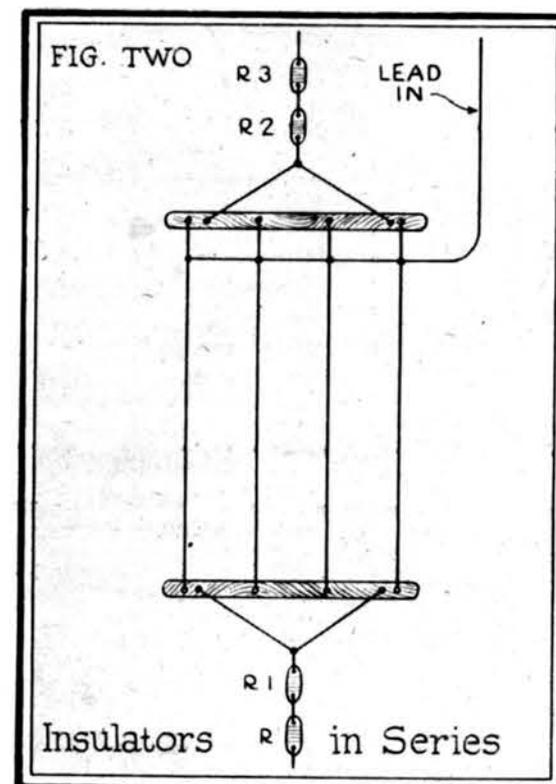
In order to understand this lesson, it is merely necessary to get a general idea of how we calculate the effect of resistances placed in different ways.

We can take two insulators and place them in what we call series. That means that they are connected in such a way that the electricity must pass through one first and then pass through the other one.

We can also connect the resistances in what we call parallel—which means that the electricity divides and passes through all of the insulators at once.

Those of you who remember the old days of the popularity of the horse before the automobile came will understand what I mean when I say that resistances connected in series are like the old form of driving "tandem"—that is to say, with one horse in the shafts and the other one ahead of him.

Resistances connected in parallel are much like driving a pair or three abreast,



Let us now see how this applies to our aerial.

In Figure 1 we have the two insulators R' in series, the two insulators R'' in series and the two insulators R''' in series. However, the insulators R, together, are in parallel with the insulators R' and, in fact, they are parallel to every other pair of insulators in the aerial. Likewise, each pair of insulators is in parallel with every other pair.

Assuming all of our insulators to be 20 megohms resistance, we find that the two insulators R, being in series, give us 40 megohms. The two R' give us 40 megohms. The two R'', 40 more megohms and the two R''' give us another 40 megohms. Remembering that the pairs are in parallel, we have:

$$\frac{1}{1/40 + 1/40 + 1/40 + 1/40} \text{ or ten megohms}$$

as the total resistance of our antenna. But suppose that, due (Continued on Page 44)



The Program— As You Like It



DIVINING public preference as to what shall be broadcast by radio is about as difficult as ascertaining what the public wants in its government, its press, its stage or any other national activity. For our "dear public" is a many-minded individual, with a genius for finding two sides—or more—to every question.

In the early days of broadcasting, just as in the early days of the phonograph, the motion picture and other scientific vehicles of entertainment, anything was acceptable because of the novelty of the medium itself; but the writer submits that we are entered upon a period when the broadcast listener is likely to be more critical of what goes on the air.

At first blush it seems to the average man to be the "height of nerve" even to suggest his preferences to a broadcasting station. "This wonderful entertainment is being given me free," he reasons; "who am I to say what shall be broadcast?"

Yet suggestions and criticism are precisely what the sending station wants; because whatever its reason for existence, each station wishes to be a favorite with the man who twirls the dials.

Moreover, station managers will tell you that this co-operation on the part of the unseen audience is very hard to obtain—all sorts of plans from applause cards to prizes having been tried in the effort to plumb listener-interest in the programs being given.

Viewed in this light, does it not become the duty of each of us who has a radio receiver in his home, to help the broadcasters with our suggestions, our encouragement and all the information we can give them?

Let us review the material which is available to the program manager. The broadest classification of radio talent resolves itself into music and speech. The first-named may be sub-divided into orchestral and band music, solo performances on various instruments, and vocal selections. These may be further classified as sacred music, classic, semi-classical selections and jazz.

By **HAROLD N. LOEB**

Under the topic of speech may be included sermons, instruction, news, fiction, humor—everything in the world that persons talk about. And just because these classifications are of necessity so general, the broadcast stations want to know your preferences.

You may be one of those who laugh at the soap-box orator; at the maiden lady who sends letters to the editors of newspapers, and at the self-appointed reformers

through the customary two-hour broadcasting period listening to "the pupils of Madame Squeak" or "the Haggem & Scraggen Fence Company's Glee Club."

I do not like broadcasting advertising in any of its thinly veiled forms; I do not like an act from a drama being staged in some theatre; I do not like phonograph music on the air, and I do not like "program-coming-in-fine" stuff.

These comments are made with what the writer believes to be a fair knowledge of the difficulties under which broadcasting stations operate. Presumably they cannot afford to pay all their talent; neither can they obtain enough headliners exclusively to fill a year's programs. And, as has been said, a majority of us listeners have been

derelict in our expressions of opinion, so the fault is partly ours.

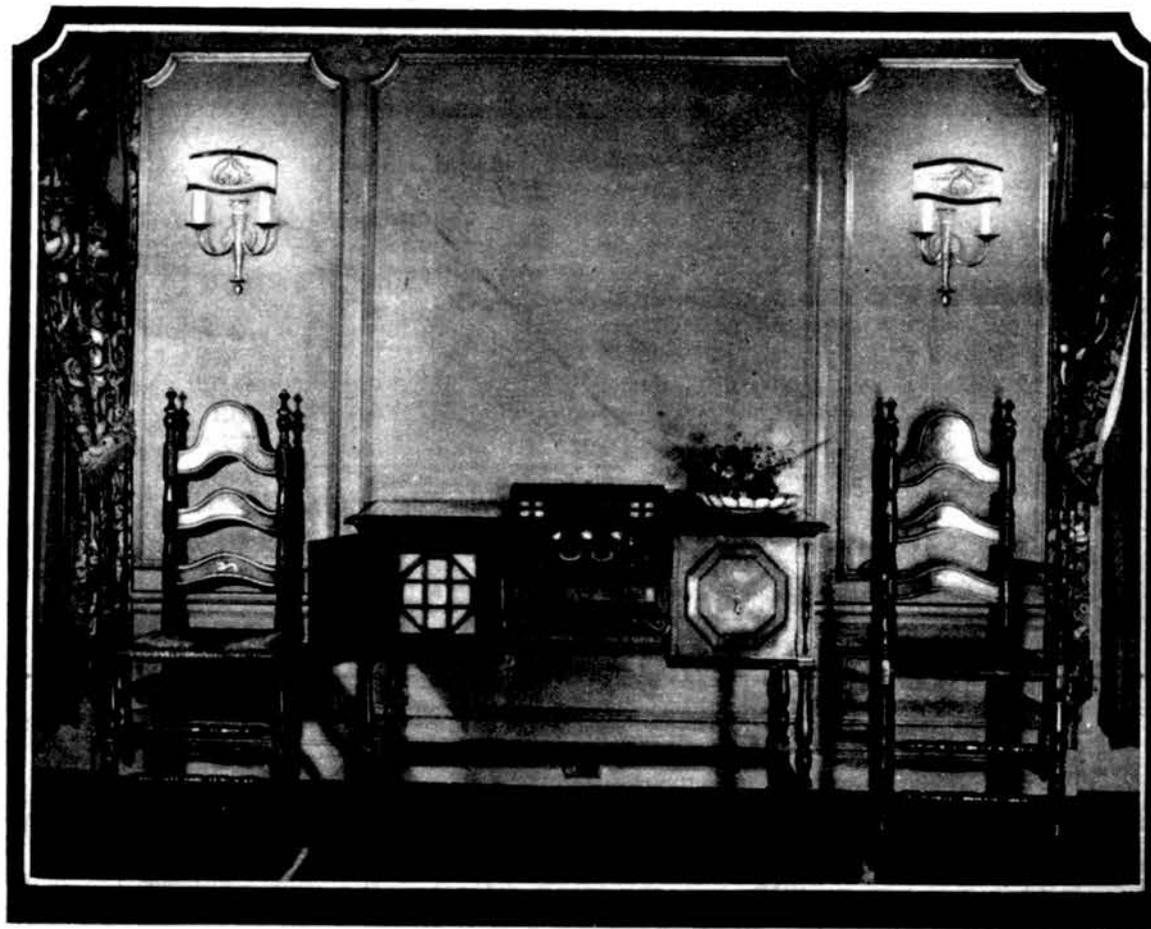
Most problems can, however, be worked out by the application of common-sense principles, and this matter of what should go on the air should prove no exception. The reduction of advertising to a science or quasi-science is a case in point. In the infancy of modern advertising, the craft did not know what type of "copy" or which mediums brought the best returns. Today, the popular reaction to almost any advertising program can be foretold within close limits.

How was this brought about, and how can the same principles be applied to broadcasting? Very simply!

Advertisers sought the facts in the maze of possibilities, and applied them to their business. They learned what competitors were doing, and with what success; they sent query-forms into the homes asking what magazines and newspapers the family read; and through unselfish association activities, they established advertising as a world-force.

The broadcasters can proceed, and doubtless are proceeding, along the same lines. They have several strong and estimable organizations whose sole object is to give the public

(Continued on Page 32)



Radio in the Studio of Scruggs-Vandervoort and Barney, 9th and Olive Streets, Saint Louis, Mo. The set shown in this photograph is the Kennedy Console Model.

The photograph is through the courtesy of the Colin B. Kennedy Corporation.

in general; yet remember, that progress was never made through indifference.

Just to practice what I preach, I, as the average man, am going to tell what I enjoy and what I do not like via radio.

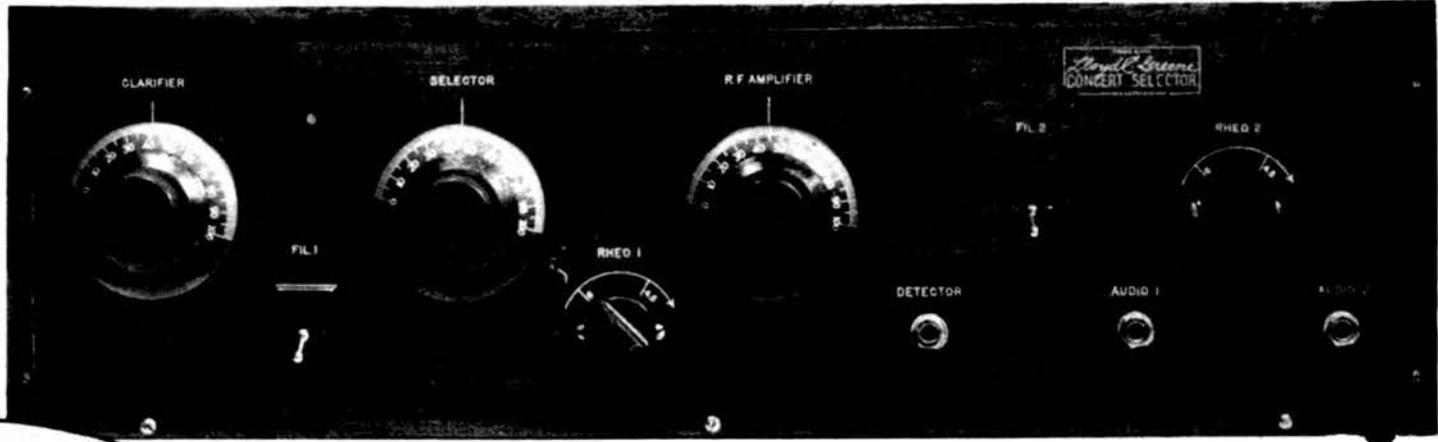
In the first place, I enjoy a balanced program of music and speech. Variety lends interest; too many consecutive songs or talks are likely to prove monotonous.

Second, I like anything distinctively novel, such as the solos on that little-known instrument, the celeste, recently featured by WLW, or the war adventures of a member of our Intelligence Corps which were transmitted on several occasions last winter by WGY.

Third, I enjoy the work of artists, whatever their medium of expression, and would rather pass a half-hour nightly with a few entertainers of high standing than to sit



This photograph shows the extremely neat appearance of the front panel of the Greene Concert "Selector." You can clearly see the two switches which control the filaments, which is one of the features of this set



The Greene "Selector"~ New England's Favorite

FOR several months in succession the letters which we published from Boston in our department "The Slant of the Trade on Radio" said that by all means the most popular circuit throughout New England was the Greene receiver, developed by Lloyd C. Greene, Radio Editor of the Boston Globe.

I immediately got in touch with Mr. Greene and asked him if he would not write for me a complete article with diagrams and photographs telling our readers how they could put this set together. He replied that he had made a development which very greatly improved the set and that as soon as that development was ready he would send me the article and pictures.

Here is the result. This is the set which is almost the standard throughout New England, and I am sure that both Mr. Greene and myself would like to know how it pans out in other sections of the country. H. M. N.

By **LLOYD C. GREENE**
Radio Editor, Boston Globe

IN the early days of broadcasting, a problem confronted radio engineers who were endeavoring to design apparatus to meet the needs of the public—a public unfamiliar with even the simplest instruments ordinarily employed in receiving radio concerts. Considerable time, thought and money were given to research by the large manufacturers of radio sets to develop a type of receiving device which would render a satisfactory service to those unskilled in the use of instruments, radio or electrical.

I believe it was Frank Conrad, of the Westinghouse Electric Company, who originated the design of the first and most popular of these receivers. It was of the single-circuit, regenerative type and, because of its simplicity and gratifying performance, was extensively used. The Aeriola, as it was called, incorporated the regenerative principle of amplification in the so-called "tickler-feedback" form. This design, as it later developed, proved the forerunner of a veritable "flock" of receivers of similar design.

But radio and the radio public have gone a pace in these last two years. The single-circuit, single-tube receiver has served its purpose and served it well. As

the horse-drawn vehicle was superseded by the automobile to meet the demands of modern transportation, so the single-circuit receiver is rapidly giving way to radio apparatus more modern and better suited to present radio needs.

Since the advent of the single circuit the public has been offered, in order, three new receivers: the reflex, the neutrodyne and the super-heterodyne. Of these the reflex usually employs four, the neutrodyne five and the super-heterodyne six or more vacuum tubes for loud speaker operation. These new receivers all indicate the tendency toward multiple tubes in modern receiver design. Their popularity is sufficient evidence that the public is now ready for receivers of this kind.

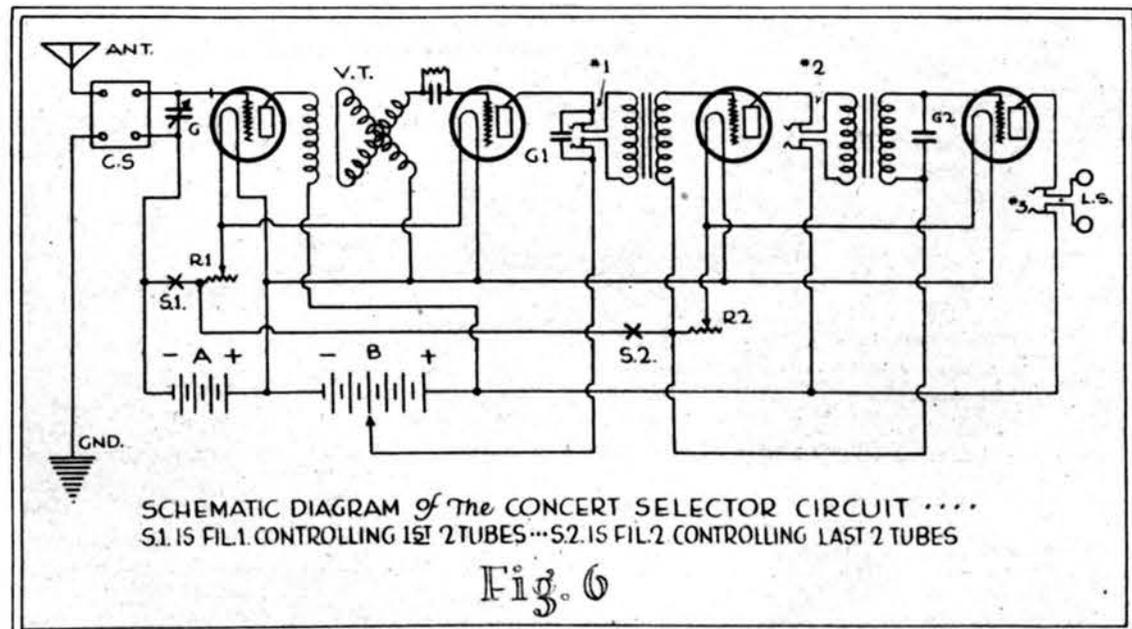
With multi-tube receivers have come the broad designations "four," "five," "six" and "seven-tube" sets, designations which are intended to describe the superiority of one set over another. While such designations are in a sense descriptive of the size and cost of a receiver, they in no way indicate whether very excellent or very poor results can be expected. A "powerful" number of vacuum tubes does not necessarily mean a "powerful" radio set—more frequently it means a "powerful" lot of

waste. This is especially true of home-made multi-tube receivers where an attempt is made to use several stages of R. F. amplification.

Perhaps the biggest problem facing the radio world and the radio fan today is "radiation"—squeals picked up by his receiver caused by oscillating sets in the neighborhood. This squealing interference is the worst thing with which a broadcast listener has to contend. It distorts and spoils the concert he is listening to. In short, it all but disgusts and discourages him.

In the past a number of makeshift circuit arrangements and changes have been offered to alleviate the squealing nuisance. Many of them were offered at the outset of a country-wide campaign against radiation, which began early this year. In the main these have failed to accomplish their purpose. It is not difficult to understand why the average fan objects to the addition of any device to his receiving set which, while it may reduce or even prevent radiation, impairs either the range or volume of his receiver.

You have all listened to the bloodcurdling noises which issue from regenerative receivers under the guise of music. Oh,



have been discarded in favor of the little UV-199 tubes, whose elements are much smaller. This choice, together with that of a very efficient and versatile form of inter-stage coupling and judicious "inductance-to-capacity" ratio in the grid circuit of the first tube, accomplishes at a fell swoop that which has been sought for in other receivers by diverse and involved methods. The Concert Selector is a low-loss instrument in every detail and to this fact owes its success. The guiding thought in its design has been the elimination of losses and the attainment of high radio-frequency amplification. Simplicity wins again.

Let us examine the Concert Selector in more detail in order to see just how these results have been accomplished. In the first place, there are three major sources of re-

Third—By covering every wire with varnished cambric tubing to prevent corrosion and consequent increase in resistance.

The dielectric losses of the instruments have been reduced to a low value.

First—By the choice of tuning instruments of correct design with a minimum of dielectric material, that material being hard rubber and so placed as to be as nearly as possible outside the electrostatic and electromagnetic fields.

Second—By the use of silk insulation "doped" only with pure para rubber.

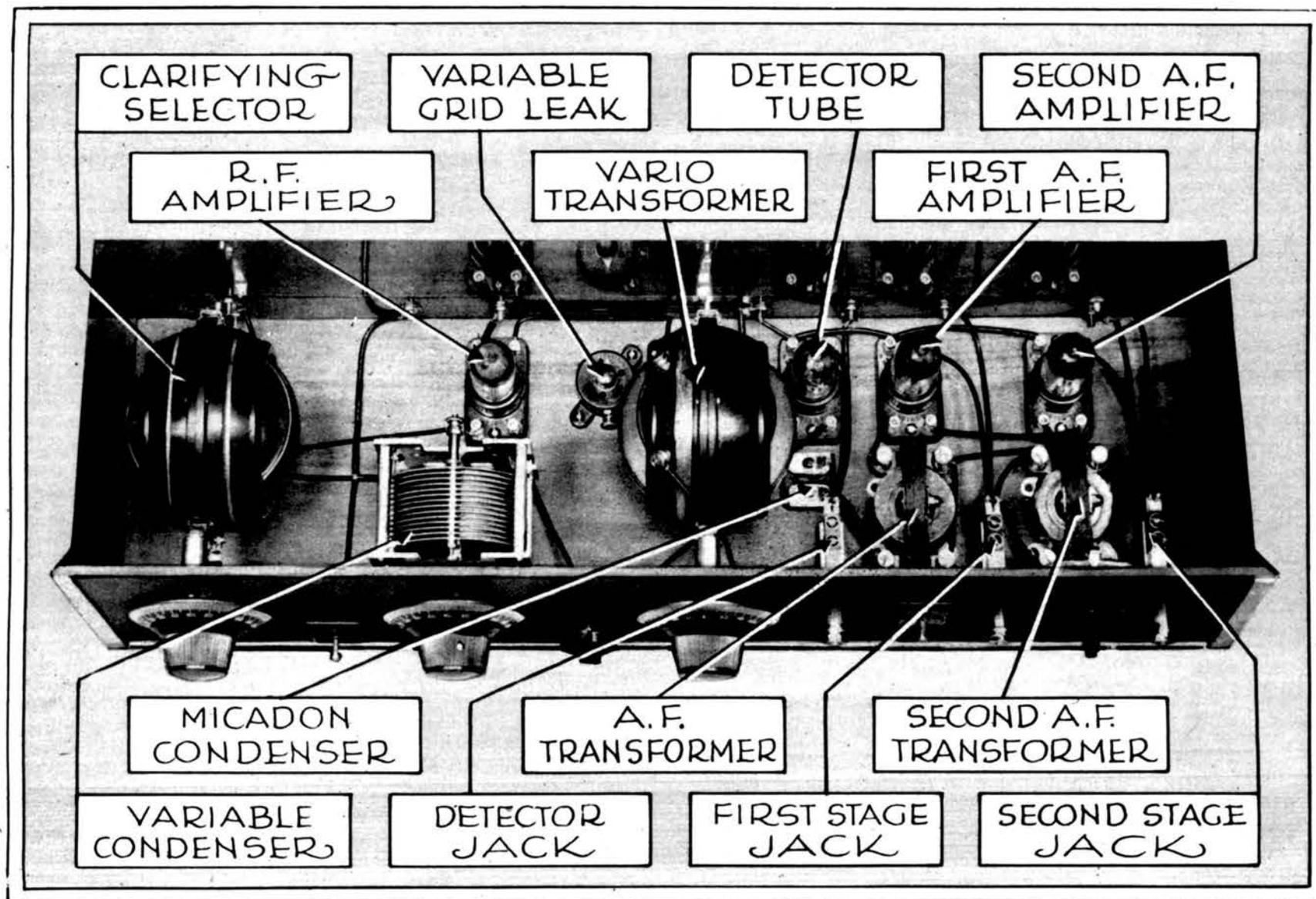
Third—By the proper placing of instruments and binding posts to prevent concentration of fields in undesirable dielectrics—dielectrics other than air.

The introduction of resistance into the

tor in its component parts. A chain is no better than its weakest link. Likewise a radio receiver is no better than its poorest part.

Figure 1 illustrates the basic electrical connections of the receiver. The three fundamental tuning units, inclosed in dotted lines, are, from left to right, 1, the Clarifying Selector, 2, the Condenser, and 3, the Variotransformer.

The Clarifying Selector is an instrument designed particularly for the Concert Selector, and allows of minute adjustment of the coupling between the grid circuit of the radio frequency amplifying tube and the antenna circuit. It consists of a rotor and a stator form of molded hard rubber of excellent dielectric properties. Upon the inside of the stator form are wound a num-



sistance in radio receivers. First, the actual resistance of the conductors used in them. This value may be and usually is many times the direct current value of resistance, due to well-known skin effect phenomenon. Second, dielectric loss, which is caused by too much material of poor dielectric properties in the electromagnetic or electrostatic fields. Third, resistance introduced in the circuits by virtue of their being too closely coupled to other circuits containing high resistance, the antenna system for example. The actual resistance of the conductor in the Concert Selector has been reduced to a minimum.

First—By so placing the instruments that the wiring is as short and direct as possible.

Second—By using conductors of large cross section.

circuits by virtue of their being too closely coupled to circuits of high resistance has been prevented.

First—By the use of the Clarifying Selector, an instrument which prevents too close coupling of the R. F. grid circuit to the antenna circuit—of necessity a high-resistance circuit—but which allows sufficient transfer of energy between the antenna circuit and the amplifier grid circuit at all frequencies within the broadcast range.

Second—By the proper spacing of the tuning elements relative to each other so that interaction of stray fields is avoided.

In this manner losses are reduced to a minimum and the Concert Selector as a whole becomes a highly efficient instrument.

