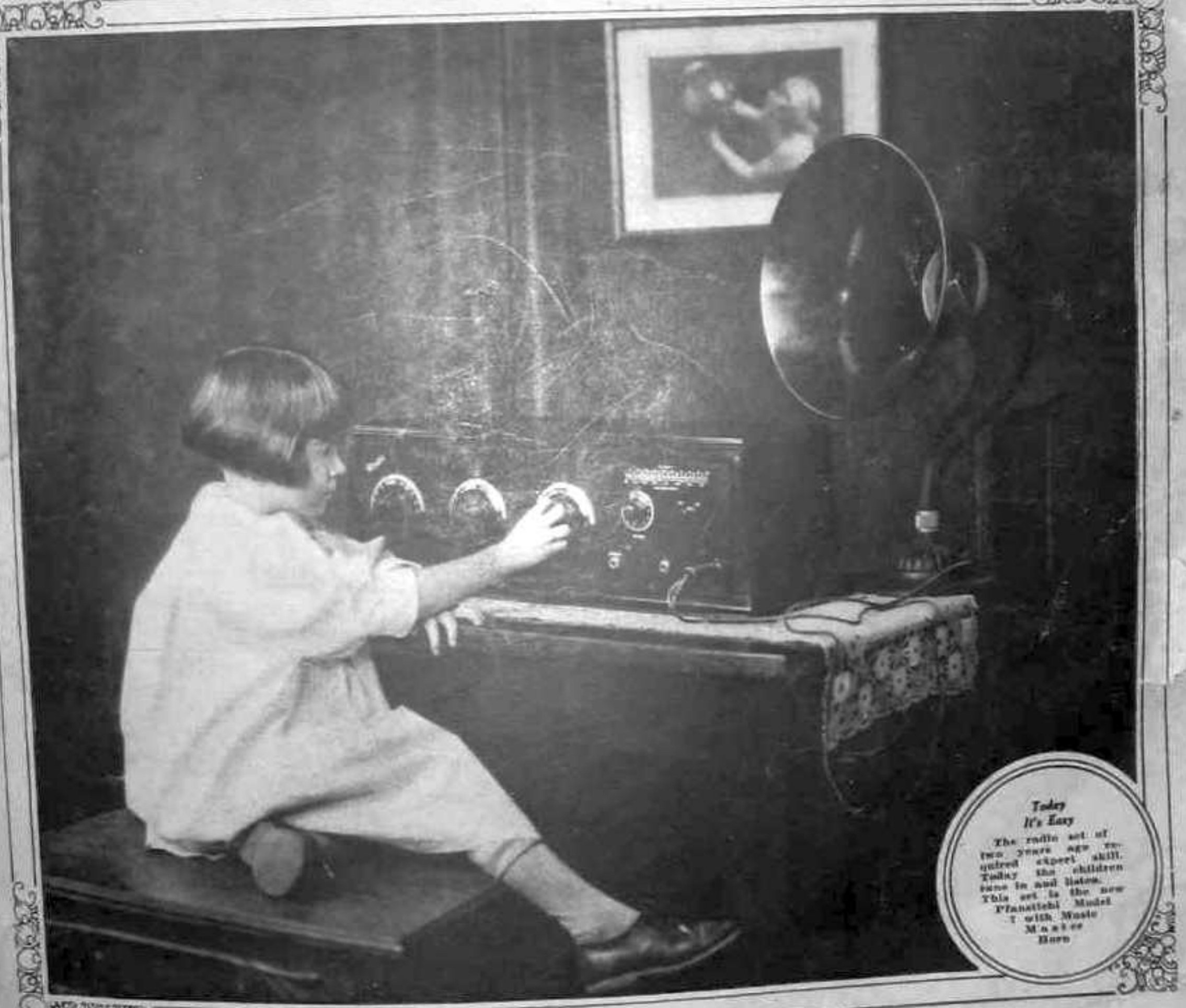
October, 1924

RADIO IN THE HOME

TWENTY CENTS

Conducted by HENRY M. NEELY



In this Issue: The New Harkness Counterflex

The Radio Tea Wagon becomes part of the home furnishings

Photograph by Harry S. Hood, through the courtesy of Durham & Company, Inc.

A Correction

IN LAST month's issue of this magazine we made an unfortunate transposition of captions under two photographs in the article "The Children's Hour for the Radio Child" by Vera Brady Shipman. On page 20 we printed a picture of a jolly-faced individual and under it we said that he was Thornton W. Burgess, of Springfield, Mass., creator of the famous bedtime stories of nature. On the next page we printed a picture of a studious-looking gentleman and under it we said that he was "Uncle Bob" (Walter Wilson), of KYW, Chicago, a favorite bedtime story teller on the radio.

Unfortunately, these two captions were transposed. The jolly-faced gentleman is Uncle Bob and the studious gentleman with the pipe is Mr. Burgess.

I suppose that it is expected that we should apologize for this but I really do not know which one of these gentlemen to apologize to.

I only know if any one should call me either Uncle Bob or Thornton Burgess I should not demand an apology but would rather thank him very much indeed for the compliment.

H. M. N.

RADIO IN THE HOME

OCTOBER 1924

VOLUME III NUMBER V

CONTENTS

RADIO IN THE HOME

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Editorially Speaking

By Henry M. Neely

THE recent discussion in this department of the reported plan of some of the big companies to establish a chain of "super-broadcasting" stations so that great events might be sent out country-wide simultaneously, seems to have split the readers of this magazine into two very distinct and somewhat prejudiced camps.

This, however, is just about what I expected it would do. You see, the radio audience must of necessity be divided into these two groups, and the sooner we recognize the groups and make our appeal to one or the other, accordingly, the sooner will we get on a sane basis in this business.

These two groups are, first, those who may be considered as already in radio, and who, without any doubt, have been the people who have brought radio to the tremendous position which it occupies today. These good folk are the ones who like to put their own sets together, or, if they buy a manufactured set, want to know at least what the circuit is and what all of the instruments inside are and do, and exactly why and how everything functions. They are very likely to be the DX "hounds" and their general attitude of mind is that all local stations should be surpressed so that the listener-in may spend a joyous evening trying to see how many stations he can log within an hour and a half or two hours.

Then there is the other type that cares nothing whatsoever about this kind of thing. This second class has not yet become very strong in radio, but it is the class which is now coming into the game entirely for its value as home entertainment and education. It is the class which has steadily stayed away from radio during its development period because of a total lack of interest on the technical side.

These good people are the people who have phonographs and good pianos in their homes and who go to theatres and concerts and lectures quite regularly. They realize that radio — "if and when perfected"— will supply them with the kind of entertainment and education which they like, and will do it with a great deal less trouble than they find now in going out on a stormy winter evening to attend such events.

This latter class is now coming rapidly into radio. Its members do not know parts and hookups and circuits; they want a radio set and want a perfectly good one all ready installed in their home just as they acquired their Victrola and their piano.

To the latter class, the plan of super-power broadcasting stations is the ideal solution of any problem of radio. They do not want to hunt distance; they want good programs, they want them regularly and they want them supplied by the very finest talent in the country. The DX fans are considerably opposed to the reported plan. All they want to get, when they tune in a station, is the call letters so that the station can be logged and

On Resistance-Coupled Amplification

I CERTAINLY got myself into hot water by the few introductory remarks which I made to the article by Kenneth Harkness in the August issue. Mr. Harkness' article dealt with audio-frequency amplification, and he expressed the opinion that resistance coupling was an obsolete and inefficient method. In my introductory remarks, I thoroughly agreed with him and said that I had never heard a resistance-coupled amplifier that gave me quality which I considered worth having.

This has stirred up quite a hornet's nest. It has also cost me money. Now I do not mind stirring up an argument because editors thrive on that, but I certainly do hate to lose money just for the privilege of expressing my own opinion about things.

Still sticking to the assertion that I have never used a resistance-coupled amplifier that I considered worth having, I quote from a letter received from W. L. Morley, 325 Elliott Square, Buffalo, New York:

"Dear Mr. Neely:

"I have been a constant reader of your magazine *Radio in the Home* ever since its inception and have always sworn by all of the statements you have made, quoted them to my numerous radio friends, and felt that your advice was just about the last word in radio construction.

"Your last issue contained the statement by you to the effect that resistance-coupled amplification was decidedly inferior to other methods. I had just about made up my mind to add two stages of resistance-coupled amplification to my present set, using it after one stage of transformer coupled. Your statement about discouraged me in doing this, but luckily I felt it worth the effort, even though you were against it. As a result, I can only suggest that you get a set of Daven parts which you advertise in your magazine, although you damn them editorially, and try out a couple of stages yourself. I am inclined to believe that you will be willing not only to retract that statement, but to recommend this method of amplification to your readers.

"For the last eight months I have been trying to add audio amplification to an Acemedyne hookup, supplementing the one stage of transformer coupled, recommended by the originators of the circuit, Danziger-Jones. The whole trouble was that this particular circuit delivers so tremendous an output from (Continued on Page 60)

A musical instrument—
not a mechanical novelty

New worlds open up to music lovers who own a Kennedy Radio. Wherever you live—in a city apartment or a lonely home many miles from town—you can receive fine music, choosing from many programs.

And you will hear *real music*, without distortion, for the Kennedy is *a musical instrument*, not a mechanical novelty. A musician will enjoy its purity of tone—an artist admire its beauty.

The Kennedy earns the praise of radio experts—a finely built set, employing the most advanced principles of wireless reception. Yet so simplified that no fussing is needed to get perfect reception.

Tunes in stations on a single dial—always at same setting

One dial controls wave lengths. Stations are always found at the same dial setting. The second dial increases or decreases volume.

The Kennedy is sold near you

If you do not find a Kennedy dealer handy, write—we will tell you where you can see and hear this beautiful instrument.

The Colin B. Kennedy Company
SAINT LOUIS

KENNEDY

The Royalty of Radio

MODEL VI

USES four tubes, either dry cell or storage battery type. Indoor or outdoor antenna. Especially recommended for loud-speaker reception of nearby or distant stations.

Volume under perfect control. Non-radiating—it does not annoy your neighbors. Tunes in stations at same dial setting regardless of aerial length.

Rich mahogany cabinet. Sloping panel has distinction and aids accurate tuning. Licensed under Armstrong patent No. 1,113,149. Price $105, without accessories. Other models at lower and higher prices.

Radio in the Home of Alex. A. Blum, 3303 Queen Lane, Germantown, Phila. This is a three-tube "Clarco," with Brandes Head Set
Photo by Harry S. Hood, Phila.

then they turn the dials to something else.

There is no question about it that this is the biggest problem that faces us in radio at the present time. I was particularly anxious to present to our readers a full outline of the plan written by some one in authority, and so I wrote to Mr. Pierre Boucheron, manager of the Advertising and Publicity Department of the Radio Corporation of America, and asked him if he would not prepare an article for me telling our readers exactly what the status of the idea is at present. It was Mr. Boucheron's speech in Atlantic City which started the entire discussion.

Mr. Boucheron has very obligingly sent me considerable material about the proposition accompanied by a letter in which he says:

"Dear Mr. Neely:

"Thank you for your good letter of August 26th. The facts about the super-power broadcasting are as follows:

"1. The so-called plan outlined in an Atlantic City dispatch last June and reputed to come from me was absolutely unauthorized and chiefly the product of an over-enthusiastic reporter.

"2. Neither the Radio Corporation of America nor its associates, so far as I know, are at this time contemplating a special super-power plan of broadcasting. As a matter of fact, there is in effect today super-power broadcasting where certain stations are using more than 500 watts; where by means of wire line links several prime stations are connected to one single event and simultaneously broadcast that event so as to blanket a major part of the country; and finally where the same thing has been accomplished by means of short wave retransmission.

"3. The idea of super-power broadcasting originally came from one of my chiefs, Mr. David Sarnoff. I attach a marked copy of the speech in which he outlined a possible future development.

"While I appreciate your request that I write an article on the subject you will see there exists no basis for such detailed and authoratitive paper at this time.

"Very truly yours,
(signed) "Boucheron."

One of the papers sent me by Mr. Boucheron was an address delivered by David Sarnoff before a gathering of Chicago business men at the Chicago Association of Commerce in April. From this address I quote the statements bearing upon this subject:

"The impatience evident in some quarters at the failure, thus far, to evolve a cut and dried solution of the broadcasting problem which resolves itself in some minds into the single question of 'who will pay the cost of broadcasting,' and the panaceas offered daily as an answer to this question by many well-meaning persons, follow, I am convinced, from a confused and distorted picture of the problem.

"Radio broadcasting is more than music, it is more than entertainment, it is more than news. It is a vast public forum which takes in all these elements. This must be borne in mind when one comes to consider the general problem presented by broadcasting. It is not merely who is to pay the artist or the singer or the actor for his service in broadcasting to millions of people. Radio broadcasting can and does draw upon a tremendous reservoir of public material—great political events, the pronouncements of public men, the ceremonies and functions of notable public events, popular sporting contests of international, national and regional interest, and a host of other happenings that constitute the life of a nation and which are not subject to the requirements of pay by the broadcast station.

"The fact of the matter is that we cannot hope to solve the economical problem presented by broadcasting, until its technical problems are in the way of solution. It is useless to consider how broadcasting might be made to pay (Continued on Page 40)

Radio in the Home of Harry E. S. Smith, Thorndale, Pa.
It is a home-made ultradyne, built in a glass cabinet, using a Music Master Loud Speaker. The Willard storage "B" batteries, "A" batteries and charger are in the cabinet

MAGNAVOX

This trade mark guarantees satisfaction in radio equipment

TRF-50

THIS new cabinet receiver includes 5-tube tuned radio frequency circuit with special features. The built-in Magnavox Reproducer unit consumes no battery current.

The cabinet is beautifully carved, with hand-rubbed antique finish: height, 14¾ in.; length, 20½ in.; depth, 18¾ in.

TRF-5

THIS model embodies the same circuit in a simpler cabinet with space for "B" batteries but without built-in Reproducer unit.

The cabinet measures: height, 9⅝ in.; length, 20½ in.; depth, 14¾ in.

A highly desirable accessory for TRF-5 is the Magnavox M4 Reproducer, insuring clearest tone for every class of program.

The tuned radio frequency circuit designed by Magnavox engineers for these receivers is an important development, greatly enhancing the enjoyment of broadcast programs.

9-27

IN designing these new Broadcast Receivers, Magnavox has successfully interpreted the radio needs of the American home.

Three decisive advantages go with the Magnavox: *unequalled simplicity of control—reproduction of exceptional clearness* in any desired volume—*a handsomely carved period cabinet* designed for quiet dignity and convenience without burdensome cost.

The Magnavox *Unit Tuner* does away with all complicated dialing, and places the novice on the same footing as the radio expert. In point of *selectivity* and *distance*, Magnavox Broadcast Receivers also satisfy the most discriminating.

TRF-50 illustrated above—a 5-tube tuned radio frequency receiver in carved cabinet with built-in Magnavox Reproducer unit and space for "B" batteries. Magnavox Tubes Type A are highly recommended.
Without tubes or batteries . . . $150.00

TRF-5 illustrated on left—identical with the above but encased in smaller cabinet without built-in Reproducer. Vernier condensers make Magnavox Radio universal for all types of tube and all antenna.
Without tubes, batteries or reproducer $125.00

Magnavox Radio Products (Broadcast Receivers, Vacuum Tubes, Reproducers, Power Amplifiers and Combination Sets) are sold by reliable dealers everywhere. If unacquainted with the Magnavox store in your vicinity, write us for information and literature.

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

After two years of intensive experimenting in and out of the laboratory, together with a survey of the requirements of the radio public, David Grimes, inventor of the well-known INVERSE DUPLEX SYSTEM, has organized DAVID GRIMES, INC., and is now producing for immediate delivery Model 3-XP, employing his famous Grimes System—Super Reflex.

The object of DAVID GRIMES, INC., is to produce for the first time the Grimes System at a popular price, plus quality and efficiency. The time for popular prices is here in the development of radio, and the Grimes System lends itself admirably to this rapidly increasing demand.

Outstanding Features:

- Absolute clarity of tone.
- Three tubes, 201-A or UV-199, equaling a six-tube instrument.
- Two stages of tuned radio, detector and three stages of audio.
- Will operate on indoor and outdoor aerial.
- Pronounced selectivity.
- Three-dial control.
- Suspension sockets, eliminating microphonic noises.
- Standard approved parts throughout.
- The 3-XP model is considered ahead of its time in various features that make for simplicity and efficiency.
- Mahogany cabinet (English Brown), hand-rubbed finish; A and B batteries contained within the cabinet.

Retail Price (without accessories) $85.00

Jobbers' territories are being allotted very rapidly.