Let us now examine the Concert Selec-

tor in its component parts. The winding, together with the low loss condenser, constitutes the amplifier grid tuning elements. On the outside of the stator form are wound six turns of wire, three turns on a side, which are electrically independent of the grid coil. Upon each side of the rotor are wound three turns of wire. The windings on the rotor and outside of the stator are connected in series.

In effect we have a variometer of small inductance in series with the antenna and ground. The stator of the variometer is rigidly and closely coupled to the grid coil. The electrostatic coupling between the two is practically zero. With the windings of the variometer opposing the electromagnetic coupling is also zero. The coupling can be varied then by means of this instrument from practically zero to a value ex-

ceeding 20 per cent. The relation between coupling and volume is very marked in a receiver employing high radio-frequency amplification such as the Concert Selector. This fact is strikingly illustrated by the curve of figure 2. With the Clarifying Selector full advantage is taken of this fact and by its use greater volume and selectivity are obtained than has heretofore been considered possible with one stage of radio-frequency amplification.

Selectivity, or the ability to differentiate between stations of nearly the same wavelength, is largely a matter of reducing the resistance of the selector circuits to such a low value that the resonance curve becomes very sharp. Assuming that the wave emitted by the broadcasting station is properly modulated and that the resistance of the selector circuits is small, selectivity becomes an accomplished fact and the listener is able to choose at will from the various stations within range.

This much-to-be-desired result is not to be accomplished with any other type of antenna coupling. It is only possible with a form of coupling of such a nature that it does not introduce the high antenna resistance into the grid circuit of the radio-frequency tube, but at the same time one which permits of the maximum flow of energy from the antenna to the grid. The Concert Selector owes the major part of its extreme selectivity to the Clarifying Selector.

The grid tuning condenser next to the right included in dotted lines is also a low loss instrument. Its dielectric material is hard rubber. The amount of material is small and it is so placed as to be almost wholly outside the electrostatic field. The plates are of heavy stock and of high conductivity and are carefully smoothed to eliminate discharge points and concentration of field. The rotary plates are grounded to the frame—a recognized

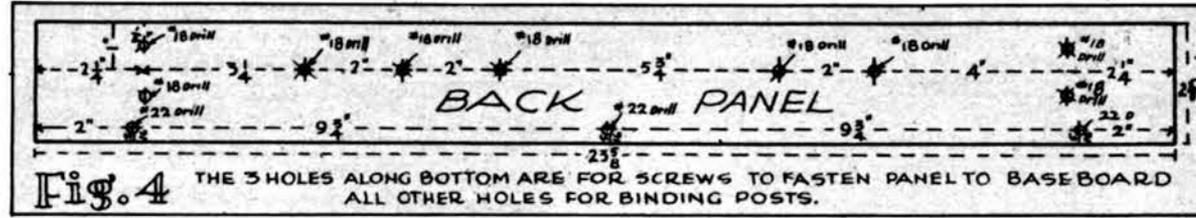
of the Concert Selector vs. Resistance is the Variotransformer. This instrument combines the advantages of pure "tuned impedance" coupling with the step-up ratio of a transformer. The vacuum tube detector is a potentially operated device. Its response is proportional to the square of the impressed voltage. In other words, the change in plate current is proportional to the square of the change in grid voltage.

from pure inductance. For this reason the variotransformer employs no condenser but consists of a variometer of large maximum to minimum inductance ratio designed with especial care for the elimination of distributed capacity. Closely coupled to the variometer is the plate coil. The coupling is sufficiently close between the two so that resonance in the grid circuit of the detector is reflected by partial resonance in the plate circuit of the amplifier. At the same time, although full advantage is taken of the principles of impedance and transformer coupling the

disadvantages of impedance coupling, namely, lack of step-up transformation and the difficulty of obtaining proper grid potential (due to the high plate voltage being directly impressed on the grid) are entirely done away with. The result is an interesting coupling of extreme flexibility and high efficiency.

The Concert Selector utilizes a single vacuum tube for its efficient stage of radio-frequency amplification to give sensitivity, a separate tube for detection to insure quality and two additional tubes solely for audio amplification to bring out music and speech in all their clarity and naturalness of tone with sufficient volume to be enjoyable in the home.

The four small tubes used to obtain these results are the UV-199 type. Four of these tubes consume no more filament current than the ordinary single tube set which employs one UV-201-A. A plate or "B" battery of 67½ volts is sufficient to give loud speaker operation on distant stations. Three 1½-volt dry cells in series are all that is necessary for filament lighting, but if you have 6-volt storage battery don't throw it away—you can use it, as provision has been made for this. The rheostats are calibrated; and whether your lighting source is 3, 4½ or 6 volts, the correct setting of the rheostat knob for proper



In order to impress the maximum of voltage on the grid of the detector tube a resonant circuit between the grid and the filament is employed.

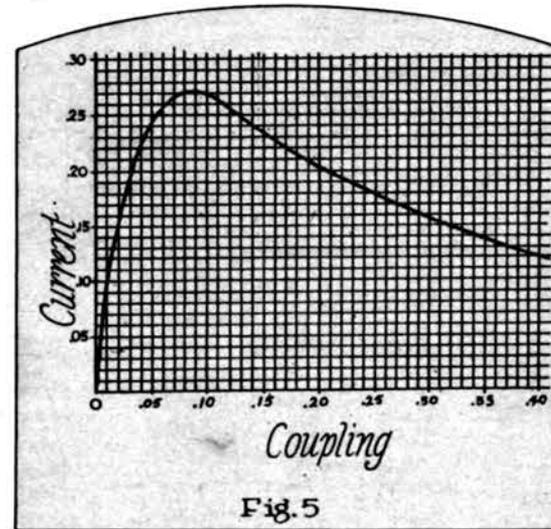
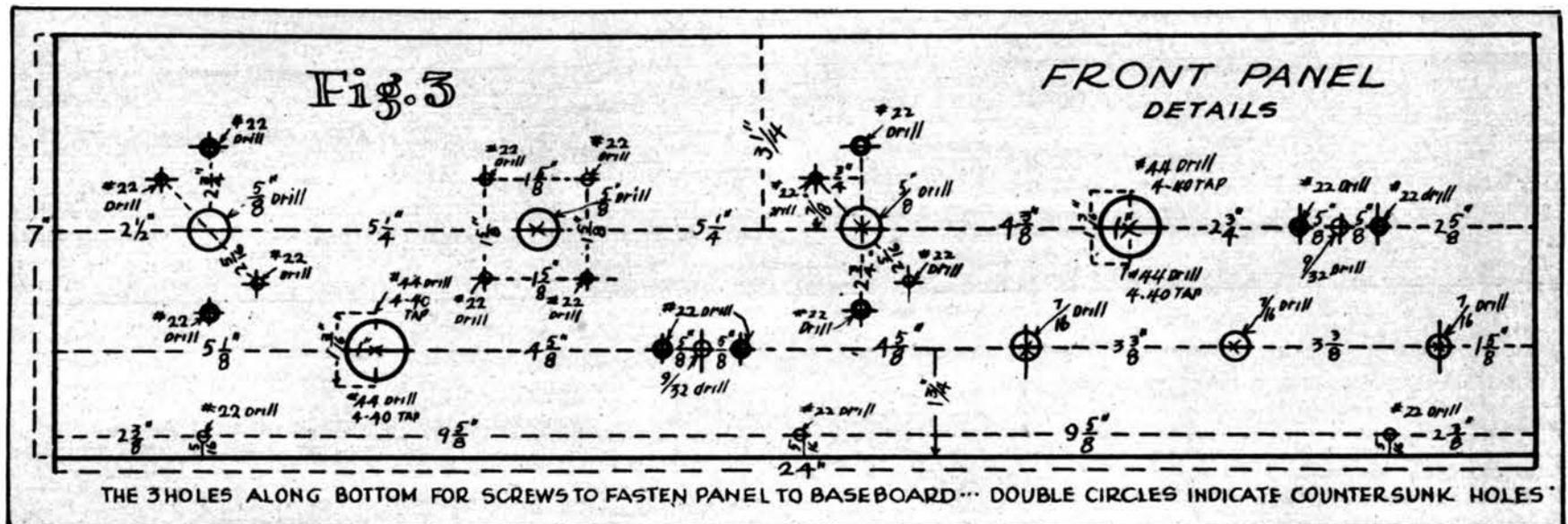


Figure 2 illustrates the relation between volume and coupling for a given wave length. The Clarifying Selector makes it possible to select the peak of the curve for every wave length in the broadcast range.



necessity in good condenser design. This is conducive to the elimination of body capacity effects. The ratio of maximum to minimum capacity is high, giving a good wave length change covering the entire broadcast range.

The final witness to be called in the case

For greater efficiency this circuit must contain the maximum of inductance and the minimum of capacity. Even if a perfect condenser, entirely without losses, were employed across the grid coil, the voltage applied to the grid of the detector tube would be less than that obtainable

voltage is plainly indicated on the Concert Selector panel. Filament current to the tubes is turned on and off by means of two small snap ("toggle") switches.

It is now apparent why the specifications should be followed with the greatest fidelity. It is only by (Continued on Page 26)



Mrs. Eleanor Poehler, Managing Director of WLAG, who announces some of the programs, and appears occasionally as soprano soloist

Business Men of Two Cities Back WLAG

By EARLE R. BUELL

station. The name of one of these companies is used with each of the programs as a countersignature, the companies taking their turn on the principal programs and sponsoring each a daily feature of the other broadcasting hours.

The Minneapolis subscribers to the station are the Munsingwear Corporation, the L. S. Donaldson Company, the Northwest Farmstead, Northwestern National Bank and Minnesota

Loan and Trust Company, Benzo Gas Motor Fuel Co., and Cutting & Washington Radio Corporation, the last-named company being the operating organization as well as one of the subscribers.

In St. Paul the station is supported by the Retailers' and the Jobbers' subdivisions of the St. Paul Association, by Brown & Bigelow and by the Purity Baking Co.

Two studios are maintained, one in the Oak Grove Hotel, Minneapolis, where the broadcasting apparatus is situated and the other in the St. Paul Athletic Club. Remote

control broadcasting is also done from both cities especially from the churches and from the Saint Paul Hotel, the Minneapolis Athletic Club and Nankin Cafe, Minneapolis.

Technical equipment of the station is a 500-watt Western Electric broadcaster with a double-basket aerial.



Dody "Radio" Reimer, comedienne at WLAG. She plays the piano and sings baritone

MINNEAPOLIS and St. Paul speak with one voice from the Twin City Radio Central, WLAG.

This, according to those who have lived in the two Minnesota cities for years, is the first time they have ever been able to unite on anything, but this is mostly an old Twin City joke.

Aside from the fact that one of the cities may not be mentioned without immediate mention of the other, there has been not the slightest difficulty in the wedding of Minneapolis and St. Paul.

Ten commercial businesses of Minneapolis and St. Paul support the Twin City



WLAG is probably the only station in the United States whose destinies are handled entirely by a woman. Mrs. Eleanor Poehler is managing director, in fact as well as in name, and she reports only to the board of directors of which she is secretary.

She is the "lady announcer" of the evening programs whose voice is recognized throughout the United States.

Paul Johnson, whose voice is so distinctive as to be a sort of trade-mark of the station, has been chief announcer since the early days of the station when its slogan was "The Call of the North."

Daylight broadcasting is one of the big features of the WLAG schedule and its afternoon concert has been heard on the Atlantic coast in several instances with

A market report from the studio of WLAG. Tess Cooperman at the microphone

similar distance marks in other directions.

At night the Twin City station has been heard in New Zealand, in Batum, Russia, in Kragero, Norway, in Venezuela and Honduras and by the McMillan expedition near the North Pole. This is considered one of the best records held by a 500-watt station.

A full schedule is maintained by WLAG.

The station bids the world "Good Morning" at 9:30 A. M., when Miss Tess Cooperman outlines the program of the day and reads news from the Minneapolis Morning Tribune.

Market reports are given at intervals throughout the forenoon with a daily period of household hints coming at 10:45, at which time recipes and other valuable information are broadcast for the housewife.

The first entertainment program of the day comes at 11:35 A. M. and runs till 12:10 or 12:30. It is called the "surprise" program and its features are never announced before hand. This proves a most valuable program because of the fact that it is closely watched by the fans so that they will not miss the surprise features and also because it enables the station to book on short notice artists who might not otherwise be available.



Joe Maland and his pet rooster, "Billy Lag," who helps him sign off now and then at Station WLAG, by Northwest Farmstead. "Billy" makes the chickens cackle



"Eleanor Freemantel at the piano." That is the way she is announced from WLAG. She plays many accompaniments, but is seldom heard as a soloist. "Oh, I don't know," she says, "I just don't, that's all"

The surprise program has run the gamut of entertainment from a mouth organ soloist to three accordions playing at once, and from an article on the inferiority complex taken from a magazine to a short play. Orchestras are often tried out on this program before being booked for evening time, but because of the fact that the surprise is usually confined to one artist or musical organization so that they may have their own way with the program, most of the regular stars of evening broadcasts are quite willing to take a surprise hour.

At 2 P. M. a meeting for women is held.

Odin Wold, veteran Minneapolis policeman and his daughter, Mrs. J. Albert Huseby, playing the musical glasses on a novelty program of WLAG

The hour is given over to speakers intended to be interesting only to the fair sex, but a considerable number of men have been found to be listening to talks on the care and training of children, the details of political organization or the proper caper in sewing or hair dressing.

A daily matinee concert is given which covers the entire Northwest and has been heard in New York State and in New Jersey. It begins at 2:40 P. M. after a market report and closes at 4 P. M. to make way for the magazine reading period, when Miss Mildred Simons reads from one of the standard magazines a short story or article of general interest for the benefit of shut-ins and stay-at-homes who find music monotonous on the radio.

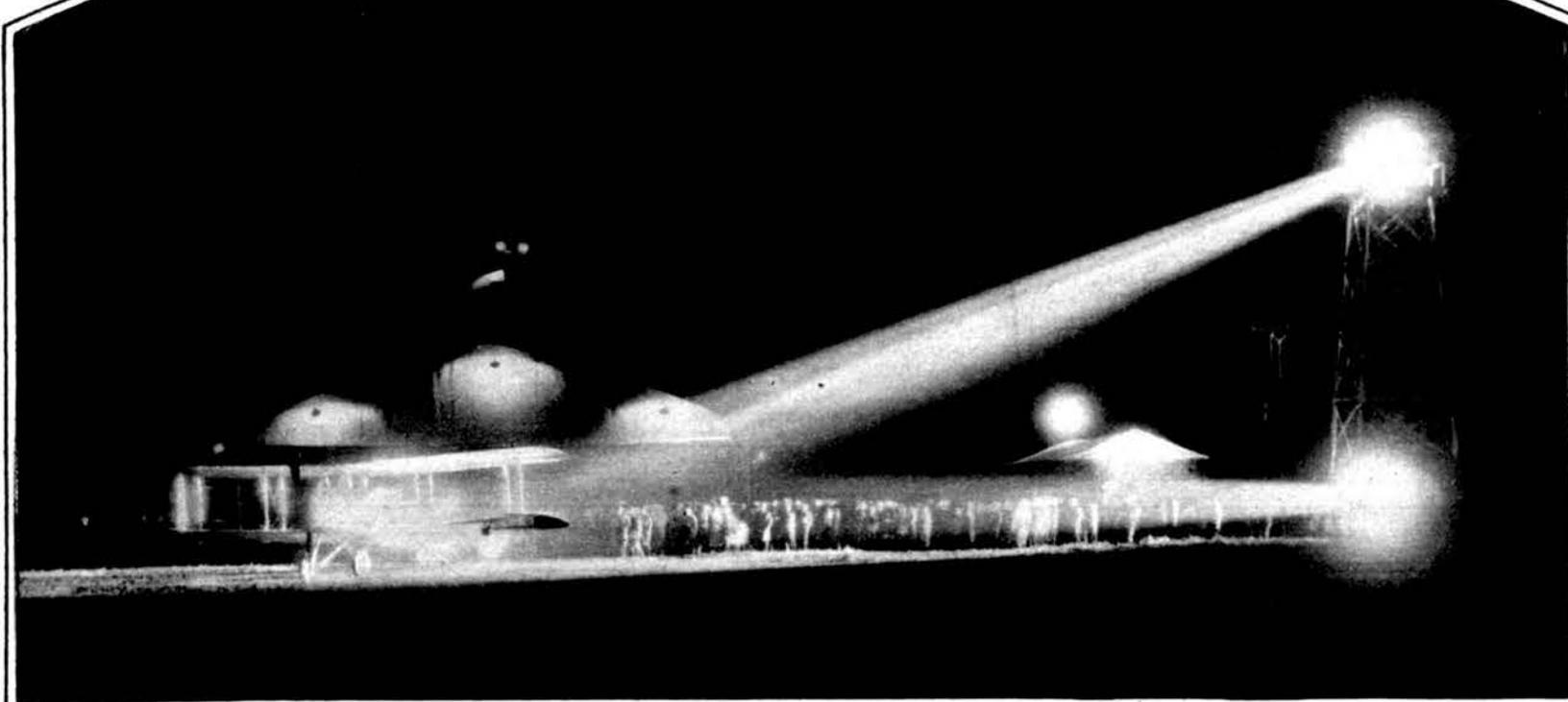
The closing market reports are given at 4:30 in the afternoon and are followed by

the reading of news from the Minneapolis Journal.

Interesting observations are being made in connection with the broadcasting of news bulletins from the Twin City station. Letters and telephone messages indicate that this is one of the services most appreciated from the station but there is no sign of any lessening in newspaper interest on account of it. In fact there is a general showing that in every case where the "lead" of a news story is broadcast, persons who are vitally affected by it hasten to buy copies of the paper to read further particulars. This, taken together with the fact that thousands of papers are bought for the express purpose of following radio programs, makes radio a great asset for the newspaper.

Children's stories are told at 5:30 P. M. daily, except Friday and Saturday, by story tellers chosen from among many in the Twin Cities. On Friday the period is given over to a (Continued on Page 20)





This is one of the most remarkable night photographs ever made. It shows one of the night air mail planes arriving at midnight at Fort Crook, Neb., from Chicago. The giant searchlight at the top can be seen for 150 miles, and the bottom light floods the field while fliers alight and "take off"

Photo by Nat Dewell, Omaha, Neb.

You'll Hear the Night Mail Fliers Now

OCCUPYING a distinctive and unique place among the radio-casting stations of the world is KDEF, owned and operated by the United States Air Mail Service, at Omaha, Neb.

KDEF boasts no silver-tongued announcer, and those who have tuned to its wave have never heard the strains of a jazz orchestra, pipe organ, or the like, yet, very soon, KDEF will commence a schedule of broadcasting which will mean more to a little group of men than all the other stations combined. In a little "shack" at Fort

By WILLIAM H. GRAHAM

Crook, fifteen miles south of Omaha, KDEF is located. The station recently was donated to the air service by the Westinghouse Electric Co., of Pittsburgh, Pa., and when present plans are perfected, it will be the voice to help guide the air mail fliers after they hop off from Chicago, westward, into darkness in their schedule to put New York mail into San Francisco thirty-six hours later!

If you tune to KDEF's wave, 222 meters, some night, you probably will hear a conversation something like this:

"Hello, Slim. This is KDEF, Hempel talking. There is a heavy fog over the Missouri River, and you will have to fly at an altitude of 2000 feet to get over. Where are you now and how is everything?"

Then, a few moments later, if you keep

Left—H. T. (Slim) Lewis, intrepid air mail flier, who will have charge of the night air mail fliers between Chicago and Cheyenne. Note the radio receivers concealed in his helmet. Lewis will be one of the pilots of the air mail service's radio-equipped plane, 245

Right—Jack Knight, who gained prominence by flying from Cheyenne, Wyo., to Chicago at night, before beacon lights were invented, will be one of the operators of the radio-equipped night air mail plane. He is pictured herewith in aviator-radio garb, which is quite in contrast with the "soup to nuts" dress most of the announcers wear

on the same wave, you probably will hear "Slim" come on the air with:

"Hello, KDEF. This is H. T. (Slim) Lewis, in plane No. 245, between Chicago and Omaha, talking. I am now flying over Iowa City, about to land to refuel. Motor is humming like a top and I will be in Omaha about midnight. Much obligated for the information about the fog. Give me a call in an hour and let me know if it has lifted."

In recent tests between KDEF and the radio-equipped air mail plane, two-way



conversation between the ground station and the pilot "somewhere in the air" has been successfully carried on for distances up to 250 miles in daylight. Only one plane thus far has been equipped with both sending and receiving apparatus, and this ship, it is expected, will be put into service shortly on the night air mail route.

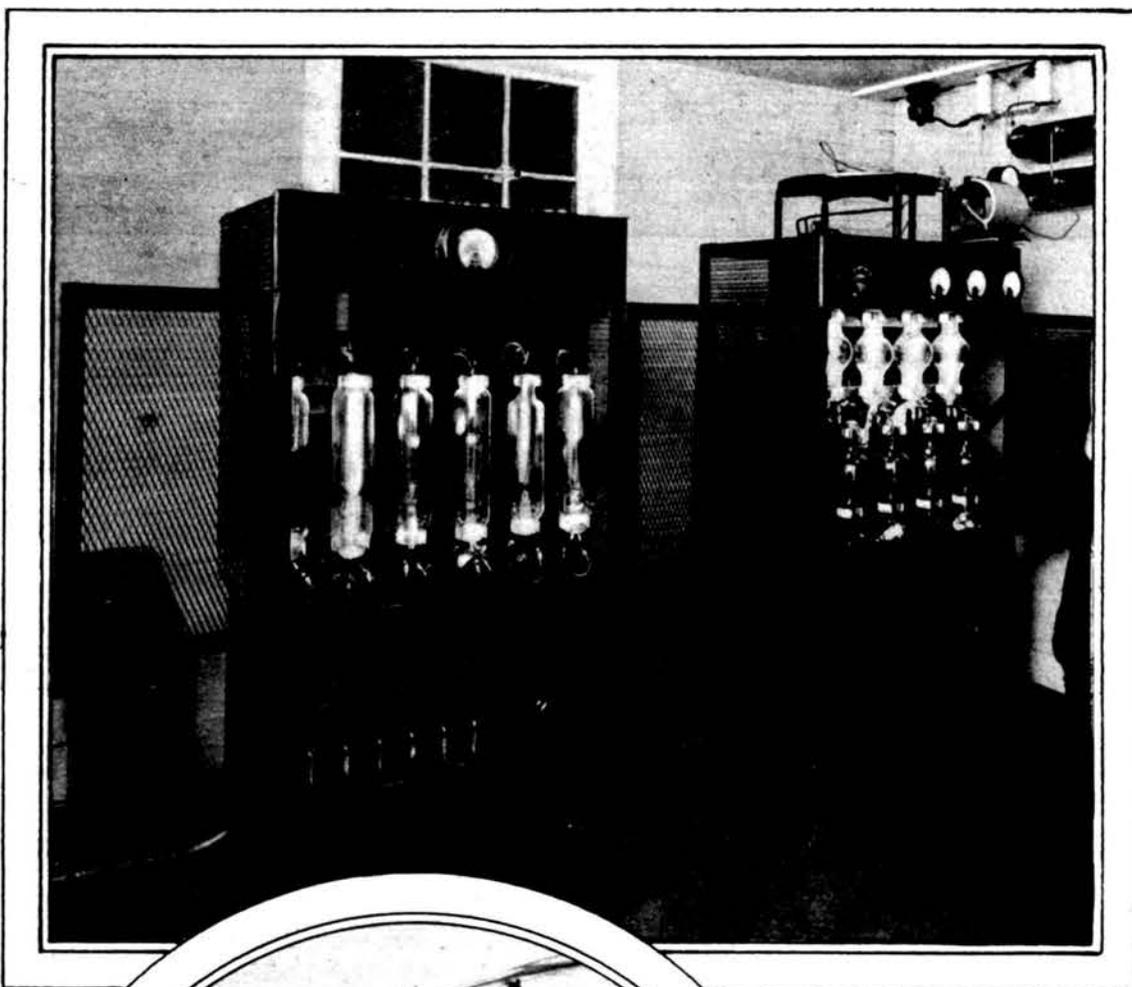
C. B. Hempel, radio engineer and chief operator at both the air mail's voice and C. W. stations in Omaha, is the man in back of the gun at KDEF. The Westinghouse engineers installed KDEF under his direction and Hempel, in turn built and installed the receiver and the 100-watt transmitter in plane No. 245.

The plane's transmitter is operated by storage batteries and the ship's motor charges the battery at a rate sufficient to operate the transmitter for fifteen minutes every hour. The receiving apparatus, a combination of the neutrodyne and superheterodyne principles, of course, can be operated continuously, and as the pilot wings his way through the air on a tiresome night journey, he may tune for an opera singer at KDKA, a jazz band at WGN, or a speech from WEA.