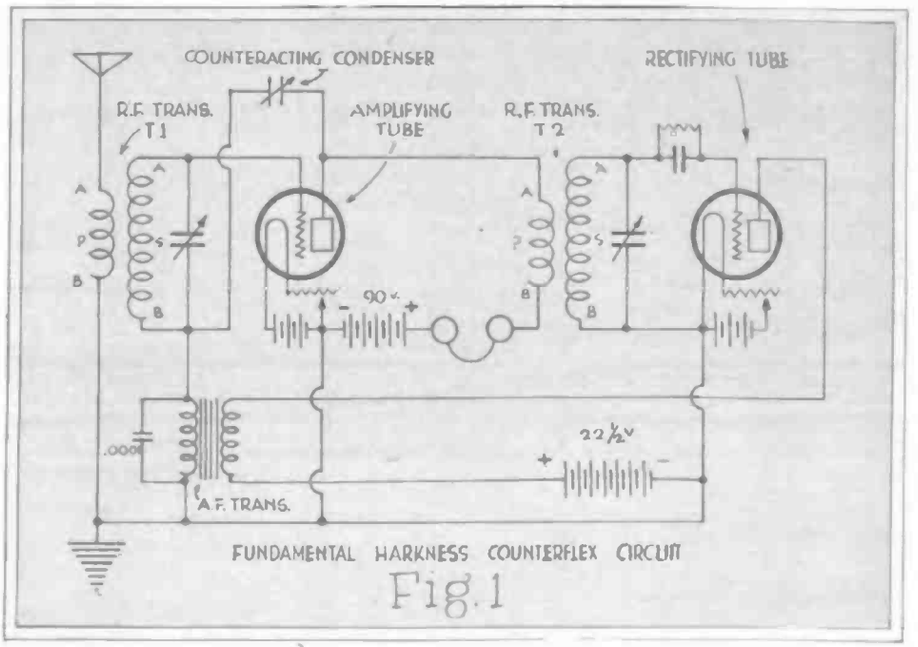
INVERSE DUPLEX SYSTEM Insures Natural Tone Quality

For further information apply to your jobber or direct to

DAVID GRIMES, Inc.

1571 Broadway : : : New York, N. Y. : : Strand Theatre Building

The New Harkness Counterflex Circuit



By KENNETH HARKNESS
President, Kenneth Harkness Radio Corporation

I AM glad to be able to give to the readers of *Radio in the Home* the first details of a new circuit which I have recently perfected. As a matter of fact, it is more than just a "circuit"; it is a new method of controlling self-oscillation in a reflex receiver, a method which can be used in various reflex circuits, and which enables the construction of unusually efficient reflex receivers. Receivers using this new method of controlling self-oscillation will be known as "Counterflex" receivers.

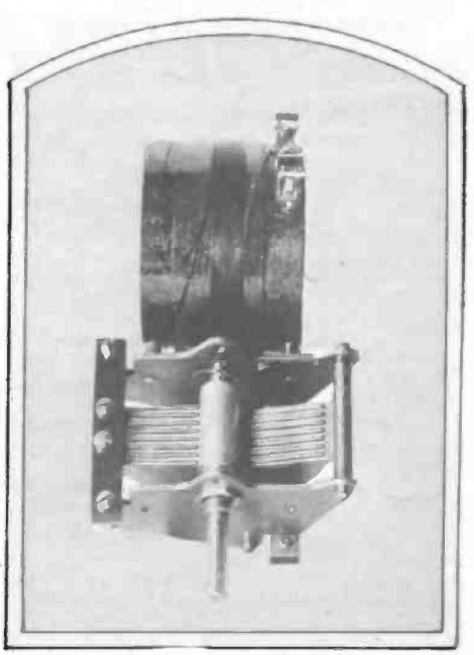
In this issue I am showing the circuit and photographs of a three-tube Counterflex receiver which I believe to be one of the simplest and best applications of the Counterflex principle. This receiver is remarkably efficient. In both audibility and selectivity it has proved to be the equal of a popular type of five-tube set.

For instance, at Station 3XP, where I demonstrated the set one hot evening in August when static was at its worst and receiving conditions were distinctly unfavorable, we were able easily to pick up stations within a radius of about 1000 miles with more than sufficient audibility to operate a loud speaker satisfactorily. It was the general opinion of those who were present at this demonstration that the Counterflex had "some kick to it." I have also tested the receiver in other localities and it has invariably proved itself to be equally efficient.

As stated above, the important new feature of the Counterflex circuit is the method used to control self-oscillation. In the July issue of this magazine I discussed the subject of self-oscillation in some detail, explaining the causes responsible for this effect, the precautions which must be taken to minimize these causes and the means which may be adopted to control self-oscillation when it is impossible, by precautionary measures alone, to prevent self-oscillation from taking place. I explained that self-oscillation in a receiver with radio-frequency amplification is caused by inductive or capacitive coupling between the circuits of the amplifier. This coupling cannot be entirely eliminated as some of it is inherent in the amplifier; for instance, the coupling caused by the capacity between the plate and grid of each vacuum tube is inherent and cannot be avoided. It is necessary, therefore, to add resistance to the circuits in some convenient manner so as to prevent the generation of continuous oscillations.

In the Counterflex circuit, self-oscillation is controlled by coupling the circuits of the radio-frequency amplifier to produce a *negative* feed-back effect, a feed-back which is directly "out of phase" with the positive feed-back set up by the inherent coupling between the circuits. Whereas the positive feed-back *decreases* the effective resistance of the circuits, and, if it is strong enough, *permits* the generation of continuous oscillations, the negative feed-back *increases* the effective resistance of the circuits and *prevents* the generation of continuous oscillations. The positive feed-back has an amplifying effect, known as regeneration or reaction; the negative feed-back has a diminishing effect which I have termed *counteraction*.

Figure 2—The counterformer mounted on its variable condenser



The underlying principle of this system of controlling self-oscillation is commonly called "neutralization," although it seems to me that the term "counteraction" better describes the action which takes place. The principle is not new, having been clearly set forth by French engineers about ten years ago, but the method of applying the counteraction principle in the Counterflex receiver is entirely new and original and has many advantages over other methods.

The fundamental Counterflex circuit is shown in the diagram of Figure 1. In this diagram separate batteries are shown for each tube so that the essential connections of the circuit may be more clearly seen. If this diagram is studied it will be seen that the circuit is very similar to the "Harkness Reflex" circuit, except that a vacuum tube is used as a rectifier in place of a crystal detector. The amplifying tube serves a double purpose. It amplifies the high-frequency currents of incoming signals, and, after rectification by the detector tube, also amplifies the audio-frequency current variations, the signals finally being detected by the telephones included in the plate circuit of the amplifying tube.

The radio-frequency transformers T1 and T2 are similar to the transformers T1 and T2 of the Harkness Reflex, although the inductance values are different. To insure maximum sensitiveness the terminals of these transformers must be correctly connected in the circuit. In Figure 1 the letters A and B represent, respectively, the beginning and end of each winding, the primary and secondary coils of each transformer being wound in the same direction.

Now, the inductance values of the radio-frequency transformers are such that continuous oscillations would be self-generated in this circuit if no means were provided to control self - oscillation. Counteraction, therefore, is used for this purpose, and it is obtained *by connecting a small variable condenser between the plate of the amplifying tube and the filament side of the secondary coil of radio-frequency transformer T2.*

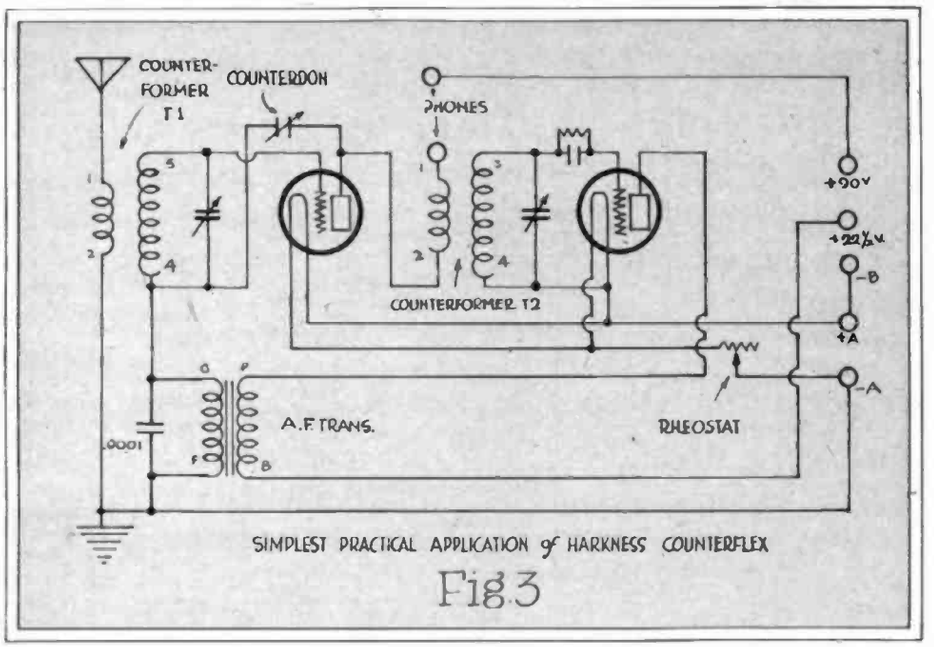


Fig.3

This method of obtaining and varying counteraction to control self-oscillation in a reflex circuit is entirely new. It is positive in action and permits a simple and accurate control of counteraction. Counteraction can be increased or decreased, as may be necessary, by increasing or decreasing the capacity of the counteracting condenser. If, while tuning in signals, continuous oscillations are generated by the amplifying tube they can be promptly and accurately dampened out by increasing the capacity of the counteracting condenser. The exact value of counteraction necessary for maximum efficiency at any frequency to which the receiver may be tuned can easily be obtained.

The use of this method of obtaining and varying counteraction enables the construction of highly efficient reflex receivers based upon the fundamental circuit of Figure 1. The inductance values of the radio-frequency transformers (particularly T2) can be sufficiently high to obtain unusually good radio-frequency amplification.

In place of the crystal detector of the Harkness Reflex system a vacuum tube can be used for rectification, thus simplifying the operation and greatly increasing the selectivity of the receiver. The normal potential of the grid of the amplifying tube can be maintained at a negative value, thus insuring maximum audio-frequency amplification.

The diagram of Figure 3 illustrates the simplest practical application of the Counterflex circuit. For all-around service it is better to use a third tube as audio-frequency amplifier, the two-tube circuit of Figure 3 being intended for use with head phones only. The two-tube circuit, however, will operate a loud speaker when receiving local stations. With the exception of the radio-frequency transformers all the parts needed to build either the two-tube or three-tube Counterflex receivers are of standard design. The constants of the radio-frequency transformers (designed for use with a .0003 MF variable condenser with low minimum capacity) are as follows:

Transformer T1: Secondary coil has sixty turns of No. 28 silk-covered wire wound on a formica form 2⅝ inches in diameter. Primary coil has ten turns of the same size of wire wound directly on top of the secondary coil, the two coils being separated by a piece of insulating paper or Empire cloth. Both coils are wound in the same direction.

Transformer T2: Secondary coil has fifty-five turns of No. 28 silk-covered wire wound on a formica form 2⅝ inches in diameter. Primary coil has twenty-five turns of the same size wire. The coils are wound in the same manner as type T1.

These transformers, mounted on the variable condensers for which they are designed, may be purchased, if desired. The complete transformer and variable condenser unit will be placed on the market shortly and will be known as the "Harkness Counterformer." These units are similar to the Flexoformer of the old Harkness Reflex circuit except that the constants of the coils are different. The counterformers will be obtainable, of couse, in two types (T1 and T2) as required by the circuit.

There is nothing particularly unusual about the counteracting condenser of the Counterflex circuit. It is merely a small variable condenser. It is possible to use some of the standard types of "vernier" condensers now on the market, although I am designing a special condenser with the correct range of capacity needed by the circuit. This special condenser will be known as the "Harkness Counterdon."

Using the above-described special parts and other standard material the two-tube circuit of Figure 3, then, can be built with the following items:

1 Counterformer Type T1.
1 Counterformer Type T2.
1 Audio-frequency transformer (ratio 4 to 1).
1 Counterdon or "vernier" con denser.
1 Filament rheostat.
1 Grid condenser (.00025) and grid leak (1 meg.).
1 Fixed condenser (.0001 mf.).
2 Tube sockets.
8 Binding posts.

The counterformers, counterdon and rheostat should be mounted on a front panel measuring 7 inches by 18 inches and the remainder of the parts screwed to a baseboard, the binding posts preferably being mounted on a strip at the back of the baseboard. The parts can then be wired up as shown in Figure 3. The terminals of the counterformers are numbered, and it is absolutely essential that the connections be made to these terminals to correspond with the diagram of Figure 3. On counterformer T1 terminal No. 1 is the beginning of the

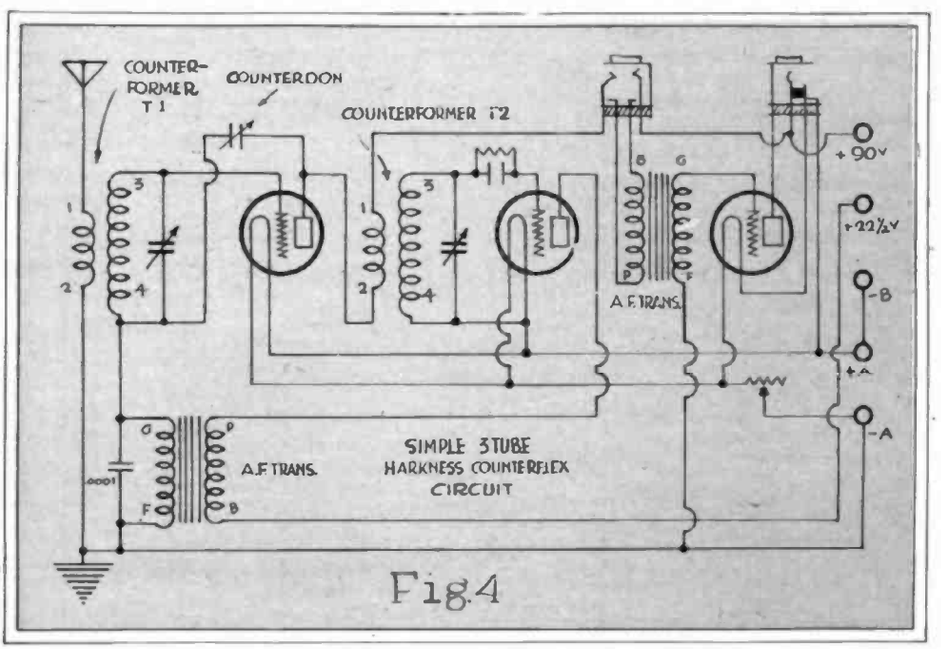


Fig.4

primary winding and terminal No. 3 the beginning of the secondary winding. On counterformer T2 terminal No. 1 is the beginning of the primary coil and terminal No. 4 the beginning of the secondary.

With an additional stage of audio-frequency amplification the Counterflex receiver becomes a much more serviceable instrument. For headphone reception the telephones can be plugged in the plate circuit of the reflex tube, thus cutting out the third tube entirely, or the loud speaker can be plugged in the plate circuit of the audio-frequency amplifying tube for the reception of both local and distant stations with good volume. I show, in Figures 4 and 5, two different circuits, each using three tubes. Figure 5 is the circuit which will be used in the commercial model of three-tube Harkness Counterflex receiver. Figure 4 is a modified and simpler arrangement of the same circuit. It will be noticed that the commercial circuit of Figure 5 uses a special "counterswitch," while the circuit of Figure 4 omits this entirely. Otherwise the circuits are identical, with the minor exception of the fact that both jacks of the commercial circuit are of the filament control type, whereas the simpler circuit has an ordinary double circuit jack in the plate circuit of the reflex amplifying tube.

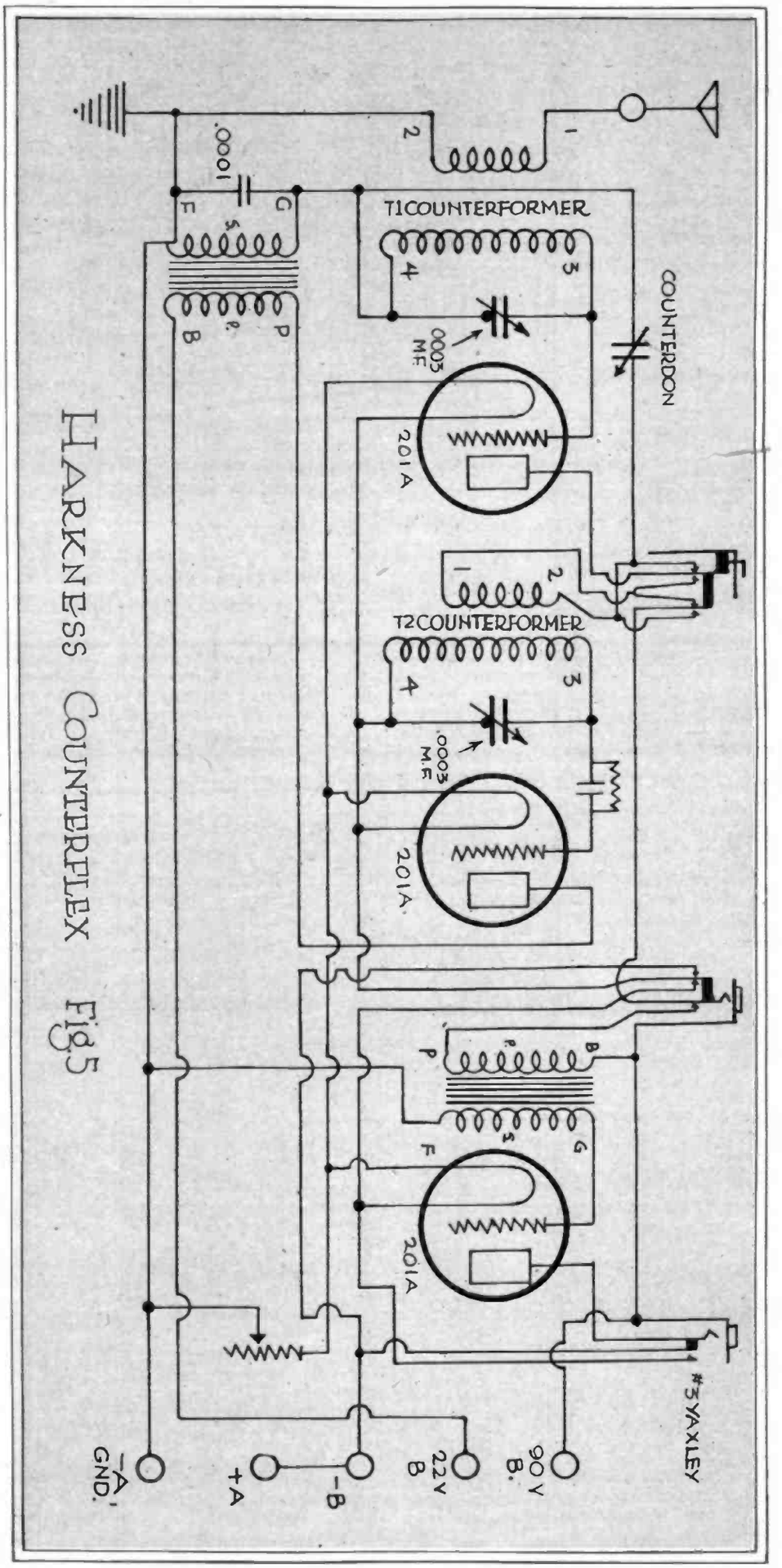
The "counterswitch" of Figure 5 is merely a special type of double-pole, double-throw switch. If the wiring diagram is studied, it will be seen that this switch makes it possible to reverse the connections of the primary coil of counterformer T2. The object of this switch is to prevent the receiver from "squealing" when the strong signals of nearby broadcasting stations set up forced oscillations which cannot be controlled by the counterdon.

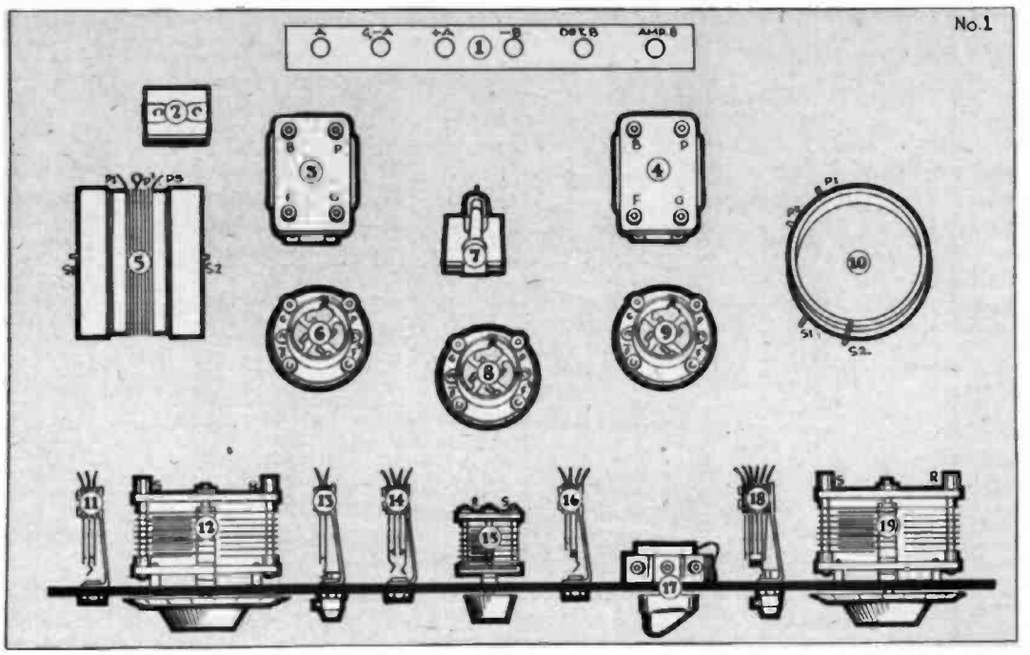
If you live more than twenty-five miles from a broadcasting station, you will not need to use this switch at all; you can then permanently connect counterformer T2 as shown in Figure 4, the beginning of the primary coil going to the plate of the reflex tube, and the beginning of the secondary coil going to the grid of the detector tube. But if you live within two or three miles of a broadcasting station, the strong signals from this station will cause the receiver to howl when the station is tuned in. It is possible, of course, to eliminate this howl by detuning the set, but this use of the counterswitch renders this unnecessary and makes it easier to pick up different local stations. Incidentally, with the counterswitch on the "local" side, the audibility of the receiver is so greatly reduced that the receiver is more selective and the different local station can be received without interference.

The three-tube Counterflex circuit of Figure 5 can be built with the following parts:

1 Counterformer Type T1.
1 Counterformer Type T2.
2 Audio-frequency transformers.
1 Counterdon.
1 Counterswitch.
3 Tube sockets.
1 Double-circuit fil. control jack.
1 Single-circuit fil. control jack.
1 Filament rheostat.
1 Fixed condenser (.0001 mfd.).
1 Grid condenser (.00025 mf) and grid leak (1 megohm).
6 Binding posts.

The counterformers, counterdon, counterswitch, filament rheostat and telephone jacks can be mounted on a panel measuring 7 inches by 18 inches (Continued on Page 37)

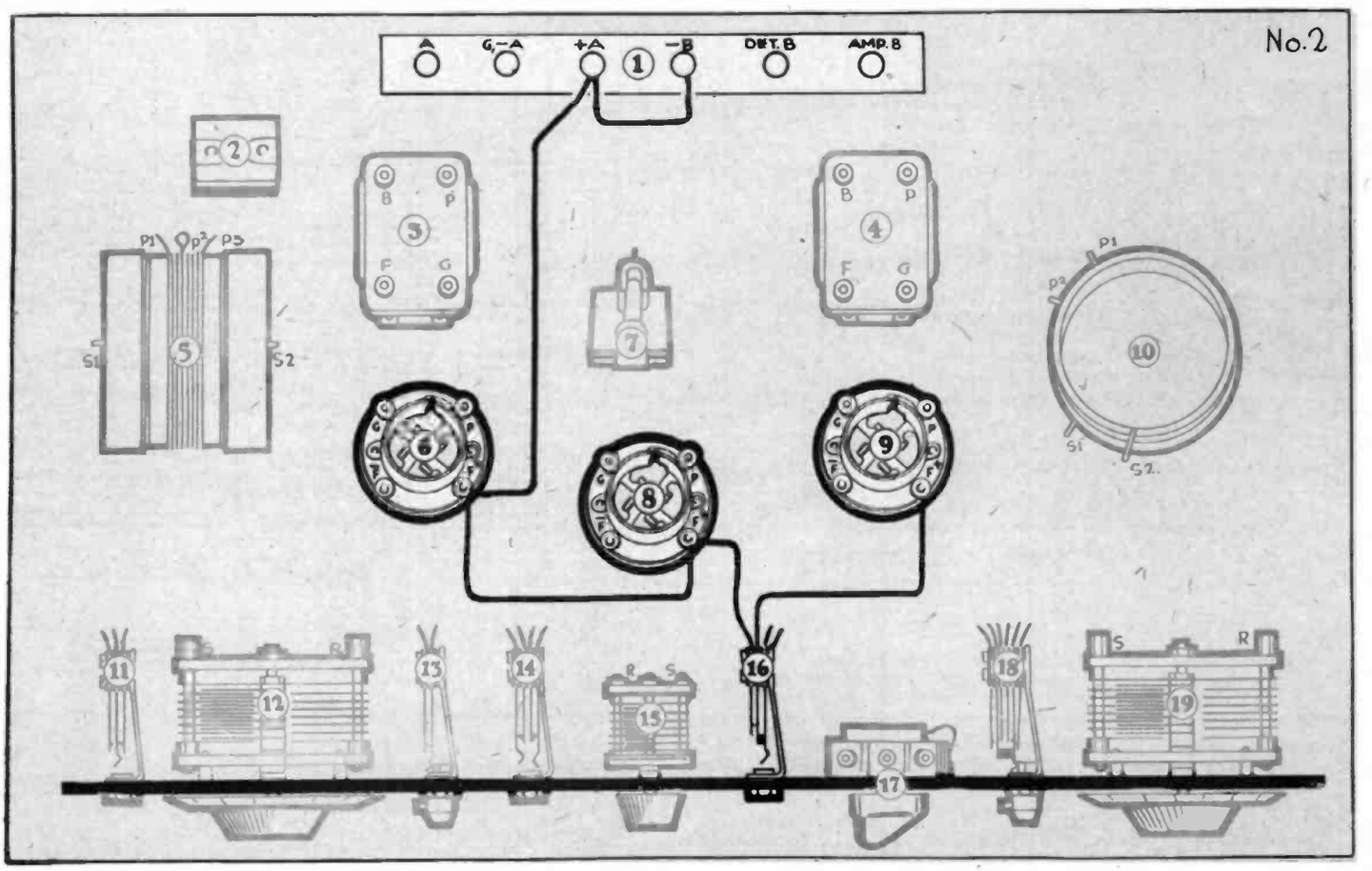


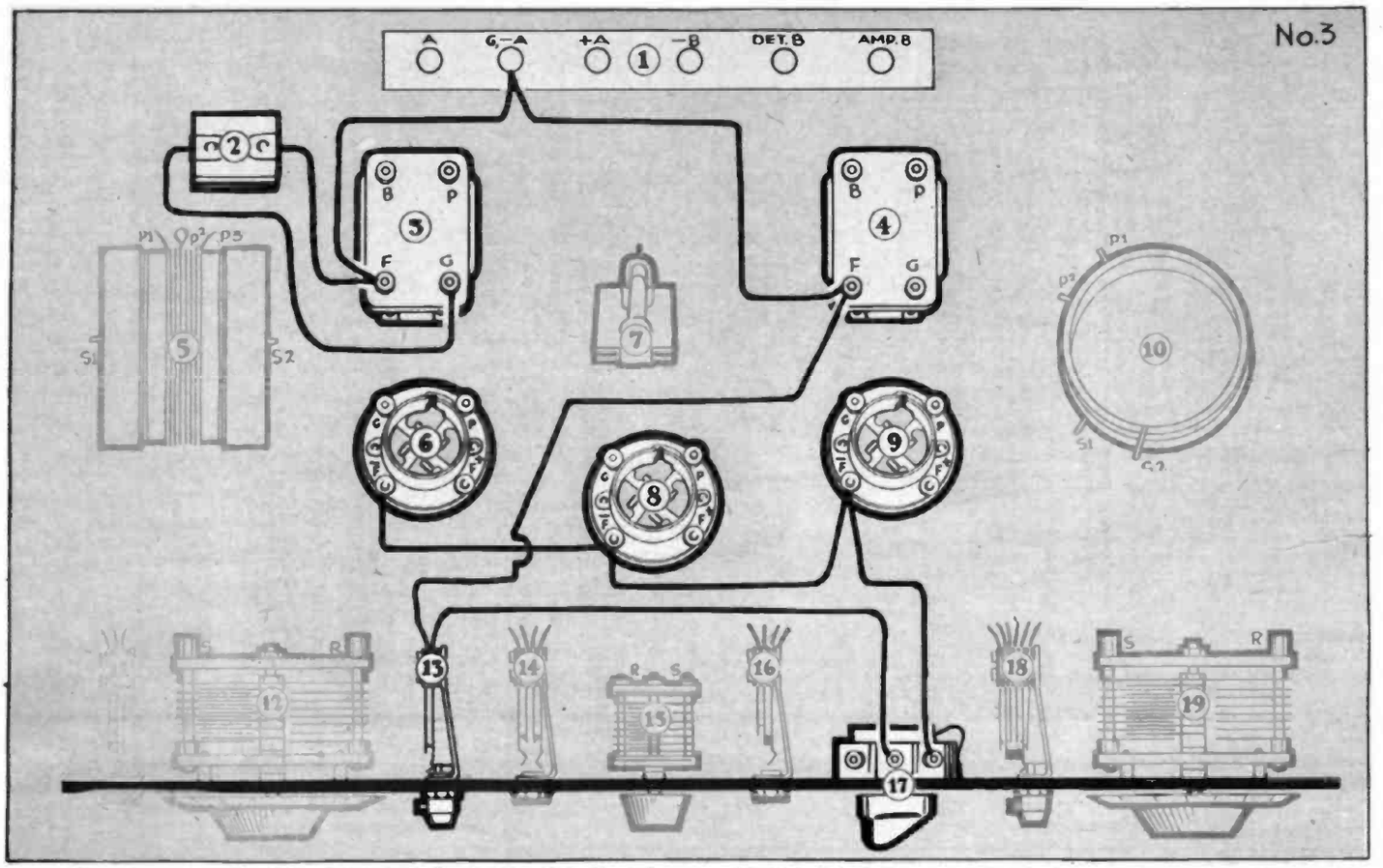


3XP Style of Hook-Ups of the New Harkness Counterflex

IN WIRING up the new Harkness Counterflex circuit at Station 3XP, we purposely used ordinary standard apparatus which we had on our shelves, and we wound our own coils just to see whether the circuit would function as well with the kind of parts the average amateur has on hand or can easily get at the store as it would with parts especially made for it. Unquestionably, when special parts are developed for this circuit the performance will be improved, but we were glad to find that the circuit functioned very efficiently with almost anything we put into it.

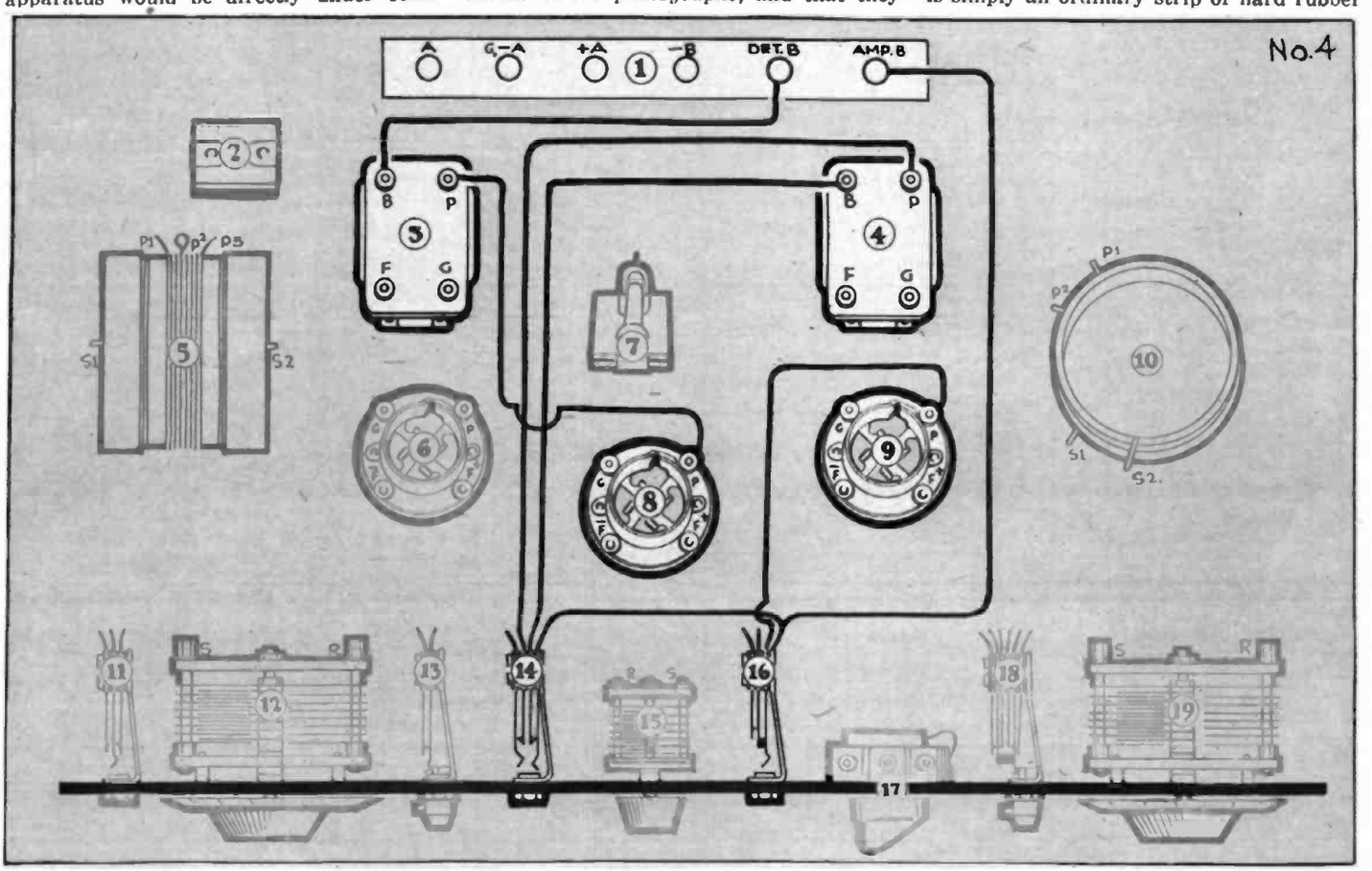
Consequently, you can build this set by substituting any standard make or piece of apparatus, providing its electrical values are about the same as those of the apparatus which we used. Turning to diagram No. 1, which shows the approximate layout of the material in the set we built, I want to explain first that the various jacks and switches along the panel are not arranged in the drawing as you will find them in the photographs of our set. It was necessary for us in making the drawing, to spread them apart in order to show the