Under ideal conditions this winter, Hempel believes he can keep in touch with the pilot aboard the radio-equipped plane all the way from Chicago to Cheyenne, Wyo., the distance the intrepid air mailmen must span in darkness.

Carl F. Egge, superintendent of the night air mail service, who has been in Omaha for the last several weeks superintending the night flying, says that for the present only the one plane will be used in the work. In the near future, however, he believes it will be for the best interests of the pilots to have every ship so equipped.

Jack Knight, of Omaha, who piloted the first mail plane from Cheyenne to Chicago in darkness, without beacon lights to guide him, was the first operator successfully to work the plane's radio apparatus. Some



time ago he was relieved of experimental duty, placed back on a regular "run," and since that time, H. T. ("Slim") Lewis has been the experimental pilot. Both will engage in the night flying, however, and radio fans no doubt will hear both of their voices from the plane's radio.

KDEF is a 100-watt transmitter, powered from a 220-volt alternating current line.

This current is stepped up to 6600 a. c. current and then rectified into 2000 volts of direct current. In reports to the station, the correspondents almost without exception have commented on the fact that the station has no audible generator hum.

During the tests with the plane on experimental flights, KDEF has been heard seven times in Australia, a distance of some 7000 miles from Omaha, twice in France and numerous times in England.

During the night flying, the pilots will have giant beacon lights at various points along the route to help guide them. The light at Omaha has been "picked up" by the pilots on several occasions, 150 miles away, and pilots have had no difficulty in following it into Fort Crook.

"We shall be glad to get reports from any of our hearers when we get to working properly," said Hempel. "We especially want to get long-distance reports from those who hear the ship's radio, and from those who are able to pick up both conversations."

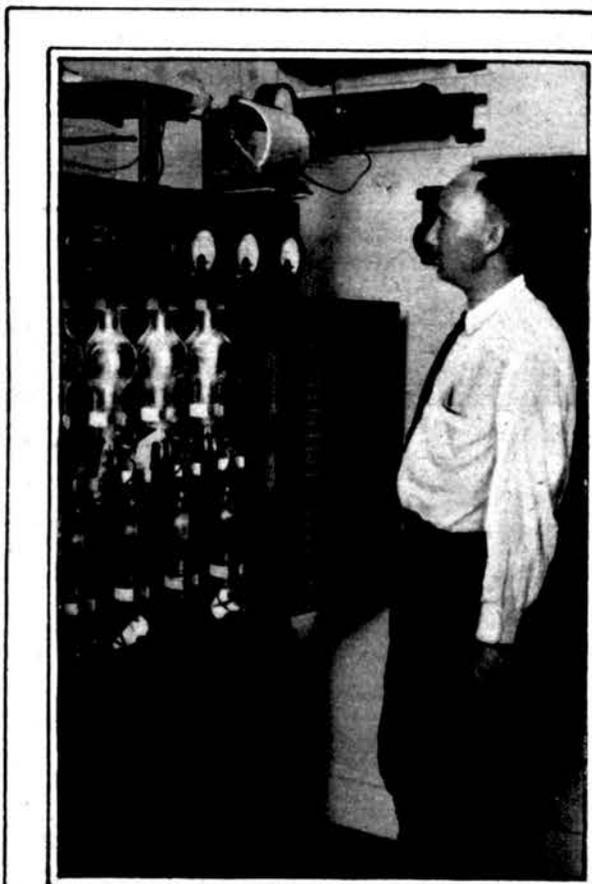
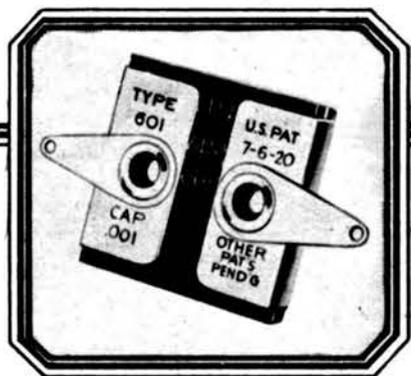


Photo at top is the inside of KDEF, the ground station of the night air mail service at Omaha, Neb. At the left is the unit which rectifies 6600 volts, alternating current into 2000 volts direct current, for the speech amplifiers and modulators at the right

Circle—Jack Knight, aboard radio-equipped air mail plane 245. The ship's aerial runs from a reel at the bottom of the cockpit when the plane is in flight, and the apparatus is grounded to ship's framework
Left-hand photo, the "man behind the gun" at the night air mail's radio KDEF. He is C. B. Hempel, of Omaha, radio engineer and experimenter, also chief operator at Fort Crook air mail headquarters. He designed and built WAAW, the Omaha Grain Exchange's 500-watt station



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Condensers of Fixed and Permanent Capacity

You will have condensers that maintain a fixed capacity if you buy Micadons.

The Dubilier Micadons are found in over ninety per cent of the sets made by amateurs and manufacturers throughout the country. The experts specify Micadons. The name Dubilier on a condenser has the same meaning as the name sterling on silverware — highest quality.

There is a Micadon for every circuit—different types are made for different requirements.

For free booklet showing methods of soldering Micadons in radio circuits, address 45-47 West Fourth Street, New York

Dubilier

CONDENSER AND RADIO CORPORATION

The Greene "Selector"—New England's Favorite

(Continued From Page 31)

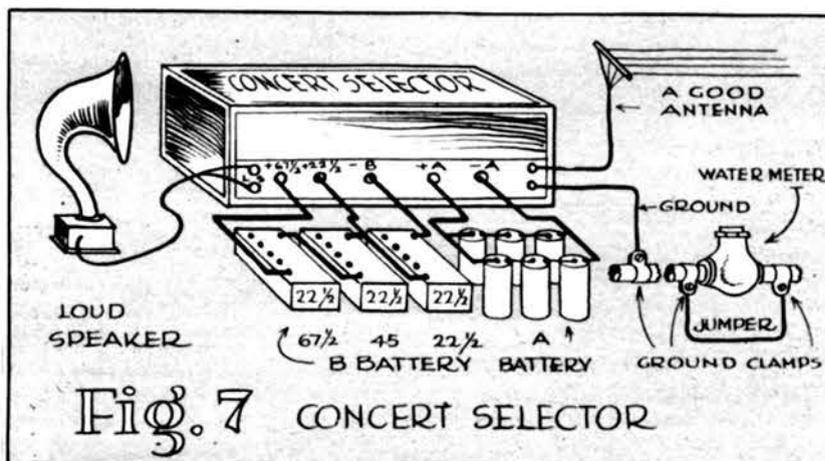
the application of the principle of cumulative efficiency that a receiver of this kind can be built with any degree of success. It is quite comparable to the manner in which the sea is held in check by the dikes in Holland. Let one break occur and the entire country is inundated. Just so with the Concert Selector. One poor part may render mediocre a receiver of the greatest excellence.

In building the Greene Concert Selector readers are urged to follow instructions closely and to the letter and not to deviate from them in the slightest detail. There is a reason for this. Building a radio set is much like making a cake. When the recipe is followed and the proper ingredients included something edible results. If instructions are not followed failure results. This applies to radio as well as to the cake. Never attempt to

- 3 Two-circuit jacks (Pacent or Federal) 2.40
- 9 Eby binding posts..... 1.35
- 4 1½" 6-32 flat-head machine screws (nickel brass)... .05
- 4 ¼" 4-40 flat-head machine screws (nickel brass)... .05
- 4 brass pillars 15-16"x½" with hole untapped, for 6-32 machine screws20
- Wood screws for mounting transformers, sockets, etc., to baseboard10
- 20 feet No. 18 or 20 bare copper wire and 15 feet of spaghetti for wiring..... .50

Total \$63.00

Figure 3 tells more clearly than many words just how and where to drill the different sizes of holes for assembling instruments on the front panel. Read the dimensions from



improve upon any radio set until you have first tried it as described.

In describing the construction of the Concert Selector it has been deemed necessary to mention names and makes of various instruments used in the models. Two reasons may be given for this. First: The radio public who will spend the money for these instruments wants to know what was used in the models to obtain the results claimed for the Concert Selector. It is entitled to this information. Second: The author knows that if the parts specified are used the selector will function as represented. The prices in the following list are only approximate and are mentioned solely to give the reader some idea of the total cost of a set of parts:

- 1 Radion panel 7"x24"x3-16"... \$3.50
- 1 vulcaewood cabinet 7"x24"x3-16" 12.00
- 1 Langbein & Kaufman clarifying selector 7.00
- 1 Langbein & Kaufman variotransformer, type VT-25.. 8.50
- 1 National special capacity (.00055 M.F.) variable condenser with dial 6.00
- 2 National vernier dials..... 4.00
- 1 Dubilier fixed condenser (.002 M.F.), type 601..... .35
- 1 Dubilier fixed condenser (.001 M.F.), type 601..... .35
- 1 Strand variable grid leak and condenser 1.25
- 2 toggle switches (Connecticut) 1.00
- 2 Pacent rheostats (30 ohms).. 2.00
- 4 UV-199 tube sockets (Pacent, General Radio or other good make) 3.00
- 2 Audio amplifying transformers (Acme or General Radio) 10.00

the plan of this figure and lay them on your panel with pencil lines and cross lines. Don't drill any holes until you are sure you have them properly located and be sure to place a piece of soft board beneath the panel to prevent the drill from breaking away the edges as it emerges from the back of the panel. When drilled erase all pencil marks made on the panel. If these marks are not thoroughly erased they may form leakage paths, especially between binding posts, and introduce serious losses.

In order to mount the Pacent 30-ohm rheostats as shown in Figure 5, i. e., with the posts pointing upward, it will be necessary for the constructor to file a flat face on the rheostat shaft opposite that on the shaft as furnished. If the rheostats are not mounted in this manner the calibration on the panel for filament voltages will not hold. Nor will these calibrations hold if another type of rheostat is used.

Figure 4 illustrates the back panel layout upon which all binding posts are mounted. This panel should be drilled next and the binding posts mounted. Small copper soldering lugs on these posts will make the soldering easier, especially if the lugs are tinned before fastening to the posts. Sometimes it is more convenient to carry a wire to one side of a binding post than to another, and these small lugs can be readily turned to suit conditions. The front and back panels should now be fastened to the baseboard.

If a vulcaewood cabinet 7"x24"x3-16" is used you will find a baseboard of the right size in the package containing the screws, metal strips and sides. This baseboard measures 23½"x6½"



Home-comfort and entertainment!

Enjoy the cool comfort of an easy chair and all varieties of music, sports, helpful talks and speeches. On the cool side of the porch—the calm pleasure of restful evenings with an entertainer of infinite versatility—radio and a Table-Talker.

It generously reproduces every part of the fascinating radio program.

Brandes

The name to know in Radio



x 5/8". The panel, which is purchased separately, measures 7"x24"x3-16". The 3/8" difference in panel length and baseboard length is due to the thickness of stock used in the cabinet sides, which is 3-16", two sides making 3/8", which is added to the baseboard length when the cabinet is assembled. The baseboard to use, if you choose another type of cabinet, might be 23"x7"x5/8". This will permit a sidewall thickness in the cabinet of 1/2".

The next step in construction is to mount the instruments on the panel and panel baseboard. Whatever you do, don't "throw" the apparatus together in your eagerness to complete the selector. It's worth building right and it takes time to make a good job of it."

You will notice in the bill of materials required these two items: four 1 1/2" 6-32 flat-head machine screws (nickel brass) and four brass pillars, 15-16"x1/2" with hole untapped for 6-32 machine screws. Two of these screws and two brass pillars are used in mounting each of the two tuning instruments, the clarifying selector and the variotransformer. The clarifying selector is shown at the left in Plate B.

The four 1/4" 4-40 flat-head machine screws (nickel brass) mentioned in the list of materials are used in fastening the snap (toggle) switches to the panel, two being used for each switch. These switches control the filament circuits. The switch at the lower left (shown in picture of completed set) lights the first two tubes, while the other lights the two audio amplifiers. The first switch is called FIL 1, and the other FIL 2.

Figure 5 is a wiring diagram of the Concert Selector in picture form. An endeavor has been made to present this part of the description in the clearest manner possible. If you will follow the instructions immediately succeeding you will be able to wire your selector exactly as the model was wired. By adhering to these instructions you will get the connections from one instrument to another in the order which will make the wiring simplest and easiest; and what is more, you cannot "go wrong," if you use a reasonable amount of care.

Use the No. 18 or 20 soft-drawn copper wire for wiring and cover with spaghetti as you go along. Measure the spaghetti to fit each length of wire and your set will look the better for it when finished. And above all things go light on the soldering flux. Use as little as possible and wipe all joints clean. It will pay you well to do it and it takes only a moment.

Note the markings and the numbers and letters in Figure 5 and wire as follows: Ant to 1; Gnd to 2; A to 3; 4 to 5; 5 to 6; 6 to 7; 7 to 8; 9 to the wire from A to 3 at point W and continue to 10; 11 to 12; continuing to 13; 14 to 15; 16 to 17; 18 to 19; 20 to A positive, continuing to B-; to 21 to 22, and to 23; 24 to 25, and continuing to 26; 27 to B- or A plus; 28 to 29; 30 to 31, and continuing to 32; 33 to 34; 35 to 36; 37 to 38; 39 to 40; B plus 22 1/2 to 41, and continuing to 42; 43 to 44, and continuing to 45; 46 to 47, and continuing to 48 and B plus 67 1/2; 49 to 50; 51 to 52, and continuing to 53; 54 to 31; 55 to 56; 57 to 58; 59 to 60; 61 to 62.

Point W previously referred to is plainly indicated at the right in Figure 5.

If you have taken care to place your sockets, rheostats, transformers, etc., in the relative positions, your selector is now correctly wired.

Figure 6 is a schematic wiring diagram of the Concert Selector and is given for the benefit of those who prefer this method of illustrating wiring connections. It is self-explanatory.

In attaching the vernier dials, set the rotors of the vario-transformer

and clarifying selector so that the wires from the rotor shaft to outside of rotor windings point to the right as you look at them from the front of the receiver. This is zero setting for the dials.

The rheostats, if Pacent 30 ohm type is used, may be calibrated for 6 or 4 1/2 volt filament battery. When the rheostats are mounted in the positions shown and a mark placed at "10 o'clock" on the circumference described by the rheostat knob, this mark will indicate the correct setting when a 6-volt battery is used to light the tube filaments. A mark at "1 o'clock" on the circumference will indicate the correct rheostat setting when a 4 1/2-volt battery is used. If a 3-volt lighting battery is used, turn the rheostat on full.

Either UV-199 or C-299 vacuum tubes should be used in the Concert Selector. Other tubes will not function properly except in the audio amplifiers—try it if you doubt it.

The installation of the Concert Selector plays an important part in the results that may be obtained by its use. Although the selector is a very sensitive instrument and may be used with a small indoor antenna, one of the principal advantages is the fact that it may be used with a very large outdoor antenna and still retain its selectivity. This feat is made possible by the use of the clarifying selector already described, and it is a source of real radio economy.

This increased pickup of the large antenna will enable the reception of distant stations with the effect of great radio-frequency amplification. In other words, it is now possible to use a large antenna and four tubes and accomplish the same results as formerly with a small antenna and more tubes. Antennae are cheap and tubes are expensive. The facts to remember in conjunction with the antenna and ground connections to be used with the Concert Selector are these:

The instrument entirely discards regeneration. It is incapable, as the regenerative receiver was, of making up for the defects of a poor antenna and ground system. It will, therefore, repay richly any effort to improve this part of the receiving system.

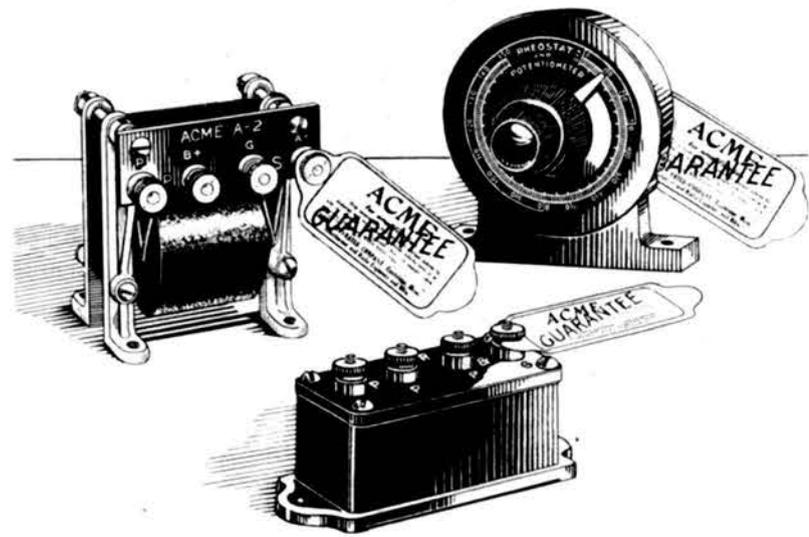
Use a good antenna. By a good antenna is meant one, 100 to 150 feet long, as high as possible and hung clear of all obstructions. Erect your antenna in the open if possible. Insulate it well and put all your insulators in series, not in parallel. Use good glazed porcelain, glass or Pyrex insulators. Where the lead-in leaves the flat-top solder the joint, or make the lead-in and flat-top one continuous piece of wire. Swing the lead-in clear of the house; do not bring it down the side of the wall with a flock of insulators.

Insulate the point of entrance into the house with a porcelain tube. And above all things use a good ground. Run a heavy copper wire to the nearest cold water pipe. Fasten to the pipe with a ground clamp. Then place a jumper around the water meter as shown in Figure 7. The importance of a good ground cannot be overestimated.

Figure 7 plainly shows the connections of the various batteries and needs no explanation. If the volume is not quite what you expect, try reversing the leads to the loud speaker.

Tuning in broadcasts with the Concert Selector is reduced to simplicity itself. There are three controls, namely, "clarifier," "selector" and "R. F. amplifier." The "R. F. amplifier" control, located at the right hand, is set for the wave length of the station desired. The correct setting of this dial for any wave length is plainly indicated in the tuning chart. The dial setting will always remain the same for any given wave length, so that once it is set for a

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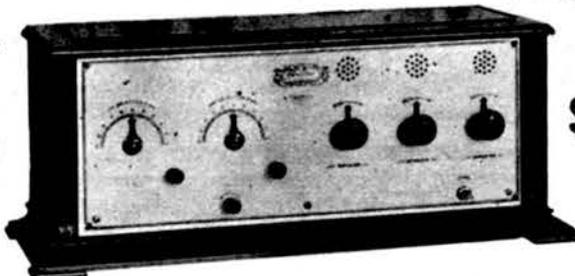
ed to prevent inter-stage coupling or reaction. (3) Stable; free from any tendency to oscillate. (4) Windings specially designed to eliminate capacity; properly treated to exclude humidity. (5) Every transformer "circuit-tested" for accuracy and precision to insure uniformity and highest efficiency. (6) The best long-wave transformer that can be made. Fully guaranteed. All the better dealers recommend the All-American. Built by pioneers in the industry. Rauland Mfg. Co., 2666 Coyne St., Chicago.

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DISTRIBUTORS AND DEALERS: Cleartone sets are their own most effective salesmen. Get a sample and find out just what we offer.

Model 60	\$ 60.00	Clear-O-Dyne Model 71	90.00
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THE CLEARSTONE RADIO COMPANY, Cincinnati, O.

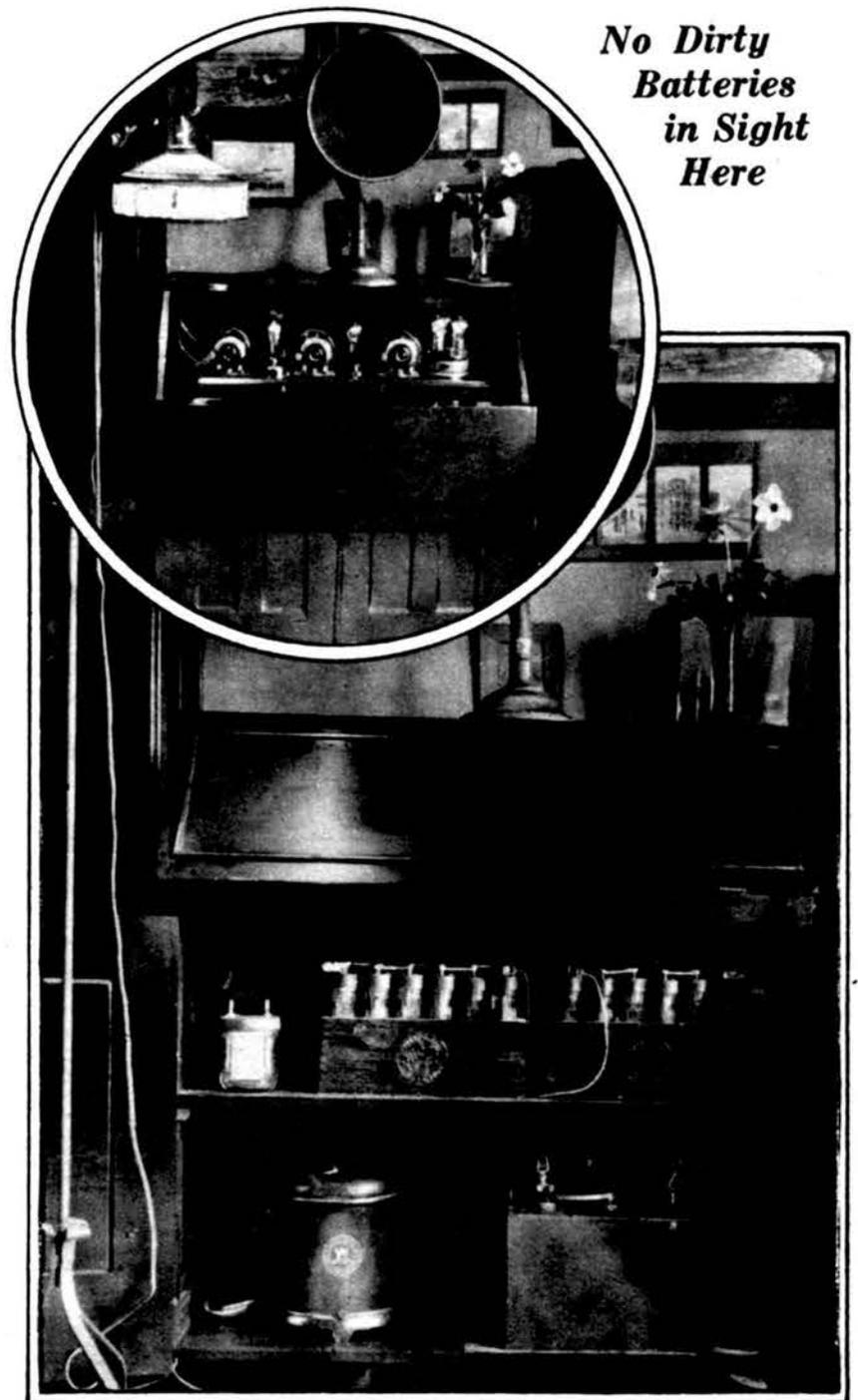
station no further attention need be given it. Next set the clarifier dial at about 50 degrees. The middle or selector dial should now be turned carefully until the desired station is heard.

If the selector setting falls on a number below 50 degrees, reduce the clarifier setting for best reception. If above 50 increase the setting of the clarifier. The great advantage of this method of tuning is that the amplifier control is set in advance of the sta-

length of 244 meters; and for WSAI, whose wave length is above that of WNAC, the R. F. dial is set at 30, which corresponds to a wave length of 309 meters. All you need to remember then is that for stations of longer wave lengths the R. F. amplifier control should be set at higher numbers on the dial, and for stations using shorter wave lengths set the R. F. dial on the lower numbers.

From the several settings shown in

No Dirty
Batteries
in Sight
Here



These two photographs show the installation in the home of H. W. Leeds, 107 North Thirty-fourth Street, Philadelphia, Pa. The bottom compartment of the desk contains storage, A, B and C batteries with chargers and with the switching arrangement given not long ago in RADIO IN THE HOME. It is only necessary to throw a switch from "use" to "charge" to freshen up any of the batteries for further use.

tion selector control. Therefore when the desired station is found on the selector dial it alone comes in highly amplified and cannot be missed.