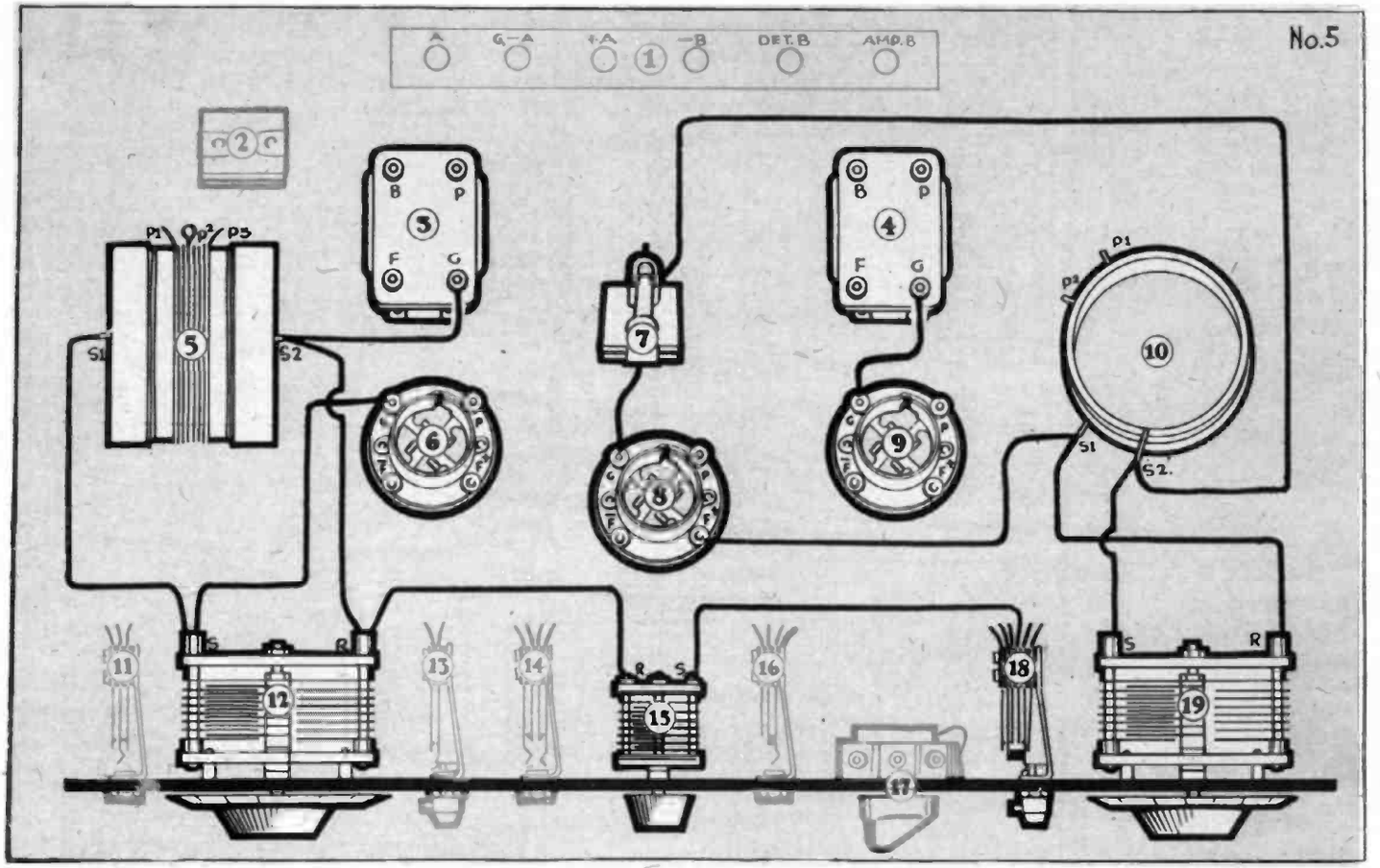




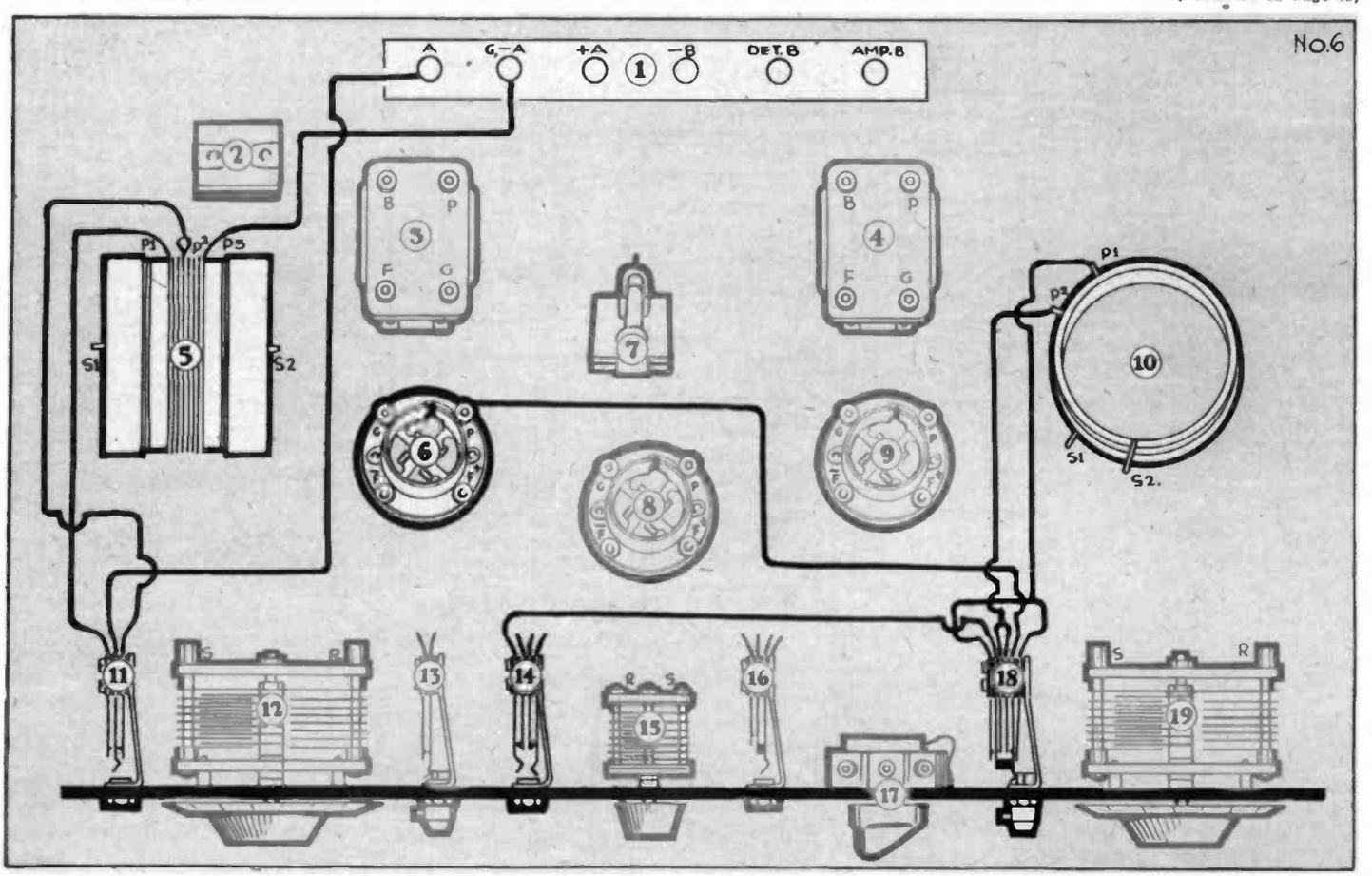
connections to each. If we had attempted to make the drawing exactly as the photograph is, or as we built the set, some of the apparatus would be directly under other parts and therefore could not be seen.

In hooking up the set, *remember that the placing of the instruments should be as shown in the photographs*, and that they are purposely spread apart on the panel of the diagrams in order to make the wiring-up clearer. Number 1 in the first diagram is simply an ordinary strip of hard rubber





with six Eby binding posts mounted on it in the usual way. Number 2 is a Dubilier Micadon condenser of .0001 mfd. Numbers 3 and 4 are Kellogg transformers. You can use any audio-frequency transformers which you have, but it is wise not to have the ratio greater than four to one. Number 5 is the first "counterformer" or coil wound in accordance to the directions given by Mr. Harkness. Numbers 6, 8 and 9 are standard tube sockets. Number 7 is the regulation grid condenser and (Continued on Page 48)



Railway President's Wife Teaches the Bible by Radio

By EUGENE KONECKY

THE story of the career of this eminent Bibical student presents some of the most interesting phases of the modern problems of womankind. In fact, the problems of Mrs. Gray were typical of those faced by thousands of women in the old struggle of life. Her own unique solution is, therefore, of great suggestive value to those other women who have not been so fortunate as she.

But before we plunge into the absorbing details of this dramatic combination of radio femininity, the home and the "happy ending,". . . . let us introduce Mrs. Carl R. Gray.

Since the evening of Sunday, December 30, 1923, she has been conducting the evening Bible Study Hour at 6:30 o'clock as a regular feature of the Sabbath programs broadcast from Station WOAW, "the gateway to the East and to the West," owned and operated by the Woodmen of the World Life Insurance Association at its headquarters at Omaha, Neb.

The manner in which Mrs. Gray became affiliated with this powerful midwestern radiophone indicates that there is in this mundane scheme of things a guiding destiny which surely unites the lives of individuals harmoniously with the greater social forces for the purpose of beneficent service.

Radiophone WOAW had scored a great success in its World Radio Congregation broadcasting services morning and evening from its modernly equipped studio on the top of the nineteenth story of its two-million dollar building. It had succeeded largely in "fraternalizing the air" through its World Radio Camp. *Radio in the Home* has amply featured both these enterprises in previous issues, so that its readers are thoroughly familiar with its significant details.

But to the executives of the Woodmen of the World who are ever directing the destiny of Radiophone WOAW, defining its purpose, analyzing its influence, etc., it soon became evident that there was one important field of religious service which was really neglected in the general effort to establish doctrines and authorities in the Church.

This important phase of religion was the calm, impartial, critical study of the Bible.

Those executives were clearly cognizant of the existing confusion of Biblical doctrine never so obvious as in this moment of conflict between fundamentalist and modernist, "symbolist and literalist." They believed that the proper and conscientious study of the source of the various sectarian faiths could establish a clear conception of fundamental principles. They realized that radio more than any other instrument could be powerfully wielded in behalf of this purer understanding of religion.

Mrs. Carl R. Gray

Once convinced of this, they looked about for the one person who could meet with all the complex, difficult and delicate requirements of this unusual situation.

It was by no chance that they cast their decision in favor of Mrs. Carl R. Gray, wife of the president (Continued on Page 44)

The new Pfanstiehl Number 7 uses a totally different and original system which is attracting a great deal of attention everywhere

New Sets of This Season

AFTER something more than two years of a hectic infancy, radio has now reached the age of adolescence, even if we cannot quite claim that it has entered the beginning of its maturity. It is at least old enough now for us to be able to survey it with some feeling of confidence in making predictions for its future. The most significant phase of the season which is just beginning is the evidence on all sides of us that we have passed at last beyond the wild orgies of the first craze and have now settled down to a just regard of radio in the light of its genuine present value and its immense potential leadership in the realm of universally applied sciences.

Note: If you have a non-technical friend who is thinking of buying a radio set give, or send, him this article.

The Fada neutrodyne also comes in a beautiful cabinet

The radio set of yesterday was a bunch of junk, fit only to occupy the kitchen table or a rough board shelf in the attic or garage. The radio set of today is a beautiful piece of furniture, quite worthy of a place in the most tastefully finished American home. Added to this, the radio of today, in its musical aspect, *has already surpassed any type of talking machine* and is only little behind the musical quality which would be produced by having the artists in person playing or singing in the same room.

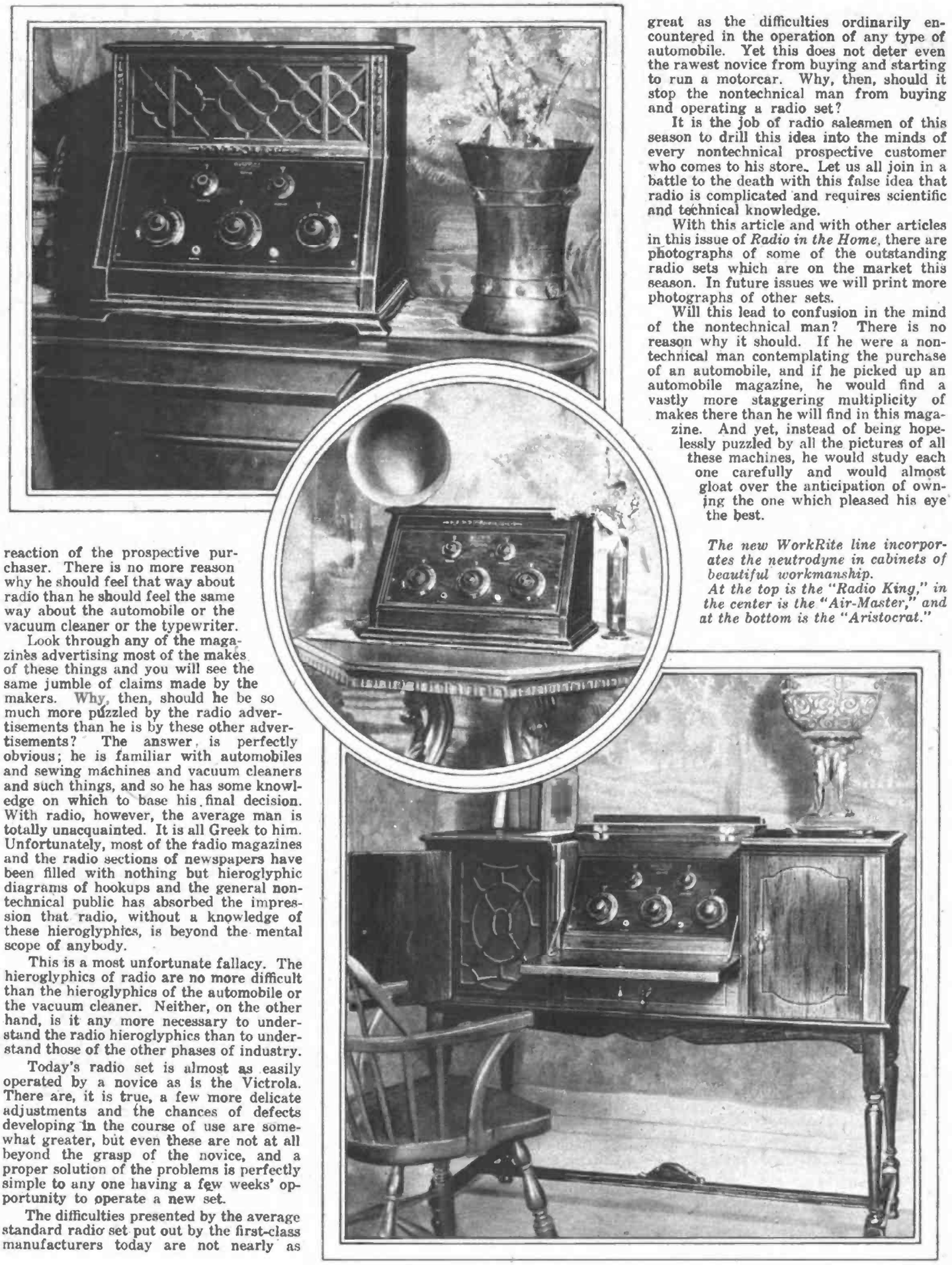
Little more than a year ago, this magazine declared that radio would not take its rightful place until its quality of reproduction was at least equal to the talking machine. That day has already come. We have radio sets and loud speakers now which, for sheer beauty of tone and faithfulness of reproduction, will far surpass the best talking machine made.

The man who approaches the purchase of a radio set this season—presupposing that he has no knowledge whatsoever of radio or the various makes of instruments—finds himself hopelessly puzzled as to which type to buy.

He looks through the advertising pages of the radio magazine and sees dozens of sets advertised, each blazoned with assertions of vast superiority over all others, and each claiming to be the ultimate in radio perfection.

The prospective purchaser holds back. He is afraid to buy. He does not know which of these claims is true, nor if any one of them is true. He feels that, in the multiplicity of such claims lies a proof that radio has not yet arrived and that he had better wait until it has settled down to a basis where he can intelligently form a decision. That is the oddest phase of the mental

Another style of cabinet in which Fada neutrodyne is mounted



The new WorkRite line incorporates the neutrodyne in cabinets of beautiful workmanship.
At the top is the "Radio King," in the center is the "Air-Master," and at the bottom is the "Aristocrat."

reaction of the prospective purchaser. There is no more reason why he should feel that way about radio than he should feel the same way about the automobile or the vacuum cleaner or the typewriter.

Look through any of the magazines advertising most of the makes of these things and you will see the same jumble of claims made by the makers. Why, then, should he be so much more puzzled by the radio advertisements than he is by these other advertisements? The answer is perfectly obvious; he is familiar with automobiles and sewing machines and vacuum cleaners and such things, and so he has some knowledge on which to base his final decision. With radio, however, the average man is totally unacquainted. It is all Greek to him. Unfortunately, most of the radio magazines and the radio sections of newspapers have been filled with nothing but hieroglyphic diagrams of hookups and the general nontechnical public has absorbed the impression that radio, without a knowledge of these hieroglyphics, is beyond the mental scope of anybody.

This is a most unfortunate fallacy. The hieroglyphics of radio are no more difficult than the hieroglyphics of the automobile or the vacuum cleaner. Neither, on the other hand, is it any more necessary to understand the radio hieroglyphics than to understand those of the other phases of industry.

Today's radio set is almost as easily operated by a novice as is the Victrola. There are, it is true, a few more delicate adjustments and the chances of defects developing in the course of use are somewhat greater, but even these are not at all beyond the grasp of the novice, and a proper solution of the problems is perfectly simple to any one having a few weeks' opportunity to operate a new set.

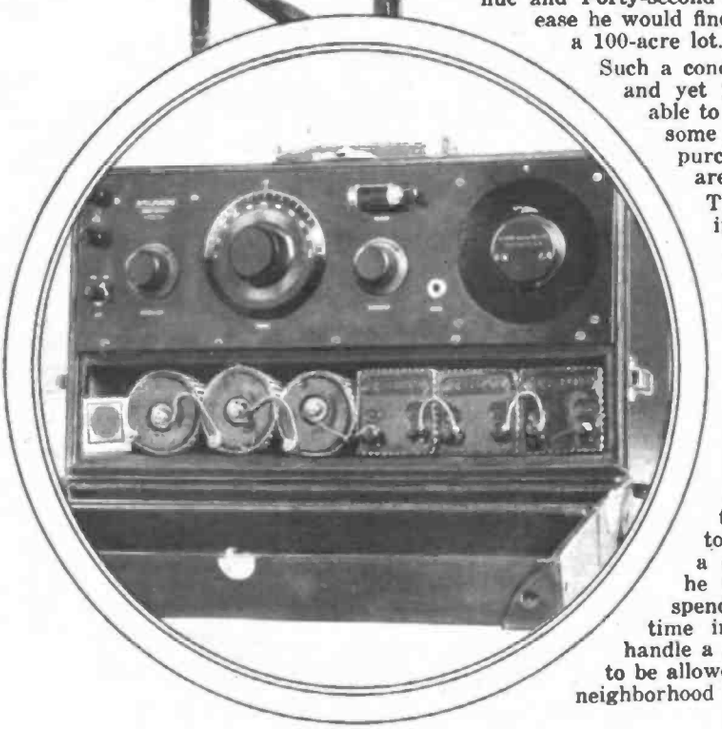
The difficulties presented by the average standard radio set put out by the first-class manufacturers today are not nearly as great as the difficulties ordinarily encountered in the operation of any type of automobile. Yet this does not deter even the rawest novice from buying and starting to run a motorcar. Why, then, should it stop the nontechnical man from buying and operating a radio set?

It is the job of radio salesmen of this season to drill this idea into the minds of every nontechnical prospective customer who comes to his store. Let us all join in a battle to the death with this false idea that radio is complicated and requires scientific and technical knowledge.

With this article and with other articles in this issue of *Radio in the Home*, there are photographs of some of the outstanding radio sets which are on the market this season. In future issues we will print more photographs of other sets.

Will this lead to confusion in the mind of the nontechnical man? There is no reason why it should. If he were a nontechnical man contemplating the purchase of an automobile, and if he picked up an automobile magazine, he would find a vastly more staggering multiplicity of makes there than he will find in this magazine. And yet, instead of being hopelessly puzzled by all the pictures of all these machines, he would study each one carefully and would almost gloat over the anticipation of owning the one which pleased his eye the best.

Above is the new Cleartone, and to the right is the portable Telmaco



Why the difference? It is because he knows that all of those automobiles will, in the long run, give the service and the satisfaction that he wants. In other words, their performance is a foregone conclusion and all he need do is pick out the one which best pleases his personal taste, and he knows that his purchase will be a good one.

Radio today has reached exactly that plane. Every one of the sets shown in this issue of this magazine and every one that will be shown in future issues can guarantee satisfactory performance. It is, then, a matter of pleasing the personal taste of the purchaser, and what is even more important, of pleasing the personal taste of his wife if he has one.

Ordinarily, you will hear the nontechnical man say, "All I want is to be sure to get the local stations with satisfactory quality on a loud speaker and with plenty of volume."

Every one of these sets will give him that.

Or he may say, "I would like to get stations a thousand miles away now and then and receive them with fair quality and volume." Every one of these sets will also give him that—provided he is in a location which is average.

Or he may say, "I want to be able to tune out that 500-watt station four blocks from me and get a station 1000 miles away without hearing the local one at all."

Well, that is another story. It can be done, but it cannot be done by a nontechnical man.

Yet this is not a statement to discourage any one contemplating entering radio. A comparable situation presents itself in the automobile field.

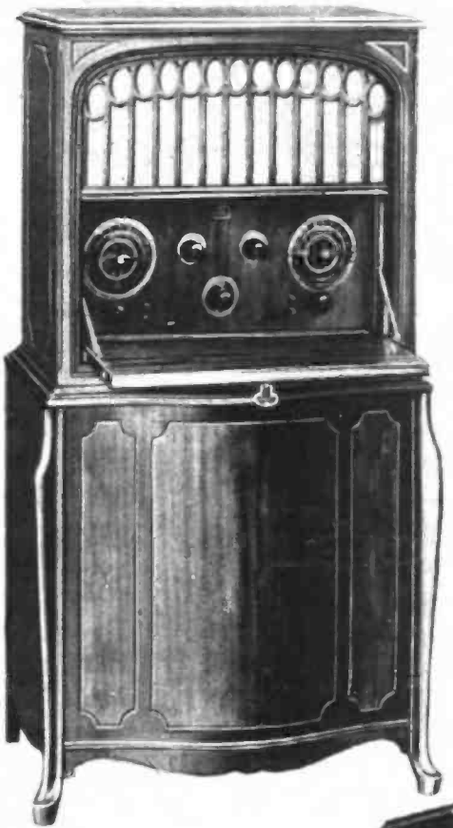
Suppose the prospective purchaser of a motorcar insisted that his car should give him the ability to go seventy-five miles an hour, to carry three tons, to climb Pikes Peak in high gear, and then suppose that he should also insist that he should be able to take it out on the very first day on which he ever sat at the wheel of a car and drive through the jam of traffic at Fifth avenue and Forty-second street with all the ease he would find in driving around a 100-acre lot.

Such a condition is impossible, and yet it is quite comparable to the demands which some of the prospective purchasers of radio sets are making.

There must be reason in all things, and this applies to the radio set as well as to the automobile.

If a man demands super-selectivity such as is required to tune out a 500-watt station within a mile or so, he must be willing to spend the time and the thought and the effort necessary to learn how to handle a delicate set just as he must be willing to spend a great deal of time in learning how to handle a car before he ought to be allowed to drive it in the neighborhood of Fifth avenue

The new Garod V shows the modern trend toward beautiful cabinet and sloping panel



With the lid of the cabinet let down, the controls are available for tuning

and Forty-second street. We have on the market now so many sets embodying so many different circuits, and these circuits have names which are so unfamiliar to the novice that confusion is caused in this way.

We have the superheterodyne and the neutrodyne and inverse duplex and an army of flexes and dynes, and the prospective purchaser feels that somebody should tell him which one of these is absolutely the best.

Would any man attempt to ask an automobile expert which motorcar was absolutely the best?

No expert would answer that question. He would first have to know what was expected of the car and then he would name a dozen or more makes, any one of which would deliver the service required in that particular case. It is just so in radio. There is no such thing as an absolutely best set. There may be a set which pleases me better than any other set on the market, but, if you would go to somebody who perhaps knows a lot more about radio than I do and ask him which was the best set, he would probably name another one. And in going around among a half dozen experts, you would probably hear a half dozen sets named as the favorite of the particular expert.

But one thing should be thoroughly understood. There is no such thing as one best set.

Any one of these standard sets is the best as much as is any other. No man will make a mistake in buying whichever one most pleases his fancy.

Notwithstanding the many new models announced for this season, the fact remains that there is nothing radically new in any of these sets—that is, there is still no sign of that "revolution" in radio which has been predicted by so many who are not in close touch with the situation.

There are many refinements embodied in these sets—many improvements which make for smoother operation, better reception and simpler tuning. But there is no revolution nor is there any sign of one.

The situation is now just what it is in the automobile industry, with new models being brought out each year, each succeeding model embodying certain refinements and improvements over its predecessors, but not in any way detracting from the fact that its predecessors are still perfectly good cars and will continue to give satisfaction so long as they hold together. It is exactly so in radio.

A Radio Corporation receiver which becomes a piece of furniture giving mellow music and entertainment

The Radio Corporation has embodied a number of these improvements in its various models.

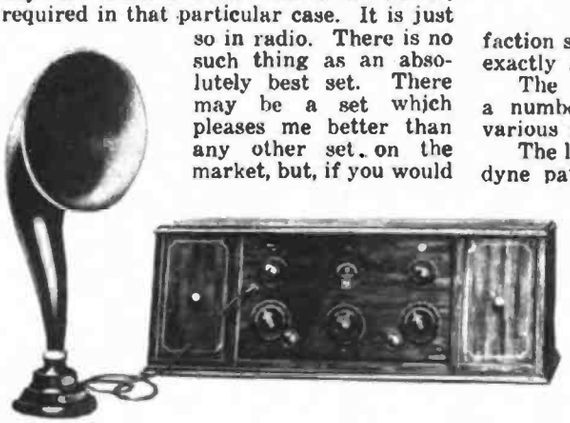
The licensees working under the neutrodyne patents have refined their sets and overcome some of the first minor difficulties, and the same has been done with the licensees working under the Grimes inverse duplex patent, with Mr. Grimes, himself, organizing a company to bring out a moderately priced set known as "the 3XP," because its circuit was developed at Station 3XP, the laboratory of this magazine.

The Radiola superhet. is available now in beautiful cabinet form

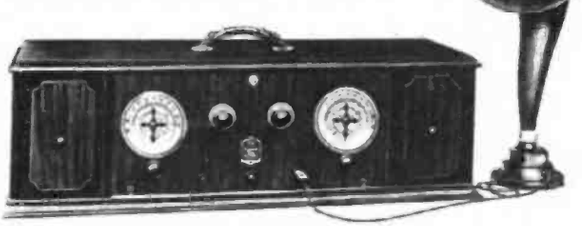
All of these refinements by all of these manufacturers are tending to bring radio more and more into the ordinary American homes where no mechanical or technical knowledge is presupposed, and where, with such sets as we have now, none is necessary.

So Carl Pfanstiehl, of Chicago, in bringing out his new Model 7, has kept before him as his principal object the idea of supplying a usable and satisfactory set to those who know nothing whatever about radio and who do not care to go to the

(Continued on Page 50)



The Radio Corporation six-tube superheterodyne is entirely self inclosed except for loud speaker



The Regenoflex is a new Radiola type this season

Mrs. Anna J. Peterson and the flowers presented to her at her second graduation class exercises for the new radio cooking school of KYW, Chicago

A Cooking Class of a Half Million Pupils

By VERA BRADY SHIPMAN

IN the beautiful rustic dining room of "Old Faithful Inn" at Yellowstone National Park, a woman tapped on the shoulder of another tourist seated at a nearby table.

"I beg your pardon, but I truly believe I know that voice. Aren't you Mrs. Peterson—the cooking lecturer of KYW?"

Mrs. Peterson, for so it was, assured her questioner that she was "one and the same."

"I thought I was sure of that voice. Listen in every morning at 11:30 to your cooking talk. I am one of your radio pals. I live in Cedar Rapids, Iowa."

This woman was one of the half million of the Middle West who listen in each morning to Mrs. Anna J. Peterson's cooking talk to her "radio pals" over KYW, the Westinghouse station at Chicago.

About 3000 letters a month testify to the American woman's appreciation. Mrs. Peterson is the Radio Mother, the husband's best girl, that boon to the American family which has put good cooking back into its place as the foundation for happy homes.

For the past two years, KYW has featured these daily cookery talks. In cooperation with the Peoples Gas Light and Coke Company of Chicago, their expert of the Home Service Department was chosen to broadcast the lectures, lessons and daily minute helps to the woman of the home.

Mrs. Anna J. Peterson is a graduate and exponent of the Fannie Farmer Boston Cooking School, and has done post-graduate work for many seasons with various home economics schools of the country. For ten years previous to her Chicago work, she was cooking expert for the Corn Products Company.

You have doubtless listened to her series of cooking lectures given annually in your home town, sponsored by your local newspaper. That annual week was so filled with ideas and recipes that you and your friends were months in using them up.

And now the radio housewife has the advantage of this advice, the affection of this motherly woman and the co-operation of the great organizations which have made such broadcasting possible.

And the best part of the home service radio cooking is the personal contacts, the love between this womanly woman and the vast radio world of listening housewives.

"I love every one of my radio pals," Mrs. Peterson will say, "I love the flapper. She is often misunderstood. The girl of today may bob her hair or rouge her cheeks, but she wants her home and her children to be well nourished and happy.

"The bride is overconfident, but after the first year, when the baby comes, then she realizes that she must have help to plan her budget to cover the increasing cost of another head."

Mrs. Peterson is constantly receiving gifts from her radio pals—a dresser scarf today from Aurora, a lunch cloth from Wisconsin or flowers from an Indiana admirer.

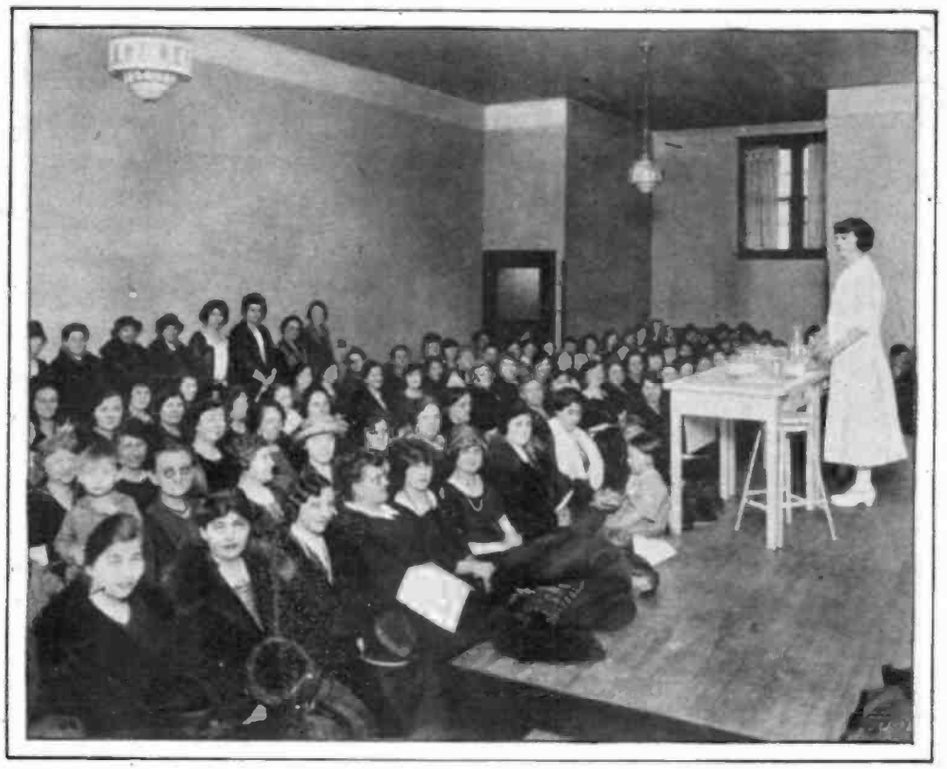
"These gifts which are sent me are beautiful symbols and I love them, but the real gifts are those letters of appreciation, the wives and mothers and sometimes the fathers, too, who write me of how their homes have been bettered, their meals balanced and the family circle more congenial through their contact with the 'Radio Mother,' as they call me."

An interesting recent happening on a Northwestern suburban train is typical of the interest shown in Mrs. Peterson's expert advice. Four commuters were comparing the good dinner they each had the evening before. One spoke of the meat, another of the salad and another of the dessert. They found their menus identical—and each was the result of the morning's cooking radio talk by Mrs. Peterson over KYW.

There are fathers who write that their homes are happier, young husbands whose tables are improved, a young boy, whose mother's death has left him temporarily head of the household.

"For such boys and girls as these, we wash their clothes, prepare their meals, remove stains and suggest remedies. These instructions are mailed out, typed and easily understood."

And the beautiful part of it is that it is all entirely *free*. You need not even inclose a postage stamp. A telephone call to the



A group of K Y W "radio pals" listening to a lecture by Mary Quinlan of the Home Service Department of the gas company

Home Service Department of the gas company, or to KYW, who will connect you directly with Mrs. Peterson, brings any directions or recipes to your door in the next mail.

You may ask her any of your home problems. She will plan your budget for food and clothes, your educational or entertaining pleasures. She will help you to save your money, advocating good sound bonds or stocks of some established business concern whose foundation you will learn from your bank is firm as Gibraltar.

One small boy was watching his mother making a suit for him out of one belonging to his father. She was having a bit of difficulty.

"Mother," he suggested seriously, "Why don't you call up Mrs. Peterson? She'll tell you how to make it."

Prospective grooms as well as brides write or call her for home budgeting. One young man asked for his personal budget while eating at restaurants and what he should buy for balanced food; then asked for a comprehensive budget when he added a wife and contemplated changing to home cooking.

Girls ask Mrs. Peterson for menus for bridge or mah jong luncheons, mothers for children's parties or for invalid menus. An invalid member of a family must be pleased with tempting food. Mrs. Peterson is the haven for such desire. She touches a magic wand and the favored typewritten page is sent to the inquirer.

October 25 begins the third series over KYW of the Radio Cooking School. The two series of twelve lessons each of radio cooking which were given last season, delivered between 2500 and 2800 diplomas. Eight of these were to men, some whose invalid wives required helpful home service and others who wanted to know for themselves.

Each radio cooking lesson was delivered, then tried by the pupil. If successful the report was mailed in. If unsuccessful, the report was made with equal interest and corrected, the difficulty remedied and after a satisfactory result, the second lesson was delivered. A radio written and demonstrated examination completed the course. Graduation exercises brought the pupils together and the bank of flowers in one of the accompanying pictures, shows the appreciation felt for Mrs. Peterson's service.