The chart following is given for the purpose of illustrating the correct dial settings on the R. F. amplifier control for different wave lengths in meters. For WNAC the R. F. dial is set at 24, which corresponds to a wave length of 278 meters; for WTAT, whose wave length is below that of WNAC, the R. F. dial is set at 15, which corresponds to a wave

the chart it will be an easy matter with the practice derived in picking up these stations to develop a chart for all stations. While it is not necessary to confine oneself to a chart of this kind in operating the Concert Selector, it facilitates picking up a desired program in the shortest time possible. If your R. F. amplifier dial does not correspond with the numbers indicated in the chart it is probable that you have failed to set this dial properly when attaching the vernier

(Continued on Page 32)

Business Men of Two Cities Back WLAG

(Continued From Page 23)

meeting of the Radio Health and Toothbrush Club of America, directed by Dr. Frederick W. Pepper, which requires for membership only a pledge of the child to brush his teeth every night before retiring. More than 10,000 children are members of the "Toothbrush" club, as it is called, and chapters are forming all over the

WLAG is the Northwest Farmstead lecture program at 7:30 P. M. every day, except Saturday and Sunday. At that hour the city listener is forgotten and talks of interest to farmers are broadcast. Every subject of definite interest to farmers is covered and letters are received from all over the United States commenting on them.



Two St. Paul business men, Fred Morse and Toney Oas, recently won national notice playing the harmonica at WLAG

country. Entertainment programs of the club are given with child actors and with novelty entertainers.

Sport scores and talks for men are given at 6 P. M., when workmen and business men are supposed to be waiting for dinner. It is followed by a dinner concert on three evenings a week sometimes broadcast by remote control from the Saint Paul Hotel or the Minneapolis Athletic Club.

One of the big institutions of



Paul Johnson has his own way of saying "Goodnight Everybody." It is recognized by thousands, for he is chief announcer at WLAG

No man is too big to be booked at this period, and none is too small if he has a message that means dollars and cents to the farmer. On Saturday evening the same period is handled by Brown & Bigelow, booking business talks, and similar talks are given on Wednesday and Friday nights at 9:15.

The evening concerts of WLAG are given on Sunday, Wednesday, Friday and Saturday nights. The Sunday concert is confined to serious music modeled on classical lines and many fine programs have been given by the pick of Twin City musical organizations. Wednesday concerts are intended to be of an informal nature and it is on this evening that novelties are generally booked. Friday has its program of general interest and Saturday usually sees two programs, an hour from 9:15 to 10:15 P. M. in the nature of a recital and a dance program that runs to 12:30 A. M.

The technical staff of WLAG is headed by Ray R. Sweet, chief engineer, who assisted in installing the station. Operator engineers are Harold Rawson and Lyall Smith. Their task is a heavy one because of the necessity of operating remote control apparatus and supervising installation of other remote control lines in which the telephone company officials co-operate with the WLAG staff.

The latest bit of remote control broadcasting opens a new field for WLAG and makes it truly representative of the Northwest for it has to do with the broadcasting of a concert from Mankato, Minn., about 60 miles away, by remote line. This follows the development of the winter when programs were given by representatives of various cities throughout the State and nearby territory.



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Any Dealer Can Supply

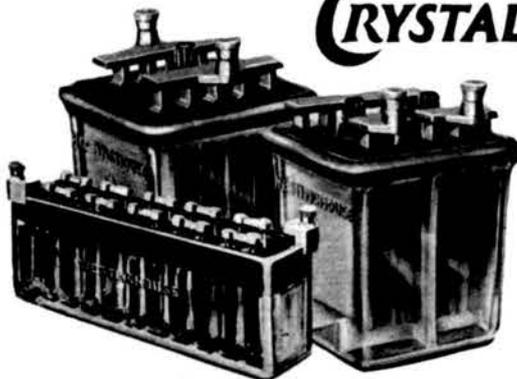
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DX Foolishness

By G. N. Garrison, I. R. E.

THERE is an old trite saying that "every story has two sides." Almost, if not invariably, every issue of every radio paper has articles galore praising the merits of their respective DX circuits. DX seems to be the cry of the age. Let us look on the other side of the question.

The other evening a certain radio friend of mine paid me a visit, and, during his stay, I tried to entertain him as best I could with music and entertainment from the local broadcasting stations. Most of the local programs were exceptionally good that night and receiving conditions, ideal—or at least I thought so.

A true lover of music would have considered remarkable the reproductions we listened to that evening. It was coming out of a loud speaker with comfortable volume and a quality surpassing that of the best phonograph.

The disappointing feature, however, at least disappointing to my friend, was that we didn't log a single DX station during his entire stay. He was fairly disgusted, though probably too polite to admit it, when I didn't even try.

I noticed the disappointed look on his otherwise charming face and, as though in reply to my unasked question, he remarked in all earnestness:

"That music of yours was very good and all that sort of thing, coming as it did from local stations, but it's early yet—suppose you drop over to my house for a little while? I want to show you a receiving set the circuit of which I have not yet made public, but I think I will be pardoned for saying, 'it's away ahead of the times.'"

From past experiences I knew it would be of no avail to "pump" my friend for further information just then, and, since he painted his own "invention" in such brilliant hues, I could do no better than accompany him home. For my friend, be it understood, was a very ingenious young man and used to accomplishing the impossible.

He ushered me into his radio "laboratory" and seated me before what appeared to be a cabinet of some two feet long by half as deep and high, over the front of which were distributed, at regular intervals, seven or eight dials and knobs. I saw nothing on the surface to indicate that it was other than the common "garden" variety of receiving set.

However, I was soon to learn that I was totally in error in this respect. Before I could get fairly and comfortably seated, my friend rushed up to his set, all out of breath from his ascent of three flights of stairs, and, while adjusting a few wires preparatory to giving me the "surprise of my life," he condescendingly beamed on me and fairly panted.

"Let me say, before going further, that I have here a set, the only one in existence, that will not get any of the local stations, no matter how hard you try to tune them in."

I thought to myself then that there was no use of his "going further"; for if, as he stated, the set couldn't be made to tune in local stations, what, in the name of good common sense, was it good for then—an ornament? As such, it was, indeed, passable.

But I simply said "marvelous," and waited for his next move.

It was not long in coming. He plugged in his loud speaker, pulled out the battery switch and began

twisting three or four of his several dials.

Before proceeding with this narrative it might not be out of place here to repeat that my friend was very ingenious. Long before he assembled this "marvelous invention" of his—a demonstration of which I was about to witness—he had been considered by his friends as quite an adept on building wave traps; in fact, built them so good that they would efficiently cut out the undesired station without affecting the strength of the station wanted. That is a whole lot more than I can say of many, far too many, wave traps that I've seen.

I learned afterward that my friend had simply assembled a number of these wave traps, using fixed condensers with each coil and so arranging the whole that each trap would cut out one, single, predetermined station—a local of course. By setting each of his traps for a different local station he had what he was pleased to call "no local interference." A series-parallel variable condenser, he told me, was so arranged that his set could be used on widely different aerials.

But to come back to the story:

After turning on the "juice," there immediately issued from the near end of the horn a far greater mixture of unadulterated wild animal noises than P. T. Barnum ever heard in his whole lifetime. If I didn't know that the other end of the horn was connected to an ordinary receiver, I would have thought it was somewhere in the middle of the Bronx Zoo. This first outbursts was followed by lifelike reproductions of thunderclaps, broken china, bird cries, fog horns and innumerable other noises too hideous to remember or recall.

All this racket seemed to please my friend greatly, for he yelled, above all the din of battle:

"I think I'm getting something!"

The racket made it impossible for me to reply, but I knew that he wasn't "getting something"—he already had it. The only question in my mind was whether to send for the wagon from the undertaker or the booby hatch.

After some fifteen minutes, during which my friend insistently twirled those little dials in front of him, the "air" seemed to become much quieter. All that now broke the silence was a continuous high-pitched whistle accompanied by at least a dozen different varieties of bird songs—mostly chippies. The monotony of this was relieved by an occasional and entirely unexpected clap of thunder.

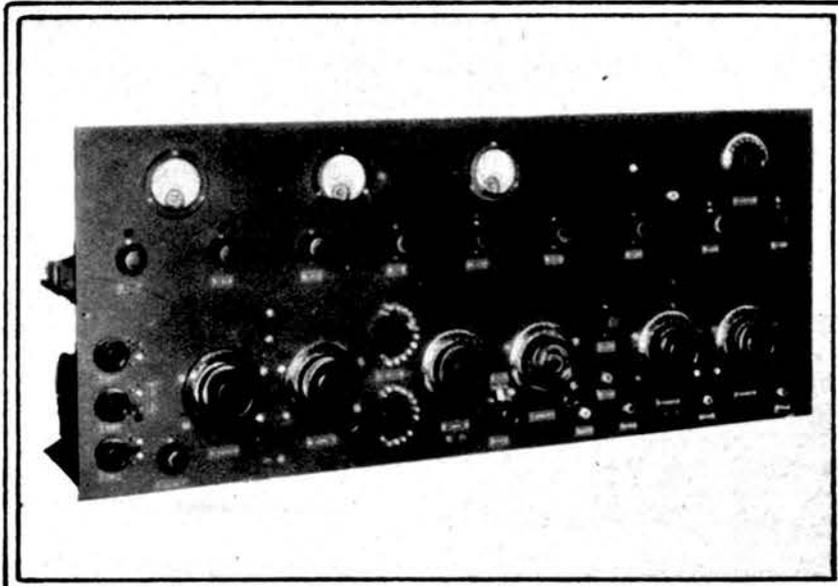
After one supreme effort of the dial twister, I was treated to what appeared for all the world to be a human voice and that coming from the female of the species. The jungle cries were particularly loud at that moment, and they mixed delightedly with the voice that I managed to get.

"This * * * station * * * F * * * X * * * the voice of * * * west. We * * * you have enjoyed * * * imitations * * * Hiram * * * This concludes * * * tonight * * * signing off * * * night."

So that was the explanation, was it? Hiram somebody from somewhere had been giving imitations of birds and animals over the radio! But, had I been Hiram, I certainly would have had the courtesy to keep my menagerie quiet while the announcer was speaking.

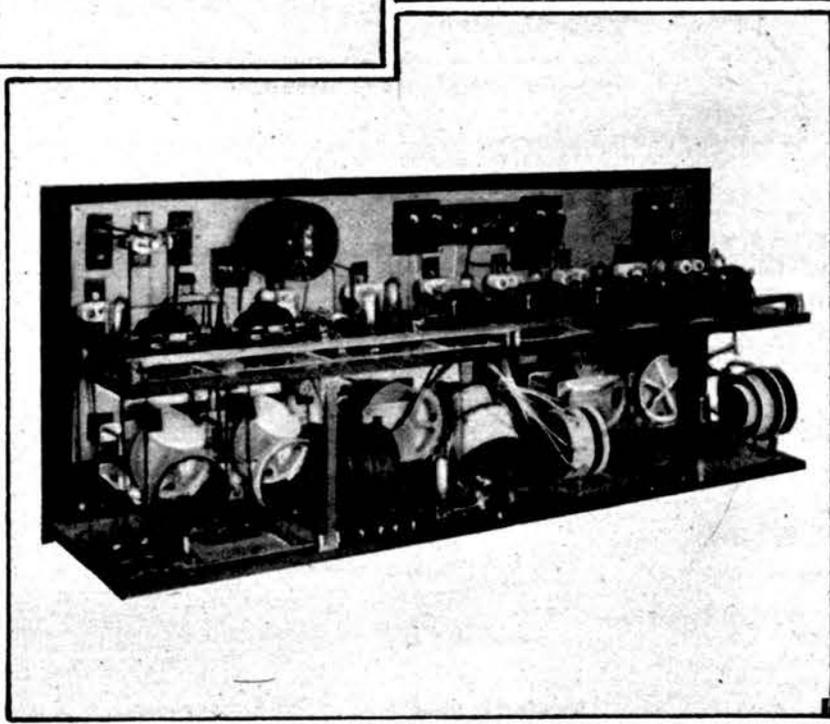
I mentioned this to my radio friend

No Wonder We Can't Sell Radio



The top photograph shows a Super-Heterodyne with two additional stages of radio frequency. The picture directly above the set is a diploma from the American Society of Mechanical Engineers, which is evidently necessary to operate the set

The photograph below shows the back of the same set, and does not look unlike a young power house



NOT long ago, the publicity bureau of the General Electric Company at Schenectady sent out these photographs with a story stating that this receiver was built by an amateur of Schenectady.

The story said, "A close examination of the set shows that no expense or effort was spared in providing every possible adjustment for better operation. The receiver consists of eleven UV199 Radiotrons arranged as follows: First detector, oscillator, six stages of intermediate frequency amplification, second detector and two stages of audio frequency amplification. The set was built for operation on an outdoor antenna and has the necessary coil system and variable condenser for tuning the antenna. There is a loose coupler feeding the first detector tube, the coupling being variable, then there is, of course, the condenser for tuning the oscillator and two more conden-

sers for tuning the intermediate frequency amplification." * * *

This is exactly the kind of set which this magazine thinks is a detriment and not a help to radio. The job of radio today is to sell radio to people who are not fans, and the moment such people see an outlay like this they immediately shrug their shoulders and say, "But you must certainly have an engineer's license to operate it."

Let's get back to sanity and simplicity. Let's keep sets like this a secret among ourselves.

and he looked at me in utter contempt with:

"You poor fish! That was station KFKX we had then and he's away out in Nebraska. The artist wasn't imitating birds and animals; he was imitating different musical instruments on his violin. It says so here in the paper. See! Those other noises you heard can't be helped; they're coming from outside and are mostly caused by other receiving sets in this neighborhood trying to get the same station and by static. Wasn't he good?"

I failed to agree, for I had heard nothing that by the greatest stretch of the imagination could be called music, and I asked him why I didn't get all those bird squawks and static splashes over at my house only across the street.

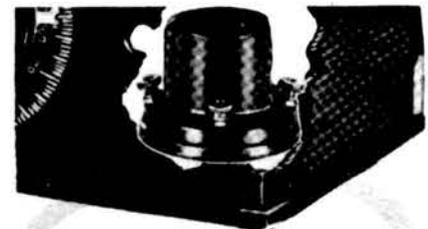
His contempt had in no wise abated as he replied:

"I thought you knew something about radio? Over at your house you didn't get any thing but those old local stations and they were so loud that you couldn't hear the reradiation from other sets nor the static. Any darn

fool can get local stations, but it isn't every one who can get DX while the local ones are operating."

I thoroughly agreed with him there, although I refrained from telling him that not "every darn fool" would want distance while there was local entertainment to be had—only certain ones, and my friend had amply demonstrated that he belonged to the latter class.

He asked me in disgust if I'd never had the DX fever. I replied that I had, and also the scarlet fever, but thanked my lucky stars that they



Get directly at them

Are the contacts in the sockets of your radio set easily accessible for ordinary and necessary cleaning?

With Na-ald De Luxe sockets in use you need neither sandpaper nor an extra reach to keep contact strips and tube terminals bright and clean.

Just rotate the tube three or four times. Instantly the dual-wipe laminated contacts remove corrosion, making a bright perfect connection. This action is on the side of the tube terminals away from the soldered ends. "It's the contact that counts."

Make your Super-Heterodyne set free from socket trouble by using Na-ald De Luxe Sockets.

Sockets and panel mounts for all tubes. Prices, 35c to 75c. Send for catalog.

ALDEN MANUFACTURING CO.

Dept. T
Springfield, Mass.





A Vertical "B" Battery

*Upright in Shape
—Upright in Use*

WHERE weight, table or cabinet space is a factor in your selection of Burgess Radio "B" Batteries, buy the Burgess vertical "B" No. 5158.

It is right at home in any position in your cabinet. Its sturdy compactness is almost a necessity in portable receiving sets.

Its height, width and weight coincide exactly with the double strength Burgess Radio "A" Battery. You are sure to be pleased with both the convenience and service offered by such an assembly of "A" and "B" Radio Batteries.

"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
Laboratories and Works: Madison, Wisconsin

Branches:
New York Boston Kansas City Minneapolis
Washington Pittsburgh St. Louis New Orleans

In Canada:
Plants: Niagara Falls and Winnipeg
Branches: Toronto - Montreal - St. John



were both passed and had left no ill effects.

After gracefully declining my friend's invitation to stay for more DX, I went home and to bed, happy in the thought that I could still hear and enjoy local broadcasting.

In closing I want to add a word or two for the especial benefit of our enterprising youths and those manufacturers who are ever looking for greater fields to conquer.

The men who have, apparently, unlimited amounts of money to spend for the entertainment of themselves and family want entertainment, pure and simple, whether it comes from a phonograph, player-piano, an orchestra, the opera or from a radio set.

If the entertainment they ask for, and which they are willing to pay good money to get, is going to be continuously spoiled by all sorts of foreign noises, then their interest in such entertainment will soon wane.

Up to the present man has developed no set that will get distant stations as clear or as good as it will get the ones right around home. Therefore, local stations are what your prospective, moneyed customer is interested in, to the exclusion of everything else. And he wants one local station at a time with not the slightest trace of any other station in the background.

The man with the greatest amount of spending money is the man, invariably, who knows the least about the mechanism of radio. Furthermore, he doesn't want to know and doesn't give a rap! The set that he will eventually buy and be proud to own will be the one on which the controls have been reduced to an irreducible minimum. Surely not greater in number than on a phonograph.

Concentrate on a set especially designed for local reception that will give as nearly perfect reproduction as it is humanly possible to obtain, and accomplish all this with a minimum of controls, and there will be more big business placed in your hands in three months than you've handled in as many years.

Remember, the big man, the man with the "real dough," wants unadulterated entertainment and doesn't give a hang how many tubes it takes to get it.

Give him only this and make its operation so simple that he can't go wrong, and he's willing—yea, anxious—to pay and pay big!

The Program As You Like It

(Continued From Page 17)

the best there is in radio. Those of us who have been enjoying radio for several years or more cannot help notice some striking changes both in programs and in our reception of them.

It is only recently that a new kind of entertainer has made his appearance—the troubadour who goes from station to station broadcasting his own compositions. He is usually an excellent accompanist as well, and it is a joy to hear him; but the significant point is that he is a radio entertainment specialist!

Another relatively recent radio development is instruction, songs and addresses in foreign languages—a treat to those who have been abroad and to our foreign-born residents as well.

Revival of the old-fashioned square dances seems to have attained great popularity through radio, and broadcasting of the presidential nomination proceedings was keenly appreciated.

As to the quality of reception, the announcer who fails to give his station call letters seems, like static, to be ever with us, as is also the director

who puts his microphone in the wrong spot in the hall at public meetings.

With the increase in radio-equipment sales, radiation has increased in many localities to the point where it is serious. All these obstacles are, however, surmountable, and the improved design of apparatus is giving us an ever-widening field from which to choose our evening programs.

The "dit-dah" fraternity is behaving splendidly in the matter of interference during broadcasting hours. Last summer, when many cities changed to daylight-saving time, there were some operators who continued unlawfully on winter schedule in order to apply an extra half hour to their dot-and-dash work; this year the code trouble during broadcast hours seems to have been largely suppressed.

The writer feels that credit is largely due to the Relay League and various radio clubs for this; and the broadcast listener who desires to go the limit of helpfulness should join some such organization.

educational factors of the present day.

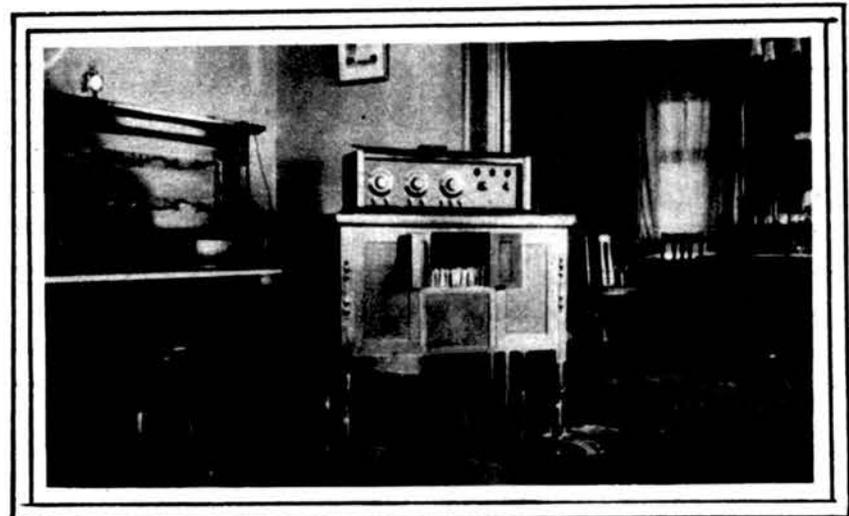
"Radio broadcasting," he says, "should do its bit, just as motion pictures have, to educate the great mass of the public who are uninformed. This educational broadcasting should be so interspersed with entertainment and music that it does not pall on the listener-in, but instead seems part of a well-arranged program."

Mr. Ince plans to have his station do educational work for the motion pictures, so the coming generation may grow up with some understanding of the problems of the motion-picture business.

Writers, directors and actors are made, not born, Mr. Ince says, and he hopes to help some of the aspiring ones along the road that leads to success in the picture business.

He plans to have a series of lectures and talks by famous actors, directors and writers from his studio, so that the people who will make the motion pictures of tomorrow may

A Clever Installation In the Home



Here is a clever installation in the home of Dr. J. H. Rice, of 718 West French Place, San Antonio, Texas. The cabinet is mounted upon ball-bearing felt rollers so that it can be moved from one room to another and in all rooms there are bakelite connections on the walls for jacks and plugs for antenna and ground. The cabinet contains all batteries and a full-sized loud speaker. This is the kind of installation that is going to help spread radio.

Earlier in the present year it was also impossible to find complete advance programs for the week in the newspapers; now almost every newspaper of any pretension whatever, is carrying them, together with studio news items which should make our listening-in more pleasurable.

And so, in a few more months, when the turn of a dial or two will again carry us from coast to coast, will you have done your share—your whole share—toward making this great national pastime better than ever before?

MOVING PICTURE PRODUCER WILL BUILD BROADCASTING STATION AT HIS STUDIO

By CHARLES F. FILSTEAD, 6CU
LOS ANGELES, Calif., July 20.

THE Thomas H. Ince Corporation of Culver City, California, is contemplating the conversion of its limited commercial station, KZY, at the Ince Studio, into a broadcasting station. Thomas H. Ince, in a recent conversation, said that he hoped to have this station on the air for a half hour in the evening about twice a week, just as soon as a broadcasting license can be obtained.

Mr. Ince firmly believes that motion pictures, radio broadcasting and educational work should go hand in hand, for motion pictures and radio broadcasting are the two greatest

have their feet placed on the right path.

Do not think that these programs will be dull lessons, though, for the entertainment and music that will accompany the lectures will be of the very finest.

The Greene "Selector"— New England's Favorite

(Continued From Page 28)

and adjusting for zero reading. The remedy, obviously, is to reset the dial for zero.

Wave Length in Meters	Station	Dial Settings of R. F. Amplifier
244	WTAT	15
278	WNAC	24
309	WSAI	30
319	WGR	32
326	KDKA	34
337	WBZ	36
341	CHYC	37
360	WGI	40
370	WGN	42
380	WGY	45
390	WTAM	47
395	WFI	48
429	WSB	55
455	WJZ	59
469	WPC	62
492	WEAF	69
509	WOO	73
526	WOAW	78
536	KYW	82
546	KSD	86

A Tube That Eliminates the "A" Battery

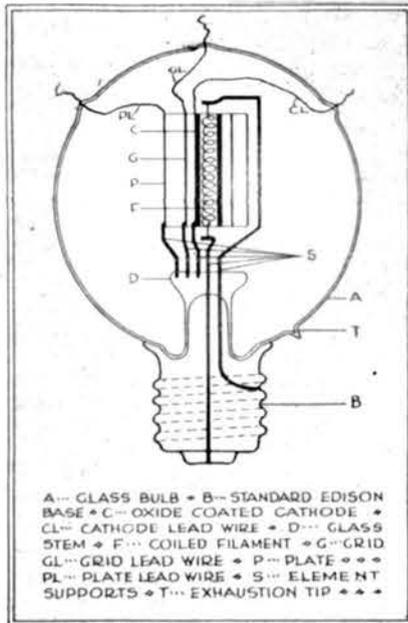
By G. N. GARRISON, I. R. E.

EVER since the conception of the three-electrode vacuum tube by Dr. Lee De Forest, radio engineers from all over the world have been constantly bending their energies toward the design of some device that will entirely eliminate the storage or "A" battery for lighting the filament.

If, as the engineers reasoned, a device could be perfected that would permit the tube to be burned, either directly or indirectly, from the 110 volt house mains, a considerable advancement would be made. Such a device, if practicable, would, indeed, eliminate for all time the "A" battery with its high first cost and constant upkeep.