"And that's the real pleasure of the service," Mrs. Peterson adds. "It's shaking hands and rubbing shoulders with the listeners. They know they are my friends and they know that the service belongs to them." A staff of co-workers in the Home Service Department is officially headed by Paul Warren. Through his interest in the "radio pals" a recipe note book was issued during Mrs. Peterson's vacation absence. This, too, is free, and with pages of index, is ready for jotting down the many little hints and menus which are given daily by radio.

With Mrs. Peterson is Miss Vivette Gorman, who broadcasts the children's luncheon menus as well as Sunday night supper hints. In the department of home service are Miss Grace Wright, Miss Mary Quinlan (whose picture is shown lecturing to a group of radio pals at a branch service station of the gas company), Miss Margaret Craig, Miss Nellie Fredeen, Mrs. Helen Farquhar, Miss Mabel Hasty and Mrs. Vandeveer. Each one of these is an expert in the home service and helps the questioner with any of her problems.

Radio teas are winter fetes with KYW radio stars as entertaining artists. Hundreds attend these and the 1923 Christmas radio party for mothers and children greeted 6000—a large overflow of which was entertained in adjoining rooms, unable to get near to the tree. Mrs. Peterson divided her time between the group at the Christmas tree and those in other rooms and corridors, so that every radio pal could be met and could shake her hand if desired.

A KYW Radio Cook Book has just been issued by the American School of Home Economics, at Chicago, by Mrs. Peterson, in co-operation with (Continued on Page 46)

An overflow group of the 6000 mothers and children who attended the 1923 Christmas radio party of K Y W

Typical of the Neutrodyne and of the sets of this season—a Garod "Georgian"

The Neutrodyne

The Question of "B" Battery vs. Efficiency

By W. A. MacDONALD
Research Engineer, Hazeltine Corporation

THIS is the second in our series of articles on the neutrodyne, written in co-operation with Prof. L. A. Hazeltine, the inventor of the circuit.

These articles are all read by Prof. Hazeltine, and approved by him, so that they are official expressions of his viewpoint.

—H. M. N.

HAS it ever occurred to the thousands upon thousands of neutrodyne users, the remarkable significance of the word "neutrodyne?" If not, let me recall a few facts.

Some two or three years ago it used to be an everyday occurrence to hear your neighbors going in on the commuters' train, or in the subway, remark, "My set was working great last night. I received Schenectady" — or perhaps some other station 100 or 150 miles distant.

With an almost unlimited variety of receivers then on the market the factor in good or distant reception depended almost entirely on the skill and enthusiasm of the fan and under the majority of conditions the reception was most doubtful.

Now consider that one word "neutrodyne" and it immediately brings a picture to the mind's eye of a set with three operating dials—a non-oscillating, non-regenerating receiver, so sensitive that stations that were originally heard only on rare occassions now pound in with loud speaker volume, and, perhaps, above all else, the unique simplicity of operation that makes a little child able to operate it.

The situation is very similar to the automotive industry twenty years ago, when every car owner had to be a mechanic. Consider the automobile of today. It took twenty years to accomplish this result in the automobile industry, while the neutrodyne receiver has accomplished the same result in the radio industry in slightly over one year.

The neutrodyne receiver that you are accustomed to, then, is a finished product with very few variable quantities. Perhaps chief among them is the operating cost.

Considerable confusion has been caused from time to time by conflicting stories, which, if they were true, would bankrupt the neutrodyne owner before he had much more than become acquainted with his receiver. The story runs like this:

"Yes, the neutrodyne is a good receiver, but it uses so much plate battery."

The answer here is very simple, and can be made in an indirect manner. Does a Cadillac burn more gas than a Ford? Of course it does, but the Cadillac owner used the increased amount of gasoline because he wants additional comfort, through more power, easier riding, and a multitude of other little luxuries.

Likewise, when the battery consumption on a neutrodyne is compared with other receivers, such as a regenerative detector and two stages of audio amplification, it is greater. It is greater because the neutrodyne is furnishing a class of entertainment that can not be equaled by a regenerative receiver. It is more sensitive and more selective for the quality of the performance rendered; therefore, it is reasonable that for this increase, the cost of operating it shall be more.

It is difficult indeed to obtain an idea of operating cost against general performance, in comparison with other types of receivers. This difficulty is apparent when we consider a few of the more pronounced characteristics such as sensitivity, sharpness of tuning, volume and quality. The last item is perhaps the most difficult to measure.

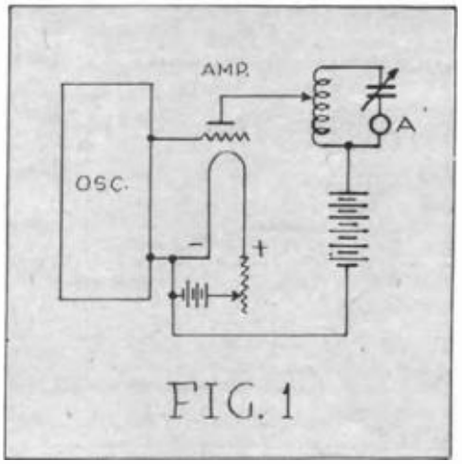


FIG. 1

In practice the plate battery consumption of the average neutrodyne receiver operating on an 85-volt plate battery, at the most efficient filament temperature, is about 20 milliamperes. This plate battery drain is very much a function of the filament temperature and for that reason all the filament rheostats should be adjusted as low as possible.

For example, if the filament rheostats are inadvertently twisted around, without attention to the most efficient operating point it is possible to increase the plate battery drain to as much as 35 milliamperes, and actually decrease the effectiveness of the receiver.

As in all other primary branches of endeavor, the neutrodyne principle is continually being investigated. The system is particularly productive of research, because of the comparative simplicity of the fundamental principles which allow in many instances of a direct method of study.

In determining the amplification obtainable with any type of amplifier, perhaps

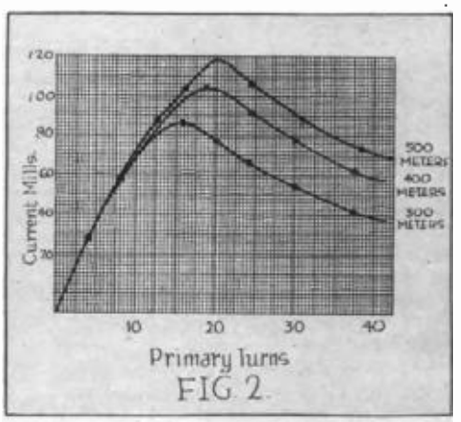


FIG. 2

the most important feature is the coupling transformer, or the device coupling the plate of one tube to the grid of the following tube. The object is, of course, so to transform the energy from the plate circuit as to give as high a voltage as possible and supply it to the following grid circuit.

It is well known that when the external impedance is about equal to the plate-filament impedance of the tube, the maximum output will result.

A method for determining this experimentally is by the use of the power amplifier. Assume, for example, that some particular coil and condenser, such as

would be used in a receiver, is inserted in the output of the power amplifier, and the coupling tap made adjustable, as shown in Figure 1. Then, by varying the coupling as, by using 2, 4, 6 and 8 turns and noting the reading in the indicating meter, a curve is obtained which is shown in Figure 2.

This process can be repeated for a number of frequencies, and gives an accurate idea of the ratio of primary to secondary turns necessary to obtain the maximum output from the amplifier. This current reading can readily be changed into a voltage reading as is done in Figure 3, and supplying a constant voltage from the oscillator, the curve gives an accurate idea of the output voltage possible over the operating range of the unit.

The particular circuit diagram is not, of course, in accordance with the Hazeltine patents, and would obviously oscillate in an amplifier circuit. It is used simply to determine the operating characteristics of the coupling transformer, a correct circuit of which is shown in Figure 4.

The number of primary turns used on the average coupling transformers, as almost every one knows, is about 6. Using as a basis the curves plotted in Figure 3, it will be found that by using some arbitrary value of input voltage, and the optimum value of primary turns the

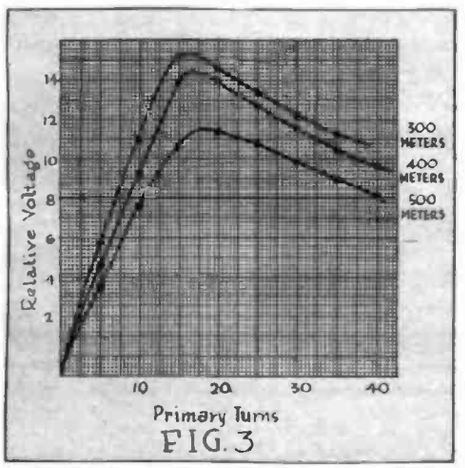


FIG. 3

efficiency of the transformer can be increased about 200 per cent at 400 meters. This falls off somewhat over other parts of the range and would average about 100 per cent increase. The curves shown in Figure 5 give a good example of this effect.

Assuming that a voltage amplification of about seven per stage is obtained with the present amplifier by using only one stage and increasing the efficiency of the transformer the voltage at the detector due to any incoming signal would only be about one-third the value obtained with the present two stages of radio amplification.

This opens up a new line of thought in connection with the neutrodyne receiver—that is, the possibility of a one radio-stage receiver with two tuning dials. If a set of this character were designed it would further simplify an already simple tuning problem and at the same time reduce the operating cost.

However, increasing the number of primary turns will broaden the tuning as will the use of only two tuning dials instead of the usual three. Although it is believed that an amplifier of this character would be impractical where extremely sharp tuning is necessary for certain districts, it might be very successfully used—for example, at distances up to 100 miles or so from New York or other large broadcasting centers. At this distance the comparatively local signals could be received at all times with loud speaker volume and at the same time the receiver would be sufficiently sensitive to receive distant programs after dark.

In connection with the possible increased amplification obtainable with the one stage neutrodyne there is the possibility of materially increasing the amplification obtainable on our present receivers. This leads on to the three-tube neutrodyne and the probable receiver of the near future.

With the increased amplification obtainable with two or three stages, additional difficulties are encountered. The problem

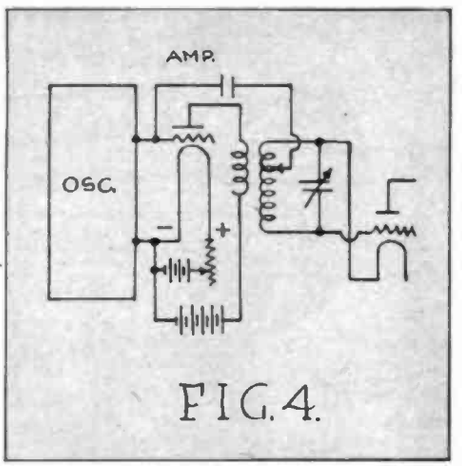


FIG. 4.

of over-all coupling or coupling between the antenna and output circuit becomes increasingly difficult to solve.

These phases of amplification will be considered in another article.

New 110-Volt Tube Has Replaceable Filament

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

IN A recent month's issue of *Radio in the Home* appeared an article on a new type of vacuum tube, the outstanding features of which were:

1—Entire elimination of storage or "A" battery.

2—Filament operated directly from regular house current of 110 volts, either alternating or direct.

3—Elimination of all A. C. hum or D. C. "ripple."

4—Standard Edison base, permitting tube to be used in ordinary lamp socket.

5—At least a 1000 per cent increase in filament life.

The tube illustrated last month is, in at least one respect, like every other three-electrode vacuum tube now on the market. Although the filament life of the new tube is ten times greater than the filament life of vacuum tubes designed for "A" battery operation, still, like human beings, it does have an end. And when the filament finally burns out the tube is useless.

It is to overcome this "human" tendency on the part of vacuum tubes to die, and, at the same time to produce a tube whose life should be at least as long as the life of the set in which it may be used, that a tube with a replacement heating element (filament), is soon to be placed upon the market by the same company responsible for the other tube. It is represented in the accompanying drawing. This drawing shows

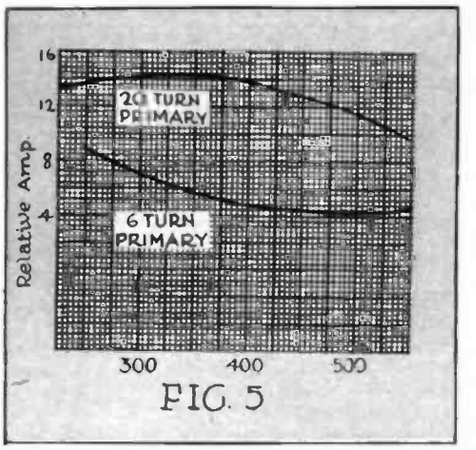


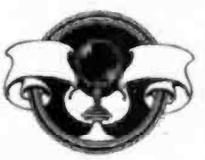
FIG. 5

the tube as though it were cut in two lengthwise, through the middle, leaving the heating element intact.

The functions of the elements P and G are the same as in any other type of three-element vacuum tube, P being the plate while G is the grid. The latter is in a form resembling wire mosquito netting. As in the former drawing, the elements, P, G and C are cylindrical in shape and are in the relative positions shown.

C is an oxide impregnated "alundum" cathode which has the property of abundantly emitting electrons when heated to only a dull red. It fits snugly over a quartz glass, hollow stem, S, wound on an "alundum" form, M, and fitting snugly inside of the hollow stem S, is our heating element F. This heating element varies from the usual filament in that it is wound with "nichrome" ribbon. "Nichrome" ribbon, an alloy, is the heating element used in sad irons, electric heaters, toasters, etc., and was designed to be used in the air and not in a vacuum as is the ordinary filament. The quartz glass stem S is welded onto an ordinary glass bulb D at J.

Quartz glass is used for the stem S on account of its heat-resisting qualities. If ordinary glass were used here, the heat developed by the heating element F would soon soften it, rendering it useless. Quartz is not used for the combined bulb and stem, simply because it would add considerably to the cost of the tube.



Collar R serves to support the "alundum" form on which the heating element is wound, rigidly from contact stud A. It also serves to connect one side of the heating element with the center of your socket, and is threaded to screw into the insulating material H. The Edison lamp base B is permanently fastened to the bulb D while the supports, for holding the elements, are represented at P', G' and C'. The outer end of these supports terminate in connecting lead wires P", G" and C".

When the tube is connected to your 110-volt supply, a few seconds only elapse before the heating element becomes a light cherry-red in color. Almost the total amount of the heat represented by this color travels, by conduction, through

(Continued on Page 47)

TUBES—A Survey and a Forecast

By DAVID GRIMES

Inventor of the Inverse-Duplex System, and Associate Editor of "Radio in the Home"

THE whole story of the vacuum tube is one that is most interesting and fascinating. It reads almost like a novel from its earliest infancy until now. Of course, no one knows just what the future holds for it, but by knowing of its past, it is at least easy to make a reasonable guess as to its next general development.

The birth of the whole vacuum-tube family primarily started when the eminent and never-tiring Edison noted that the negative ends of his carbon filament electric lamps apparently emitted infinitessimal particles which lodged on the inside of the glass. It occurred to him as a peculiar phenomenon and he made note of it. It was called the "Edison effect." This was, however, before the days of electron knowledge, so it was neither understood nor employed.

It remained for an advanced scientist and physicist, Dr. Fleming, to study this problem out and, with this accomplished, to put it to use. Dr. Fleming was well qualified for success in such work. He was not only a well-trained theorist, but an expert experimenter. His investigations were carried on in England for some years. The public first began to hear of his work in connection with the "two element" Fleming valve for detection of wireless signals.

It was this development that gave inspiration to the many students of electronic emission, and, of course, today our knowledge of this phenomenon has been advanced to such a degree that all the laws of the universe, and even matter itself seem to be explained by the insignificant electron.

Then our own inventor, Lee De Forest, regained America's electron lead in 1906-07, by discovering and bringing out the "three-element" vacuum tube. This had many advantages over the Fleming two-element valve. In fact, it was an entirely new and distinctive invention, in spite of the fact that many engineers merely considered it a rather minor improvement on Fleming's work. Even the courts so ruled, but Fleming's valve was never more than a detector or reflector, while the three-element tube not only performed the function better, but assumed an entirely new role—that of an amplifier—both of signals and voice.

All modern radio utilizes the ultimo of amplification, and it is difficult to imagine present broadcasting without voice magnification. In fact, the era of modern radio started with Lee De Forest's contributions in 1907.

The whole theory of vacuum-tube operation is too well known and has been explained by too many experts for me to attempt to take space here to discuss it. But it will not be amiss if it is recalled to the reader that a three-element tube is so-called because it has three separate parts in its interior. These parts are called the filament, the grid and the plate. When the tube is in operation, a current, or stream of electrons (for that's all an electric current is), flows from the filament through the meshes of the grid to the plate. In order for this current to flow, it is necessary that all air be removed from the tube. The filament is used as the source of electrons, and because most substances will not emit electrons at ordinary temperatures, the filaments are heated in some sort

Here is the new Magnavox tube which Mr. Grimes mentions in this article

of manner. The energy supplying the force for this stream is given by the "B" battery. The "A" battery is used merely to flow through the filament and heat it to the desired temperature to permit electronic emission.

The performance of a three-element vacuum tube when amplifying signals is explained as follows:

When signal or voice currents are desired to be amplified they are connected across the grid and filament of the tube. The currents set up an electrical pressure on the screen or grid that alternately attracts and repels the electronic stream flowing through it. This action produces large variations in the "B" battery current with only the feeblest energy supplied to the grid. It is analogous to a man operating a dam, whereby his weak energy applied to a wheel and a gate, can cut down or increase large streams of rapidly flowing water. In this manner, one man-power can control many horsepower.

Now we are ready for an intelligent discussion of present-day tube design and the possibilities of the future.