Most, if not quite all, the development work along this line has been done on step-down transformers; rectifiers, both electrolytic and static, and on filtering systems. The step-down transformers were used to step the voltage from 110 volts down to that suited to present day vacuum tubes, six or less. The rectifiers, of course, change the alternating house current into direct current, while the filtering system was supposed to filter out the undesirable A. C. hum.

It was soon found, however, that even with the very best of these transformers, rectifiers and filters, it was



impossible to eliminate all of the A. C. hum, with the result that, especially when phones were used, a very disagreeable buzzing noise accompanied the broadcasting. The system was, therefore, not ideal.

The solution, as with many inventions, was extremely simple, but it remained for a large eastern manufacturer, whose name is practically a household word, to develop a four-element tube that requires neither transformer, rectifier nor filter. Its filament is lit directly from the regular 110 volt house current, either alternating or direct, and forms no part of the receiving circuit.

The accompanying drawing, which shows the tube as though it were cut in two, lengthwise, through the center, should make its operation clear.

The three elements, C, G and P, are cylindrical in shape and occupy the relative positions shown.

The filament, shown at F, is wound in the shape of a coiled spring and is of such a diameter that it fits quite snugly inside of the cathode tube C. The filament is of tungsten.

An electric furnace product known as "Alundum" is used as the cathode C, and it is impregnated with a certain oxide—the same kind of oxide as is used on the filament of the Western Electric tubes known as 216-A, VT-1 and VT-2, etc.

There is nothing unusual about the grid shown at G except the fact that it resembles wire mosquito netting.

The plate, which is of nickel, is shown at P.

Designations of the other important parts of the tube are given under the drawing and need not here be repeated.

It will be noted that the tube employs an ordinary Edison lamp base, the same as is used on your electric lights, and that the filament is connected directly to this through two of the element supports S.

When the filament is lighted and the receiving circuit connected properly to the wires PL, GL and CL, which extend through the tube at the top and sides, the following action takes place within the tube:

The oxide impregnated cathode C almost immediately becomes a dull red, due to the conduction of heat between the filament which fits snugly inside the cathode tube and the cathode itself.

In the Western Electric tubes the best operation occurs when the filament is no brighter than a dull red. Since the cathode of the new tube is impregnated with the same kind of oxide as the Western Electric tube filaments, it is only necessary for it to become a dull red in color in order for it to emit its maximum amount of electrons.

The path of the electrons in the new tube after they leave the cathode is no different from that in any other tube. They simply pass through the grid, which controls their flow to the plate.

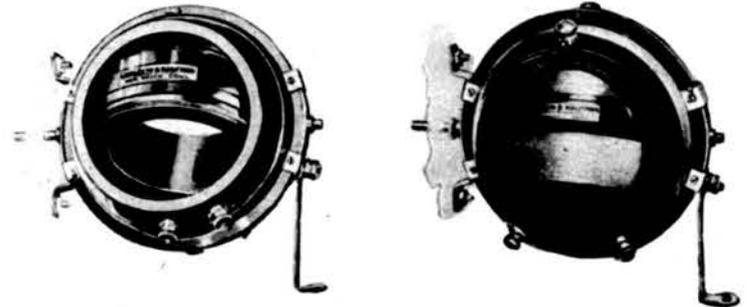
No A. C. hum can possibly enter the receiving circuit and be heard in the phones, for the reason that the filament of the new tube forms no part of the receiving circuit. It is merely used as a heating element for heating the cathode. The cathode, in turn, emits the electrons on which the operation of all vacuum tubes depends.

Since the filament of the new tube is designed to operate on 110 volts, its current consumption is not important. Consequently it is made much heavier than the filaments generally used in electric lamps, with a resulting lengthening of the life of such filament.

In the ordinary 6-volt vacuum tube, the filament, with care, should last 1000 hours. Due to the much heavier filament in the new tube, its life will be well over 10,000 hours, and it will be impossible to burn it out should the "B" batteries accidentally be shorted across it.

Although this new tube is one of the greatest advances in the art of radio since the introduction of the vacuum tube itself, next month we will describe another type of 110-volt tube, also soon to be placed on the market, in which the filament, when it outlives its useful life, is replaceable by any radio fan with absolutely no tools and at a cost not exceeding seventy-five cents!

Control plus Amplification



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. Eliminates taps.

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 diagram-booklet.

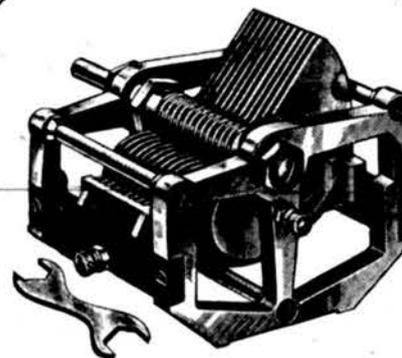
Jobbers; Dealers—Our Latest Trade Sheet is Available

The Home of Moulded Tuner Specialties

LANGBEIN & KAUFMAN

654 Grand Avenue

New Haven, Conn.



Bremer-Tully "LIFETIME" Condenser

The new Bremer-Tully "Lifetime" condenser gives you everything you can and should expect in a condenser. Adjustable, Lubricated, Two-step, Thrust Bearings with exclusive take-up features found only in the B-T Condenser. A "Laboratory Type" at a commercial price. For sale at dealers.

Send for "20 Point" circular giving full description

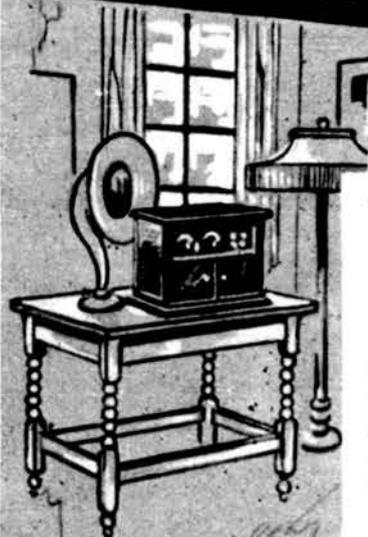
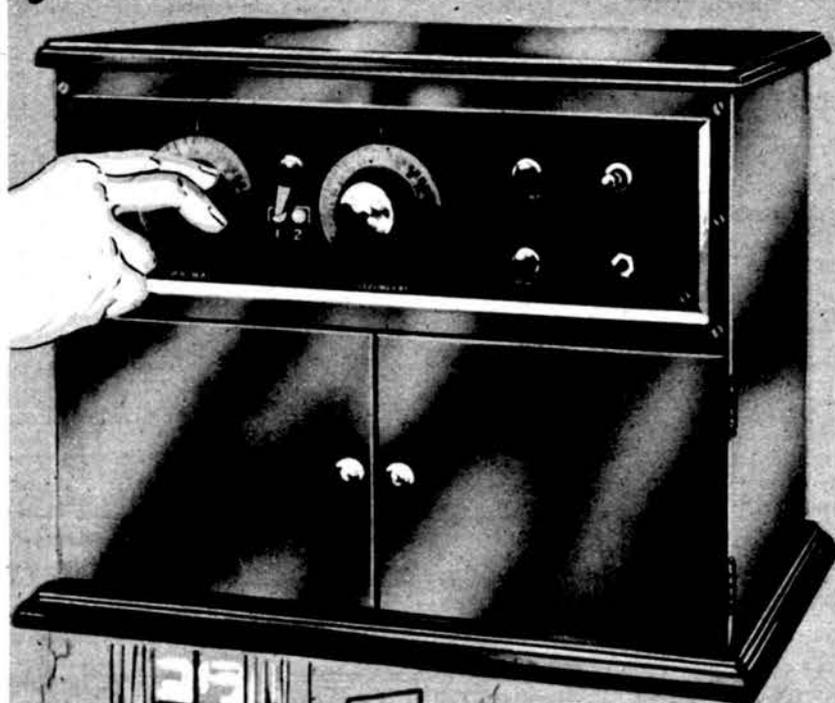
BREMER-TULLY MFG. CO.

538 S. Canal St., Chicago

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.

The New INDUCTROLE



Owners Delighted With This Set

Replies to Questionnaires we send to owners have far exceeded expectations. We knew the "Inductrole" was a wonderful set—unequaled in its combination of selectivity, power, beauty, tone quality and easy operation.

But we did not expect such immediate and enthusiastic reception—and from all parts of the country!

From Maine to California, from Texas to the Great Lakes, the reports are the same—"Wonderful!" "Fills the bill!" "Entirely satisfied!" "Best I've ever seen." It makes no difference whether the owner has had two or three previous sets or just beginning his radio experience!

We ask this favor—will you please send us a post card giving your name and address?
If you add that you'd like a demonstration, we'll give you one, if possible, in your own home, without cost to you. And anyway we'll be glad to send you booklets fully describing this fine set which operates on the scientific principle of "Inductance Tuning."

The "Inductrole" is illustrated above, encased in hand-rubbed mahogany with special battery compartment, operates four tubes, extremely selective and a supreme value at \$100.00.

AMERICAN RADIO AND RESEARCH CORPORATION

Department RH, Medford Hillside, Mass.
New York Chicago Philadelphia Boston

AMRAD

"The Voice of the Air"

Editorially Speaking

(Continued From Page 6)

it is becoming increasingly difficult to get good talent to make a uniformly high-grade program for any one station. All of the stations are suffering from this—even the biggest ones. Consequently, these 10,000,000 people seldom listen in to a program which is entirely satisfying to them artistically.

Of these, I believe that the greatest obstacle to selling the unsold 10,000,000 is the growing multiplicity of the controls and of apparatus in our receiving sets. And yet this multiplicity is essential in order to get the sharpness of tuning necessary to go through undesired stations and receive a station which is desired.

This in turn is made necessary by only one reason and that is the fact that more than 500 broadcasting stations are wildly clamoring to get their voices upon the air as often and as long as possible.

And what are these 500 stations giving us—at least, what are the majority giving us?

Less than half of these stations can be classed as really desirable from the standpoint of judgement or good taste. More than half are small, inefficient, badly operated and badly conducted, low-power sending sets which are established and maintained for one purpose only—and that is to bring publicity for some reason or other to their owners and operators.

The man who lives within a short distance of such a station is in very bad luck indeed. He cannot tune it out, and yet the stuff which is put on the air is obnoxious in his ears and makes radio a laughing stock and a byword to all of his neighbors who come to his house and listen to his set.

The time has come when we should face this broadcasting situation sternly and uncompromisingly. *The inefficient station must go.* For the benefit of the entire radio industry and the public at large, we must eliminate the stations which cannot maintain a certain standard of excellence, both in transmission and in quality of program.

Until we do this, the 10,000,000 people who are now unsold will remain unsold, and the radio industry will simply chase itself around its circle confined within the limitations of the possible 4,000,000 that are with it now.

With such a system as was outlined by Mr. Boucheron, and with the elimination of more than half of the present undesirable stations, radio would leap forward until in magnitude it passed the automobile and phonograph industries. Does that seem like an exaggerated statement? Personally it seems to me only logical that such a marvel as radio—so convenient, so simple in its essentials, so comparatively cheap and yet so universally invaluable—should find its way into homes which at present have neither phonograph nor automobile, and it is also applicable in many places in which the other two find no scope.

Most certainly the radio industry should set no goal for itself lower than the goal already reached by the phonograph. To do so would be to overlook one of the greatest industrial opportunities that the history of civilization has ever offered to man.

But to reach this goal, a major operation is necessary and we should operate at once.

We must eliminate the inefficient broadcaster.

With broadcasting stations limited to some 100 or 150, and with all of those maintaining high standards at present in effect in most of the class B stations, the publicity value of a broadcasting license would be immense. It would be so great that it would

attract wealthy and influential corporations to maintain fine stations mainly for the purpose of winning public good will, but we must, in order to reach such a desirable condition, make the mere possession of a broadcasting license a distinctive mark of honor so that it will be well-worth paying for and guarding jealously.

The past few months have shown us the wonderful possibilities of broadcasting when a chain of stations are connected together in a system operated by corporations whose financial resources are ample to meet all demands. I refer now particularly to the broadcasting of the political conventions, and of President Coolidge's speech of acceptance.

Mr. Boucheron's proposed chain of ten great stations would make such events as this not the exceptions but the rule. We would have such events constantly.

There is becoming apparent in the broadcasting phase of radio a very healthy and welcome sign of spirited competition among the great corporations. This apparent competition may be merely a gesture to counteract the many cries of monopoly which have been raised, but I personally believe from what little knowledge I have of the corporations involved that it is genuine competition. It seems to me that the Radio Corporation and its affiliated companies on the one hand and the American Telephone and Telegraph Company on the other hand are approaching radio from two distinct and different viewpoints, and that each must continue in the fight in order to exist as far as this new science is concerned.

It may be said that the American Telephone and Telegraph Company has no immediate interest in radio as radio, but I feel quite sure that the level-headed and far-seeing officials of that corporation are looking into the future and to the possibilities of home entertainment developing along different lines, and when that time comes, they will be the logical ones to operate the system and to make adequate profits from it. In order to be prepared for this future eventuality, it is necessary for them now to maintain a lead in radio and to keep that lead as radio develops. As for the Radio Corporation and its affiliated interests, their very life depends upon their stimulating as much interest in radio as possible.

I do not believe that there is any question of who shall pay for broadcasting as far as either one of these two combinations is concerned. I am quite sure that they would like to have some one help them pay the cost, but I am equally sure that if there is no way of making some one else come across, they themselves will continue to defray whatever expenses are necessary in the competition.

If you will look over the news items in the radio magazines for the past two months, I think you will see there many more evidences of my claim that there is no such problem.

Out in Los Angeles, Mr. Anthony, owner of KFI, has gone the limit in purchasing equipment to make his set one of the most powerful and complete in the country. He does not appear to be worrying about who is to pay for this. In almost every city there are evidences that the class B stations maintained by the better stores, newspapers and corporations are expanding and spending more and more money and not asking any one to help them pay.

There is also the announcement from the General Electric Company of Schenectady, New York, that work has been started on the Denver, Col. station, and that this link in their immense transcontinental chain will be on the air late in the fall or early in the winter.

This will give the General Electric Company, WGY of Schenectady, KGO

(Continued on Page 37)

Announcing



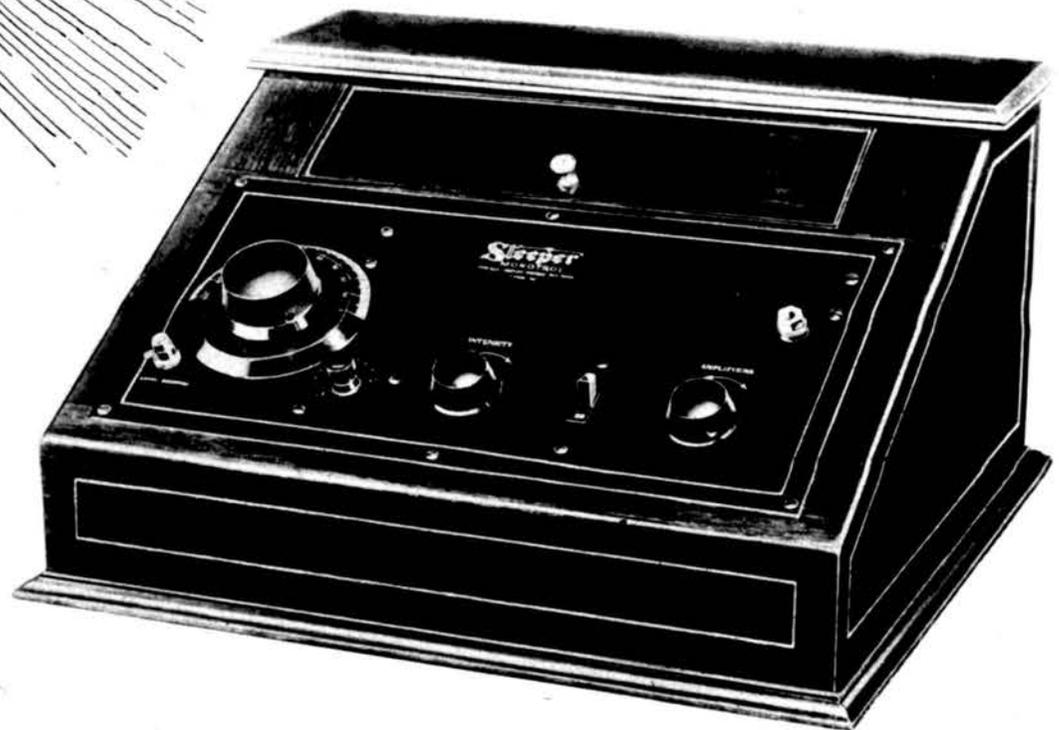
The new

SLEEPER

MONOTROL

REG. U.S. PAT. OFF.

Type
54



The Grimes Inverse Duplex System with 24 Improvements

The new Type 54 Monotrol is not a "revolution" but an "evolution." With twenty-four improvements it has evolved so far along the pathway toward attainable perfection that it answers questions which were not even asked of radio receivers a few months ago.

In adding these improvements to the furthest previous development of the Inverse Duplex System, the Sleeper Radio Corporation has so broadened possibilities for good reception in all localities, so simplified the tuning while increasing selectivity, so equalized the quality of tone, so beautified appearance and improved construction that, judging by the standards of last year, no very close comparison can be drawn.

Features New to Radio

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.

Sets heretofore were either dry or wet cell sets. The Monotrol, Type 54, is both in one.

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

hear 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.

To Dealers—The Monotrol will be sold throughout the United States by Authorized Community Dealers. This plan offers the dealer the strongest sort of merchandising help, greater profit and protection against illegitimate competition. Ask your jobber for details now or write to us direct.

SLEEPER RADIO CORPORATION
88 Park Place New York

"The Most Perfect Radio Set in America"



Simply a matter of taste

Some persons are satisfied if their Loud Speaker will produce big volume. The more discriminating, however, want their radio reception to come from the Loud Speaker with all the refinements of the original broadcasting.

It is for these more refined in taste that Bristol Audiophone is particularly suited. Here quality has not been sacrificed to obtain volume, but the two have been combined in pleasing proportions.

The Audiophone is ready to use—no auxiliary batteries required to operate. There are three models to select from, including Senior \$30.00, Junior \$22.50 and Baby \$12.50.

If sufficient amplification is not available in your set to operate a Loud Speaker, a convenient unit is provided

in the Bristol One-Stage Power Amplifier. When used with Loud Speakers of the better class and particularly with Bristol Audiophone, music and speech are reproduced without any distortion that the ear can detect. Any desired amplification can be had by connecting several Bristol One-Stage Power Amplifiers together.

Price \$25.00.

Ask for Bulletins
Nos. 3011 and 3017-Q

Made and Sold by

THE BRISTOL COMPANY

Waterbury

Connecticut

Audio Frequency Amplifiers

(Continued From Page 12)

potential of one volt produces a change in the potential across the external plate circuit of ten volts, the voltage amplification is ten times.

The amplified variations of voltage are applied between the grid and filament of tube B and reproduced in the plate circuit of this tube in which the telephones are included.

As the audio-frequency amplifier of a radio receiving system, this resistance-repeating system is obsolete and should remain so.

The amplification per stage is very much lower than that of the trans-

forming a low resistance to the direct plate current.

The amplification of the inductance-coupled amplifier depends upon the impedance of the repeating inductances. The greatest amplification would be obtained if the impedance of these coils were infinitely high. But the gain in amplification after the impedance exceeds a certain high value is exceedingly small. The actual impedance of the repeating inductances, of course, depends upon the frequency of the current variations; but coils can be designed to have a sufficiently high impedance over a fairly wide range of low frequencies.

An audio-frequency amplifier of this type, with correctly designed coils, gives fairly even amplification over the necessary band of audible frequencies. The efficiency, however, is very low as compared with a transformer-coupled amplifier.

The great advantage of the transformer-coupled amplifier, which has superseded all previous types, is the step-up of voltage which is affected by means of the repeating transformers.

The principles of operation are illustrated in the theoretical circuit of Figure 3. The variations to be amplified are impressed across the input terminals which connect to the primary of the transformer TR1. An alternating electro-motive force (e. m. f.) of similar form is induced in the secondary of this transformer and applied across the grid and filament of the first amplifying tube.

Transformer TR2 is used to repeat the amplified variations from the first to the second tube. The plate current variations of tube A induce an alternating e. m. f. in the secondary of this transformer, which is connected across the grid and filament of tube B.

The transformers are wound with a step-up ratio of turns so that the voltage induced in the secondary is very much higher than that across the primary. As a result, the varying voltage impressed on the grid of each tube of the amplifier may be four or five times as great as the voltage across the external plate circuit of the preceding tube. In other words, the transformers themselves have a

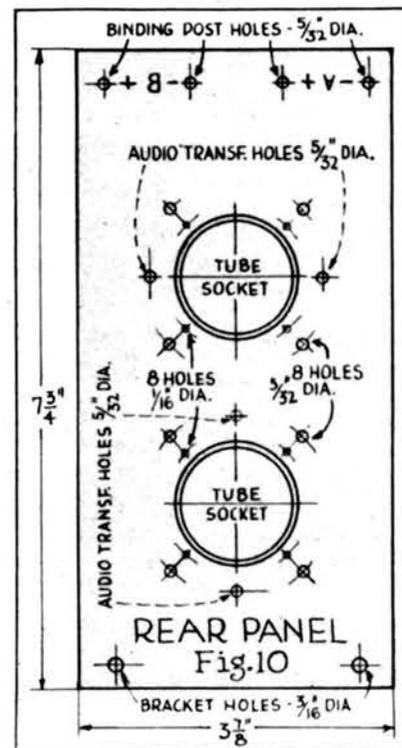
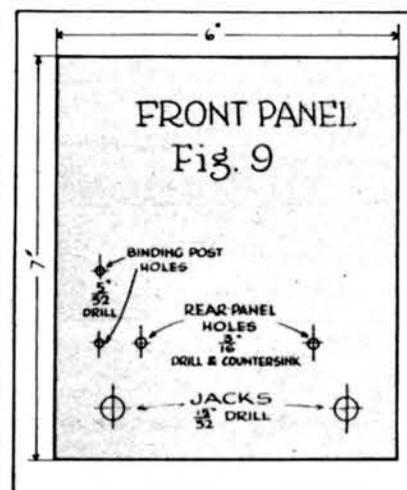
former-coupler amplifier. Moreover, the B battery voltage of the resistance amplifier must be made from two to four times the normal value, as the resistances absorb a large part of the plate battery voltage.

As a radio-frequency amplifier, however, the resistance amplifier has distinct advantages, but a description of these advantages is beyond the scope of the present article.

The inductor-coupled amplifier is similar to the resistance-coupled type except that an inductance is used in the plate circuit of each amplifying tube instead of a resistance. Instead of relying on the resistance of the external plate circuit to produce potential variations when the grid voltage is varied, the same effect is obtained by the reactance of an inductance with low D. C. resistance.

The principle of operation will be understood by referring to the theoretical circuit of Figure 2. It will be noticed that this circuit corresponds exactly with that of Figure 1, except that an inductance is used instead of a resistance in the plate circuit of tube A. The varying voltage to be amplified is impressed across the grid and filament of tube A. Corresponding variations of the plate current are produced. The self-induction of the repeating inductance L causes a reacting voltage to be set up across this coil, acting in opposition to the changes of current passing through it. Consequently, variations of the grid potential of the tube A produce a varying voltage across the points XY of the external plate circuit. These amplified variations are then impressed across the grid and filament of tube B, as in the case of the resistance-coupled amplifier.

The amount of amplification obtainable by this system is not much greater than the resistance-coupled amplifier. Its main advantage over the latter lies in the fact that a normal value of B battery may be used, the repeating inductances offer-

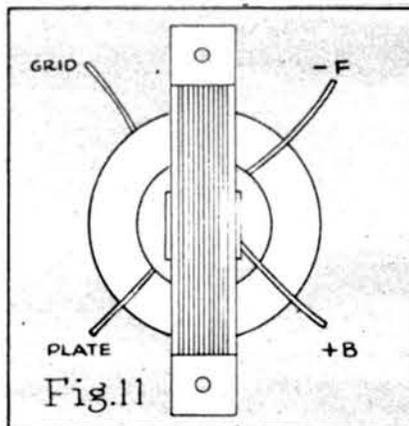


considerable amplifying effect, independent of the amplifying action of the vacuum tubes.

The efficiency of a transformer-coupled audio-frequency amplifier largely depends upon the design of the transformers. The efficiency of a transformer is measured by:

1. The voltage amplification it affords.
2. The uniformity of its amplification of musical frequencies.

The voltage amplification of an audio-frequency transformer is not necessarily governed by its ratio of turns. If, to increase the ratio, the secondary is wound with too many turns of wire, the resulting increase of distributed capacity may reduce the impedance of the secondary and thereby reduce the voltage amplifica-



tion. It has been found, in fact, that the transformer with ratio of 1 to 4 or 5 generally gives greater step-up of voltage than one with a higher ratio.