In the first place the whole operation of a tube requires a source of electron emission. This source is the filament and must be made of some sort of material. Different substances give off electrons at different temperatures. Some elements have been discovered that perform this stunt at ordinary room temperature. In other words, such a tube would have what is known as a "cold filament."

Substances of the radium family do this. This would be the ideal tube because no "A" battery would be required. But tubes with radium filaments would cost *some* money—many thousands of times more than most of our imaginations will permit us even to think about. So, commercially, for the present at least, the cold filament tube is out of the question. It still remains for some enterprising inventor to discover a less expensive material that will do its electronic emitting without being heated.

Other elements such as tungsten operate most efficiently as electron emitters at very high heats—the filaments of such tubes burning intensely white.

Then there is barium oxide that works very well when heated merely to a dull red.

And finally there is the development of the thorium filament which literally oozes electrons when subjected to only moderate warming.

The tungsten filament is well known. It is used in most modern electric lights, and was employed in the old UV201 tubes. Barium oxide is used in such tubes as the Western Electric 216A. These burn with a dull red glow. The thorium-coated filaments form the basis of the present UV-201-A tubes which are barely alight when operating at their best.

It is but natural that the development should travel in the direction of tubes that require absolutely no batteries. What could be more nearly ideal than a radio set with no fussy "A" and "B" batteries? Immense rewards await those who will be first to do this. Hence many hundreds of people are working on the problem.

But it is not new. It was recognized from the earliest dates of vacuum tubes, and we have but to scan the patent records to find the art fairly well covered scientifically. Even commercially, a few rather cumbersome units have appeared, and every day startling announcements are placed before the public concerning this elimination of all batteries.

This in turn frightens the prospective buyer of radio into believing that he had better wait for awhile. No such revolutionary thing is going to happen. As it has been said in this magazine before, radio will be evolutionary, not revolutionary.

So let us look at this problem in a safe and sane manner. Let us put the micro-

scope of reason on it and draw conclusions accordingly.

In the first place, the question resolves itself into two divisions—the development of a cold filament tube requiring no "A" battery, but still some source of "B" energy and the other more possible class of a tube or circuit permitting the operation on commercial electric power lines.

If a cold filament tube could be built at a reasonable price, this would function anywhere, while the latter class is confined to communities and houses having electricity for lighting or power.

The cold filament development seems to be much in the dim distant future. Incidentally, a vast number of communities are now supplied with electricity, and power lines are rapidly spreading over the country. We will confine our remarks, then, to the radio set operated from the electric light sockets.

It must be appreciated that there are two different kinds of electric power—some homes are supplied with one kind, while others use the other variety. These are classified as "direct current" and "alternating current" systems. "Direct current" or D. C. is to be found in the center of most large cities. At other places "alternating current" or A. C. is to be found.

And therein lies the difficulty. A great majority of the residences are supplied with A. C., and this causes a bad hum when applied to the vacuum tubes. With D. C. the problem is easy and if D. C. were more universally used, most modern sets would be batteryless. Many of these present so-called sets operate only from D. C. systems and are therefore restricted in their use.

The A. C. operation also divides into two classes—that of the "B" supply and that of the "A" supply. These are two entirely different problems and demand different attitudes of attack for their proper and successful solution.

The use of A. C. for replacing the "B" battery is a much easier job than the "A" battery question. Several successful units are now on the market which replace "B" batteries on many types of sets, but so far they have not been immensely popular. This is because of one thing. People do not object so much to "B" batteries as they do to the bulky, acid "A" battery.

So it would appear that we are, after all, concerned with but one problem in this battery business and that one problem is dispensing with the storage "A" battery. These discussions appear to run in couplets because this, too, groups itself in two classes.

(1) The question of operating the present tube on A. C. power.

(2) Redesigning the tube for specially running on all classes of electric light circuits.

No great success has yet been attained in the first class except by the use of rather expensive auxiliary equipment. This apparatus consists of rectifying devices, choke coils and filters, the total costing considerably more than a battery and charging mechanism. For this reason it has not been in great demand. Not more than two stages of audio amplification have been worked out with this and phones cannot be used because of the hum. It is not objectionable on a loud speaker. More than one stage of radio amplification under this filtered A. C. system produces a rattle in the voice and music, which has defied all quieting attempts so far.

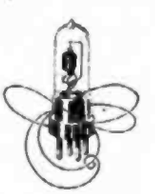
The redesign of the entire vacuum tube structure appears to be the only solution that will permit its successful operation on the electric light socket. Such a tube would then connect direct to the A. C. mains without any fussy and expensive accessories.

Several types of such tubes have been built with entire satisfaction. The patent art on these goes back a half dozen years and more. They are based on a "heater coil" principle rather than running the electricity through the filament itself.

Figure 1 shows the present way that the filament is heated. The electric current from a battery is placed directly through it. When this is done with the electricity from the electric light sockets the interfering noises are objectionable.

Figure 2 shows the heater coil system, whereby the electricity is fed through a small coil placed near the substance which will emit the electrons when hot. The heat from the coil then heats the electronic substance and the tube functions—because, after all, it is only the heat that is required and the heater coil supplies that, keeping the actual electric light current away from the filament or electronic cup.

This will undoubtedly be the tube of the near future. Many of us have expected the Radio Corporation to put this tube out before now. Undoubtedly they have been delayed by several production difficulties and then again, they may be waiting until their present 3-element tube patents expire early next spring. They will, of course, encounter great competition at that time, resulting in a further drop in price of the present tube. This would appear



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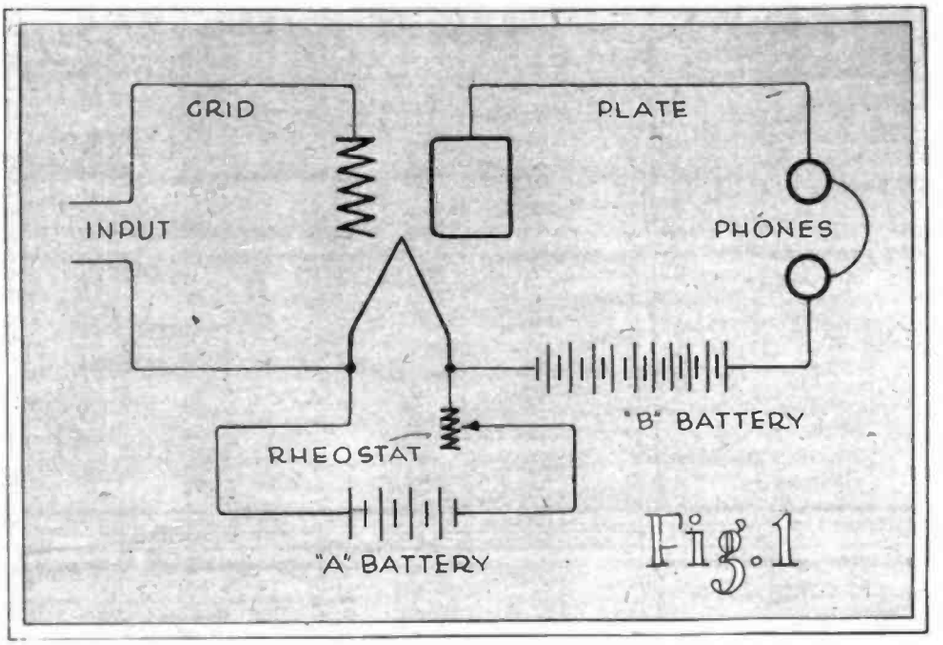


Fig. 1

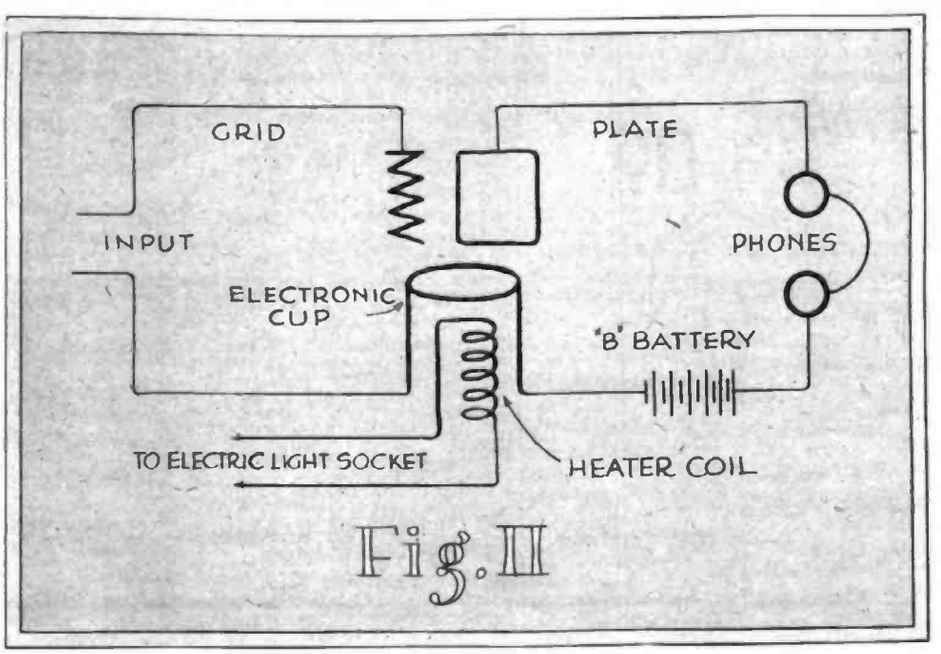


Fig. II

The inimitable "Happiness Boys," Ernest Hare, Larry Briers and Billy Jones, who radiate a half hour of happiness through WEAF every Friday evening

The lower photograph shows Graham McNamee, who gave colorful descriptions of both the Republican and Democratic conventions. He is considered the "star announcer" of WEAF

Who's Who at WEAF

By RICHARD LORD

EACH of the radio favorites at WEAF is worthy of a niche in radio's Hall of Fame. The versatility of its announcers, the popularity of its regular features and the quality of its transmission make WEAF one of the country's great broadcasting stations. To do its program stars justice in a brief outline of this kind is a difficult task, but obviously the announcers deserve much credit for the station's place in the hearts of thousands of radio listeners.

If any one of WEAF's staff of announcers deserves the title of "star announcer," it would probably be conceded to Graham McNamee, whose resonant voice was heard during the Democratic convention at Madison Square Garden through eighteen broadcasting stations distributed in all parts of the country. His rich, sympathetic voice resonates with human quality which makes him welcome in hundreds of thousands of homes. His inflection rises and falls with his responsive mood, so he adds to his vivid word pictures all the implication varying intonation can. McNamee is more than an announcer. His ability to create graphic word pictures would do credit to the star reporter of the world's greatest newspaper. His mind works like lightning. The Democratic convention is not the only fight which he has described from the ringside.

The thud of the glove on the boxer's jaw, and McNamee's description is out almost before the eye has seen the punch.

A follower of the ring, McNamee was naturally selected for his qualifications to handle WEAF's sporting events. Some of the football games which he described for the benefit of millions of listeners—for WEAF's events are frequently broadcast by many stations—were more enjoyable through the loud speaker than in the bleak grandstands with players struggling through a sea of mud. Knowing the game as he does, McNamee's descriptions are quick, clear and authoritative.

On the occasion of the broadcasting of the President's first annual message to Congress, which was carried out through six stations scattered along the Atlantic Seaboard and through the Central West through Kansas City, Mo., and Texas, he performed a feat which astounded the newspapermen who were aware of it.

McNamee listened to the President's address of more than an hour-and-a-half's duration, and immediately upon its completion delivered a summary of all the important points of the President's message. His ten-minute talk was based entirely upon listening to the address through a loud speaker in the Capitol control room. He had no copy of the speech in advance. He simply

A. V. Llufrio, accompanist and announcer at Station WEAF

listened attentively and took an occasional note of a word or two which served as his outline. The newspaper reporter has the advantage of an opportunity to correct errors and does not have to produce 1500 words of copy in ten or twelve minutes. Yet this is what McNamee did with credit to himself.

Washington, D. C., has the honor to claim McNamee as birth place. His ancestry is Scotch, and there is a slight trace of Scotch accent in his manner of speaking. He took up the study of the piano at the age of seven and began his professional career in Minneapolis during early manhood. Later he came to New York, where he has done a great deal of solo work at important churches as well as concert and teaching work. His baritone voice has won the encomiums of such critics as Richard Aldrich, W. J. Henderson and Henry T. Fink.

The daddy of WEAF's announcing staff is V. A. Randall. He has the honor of being its first regular announcer. His training is unusual, for it combines twenty years of musical study with an almost equal period devoted to electrical training. His hobby is electrical and radio experimentation.

Mr. Randall has been with the Bell System since 1901, and for many years was connected with the Long Lines Department of that company. His services as WEAF's studio director began with the establishment of WEAF in July, 1922. He handled the station's first extensive outside job when four stations, KDKA, WGY, KYW and WEAF, were linked up with Carnegie Hall, a feat which represented a startling advance in radio broadcasting at that time. He handled the opening night at the new WEAF studios at 195 Broadway, a program which will never be forgotten by those who heard it.

Shortly after this strenuous program, Mr. Randall's voice was affected by a slight disorder. He handled a few evening programs with a hoarse throat and was finally compelled to take an extended vacation. That his resonant and deliberate voice was missed by his enthusiastic radio followers was evidenced by scores of affectionate letters which he received. A number of ardent friends even went so far as to offer to send him bottled remedy "to cure his cold."

The title of veteran can well go to A. V.

B. Fischer & Company "Astor Coffee" Dance Orchestra. Regular Friday evening feature through WEAF

Phillipe Carlin, one of WEAF's most popular announcers

Llufrio, who joined the force a short time after Randall announced his first program. He has probably handled a larger number of programs than any other announcer on WEAF's staff. Llufrio received his musical training at the Washington College of Music, and was a graduate of George Washington University in 1913. Like most of the members of WEAF's staff, Mr. Llufrio has many abilities which stand him in good stead when emergencies arise. His tenor voice is of wide range and of a winning, sympathetic quality, while his ability as a pianist and accompanist has fre-

Winifred T. Barr, WEAF's hostess and accompanist, is frequently heard with many of the prominent artists

quently been utilized on WEAF's program.

Mr. Llufrio's varied capabilities came to the front during one of the first programs which he handled in 1922. It was on one of the national holidays during the winter. A famous dance orchestra had been scheduled to appear on WEAF's afternoon program, beginning at 4:30, and Llufrio was assigned to handle the announcing on the occasion.

Four-fifteen came, but no orchestra appeared. Mr. Llufrio paced up and down the room in a considerable state of agitation. Four-thirty arrived, and it was time to go on the air, which WEAF does unfailingly at the scheduled instant. The studio and reception room were deathly still, there being no activity on account of the holiday.

Mr. Llufrio began his customary announcement with one eye on the studio door. He then informed the radio audience that the first artist who would entertain was Albert Vincent, tenor. Albert Vincent sang until his voice was weary and still no orchestra appeared.

The next program feature was Howard Brown, pianist. Mr. Brown presented a most versatile repertoire and continued for some time, but finally he, too, became exhausted and Albert Vincent resumed with a second group of selections.

In the meantime, announcer A. V. Llufrio continued to look impatiently at his watch. Gradually the hour of 5:30 approached, and when it did Mr. Llufrio signed off. A weakened figure sank heavily into the couch in the reception room and wiped the combined brow of Albert Vincent, Howard Brown and A. V. Llufrio.

"Gee, this broadcasting is a tough business!" he remarked.

"Good morning, ladies and gentlemen," says a pleasant voice of a young lady who has plenty of unknown admirers. It is Miss Helen Hann, WEAF's only lady announcer and a frequent soprano soloist. Miss Hann was made a member of WEAF's staff to pursue a clerical duty, but her remarkably pleasant telephone voice immediately attracted attention of the station directors, and she was made a member of the regular staff of announcers. She is a soprano soloist of no little ability and is continuing her studies under prominent teachers.

Everybody knows Winifred T. Barr, WEAF's hostess, accompanist and piano soloist, because everybody is attracted by her winning smile. You can't hear her smile through the loud speaker, but you are conscious of it nevertheless. Thousands of the radio audience are won by her pleasant personality, for everybody mentions it when they write her.

Miss Barr has the distinction of being the first person to open a new broadcasting station while 200 miles distant from it. Miss Barr did this when she played the opening program for station WCAP in Washington, utilizing WEAF's studio in New York.

But this would be an unbalanced picture if all its space were devoted to announcers, for there are other persons who appear with almost the same regularity as the announcers. Heading the list as radio's greatest fun

Alexander Fenner, manager of the Clef Club, supplying the "Eveready Minstrels"

makers are Billy Jones and Ernest Hare, the famous Happiness Boys who appear every Friday evening at 8:30. Millions, young and old, wait their appearance for their pleasantries and their rich voices.

These two boys are almost inseparable, and most people have trouble at first telling which is which, until they learn the formula: "Ernest Hare is the one without the hair." Both were born on the Ides of March; Ernie in 1883 and Billy in 1889. They are both the same height, they weigh the same and their tastes are so alike that each one can order a dinner for the other just as well as he can for himself.

"Not that Ernie would buy me a dinner, Mr. Lord," said Billy, by way of explanation.

"Don't let that boy fool you, Mr. Lord," came back Ernie. "This fellow Jones wouldn't buy me a meal with my own money!"

Although natural-born humorists, Hare began his career to fame as a salesman. His first product was baking powder, but he couldn't get a rise out of it. Then he went on the road for a piano-manufacturing concern, but carrying samples, so he says, did not appeal to him. His first musical connection was with the Peabody Oratorio Society of Baltimore, following which he secured an engagement as soloist for a prominent Catholic church of that city. Mr. Hare's ambition ran to singing good music, and his rich baritone voice certainly made him worthy of an operatic career, but popular music proved vastly more remunerative. From church singing, he came to New York in 1905 and sang in numerous productions. He understudied Al Jolson playing the lead in "Sinbad," and sang in ten Winter Garden productions as well as quite a number of other musical shows.