The audio-frequency transformer must also be designed to amplify all the musical frequencies with fair uniformity. Speech and music cover all the frequencies from about 100 to 4000 cycles. If the transformer does not amplify over this range with fair uniformity, some frequencies will be magnified much more than others. This is evidently undesirable and prohibits the true reproduction of voice or music.

The recent advocates of the resistance-coupled amplifier have endeavored to justify their claims by declaring that the transformer-coupled amplifier "distorts," whereas the resistance amplifier does not. Distortion, however, is by no means an inherent quality of a transformer-coupled amplifier, and only takes place when inefficient transformers are used. An amplifier built with low ratio transformers, as suggested above, will not distort in any way, provided the amplifier is correctly wired.

In the photographs accompanying this article we show different views of a two-stage transformer-coupled amplifier, using transformers with a ratio of 1 to 4½. This amplifier can be easily and inexpensively built, and will be found a useful adjunct to any simple receiving system.

The complete circuit of the amplifier is given in Figure 4. This is, in effect, the system of Figure 3 with some refinements. Telephone jacks are provided so that the telephones may be inserted in the output circuits of the first or second tube. Moreover, the jacks are of the filament-control type. When the phone plug is inserted in the first jack the filament of the first tube automatically lights; in the second jack, the filaments of both tubes light up. If the phone plug is removed the filament circuit is opened.

The general construction of the amplifier is compact and convenient. The front panel measures only six inches in width. On first appearance

the design may seem beyond the scope of the ordinary amateur workshop, but as a matter of fact, with a little extra work and care, the amateur can build this amplifier in his own home with the ordinary tools at his disposal. The efficiency of the design and the neatness of the finished product will be well worth the little extra effort put into it.

To build this amplifier the following parts are needed:

- 1 hard rubber front panel, measuring 6"x7".
- 1 hard rubber rear panel, measuring 7½"x3½".
- 2 special tube socket shells, with contacts.
- 1 Patent filament control double-circuit jack.
- 1 Patent filament control single-circuit jack.
- 1 Patent 20 ohm filament rheostat.
- 2 Radio Guild or any other good audio - frequency transformers.
- 6 binding posts.
- 2 mounting brackets.

The special tube socket shells are visible in the photographs. These shells eliminate the necessity of using individual tube sockets, greatly improve the neatness of the amplifier, and permit short, invisible wiring. If any difficulty is experienced in purchasing these tube socket shells and contacts, I will be glad to inform readers where they may procure them.

Figures 9 and 10 show how to drill the front and rear panels. If any difficulty is experienced in drilling the 1-inch holes in the rear panel, take your panel to some nearby machine shop; they will cut these holes for you at a very low cost. An optional method is to drill four holes ¾ inch in diameter for the four pins of the vacuum tube.

The photographs of Figures 5, 6, 7 and 8 show very clearly how the various parts are assembled. The tube socket shells are screwed to the surface of the rear panel and the tube socket contacts attached to the lower surface of this panel. The transformers are also secured underneath the rear panel by means of screws passing through the panel and tightening into tapped holes in the transformer housings. The rear panel is attached to the front panel by means of the mounting brackets.

The complete wiring diagram is given in Figure 4. Particular care should be taken to connect the leads from the transformer coils correctly; otherwise poor amplification or howling may result. The diagram of Figure 11 shows how these leads should be connected with a Radio Guild transformer.

The quality of reproduction of an amplifier of this type is sometimes improved by connecting a small fixed condenser or a variable high resistance across the secondary of the last audio-frequency transformer; this, however, is not absolutely necessary.

Editorially Speaking

(Continued From Page 34)

of Oakland, Calif. and the Denver station.

Recently WGY has been tying up in broadcasting with Station WJZ in New York, and if the very wonderful programs arranged by WJZ should be put out by WRC in Washington and over these three big stations of the General Electric Company, I think the whole radio audience will rejoice and be exceedingly glad.

There are probably no programs in the world to compare with those of WJZ and WEA. If these programs can be spread country-wide by two chains of super-stations, radio will begin to mean something and there won't be any 10,000,000 people unsold on it.



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Look for this stamp on every genuine RADION Panel. Beware of substitutes and imitations.

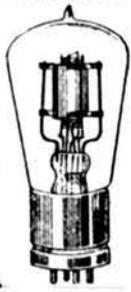
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The Slant of the Trade on Radio

CONVENTION BROADCASTING GAVE MIDDLE WESTERN SUMMER TRADE BIG BOOST

By STUART C. MAHANAY

ST. LOUIS, July 25.

FORTUNE smiled on the radio industry during the month of June in that the proceedings of two political conventions were broadcast by a network of stations linked together which served the entire eastern half of the United States.

There is no doubt about these two events being directly responsible for greatly increased sales of sets, parts and accessories—particularly of "A" and "B" batteries. Likewise, many crystal sets were bought for the sole purpose of "listening in" to the events as they took place in the convention halls at Cleveland and New York. Crystal receivers found a ready market because of their low initial cost and because it was unnecessary to have a more expensive set in order to pick up the signals broadcast by a local 500-watt station.

The crystal-adjusters of today, however, will be the tube fans of tomorrow, and so every dealer was quite as anxious to sell a crystal receiver as one of the tube variety.

Generally speaking, the market has taken a decided turn for the better as compared with last month, due, in all probability, to the above-mentioned causes.

One representative dealer exhibited a record of sales. Comparative figures showed an increase in radio sales of 60 per cent over June last year. He attributed the increase to the broadcasting of the two political conventions. The sales which made up this increase consisted of plate and filament batteries, tubes and complete receivers—both crystal and tube.

He said that during the entire month of June (1924), he had not sold one super-heterodyne or neutrodyne receiver. The reason, he believed to be due to the fact that the public has been thoroughly convinced that no radio receiver, large or small, is practical during the summer months.

Regarding super-heterodyne sets, it was explained to the writer that the majority of the fans who assemble their own, return to the dealer, after a few days of experimentation, for more information, either as to layout, assembly details, or particulars on tuning and how it "should work." He said that many receivers have been assembled by fans who knew nothing about radio and that in many cases, quite satisfactory results were being obtained. Another way people are "getting around" the high cost of a manufactured super-heterodyne set, he explained, was to buy the parts and proceed as far as possible with the assembly, then have the service men in the store where the parts were purchased, complete the job.

He was also convinced that, while the super-heterodyne receiver may be all that is claimed for it, the price is entirely too high. "When a manufacturer places on the market a super-heterodyne receiver which will retail for \$150.00, his fortune will be made."

His further views on the "super" circuit were that "while it is the last word in radio receivers at the present time, it will continue to be

popular only until another newer and better circuit makes its appearance, heralded by the nation-wide advertising that accompanied the super-heterodyne." He failed to register enthusiasm over the ability of the circuit to perform, and his opinions quite coincided with those of another dealer who said that during his vacation, he had compared a super-heterodyne receiver and a standard four-tube reflex circuit, with the result that the reflex set "brought in" all that the eight-tube set picked up, with equal volume, with equal flexibility, and current consumption just one-half that of the super-heterodyne. His conviction was that the latter is highly over-rated.

The manager of another radio store was found to be an ardent

no fault with operation of the receivers, however, and his sales were very good, considering the time of year and the poor atmospheric conditions for radio reception.

His comments on Crosley's practice led him to make some further comments regarding the radio industry.

The public is kept in a continual state of indecision, he said, by manufacturers—even those with established reputations bringing out a new and improved model, "entirely different and better," every few months.

"People hesitate to buy, fearing that they may have their receiver only a short time until an improved type will appear making their purchase obsolete," he said. "The radio industry needs to get down to a solid permanent business basis. The

to tubes, for they are the heart of a set."

One store in this city, however, reports "fairly good" sales of tubes listing at one dollar each. It is the general opinion that repaired tubes never equal, in efficiency, the product of standard recognized manufacturers.

An interesting explanation as to why there was little demand for portable sets at one store was given by the salesman who believed that the fans who want portable receivers construct their own, while those who would not attempt the assembly of one are not sufficiently interested to spend the money.

Little hope is held out for much increased radio business during the month of August, but some dealers are already beginning to lay plans for the biggest season in the history of radio, and they say it will begin about the early part of September.

PORTABLE SETS HELP OFFSET SUMMER SLUMP AROUND LOS ANGELES

LOS ANGELES, Calif., July 20.
IT IS generally conceded that the radio parts business is, at the present writing, decidedly at a standstill. Summer radio conditions are, of course, primarily responsible for this. In addition, however, there is a decided tendency of the average Southern Californian to take life easy during the summer, and it's too much work, as one radio fan remarked, to make a set at this time of year.

The set business is still fair, despite pessimistic predictions early in the season. Portable sets are doing exceptionally well as is to be expected here. The DeForest Radiophone, requiring neither ground nor aerial, seems to be a popular favorite. The Crosley portable Fifty-one and the Harkness Reflex two-tube are well established in the summer trade. The Kennedy portable is also still a good seller.

Dealers report a fair weekly sale of the following sets: Californian, polydynes, equatones, neutrodyne and teledynes. Radio stores of the Southland have found that they must handle sets that "stay sold"—those that are trouble proof and tune accurately and sharply.

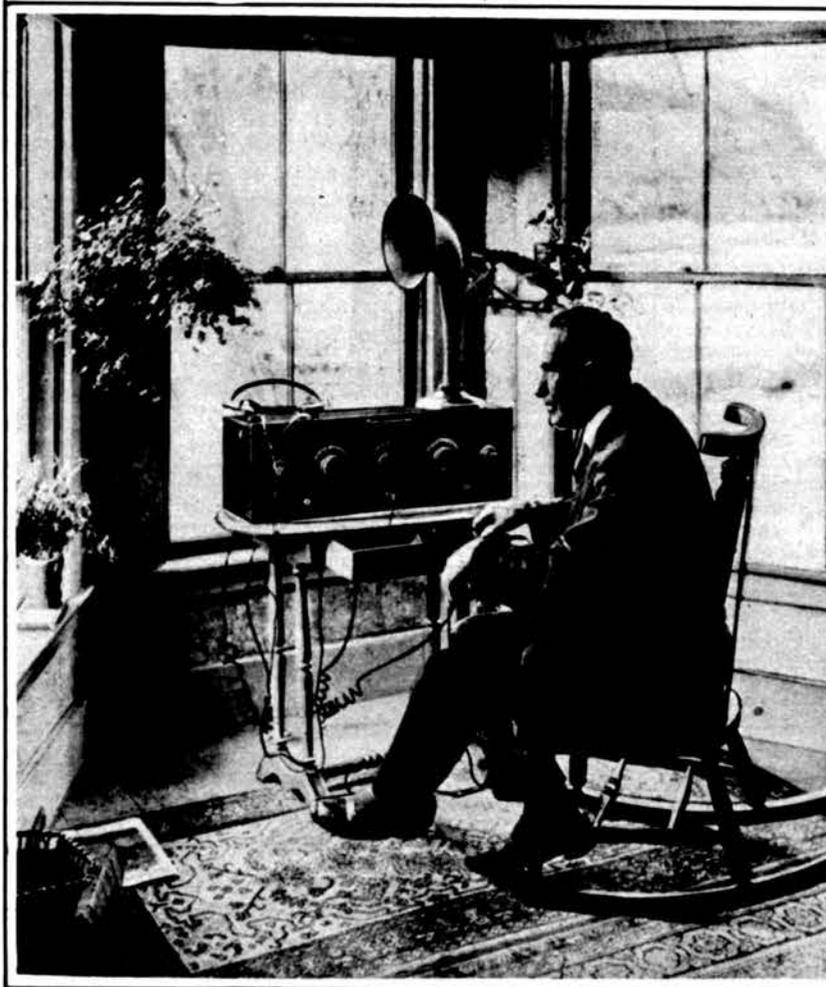
The magic of radio is nowhere shown more conclusively than in the Pacific Southwest. Five hundred miles from the city, huddled close to the ruddy glow of the cheerful campfire, and yet campers are next door to grand opera, first-class orchestras and the churches.

After some four months of "out of stock," Radiolas 111 and 111A are here. One wholesaler was nearly 1400 orders behind. The cheapness of these sets makes them easy sellers and they are giving good service.

Crystal sets are no longer good sellers except among the youngsters. Newspapers continue to offer them for premiums on circulation plans.

The Perfectone leads in the medium-priced loud speakers with the following close seconds: Radyne, and Dictogrand.

The Ambassador Hotel orchestras, Max Fisher's and Abe Rosenthal's,



Mr. John Coolidge, father of the President, declined invitations to the conventions because he knew he could follow them better right at home by radio. His location is an excellent one, and he had his choice of which stations to hear the Democrats through, while they decided on some one to oppose his son in November

booster of the super-heterodyne and was particularly sanguine as to the radio prospects for the coming fall, although he anticipates no change in business conditions before September.

At the present time, the Crosley "51" portable is his best seller. He is offering it complete with tubes and batteries at a special price of \$39.95 complete. "It is the best receiver on the market for the money," he declared.

"Crosley is flooding the market with too many different kinds and types of sets," according to another dealer, and in his opinion, this manufacturer should limit his models to a number of standard types and "stay with them." This agent could find

manufacturers ought to limit their products to two or three models a year and make every possible effort to reach a basis of standardization" and thus he likened it to the automobile industry.

Readers may judge for themselves the possibility and practicability of such a procedure at the present time in the radio world.

There is little demand here for tubes of the "cheaper" variety. One clerk pointed to his shelves with the remark that, "There are some we have had two months. I've compared them with Cunningham and Radio Corporation tubes, and find that there is absolutely no difference, but they don't sell. The public wants the standard product when it comes

now operating an hour of evening dance music through remote control to KFI, announce that unless fans deluge them with letters of appreciation they will cease to broadcast. The real reason, it is understood, is the doubling of telephone rates for the three-mile line extending from the hotel to the Packard Building.

One store has marked a set up double and each day reduces the price a dollar until sold. It is still in the window where it is carefully dusted daily.

Pessimists have continually exclaimed that the American home is no more, but sociologists of Southern California are preparing interesting data to show that home life is fast taking on new meanings with the advent of radio and the consequent staying home nights.

To make it less difficult to purchase sets, several enterprising stores just ask the customer to phone the store. A man is sent to the home, installs and demonstrates a set, leaves it a week on trial and then sells on 12-month installments with a minimum down payment.

The writer knows of several new homes which not only have radio sets built in, including the loud speaker, but the aerial is run around the rafters before the plaster seals the ceiling.

Kodel, called by its makers "the camera of radio," is on the local market and first trials promise future possibilities.

Erla Knock-Down Kits and Work-rite sets are continuing popular among those who find time and inclination to "build their own."

As predicted in this column two months ago, the super-heterodyne has not made good in California to the extent which dealers and fans anticipated. Perhaps this is due to too much advertising for, frankly, radio fans anticipated a panacea for radio ills from the super. It is possible that the season has not fittingly demonstrated the set but it is equally certain that the results, from the listeners-in standpoint, are not what were expected.

There are more crystal detectors on the market here than in any other part of the country. Unquestionably Los Angeles is the mecca for inventors and mechanical genius. They flock here by the hundreds to get rich quick or break into the movies. They do neither.

George H. Frenger, formerly of the announcing staff at WJZ, has returned to his home in Los Angeles after severing his connection with the New York station.

E. O. Davis, a radio operator on the U. S. S. George Washington, which carried the late Woodrow Wilson to Europe and back during the stirring days after the armistice, is now in the radio business in the downtown district of Los Angeles.

The Pasadena Radio Dealers' Show was held late in June with displays, more especially of portable models. Band music and dancing were offered as attractions to boost attendance.

Retail members of the Radio Division of the Music Trades Association, B. H. Dennis, presiding, have held a number of meetings to discuss

summer advertising which is tremendously important with the slump of parts sale and the lessening of some lines of sets. The Radio Jobbers' Association also continues to hold its regular gatherings.

CONVENTION BROADCASTING BOOMED RADIO BUSINESS THRU OMAHA TERRITORY

By WILLIAM H. GRAHAM
Radio Editor the Omaha World-Herald

OMAHA, NEB., July 3. RADIO, without a doubt, has won its summertime spurs in the Middle West, as a result of the success attending the broadcasts of the Republican and Democratic conventions from Cleveland and New York, respectively.

On every hand there are only words of praise for the stations and radio folk who have made possible these successes. Deserving of most credit in this section of the country is WDAF, and the Kansas City Star officials, and KSD, and the St. Louis Post-Dispatch. Both stations, even in daylight, have successfully cut through the summertime static with their convention broadcasts, enabling thousands of mid-western receiving set owners virtually to attend the conventions by radio.

Even as this is written (at 1 P. M.) WDAF is being received in Omaha, although the air is anything but clear of static. The fifty-second ballot has just been taken!

The chairman at Madison Square Garden, more than a thousand miles away, has just rapped his gavel for order—the fifty-third ballot is on!

C. S. Rainbolt, grain man, near David City, Neb., probably holds the long-distance record for the Democratic National Convention. David City is eighty miles southwest of Omaha and twenty miles northwest of Lincoln. Mr. Rainbolt, an inveterate fan, is listening on his "sooper" to Kansas City, and perhaps is the farthest man west to be able to follow the convention direct.

United States Senator R. Beecher Howell, of Nebraska, who is in Omaha on his first trip, following adjournment of Congress, expresses belief that the next Congress will pass legislation decreeing the air to be the inalienable possession of the people.

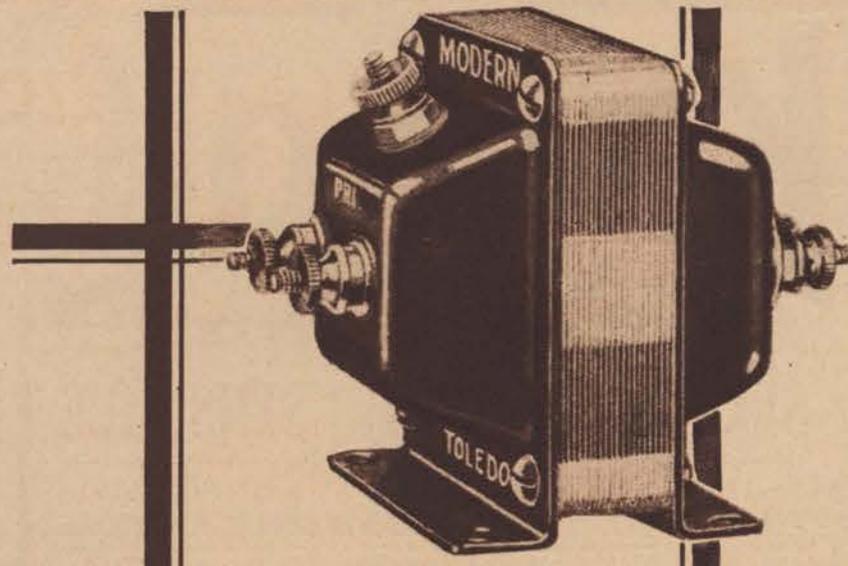
Senator Howell sees an attempt in the future of "certain big corporations" to reach out and try to obtain a monopoly on the ether.

"The fight is just begun," he said. "At the past session, my bill to make the air the inalienable possession of the people passed the Senate, but it was amended to such an extent in the House that I wouldn't recognize it. The White bill was tacked on, and I might say that the White bill contains many good features overlooked in my bill."

Before the next session of Congress, Senator Howell said, he will make a strenuous attempt to have broadcast the doings of every session of both houses of Congress, just as the two national conventions have been broadcast. He would have this expense borne by the Government, believing the service thus rendered of such import that any reasonable expenditure would be warranted.

Senator Howell was a dyed-in-the-wool radio enthusiast before he was elected to the Senate two years ago. He owned and operated the first broadcasting station in Omaha—a 50-watt affair, licensed in the name of the Metropolitan Utilities District of Omaha, of which he was general manager. This station broadcast news bulletins and phonograph music.

Three years ago, Senator Howell spent considerable time in Europe investigating radio conditions, and he is, perhaps, the best informed man in



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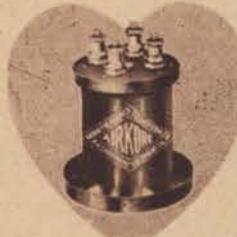
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"The very easiest sort of a circuit for DX listings is the three-circuit with untuned antenna coil described recently in "Radio in the Home" as the Kelcoil." From "RADIO IN THE HOME," June, Page 19. Parts of some letters received:

"It sure is a wonder, I'm boosting the little Kelcoil."
"It certainly is the best yet."
"I certainly will recommend the Kelcoil to my friends, and as a tuner, it can't be beat."
"It exceeded my expectations, it is an excellent instrument."
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"Am getting wonderful results with it. Stations as far as Hastings, Neb., Ft. Worth, Tex., Chicago, Minnesota, Cuba and Canada. I'm well pleased."

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[The equalized position remains fixed without any further manipulation.
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either house of Congress on all phases of radio.

To safeguard the air from monopoly, he would limit the licensing of any station to not more than two years, and would make the station owner sign "on the dotted line" at the expiration of that time, before his license can be renewed, that he relinquishes any and all claims to any particular waveband in the ether.

"I understand some sort of an attempt is to be made soon by some of the larger corporations operating stations to claim a right to the wavebands on which they now are operating by virtue of their having operated on them a certain length of time. Sort of a squatter's right, so to speak, but I will fight any such attempt."

(Note—One phase of this question is dealt with in my editorial on page 4 of this issue. If you are interested, it might be worth your while to read that editorial.—H. M. N.)

At considerable expense (the exact amount unknown at this time), the E. E. May Seed Company, of Shenandoah, Ia., shortly will install a remote control studio to work in conjunction with WOAW, the Woodmen of the World station in Omaha.

This will be one of the most distant remote control stations in the country, it being approximately 60 miles between Shenandoah and Omaha.

Mr. May, who is consul commander of the Woodmen of the World Radio Camp, says the studio will be fitted up just as elaborately as are the studios at the broadcasting stations. A long-distance line will connect the remote control studio with WOAW, and there will be a line on which the operators at both stations may talk at all times.

Programs will be broadcast in this manner at the rate of about seventy-five a year. Mr. May and his associates have made many journeys to Omaha to broadcast programs direct from WOAW, and it was to cut down this large amount of travel—at night and by auto, many times through roads heavy with mud—that Mr. May decided to "take WOAW to Shenandoah" with him.

The date for the first program from the new studio has not been fixed.

(Note—This, too, has a bearing on a part of my editorial. Evidently Mr. May is not bothering with the supposed problem, "Who is to pay for broadcasting?" Mr. May and men like him will pay for it.—H. M. N.)

WAAW, the Omaha Grain Exchange station, operating on 360 meters, broadcast news bulletins during both Republican and Democratic conventions, furnished by the Omaha World-Herald. Each night, during both conventions, the station did not sign off until the result of the last ballot was announced. Many complimentary reports were received by station officials.

Announcement of a finance, or deferred payment plan, by which retail dealers may rediscount the paper of the Radio Corporation of America, has been received as welcome news by mid-western radio prospects and retailers. The plan is to be worked out much along the same line as the Ford plan is worked.

"I believe the broadcasting of the two national conventions has done more to create interest in radio in the homes than anything else thus far in 1924," is the word from A. J. Cole, vice president and general manager of the McGraw Company, electrical jobbers, of Omaha, Sioux City and St. Louis.

"And if I am not badly mistaken, during the fall election, radio will be, by far, the most widely used as a supply of information. I believe even the newspapers will be secondary in this respect. In Fremont (thirty miles

west of Omaha) last night we could hear the fall of the chairman's gavel, the cheering and the votes of the States."

WLW, the Crosley Radio Corporation station, broke through the static on several occasions and "made" mid-western territory with its national convention broadcasts.

CHICAGO IS SUFFERING FROM FAR TOO MANY BROADCASTING STATIONS

By VERA BRADY SHIPMAN

CHICAGO, July 20.

IN SPITE of the fact that times are undoubtedly tight in many ways, this summer, so far as Chicago radio is concerned, it shows a very great increase in business over last summer. Dealers are virtually unanimous in admitting this, although, of course, they still complain that business is not good enough in summer time to suit them.

There has been quite a drive on portable sets in this city and this has had some result, but the general opinion is that it will take a year or two yet to educate the vacationist to the desirability of having a large radio installation in his home and a smaller one to take away with him on his vacation. This is undoubtedly coming, but it is equally undoubted that it is not quite here yet.

Chicago is suffering now from too many big broadcasting stations. There are seven in this city. It is becoming almost impossible for the ordinary novice to get any distant stations while the locals are on the air. Dealers feel that this is having a bad effect upon the business which they should be doing among new customers.

On the whole, however, it must be said that summer radio business is decidedly increasing and that the prospects are hopeful for radio to be an all-the-year-round sales proposition within the next few years.

Almost everybody is looking for a banner winter, beginning with September. The prospects were never so good and the most significant thing about it seems to be the fact that the factory-made set is now in very much greater demand than it has ever been before and that the class of customers that is now gradually being attracted toward radio is asking for factory-made sets and demanding performance rather than inquiring about price.

One of the officials of Sears, Roebuck Company, the great mail-order house, which has been in radio since the days of "wireless," says that his company is looking forward to a fine winter. This house is now making a neutrodyne set under license from the Hazeltine Corporation and under the name of Silvertone Neutrodyne. This set will be announced in their Fall catalogue. This official stated that the company considers the neutrodyne circuit the most successful, the simplest and the most effective in selling persons who are not naturally radio bugs, but who will be interested in radio providing an efficient set delivering good quality can be furnished to them with its control almost as simple as that of a Victrola. The company considers the neutrodyne fills this bill admirably.

They report good business of both sets and accessories with a very great increase this year over last. This official says that the tendency in radio is much like the tendency in the automobile game, where a man starts with a second-hand Ford and, once becoming accustomed to the use of a car, gradually arranges his finances so that he can graduate from one class of car to the next better one. Just so, he says, the beginner in radio perhaps builds or buys a one-tube set,

and then goes to two tubes and then adds a third and then finally decides to make the plunge and get a neutrodyne and real satisfaction. The company at present is selling by mail order more twenty-dollar sets than two hundred dollar ones, but the sale of two hundred dollar ones is growing very fast.

I saw the head of both the wholesale and retail radio department of the largest music house in Chicago. These people handle Radio Corporation sets and the official to whom I talked said that so far the propaganda for portables was very largely done to boost business in the usually dull season. He talked rather in futures, but said that in time radio would be a twelve-month business regardless of summer. June sales were much better than May, because in June they were able to get merchandise which was not available in May from the Radio Corporation. This gentleman's personal preference is the super-heterodyne cabinet selling at \$438.60 or as a 70-pound semi-portable at \$299.60.

This firm sells good sets on time payments and therefore can sell the better sets as readily as the less expensive. He also said that many of his customers had begun some time ago with inexpensive sets and had graduated to the very best in the business. He thought that this was made possible by the time-payment plan and as soon as this plan was put in force by other manufacturers of high-grade sets it would greatly stimulate the tendency of the beginner toward the more expensive apparatus.

The buyer of the radio department of one of the largest stores in the city said that their sales for portables were very small, although he knew of one other company that had sold 1200. I noticed in the retail department of this store about twenty people listening to the new Pfanstiehl No. 7, priced at \$150. This set is about as handsome a piece of work as I have seen, and my impression from the short time I listened to it is that Mr. Pfanstiehl has hit upon something decidedly valuable in radio, as the tuning seemed to be extremely easy, very sharp and selective and the quality was as nearly perfect as anything I have heard.

The head of the radio department of another big music house agreed that this summer had been much better than last. This company's best sellers have been Crosley sets, ranging in price from \$16 to \$75. This gentleman believes that many sets are being taken out on vacations, but that they are not necessarily the so-called portable sets. He has evidence to convince him that many people who go away for long vacations take their regular installation with them. He believes that the greatest hindrance to a wider market in radio is the high price of the average good set, and for this reason he believes that Crosley has made the success he has because of giving a very fair product for a very fair amount of money.

G. D. Woodruff, president of the Waveland Radio Company, tells me that sales are light at this time of year, but that last fall and winter were very good seasons and he looks for a very large business next winter.

He sells the Howard neutrodyne and the Crosley and Benson portables. His reaction to trade conditions is that the fans go to extremes—that is, they either get the high-priced neutrodynes in cabinets or some other equally expensive or elaborate set or else they go to the other extreme and get the cheapest possible one- or two-tube sets, so long as they will deliver fairly satisfactory results. He says that the whole radio world has to be educated to the portable idea, and that the idea should not be considered a failure merely because the first summer has

not put it across as successfully as some people hoped.

Sales with the Haynes-Griffin Radio Service, Incorporated, a branch of the main office in New York, have been mostly in parts for special receivers, portables, reflex sets and super-heterodyne parts. They report that sales of completed sets are not moving very fast, and that portables are below their expectations regardless of their advertising campaign. This is the company for which Major Andrew White, the sports announcer from Station WJZ of New York, is vice president. Major White came to Chicago to open the branch store here and stayed about a month before going back to New York.

The officials of this company say that men who are ingenious can build their own portables for half the price of the bought article, but that when men buy sets already made, the tendency is to buy the better kind. They report that more sets are sold at \$300 than at \$100. The June business was better than May and so far July promises to exceed June. They believe that the broadcasting of the conventions has been very largely responsible for this. During that broadcasting about three hundred and twenty-five persons a day visited their store and remained for two hours or more listening to the broadcasts from Cleveland and New York. They told me that business has been a little above average summer business but not low enough to be considered a slump. They handle many sets but consider the new Radio Corporation line the best sellers.

Both of the officials of this company to whom I talked registered vehement protest against so many Chicago stations, and blamed them for holding back business which otherwise might be coming in now.

In going around among dealers, I noticed the following combinations in stores:

- Radio accessories and sporting goods.
- Radio accessories and electrical supplies.
- Radio and musical instruments.
- Radio department in department stores.
- Radio accessories, electrical and auto supplies.

I noticed that dealers in accessories naturally preach building sets, while dealers in sets advocate the man buying the factory product.

Altogether it looks to me like a fairly good summer in Chicago. Accessories and sets are both selling far above the average of last year. People of different degrees of wealth and mechanical ability determine the amount of sales of different dealers. The handy man who has time buys parts and builds. The less handy man with more means buys the completed set.

NEW KFI IN LOS ANGELES TO HAVE 10 TIMES POWER OF PRESENT BIG STATION

Los Angeles, Cal., June 25.

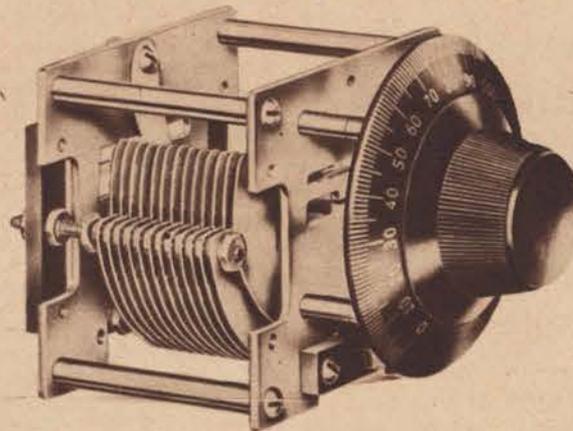
THE Radio Central Station of Los Angeles, KFI, owned and operated by Earle C. Anthony, Incorporated, has signed a contract for a new 5000-watt equipment at a cost of approximately \$75,000. It is anticipated that a day and night schedule will be in operation, which will necessitate a staff of announcers and several remote control stations.

After a two weeks' Eastern trip, Mr. Anthony placed an order for the new station with the Western Electric Company. This was the result of the brief but thorough survey which he made of the broadcast situation along the Atlantic seaboard.

Although the new station will in-

(Continued on Page 44)

THE NATIONAL PERFECT VERNIER CONDENSER



Type DX

A Vernier Condenser, that operates with no back lash and with a touch of "velvet smoothness."

Its mechanical and electrical characteristics have justified its commendation by a number of the country's prominent radio engineers.

Excellent results have been obtained when used in combination with Reflex, Radio Frequency, Neutrodyne and Super-Heterodyne circuits.

Sizes:	.001	.0005	.00035	.00025
Prices:	7.00	6.00	5.75	5.50

Write for Bulletin No. 104 A

MADE BY

NATIONAL COMPANY, INC.

Estab. 1914

Engineers and Manufacturers

CAMBRIDGE 39, MASS.

RATHBUN SINGLE-HOLE MOUNTING SUPERIOR CONDENSERS

"Extremely Low Losses"

TESTS by "Lefax" and other dependable laboratories invariably find that the losses in Rathbun Condensers are "negligible"—not worth mentioning. Point for point, these condensers give you the best value first and continually. Mechanically and electrically as perfect as fine engineering can make them. Ask your dealer to show you some of the Rathbun "points of superiority"—single hole mounting, self-wiping contacts, anchored stator plates, non-magnetic materials, remarkably sturdy mechanical structure and other advantages. These are all extra value, more for your money than you can get in any other condenser.

PRICES

PLAIN TYPES

3 Plate Vernier, .0002	\$1.00
11 Plate Variable, .0002	3.00
13 Plate Variable, .00025	3.00
15 Plate Variable, .0003	3.25
23 Plate Variable, .0005	3.50
43 Plate Variable, .001	4.50

COMBINATION VERNIER TYPES

3-11 Vernier Variable	\$4.50
3-23 Vernier Variable	5.00
3-43 Vernier Variable	6.00

Combination Types Include Knob and Dial



Write for Literature TODAY

RATHBUN MANUFACTURING CO., INC. Jamestown, New York

ACME

"CELATSITE"

(Trade Mark Reg'd)

An improved wire for
**RADIO
HOOK-UP**

Combining No. 14
Tinned Copper Wire
with real spaghetti in-
sulation. Made in 5
colors.

Unqualified approval
given by:

Radio in the Home
Popular Radio
Radio News Lab.
N. Y. Tribune Radio Lab.

Read about the wir-
ing with "Celatsite"
of the Grimes-3XP
in this number.

Made by

**THE ACME WIRE
COMPANY**
New Haven, Conn.

MUSIC
that IS music!



THE thrilling voices of great singers—the magic touch of instrumental artists—the vibrant eloquence of famous speakers—free from discordant noises—gripping—REAL!

**KENNEDY
MODEL VI (Four Tubes)**

gives you radio music reproduction that is music. Tunes with a single dial. Other dial controls volume. When a dial setting is once determined, that station will always "come in" at its own setting. Beautifully constructed throughout. Price \$120, without tubes, batteries or phones. Ask your dealer for demonstration.

Kennedy Receivers are licensed under
Armstrong, U. S. Patent, No. 1,113,140

THE COLIN B. KENNEDY CO.
SAINT LOUIS, MO.



**Neutroformers in
the Grimes-3XP**

(Continued From Page 15)

I had very good results with it. Using the loop I was able to separate on Saturday night WFI from WGY, tune KDKA, WEAP, WOR and WTAM with the loop.

On the 37½-foot aerial, which I found to be the best with this circuit and 201A tubes, I have used this set three nights and have tuned in twenty-six stations on the speaker as far as WOC, Davenport, west; Montreal, Can., north; Atlanta, Ga., south. Sunday night I listened to the Sweeny Automobile School station in Kansas City, which was clear, and had no trouble hearing it on the first floor through three rooms.

While using the loop Saturday night, I also had the thunder storm and WGY at the same time.

I am now going to put this set in a good cabinet and use it as a loop set at the shore for the summer, as

changed my admiration for this circuit.

It is our plan in publishing this series of articles to have them written entirely from the viewpoint of the novice in radio. They are not intended for the advanced amateur. The idea is to explain in as simple terms as possible the fundamentals of the circuit, and the advantages of using it so that the man who has perhaps begun his radio experience with a crystal set or with a one-tube set and now wants to graduate into something which he can consider a permanent installation will know just what he is doing when he goes out into the market to consider the merits of the neutrodyne as against other sets which may attract his attention.

I trust that before long Professor Hazeltine's time will be so arranged that he himself can write some of these articles for us. Even if he does not, however, the articles we are publishing by Mr. Dreyer may be considered as really coming directly from Professor Hazeltine, and they will

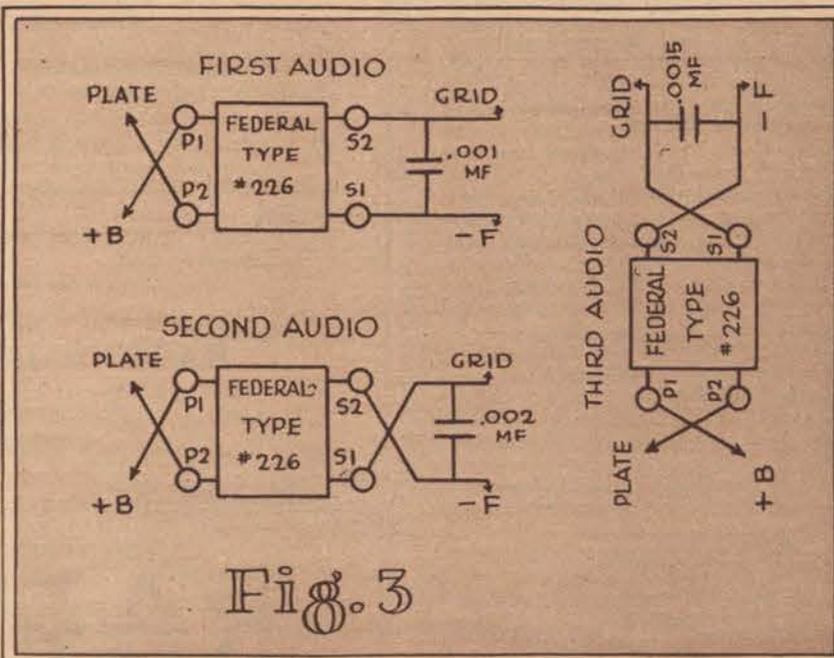


Fig. 3

I am satisfied it will give me all I care to hear on a loop away from local stations.

Wishing you success with this circuit—and if this letter is of any use to you, you can use it.

I am, yours truly,
Wm. H. Kleinberger,
3249 N. Bailey St., Phila.

**Authoritative Articles
on the Neutrodyne**

(Continued From Page 4)

tribute to the efficiency of the neutrodyne circuit is the fact that it is more popular today than it was when the first furore began about it, now over a year ago. Since then many circuits of many different names have sprung up, and some of them have been backed by large corporations, who have spent a great deal of money trying to make them more popular than the neutrodyne, but each one has met with failure. Perhaps I should say that these other circuits have not failed, but the neutrodyne has continued to lead the field in popular estimation.

I think I was the first magazine editor to come out with an article proclaiming the neutrodyne circuit a distinctly valuable addition to radio. A year ago, under the title of "Some Notes on the Neutrodyne," I spoke of the many advantages of this system and told of the great personal satisfaction which I had had in using a neutrodyne set. I have seen no development since then which has

have all of the authority they would have if they actually bore his signature.

May I be pardoned while speaking of an article published by us a year ago, if I also revert to this issue as compared to that one? A year ago, I wrote virtually the entire magazine myself. We were a young publication, stepping out rather timidly and very conservatively to find out if there was room for us in a field which seemed already overcrowded with excellent publications. We did not know whether we really had a different idea or not. We thought we had. Consequently we started and proceeded rather cautiously and conservatively.

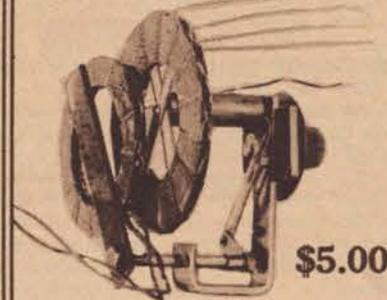
I think that the list of our regular writers and editors as given in this issue will show whether the public thought we were welcome or not. We now have David Grimes, inventor of the inverse duplex, and Kenneth Harkness, inventor of the famous Harkness set, as our associate editors and writing exclusively for us. This series of articles under Professor Hazeltine's supervision is also exclusive to us.

Our contributing editors, who write for us regularly are Brainard Foote, one of the very best known radio writers around New York, and W. Francis Goodreau, whose very clever simplifications of famous but rather complicated circuits are winning for him a host of followers.

We now have a regular correspondent in every large city in the country, and in almost all cases, this correspondent is the radio editor of the

TRY THIS

Pfanstiehl
UNIVERSAL
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 ampere

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 Reflex, 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. **\$5.00**

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 first 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.

leading newspaper in that city. In that way we are kept in the very closest possible touch with the radio situation as developed in different sections of the country, and we feel that this phase of our magazine, just recently begun under the title "The Slant of the Trade On Radio," is one of the most important things we have done. We propose to increase this department during the winter, but our readers will find that it is not strictly a "trade" department; in other words, we simply use the dealers in various cities as our source of information to keep our readers in each city informed of the favorite circuits and the favorite sets as shown by the demand in the stores in all other cities.

And now if there is anything more we can do to make this magazine *your* magazine, and the way you want it, do not hesitate to drop us a line and tell us what you desire.

The Neutrodyne

(Continued From Page 10)

lightly with the finger. A metallic ring will then be heard. The tubes should be interchanged until the one giving the least drawn-out ring or clang is found.

The receiver is now ready for use and the three tuning dials should be set to approximately the same dial readings. If no station within range is transmitting on the wave lengths to which the receiver is now tuned, nothing further will be heard. The dials should then be changed slowly either to higher or lower figures by moving each a like amount. This should be continued until a station is picked up. After having once heard a station, the dial settings should be recorded for future reference.

A person adjusting a receiver automatically tunes it for maximum signal strength. Aside from the fact that extremely loud signals are unpleasant because they are loud, it is very likely that distortion will also be present. To obtain the best quality something should be done to cut down the strength of the more powerful signals.

This may be done by any of several methods. A quick way is to detune one of the dials by moving it several degrees away from the setting which gives the loudest response. This usually improves the quality greatly, if the signal was originally loud enough to give distortion. This distortion occurs either in the detector or in the audio amplifier tubes and is characterized by a hissing or sibilant character to the speech transmitted. The "S's" are unusually prominent and in general music sounds tinny and of higher pitch than is proper. This type of distortion is known as "overloading."

A safe rule for tuning in a station is to make the voice of the announcer of conversational, rather than of oratorical intensity. This will insure that no overloading takes place on the louder musical selections.

Some receivers are equipped with rheostats especially placed for volume control. In this case adjustments of them rather than detuning may be resorted to.

For the best possible results, from a quality standpoint, headphones connected to the detector tube should be used. Here the writer has found it desirable to reverse the usual procedure, in that he uses the headphones occasionally for local stations but never for distant ones. This is because there is a loss in the sensitivity of the ear when it is periodically subjected to loud crashes of static. These static bursts are less annoying when they issue from a horn than when they are heard with headphones.

When a neutrodyne receiver is once

Radio Apparatus that Brings in the Stations Say the Radio Bugs!



February 14, 1924

KELLOGG SWITCHBOARD & SUPPLY CO., Chicago, Ill.

Gentlemen:

My antenna is fifty feet high, and slants towards the lead-in. I have a three-circuit set, completely equipped with Kellogg parts. In the list which I am enclosing, those stations marked with an asterisk were received in one night [five hours]. The complete list numbers 154 stations, all received over a period of one hundred fifteen days.

- | | | | | | | |
|-------|-------|-------|------|-------|-------|-------|
| WOS* | WMC* | WEAF* | WPA | KJR | KFAF* | KNJ* |
| WOC* | WJY | PWX | WAAW | 9CGU | WIAK | WJAD* |
| WHB* | WNAV* | 8XG | WCK* | CKAC | CFGX* | ICU |
| WLAG* | WGR* | CKCK* | WEAH | WBL | KFKX | WJAL* |
| WJAN | WSAI | KSD* | KLZ | WOAI | WLAT | WXV* |
| WHAZ | 9XN | WII | KWH | 3KY | WHO | 6KW* |
| WJAX | WCX* | WBAH | CFCA | WOAT | WGAH* | WEAD* |
| WHAS* | WTAS | KFKB* | WRM | (SNO) | WLAO | SRK* |
| WGY* | WPAD | WTAM | WSY* | CHCE | WHAA | CPCD* |
| KYW* | 9DYY | WOO* | KFBV | SCA | WDAV | KDZE* |
| WOAE | WWJ* | WAAZ | WFI | (2LO) | WKY | WKAO |
| WJAZ* | WEB | WJAG | WOI | 9CFK | WHN | WWAC |
| WOAW* | WOO* | WBAV | WIP* | 9DXL | WBAY | WPE |
| WFAA* | WEAS* | WRC* | KFDY | WIAS | WIA | CYL |
| WDAF* | WDA* | WHA | KON | WSAB | WBA | CFCN |
| WSB* | KFEB | KOI | WMAJ | WBZ | KPMX | WVAN |
| KDKA | WBAP* | WBAK | WEV | WEAN | WCAN | 9BD |
| WMAQ* | KPO* | NAA* | WMAK | WNAC | KFFO | 9CDK |
| KFI* | WCAE* | WOR | KLX | WJAR* | WIAO | 9CDU |
| KHJ* | WJZ | WPAH | KGW* | WNAD* | WPB | KOE |
| WLW | WHAN | WJAO | WGAM | WPAM | KFEL | 9DCK |
| WCBD | CFAC | WHAM | WGN* | WMAB | SCU | WDAP* |

Thirty-four of these stations are over a thousand miles, and the whole list includes over thirty-five states, all but one of the Canadian provinces, Cuba, England, Porto Rico, Mexico, Honolulu and Alaska.

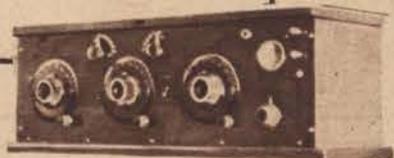
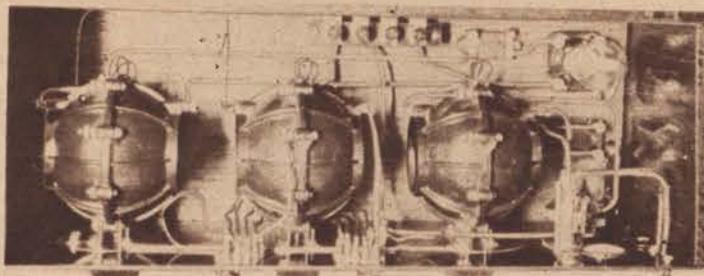
Let's give nine hurrahs for Kellogg parts, the best in the world.

Yours very truly, H. G. BROWN, Peoria, Ill.

Every piece of Kellogg radio is guaranteed—your protection of absolute satisfaction. Get the most out of your favorite circuit by using Kellogg parts. USE—is the Test.

Kellogg Switchboard & Supply Co.

1066 W. Adams St., Chicago, Ill.



Take

Radio in the Home

With You on Your Vacation

By subscribing now to

RADIO IN THE HOME

you will always get it when you want it

SEND IN THE BLANK TODAY

RADIO IN THE HOME,
608 Chestnut St., Philadelphia, Pa.
Please find enclosed check, M. O., cash, for two dollars (three, Foreign) for One Year's Subscription to *Radio in the Home*.

Name.....
Address.....
City..... State.....



A MANUFACTURERS' EXPOSITION
WHICH WILL BE ATTENDED BY THE PRINCIPAL
RADIO JOBBERS AND DEALERS OF THE UNIVERSE

*De Luxe Exhibits by Nationally
Known American Manufacturers*

Representative Displays By The Famous Manufacturers Of
ENGLAND FRANCE BELGIUM
ITALY SWITZERLAND AUSTRIA

Direction of
U. J. Herrmann and James F. Kerr

Business Office
Hotel Prince George,
New York City.

INCREASE YOUR INCOME Without Any Investment

if you can sell us a few of your extra hours, we will show you how you can make enough money to buy the little luxuries that everybody wants—but can't always afford.

You can earn as much as \$4 to \$5 in a few hours each day among your own friends and neighbors.

The work is pleasant and dignified, and there is no cost of any kind, as we furnish all necessary supplies.

If you are determined to make some additional income write to us at once. We will send you full information.

Circulation Manager

RADIO IN THE HOME
608 Chestnut Street Philadelphia Pa.

properly installed, one can be assured of good reception at any time. Of course, the batteries must be kept in good condition. The "A" battery should be tested and recharged periodically. The "B" batteries, if of the dry type, must be replaced when they are worn out.

It is very convenient to have a voltmeter for testing these batteries. One having two ranges of 7.5 and 150 volts is suitable for measuring both "A" and "B" battery voltages.

Tubes also do not have indefinite lives and should be tested occasionally. A good way to do this is to have an extra tube always on hand. If at any time the signal is decidedly improved when an original tube is replaced by the spare, then that tube should be permanently removed from the receiver and a new one obtained to take the place of the spare.

Radio Kindergarten

(Continued From Page 16)

to some flaw, imperfection or moisture, one of our insulators has a resistance of only 1 megohm. We would then get:

$$20+1=21 \quad 20+20=40 \quad 20+20=40 \\ 20+20=40$$

for the series connection, and:

$$\frac{1}{\frac{1}{21} + \frac{1}{40} + \frac{1}{40} + \frac{1}{40}} \text{ or } 8 \text{ megohms}$$

as the total resistance.

In all cases the total resistance will be LESS than that of the insulator having the lowest resistance when there is a parallel arrangement.

Since we want the insulation of our antenna as high as possible, the best way to get it so is to connect our insulators as shown in Figure 2. Here we employ but four insulators, and these all in series.

If each insulator has the same resistance as before, we will then have $20+20+20+20$ or 80 meg. ohms as the total resistance. We are using one-half the number of insulators as in the former case and getting eight times more insulation!

As a consequence, our signal strength and selectivity are materially increased, and we are happy in the thought that we have built a multi-wire aerial and insulated it properly.

The Slant of the Trade on Radio

(Continued From Page 41)

crease the power of the old some ten times, it is not planned primarily to increase the range but rather to increase the quality of reception. The additional power, for instance, means that it will be unnecessary for receiving set owners of California to use more amplification to receive the programs satisfactorily.

Since the present United States Government laws permit only 1000 watts to be put into the antenna the new KFI will be operated at 1000 watts, but a reserve of five times this amount will be available for special occasions and in case the law is later changed.

The radio equipment is to contain special transformers and special devices to increase the roundness of tone quality. The voice will be amplified by the same 500-watt equipment as now used but instead of this 500 watts going into the antenna as at present it will be put into two water-cooled amplifying tubes which will be supplied with 10,000 volts direct plate current.

That this new station is to be erected on the West Coast is by far one of the biggest news events in the radio field for some time. The set will cover at least twenty times the area in square feet of the present equipment on top of the Packard Motor Car Building in Los Angeles. It is easily the latest and best equipment to be procured for high-powered

broadcasting and is an exact duplicate of WEAJ, the American Telephone and Telegraph Company's station in New York City.

The new KFI will be of sufficient power to assure receiving-set holders of daylight reception throughout the entire State of California and perhaps also the Pacific Northwest. This is one of the big reasons for the erection of the new station, since Anthony, Incorporated, has interests up and down the coast and the station must be made to serve the interests of its own constituents as well as of the public at large. As a matter of fact, however, KFI is becoming a sort of quasi-public utility in the Pacific Southwest.

It is interesting to know, in these days of the battle of the air and the supremacy of certain stations, that the additional power of Anthony's station will in no way interfere with other broadcasting stations of Los Angeles and vicinity, of which the principal ones are the Angelus



Earle C. Anthony, owner of Station KFI, Radio Central of Los Angeles, Calif.

Temple, KFSG, the Bible Institute, KJS, and the Los Angeles Times, KHJ, as well as KFON at Long Beach and KNX in Los Angeles.

The new equipment will necessitate an additional studio so that the program may be alternated—an orchestra assembling in one, for instance, while soloists are performing in the other.

In announcements from the Anthony Studio it is said that there will be a number of remote control studios in connection with the new and enlarged KFI. At the present time there are three control stations: the Los Angeles Examiner presents programs in their own studio as well as the Evening Herald performers from theirs, and the Hotel Ambassador Orchestras complete the three remote controls.

A fourth has recently been placed in operation in the George Birkel Music House, where concerts are given on the Aeolian organ. It is also understood that Mr. Anthony, an accomplished pianist and organist, will broadcast weekly programs from the music room of his palatial private residence.

Anthony's station has been a pioneer in Western radio since its

(Continued on Page 46)

FREE

To Each Purchaser of a **World Battery**



A 24-Volt "B" Storage Battery positively given FREE with each purchase of a WORLD "A" Storage Battery. The WORLD Battery is famous for its guaranteed quality and service. Backed by years of Successful Manufacture and Thousands of Satisfied Users. You save 50%.

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Auto Batteries	Radio Batteries
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	6-Volt, 140 Amps. 16.00

Shipment Express C. O. D. subject to examination. 5 per cent discount for cash in full with order.

2-Yr. Guarantee Bond in Writing With Each World Storage Battery

proves satisfactory World performance. Mail this ad with your name and address—we will ship battery day order is received; and give you your choice of "B" Storage Battery as a handsome nickel finish Auto Spotlite, FREE. Write TODAY.

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This FREE "B" Storage Battery takes the place of dry cell "B" batteries. Can be recharged and will last indefinitely. To be sold retail for \$6.00. It is the only battery of its kind equipped with cold rubber case—an insurance against acid and leak-ge. Take advantage of this remarkable introductory offer NOW. (To those who prefer it, we will send FREE a handsome nickel finish Auto Spotlite, instead of the "B" Battery. Be sure to specify which is wanted.)

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To introduce this new and superior World "B" Storage Battery to the Public.



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ELECTRIC SERVICE SUPPLIES CO.
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is devoted entirely to better class radio—the only kind that is fit to go into the American home.

RADIO IN THE HOME

is not in the market for general radio advertising. We make our own tests of apparatus and our own investigations of the financial and commercial reliability of firms, and we solicit advertising only from those manufacturers whose products we ourselves are willing to guarantee in the light of these researches.

This is to assure our readers that they can depend on the things they see advertised in our columns.

IT IS A READER SERVICE

Radio While the Lad Shines Your Shoes

By FELIX J. KOCH

THIS story is not strictly a story of "Radio in the Home," but it certainly does show a very interesting and unique use for the new science. It strikes me as particularly clever the way the proprietor of the parlor has insured himself against silent periods, bad static or off hours by his very ingenious use of recording phonograph discs for making records while the going is good and placing them on his own apparatus while there is a silent period and letting his customers think they are still getting the broadcast from the station.

More power to him!

H. M. N.

DOWN Cincinnati way one of the leading shoe-shining and repairing parlors of the Queen of the West is enjoying, at this writing, a patronage almost second to none. Folks who come to the establishment—The Queen City Goodyear Shoe Company—whether for a shine, or to have some extended repair made

piece from the hooklet; hold it to the ear and catch, then, just whatever may be on the air!

Across the aisle from the women's section of the store is a battery of the usual sort of chairs for men receiving shines or awaiting repairs. Each of these chairs has its stout arching arm. Set to each arm (there is one to a chair only) is a neat metal brace. Hung from each brace is an identical ear piece to the radio phone. Men, in their turn, awaiting shoes, receiving shines need but lift such ear piece and they, too, will get what may be in the air!

The store in point opens at half past seven of the morning and does not close until half past six at night. While the instruments will deliver what may be in the air before, patrons are advised not to expect much of general moment in this area before eleven A. M. From then on, through the day, one is reasonably certain of hearing something of real moment. Nor do things stop there: To have new customers, unfamiliar with the service given, come in primarily to hear the radio and then be disappointed for lack of broadcast



Listening-in while having your shoes shined

to their shoes are met by a curious sight: One entire wall of the long, narrow store-space is edged with small, low-walled compartments; upon first sight much like the bath compartments in use at mineral springs and elsewhere in this part of the Middle West. Inside each compartment there is always a comfortable seat and footrest; compartments here are reserved for women customers alone. Each compartment is separated from either neighbor by a joint retaining wall, and the top of this wall is flattened to provide neighbor occupants with comfortable hand-rests. Each of these broadened shelves has at its front a small, conventional bronze figure of a draped woman, arms outstretched. Hanging to the fingers of each hand of each such figure is a familiar ear piece for the radio phone. All one needs do, as the notion seizes, is to lift the ear

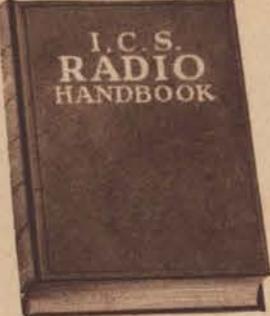
just then isn't the most satisfactory business builder in the world. Against this, a novel device known thereabouts as the "electrograph" is brought into play. For the use of the electrograph, care is taken that some one in authority shall listen in at the radio broadcasts at odd moments again and again, and particularly when the newspapers promise a worth-while program somewhere. Believing the stated number worth while, the man releases a catch in a device in a loft at the store rear and sets a blank talking machine disc to making a record. The radio broadcast is almost always strong enough to record itself on such a plate; where it's not, amplifiers are employed. Some of the shoe boys, not busy otherwise just then, stand sentry near; a cloth is thrown over the instrument, *pro tem*, to save it from the dust clouds from shining shoes and brushing of

Henry M. Neely

recommends this

RADIO HANDBOOK

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Editor, "Radio In The Home"

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SUPER NEUTRODYNE RADIO SETS

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Resistance Coupled Amplification

The tone quality from a Daven Resistance Coupled Amplifier is the most perfect known to the Radio Art.

Our Type 3-B KIT contains all the necessary parts to build a three stage resistance coupled amplifier that cannot distort. Price as illustrated.....\$13.50

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Write for a copy today



A new twenty-four page booklet will be sent, gratis, to those interested in building their own receiving sets.

A simplified method of construction is described. Illustrations and diagrams.

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EISEMANN MAGNETO CORPN.

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EBY TIP TOP



QUALITY POST

Perfect reception with four pairs of phones (series or parallel). Same workmanship and finish All Eby Posts have.

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clothes; by and by a complete record is made.

This record is then filed in a cabinet for the purpose.

An instrument for playing it is near.

There may come, then, a lull in broadcasts, and some recent number thus made on the record is slipped into place so. There is an instant's switching and connections for the head pieces from the radio-receiving device to the graphophone-reproducing device near, and in less time than it takes to tell all customers may have the small, hard-rubber cushions at their head sides, and have this other music, recitation or whatever it may be rendered squarely at their ears!

San Francisco branch of the Anthony concern for local service in the northern part of the State and other points.

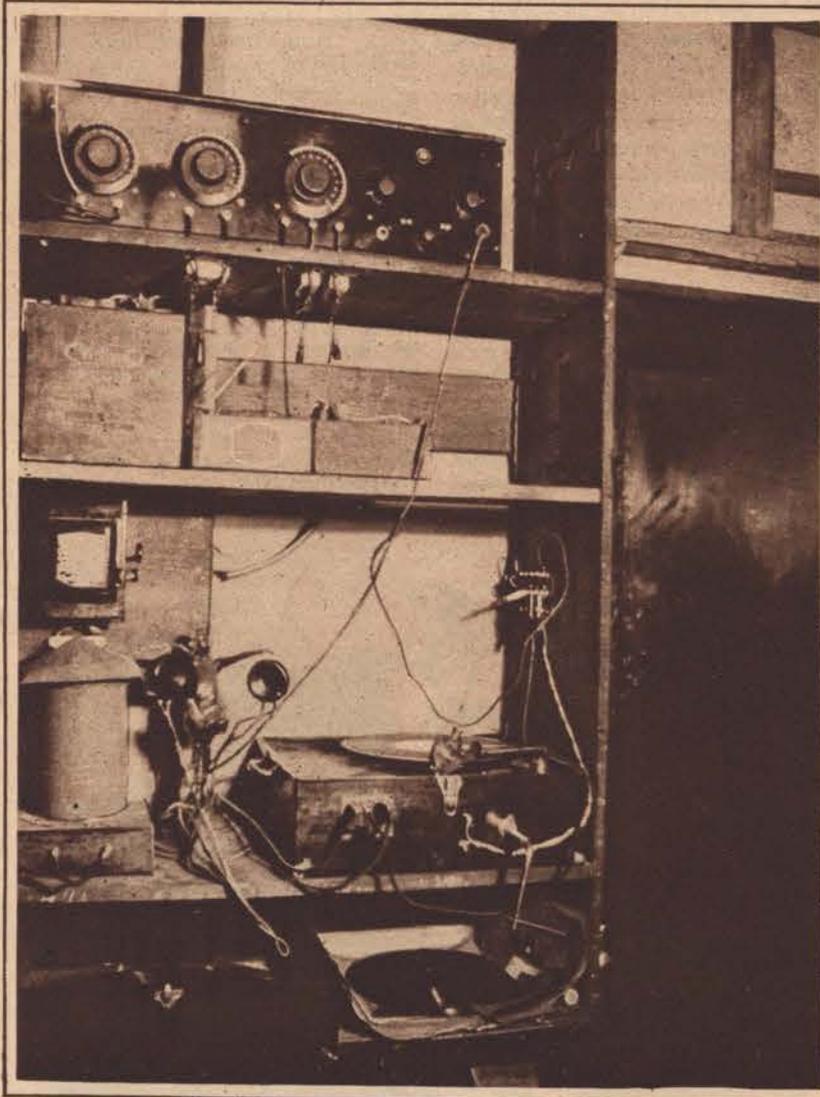
FEATURES THAT INTEREST BROADCAST LISTENERS-IN ON THE PACIFIC COAST

By DR. RALPH L. POWER

Radio Editor, Los Angeles "Examiner," and the "Sky Crier" of the Examiner studio

LOS ANGELES, Calif., July 20.

THE Wampus semi-monthly programs are attracting considerable attention in local circles. Elinor Glynn appeared on one of their recent programs and gave a short talk. The



Making a record of the broadcast for playing other times

The Slant of the Trade on Radio

(Continued From Page 44)

erection but a year or more ago. It has not been content to follow beaten paths but blazes some of its own. KFI has broadcast several features through portable panel under the auspices of The Los Angeles Examiner, notably three performances of the San Carlo Grand Opera Company from the Philharmonic as well as the Children's Orchestra and an Easter organ sunrise service from the same auditorium.

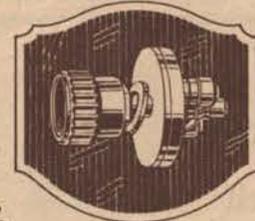
The old 500-watt station, which will be superseded by the new Western Electric equipment November 1st, according to the present schedule, has been heard in far distant corners of the globe, including all parts of the United States, the McMillan Expedition to the North Pole, Honolulu, Japan, Samoa and Australia. While the disposition of the old equipment has not been definitely settled it is thought that it may be sent to the

programs offer a variety of features including musical selections and brief talks. Asa Keyes, district attorney, and Ruth Roland, screen favorite, greeted listeners-in at a recent Wampus program. This organization is the Western Association of Motion Picture Advertisers.

The Los Angeles branch of the League of American Penwomen is giving a series of six "hour programs" from a local station. This is part of the Broadcast Committee's plan for the national organization. Bertha Lincoln Huestis created considerable favorable comment in a review of "When Geronimo Rode." Mrs. Huestis is president of the Los Angeles branch.

Katherine Thompson's Southern California Saxophone Band is making quite a hit with local listeners-in. This is composed entirely of women music makers.

During the recent biennial of the General Federation of Women's Clubs in this city many of the prominent



Off again-on again without re-tuning

NO MODERN SET lacks the convenience of a MAR-CO filament battery switch. Snap—your set is silent. Snap again—and reception continues instantly, without touching a dial! Only a few minutes to install. Prevents accidental burning of tubes.

FILAMENT BATTERY SWITCH **30¢**

MAR-CO

Greatest Selectivity

Get volume from distant stations. Cut right through local stations any time. It's easy with the Coast Coil even in summer. The only coupler made that's mechanically and electrically perfect. If your dealer hasn't a "coast coil," ask him to get one for you.



\$7.00

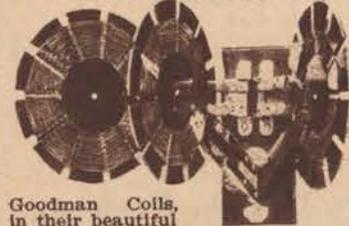
Sold with a Guarantee. Examine it at your dealer's.

COAST COIL

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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. P. on one pound

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Use Price 75¢ **DURHAM** 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.

DURHAM & CO., INC.
1230 Market St., Philadelphia, Pa.

delegates found opportunity to give educational talks to radioland.

Prudence Penny, nationally known home economics expert, and Annette Kellermann, known the world over as an enthusiastic physical training devotee, are now regular lecturers in one of the local studios.

When the Soldiers' Friend Bureau was recently opened in Los Angeles to assist veterans to fill in the new Government blanks it was found that radio reached three times the number of people that the newspapers did.

The University of Southern California has sponsored many programs recently. The School of Speech conducted three evening programs, featuring one-act plays. The annual alumni program of the university was repeated via radio for out-of-

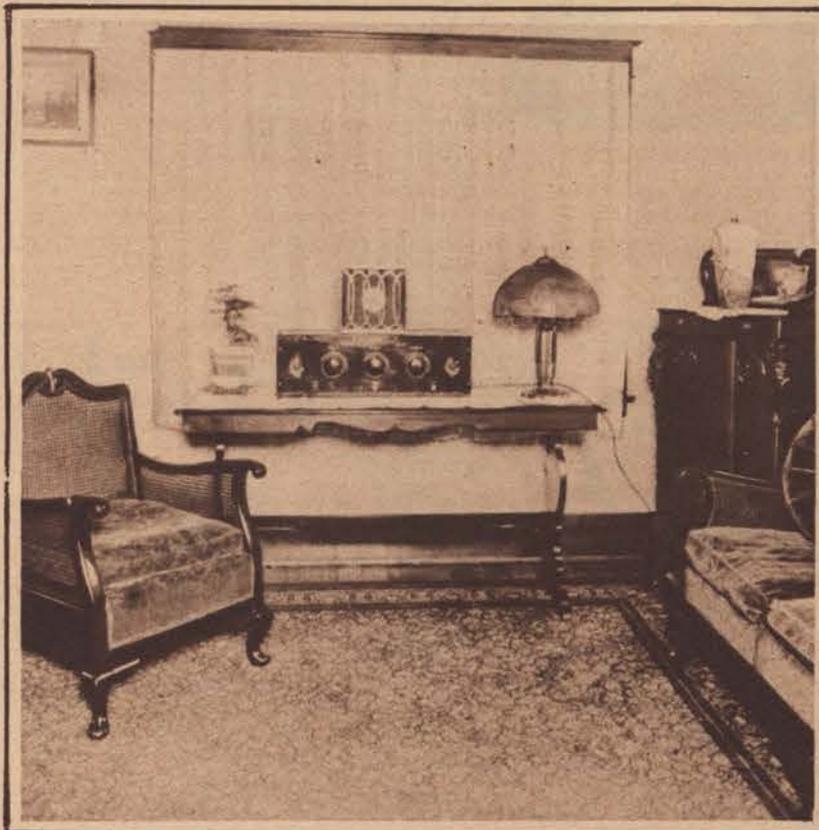
day nights and the baptismal services Thursday nights. Some of the far away people in the mountains apparently listen in for the water splashing in lieu of their Saturday baths.

HE WOULDN'T TAKE \$25 FOR HIS TUBE TESTER

My dear Mr. Neely:

Just a few lines to thank you for putting out the hookup in your June issue of a tube tester, which any one can make and use after making.

I have built a lot of different sets from a one tube to a super-heterodyne. I had lots of trouble until I got 90 volts crossed with the filament wires making some changes and blew seven tubes at once. That left me with seven good tubes—at least I thought they were good because the filaments were O. K.



Radio in the Home of Mr. K. Salisbury, Buffalo, N. Y., Radio Editor of the Buffalo Times

Photograph courtesy of Federal Radio Shop, Buffalo, N. Y.

town alumni and the Girls' Glee Club, which has sung many times through KFI, is already booked for many fall programs.

Judge John L. Fleming, of the Superior Court, is now in the midst of an interesting series of California historical sketches being radiocast under the auspices of the Native Sons of the Golden West.

The Radio Association of Southern California now holds weekly meetings in the Los Angeles Armory. Gatherings for amateurs and for broadcast listeners-in are held on alternate Mondays.

Queen Titan, a seven-year-old child who visits KHJ every week for the bedtime story hour, is now starring in Kahn's Kiddie Komedies. Press agents tell us the identity of the child prodigy remains a secret despite the fact that she has spoken from KHJ for somewhat over a year.

KFSG features its divine healing service and testimonials on Wednes-

I built an ultradyne, using the seven tubes, and it acted fairly well, but I thought it could have been better.

Then I bought the June issue of *Radio in the Home* and built the tube tester from junk parts, or rather parts from junk sets. Now I would not take twenty-five dollars for the tester if I could not make another.

In testing my tubes, I found one that was bad. I bought another tube which tested O. K. and put it in my set. Man but it does work now!

Any one with a set using more than one tube should build one of these testers and save lots of grief. It lets you see what a tube really does—something that before you had to guess at.

At the same time it does not cost over five dollars to build, and I dare say that everybody has the necessary parts lying around his work shop.

Thanking you for again giving us something useful instead of freakish, I remain

Very truly yours,
August O. Yakie,
Postoffice Box 463,
Port Arthur, Texas



FADA "ONE SIXTY" NEUTRODYNE RADIO RECEIVER



Summer Advantages of Neutrodyne

IN THE summer time, Neutrodyne maintains the advantages of good radio reception—you can bring in signals on Neutrodyne receivers that are too weak for other receivers to get.

The FADA "One Sixty" is a remarkably efficient Neutrodyne receiver. If distant stations are broadcasting and it is at all possible to get them, the FADA "One Sixty" will bring them in. Selectivity, volume and clarity of reproduction are outstanding features that have made the FADA "One Sixty" so deservedly popular everywhere—it usually brings in stations, near and far, on the loud

speaker, even when local stations are on the air.

Freedom from radiation is another advantage that is vitally important, as absence of radiation from your receiver is a deserving courtesy to your neighbors.

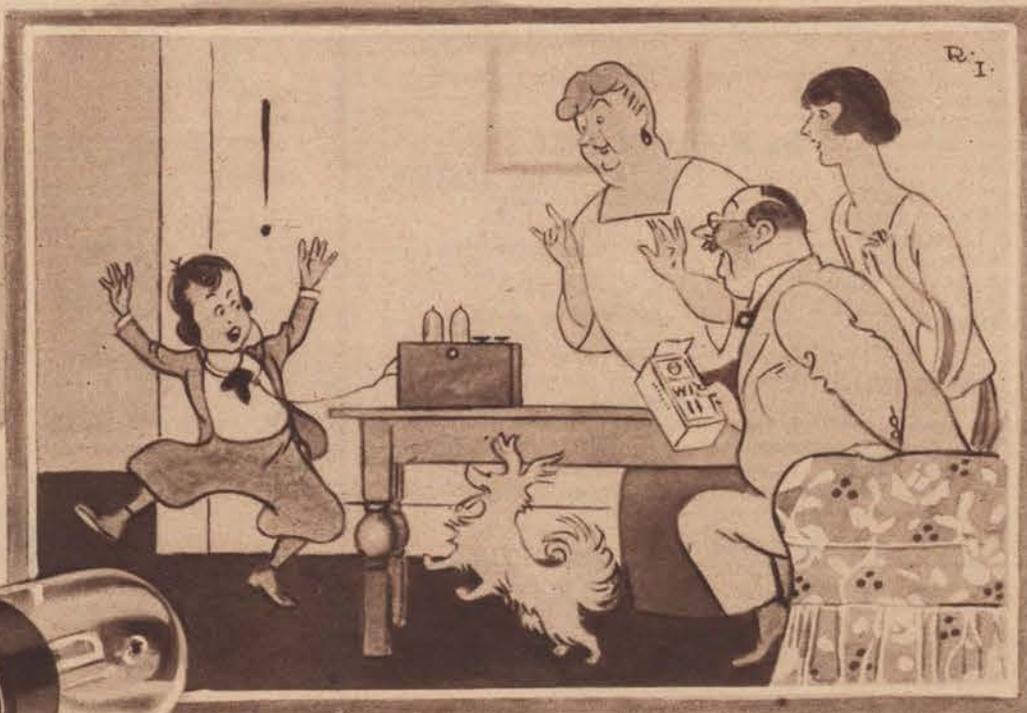
Buy a FADA "One Sixty" Neutrodyne receiver and enjoy all the advantages of summer radio at its best. It's a receiver you'll never have to apologize for—an ornament to any home. For your protection, a serial name-plate is fastened inside the cabinet. Be sure to look for it. Price of FADA "One Sixty" \$120. Tubes, batteries and phones are extra.

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If your radio set is equipped with navy type tube sockets, you can change to dry battery operation by inserting WD-12 Radiotrons. Ask your dealer for information as to how this can be done.

These are dry cell tubes—the tubes that made possible the swift progress of radio in the home everywhere. They meant clear tone—undistorted detection—radio and audio amplification—and volume reproduction—all with dry batteries. They meant radio in the city—on the farm—off in camp—everywhere!

And to-day, there are millions of these Radiotrons in use. Everybody knows

them familiarly as “WD-11’s” and “WD-12’s.” But they are not genuine unless they are RADIOTRONS. Always be sure to look for that mark on the base, and for the RCA mark on the glass. It's important, whether you are buying a new set with the Radiotrons in it, or buying new Radiotrons to replace old ones. Always look for the Radiotron mark and the RCA mark. Then you have the genuine—sure to live longest—serve best.

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