Those Eveready Minstrels who make you laugh with their surprisingly new jokes and make you smile with their tuneful choruses are recruited from the Clef Club. Three men are responsible for the success of these Eveready programs. One of them is Mr. Alex Fenner, director of the club, under whose direction it has grown to a thriving organization. It furnishes entertainers not only for private engagements, vaudeville circuits and musical comedies throughout the United States, but has filled engagements in Paris, Brussels, London and Honolulu. The best of them appear at WEAF's studio for the Eveready program. The lyrics and lines are collected by Sam Paterson, while the musical features of the program are worked up by Vm. E. Elkins, the choral director.

All the world likes the Astor Coffee Dance Orchestra because of the unique way in which it plays harmonic dance music. Unlike most dance orchestras, string instruments predominate in its personnel. The leader of this orchestra is Anna Byrne, famous in society circles because she furnishes music at hundreds of society functions every year held at many fashionable clubs and private homes.

Miss Byrne has traversed an unusually (Continued on Page 61)

Perhaps the most popular of WEAF's announcers is V. A. Randall. He was the first regular announcer of the station and its first studio director

A popular voice with the radio fans is that of Miss Helen Hann, one of WEAF's regular announcers. Miss Hann has a highly developed speaking voice. She also plays the piano and sings a clear soprano

speaker becomes beautiful furniture

RADIO has definitely turned toward the cabinet type of loud speaker.

In this, radio has followed the phonograph. Most of us can remember the many shapes and sizes there were in phonograph horns. Now these horns are all concealed in beautiful cabinets.

That radio would go to the cabinet type of loud speaker has always been our belief. The first Timmons Talker, of three years ago, was a cabinet type. Since then, however, we have made many changes, both in the construction and appearance of Timmons Talkers. The most recent of these is the addition of an entirely new design of cabinet for the A Type Talker, illustrated by the unretouched photograph on the opposite page. Now the Timmons Talker is a finished piece of fine furniture—really beautiful furniture. It has a Gothic scroll grill, backed by a screen of bronzed-gold. The finish is hand-rubbed mahogany throughout.

—And as for tone, we really believe that when you hear the latest Timmons Talker, you will have a new conception of how clear and natural radio can be. You must both *hear* and *see* Timmons Talkers. There are two types—Adjustable (Type A) retails for $35 and Non-adjustable (Type N) at the low price of $18.

This Type N without the adjustable feature and without the special feet, base and top, however, has the same hand-rubbed mahogany finish as the adjustable type. It is built around absolutely the finest non-adjustable unit so far developed by the Timmons Laboratories. The same principle of Reflected Tone (two horns) is used as is employed in the Type A Talkers. The grill is also of the same quality. We believe that this Talker at $18 is the very best value in non-adjustable loud speakers that you can buy. This model puts a really superior cabinet type talker within the reach of the most thrifty buyer.

Concerning the B-Liminator which takes the place of B Batteries

—And the Laboratories which produced these cabinet type talkers have now perfected the most revolutionary apparatus in Radio—the *B-Liminator,* successor to the B battery. It supplies smooth, noiseless, plate current direct from any alternating current electric light socket—there is no changing of your set—operates up to 8 tubes—detector as well as amplifiers. The B-Liminator comes to you in a fine crystalline case. It's at home with the beautiful Timmons Talker and with the finest looking Radio set.

See and hear these Timmons Tested Products at your dealer's. And meanwhile write us for literature fully describing and illustrating the Timmons B-Liminator and Timmons Talkers.

TIMMONS RADIO PRODUCTS CORPORATION

339 E. Tulpehocken Street

GERMANTOWN PHILADELPHIA

Radio Products

Notes on the Grimes-Briggs-Neutrodyne

THOSE of you who read last month's issue, particularly our article describing our success with the inverse duplex arrangement of the neutrodyne as perfected by John De Q. Briggs, may have thought we were over-enthusiastic about the set. Well, I have been using this set exclusively in my home ever since then and there is not one word of that article which I wish to retract.

This circuit is very decidedly an addition to the ranks of the best radio sets. I can see only one objection to it as it stands now, and that is the tendency to howl on signals that are too strong or when the loop is turned in such a direction that the neutroformers feed back into it. Incidentally, let me say right here that this howl does not radiate and will not affect other sets in the neighborhood.

The first case can easily be cured by dropping down the switch lever on the loop to the lowest tap which will give satisfactory volume. The feeding back from the neutroformers may be cured in either one of two ways. First, there is the suggestion of Mr. Briggs to shield the cabinet, and this is the only practical method at the present time. Personally I have a prejudice against shielding cabinets in this way because it has always seemed to me to broaden the tuning of the set. Mr. Briggs says that he does not find this result.

I think the ultimate solution of this feed-back problem will lie in the substitution of different coils for the neutroformers.

As I said last month, we discovered at Station 3XP, that this arrangement of the neutrodyne was really not a neutrodyne at all. In other words, the very process of inverse duplexing a tuned radio-frequency system removes the necessity for neutralizing and the set is therefore a four-tube Grimes-3XP circuit.

My own thought about this feed back is that the magnetic fields created by the standard form of neutroformer coil are very large and will distort other magnetic fields within quite a distance. This means that the magnetic fields of the neutroformers and of the loop aerial clash and both become distorted, and I believe that this is the reason for the howling which I have spoken of.

It seems to me that the obvious solution of this problem is to design coils which will not have such large magnetic fields. This thought came to me after a long test of this Pfanstiehl system for the neutroformers will totally cure this howling in this set. Mr. Pfanstiehl has very kindly had wound for me two of his coils and mounted them at the proper angles on a strip of bakelite. This unit has just arrived at Station 3XP and we are going to put it into this circuit and will let you know how it pans out.

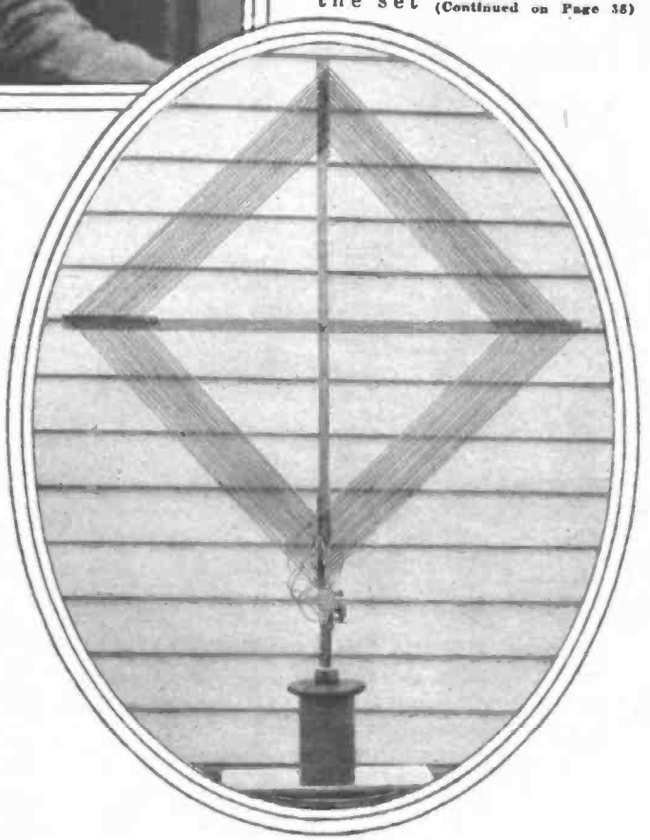
The "overload howl" is, however, a different matter. It is also, I think, a less important one.

The trouble with the feedback howl is that in many cases it takes away from you the privilege of using the directional effect of the loop aerial in order to tune out undesired stations. In other words, I have had a number of cases where I wanted to turn the loop in a certain direction to get a certain station, but found that when it was placed in that way it receives the feed back from the neutroformers and the set

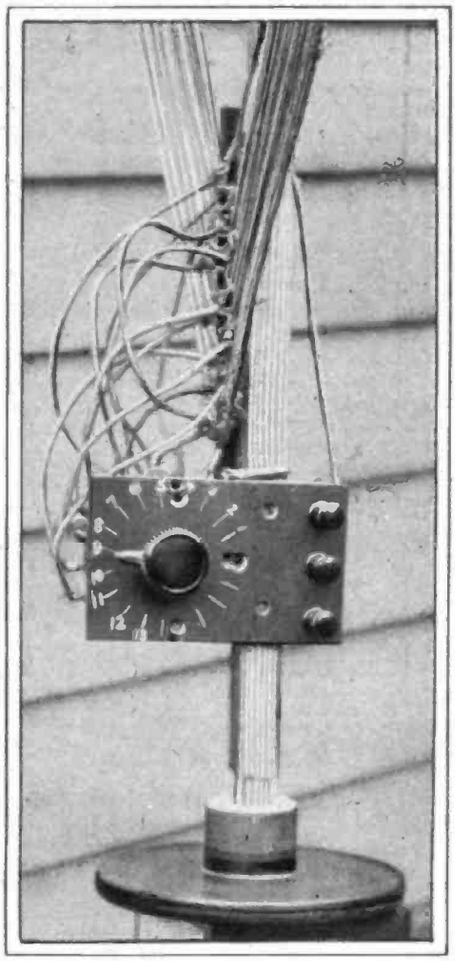
(Continued on Page 38)

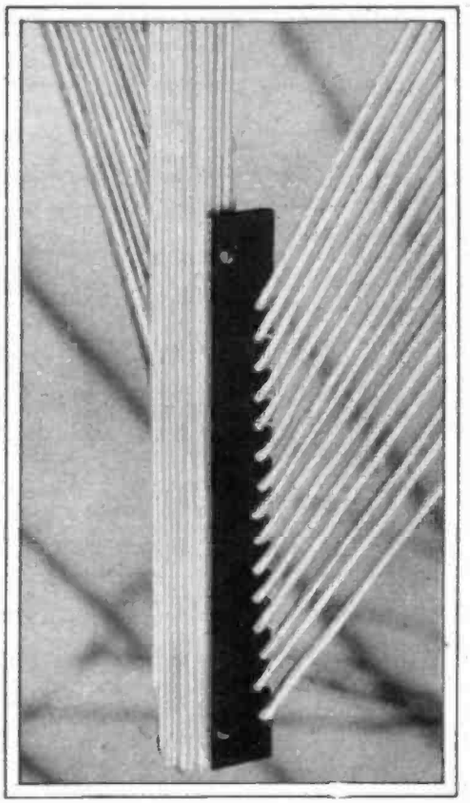
Here is John De Q. Briggs, the man who inverse-duplexed the neutrodyne

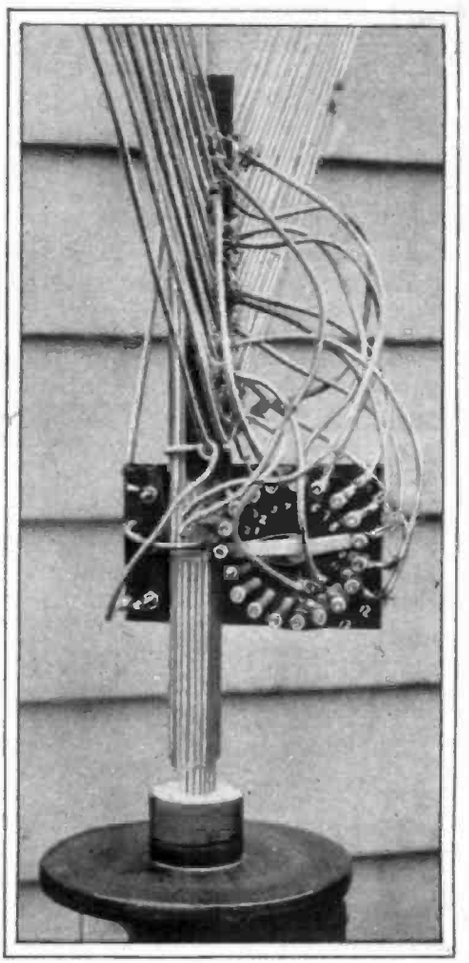
The "Old War Horse" loop used at Station 3XP



of the new Pfanstiehl model number seven receiver just developed and put on the market by Carl Pfanstiehl, in Chicago. Here is a set which cannot possibly be made to squeal or howl. When I talked to Mr. Pfanstiehl about it, he explained that he had spent many months exploring magnetic fields in radio sets and that as a result of these explorations he had designed flat spiderweb coils which, instead of sending out large magnetic fields in more or less circular form, have flat magnetic fields or rather fields which are disc shaped. I have an idea that the substitution







Here are the detail views of the 3XP loop which is fully described in this article

Our Favorite Loop at Station 3XP

I AM showing with this article photographs of the loop which we at Station 3XP call the "old war horse." This is because we find it the best loop for general use.

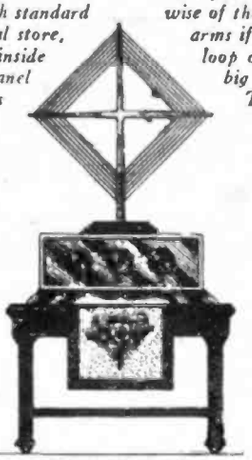
We are able to use it with any type of circuit which employs this form of aerial because its taps make it possible for us to make it any number of turns or any variations that we wish.

The vertical stick measures forty-six and one-half inches from the table to the top. It is driven into one half of a big wooden wire-spool, which forms the base and keeps the loop standing upright. Any form of base will do in place of this, but we happened to have this empty spool handy and so we simply sawed off one piece and used it for our loop stand.

The horizontal cross arm measures thirty-eight and three-quarters inches from tip to tip. We wound the loop with standard flexible lamp cord, which can be bought in any electrical store, and this loop uses something less than 110 feet. Just inside of each end of the cross arms we screw a strip of panel material measuring seven inches long by three-quarters of an inch wide. This strip is put on in such a way that it sticks out beyond the side of the wooden frame. This enables us to wind our wire so that it does not touch the wood at any part.

In each one of these strips, we cut fourteen notches, for there are fourteen turns of wire on the loop. These notches are three-eighths of an inch apart, and when the wire is wound on, the outside windings measure twenty-six and one-quarter inches on a side and thirty-seven and three-quarters in diameter.

The inside turn measures nineteen inches on its side. Near the base you will see that we have mounted another small oblong strip of radion. This has three binding posts on one side and on the other it has a back-mounted tap switch. Marco and Carter and Yaxley all make excellent switches for this purpose. We have thirteen taps, so your switch must have that many points on it.



One of the outside binding posts takes the beginning of the loop and the other the end. The center binding post is connected to the blade of the tap switch, and each contact of the tap switch is wired to a tap on the loop. Every turn is tapped in this way.

This is a flat spiral loop. Do not attempt to use a flat spiral smaller than this as, on the smaller sizes, the inner windings pick up virtually no energy. If you want a smaller loop you will have to use the square type of frame—that is, instead of screwing the seven by three-quarters radion end pieces parallel with the cross arms, you will have to make them deeper and screw them crosswise of the arms. Do not use these same dimensions for the cross arms if you are going to make the square loop. For the square loop of fourteen turns, twenty-one inches on a side will be big enough.

The advantage of this flat type is that it is more sharp in its directional effects and therefore gives us better selectivity between stations which are very close in wave length. The square type may pick up somewhat more energy, but we prefer this kind on account of selectivity.

In another article I am taking up the matter of adapting the inverse-duplexed neutrodyne to outdoor aerial.

In this article on the loop, let me say that outdoor aerial work can be done with almost any loop set by leaving the loop connected in the regular way and bringing the lead-in from the outdoor aerial to the loop, clipping it to a scraped place on the center turn. No ground connection (Continued on Page 51)

HOW FAR WILL THIS SET RECEIVE?

By W. FRANCIS GOODREAU

WHEN a man is about to buy or build a new receiver, the first question he usually asks about it seems to be "How far will it receive?" The answer usually given is "—— miles."

The answer that should be given is "It depends on many things, such as location of receiver, skill of operator, etc." Many manufacturers make a practice of stating in their advertisements the number of miles that can be received with this or that receiver. This would lead one to believe that this certain distance can be covered by any one in any location, provided he uses this or that receiver.

Let us go over some of these claims. Here is one—"800 to 1000 miles on a crystal set."

If this advertiser means that you can receive code signals from this distance using a crystal, well, it can be done at times in the average location. If he means concerts and speech, again it can be done under unusual circumstances, but it cannot be done with the average crystal set in an average location. Local stations are all that can be expected on a crystal set in the average location, and in some places not even local stations can be received.

Another advertisement reads—"2650 miles with the ———— one-tube receiver." It is possible to reach this distance with a one-tube receiver, but this is not the normal range of the set, and this distance could not be received consistantly winter and summer. If you received that distance once in a year you would be doing well.

Another advertisement reads—"1000 miles guaranteed with the ———— receiver."

Let me say right here that no one can guarantee the range of any receiver, regardless of the number of tubes used. One tube or a dozen tubes, you cannot guarantee the receiving range.

This is quite a large statement to make, and if I could not prove it I would not care to make it. As I can prove it, however, I do not hesitate to make it.

For almost a month I have carried out experiments with radio-receiving sets in the city where I live, to find out what the conditions are for radio reception in all parts of the city. I also made a radio map of the city, marking out "dead spots," weak spots, fading spots, and anything unusual in any way.

In most of my tests I used a Goodreau split variometer receiver, using UV200 as a detector, and two UV201-A tubes as audio amplifiers. This circuit is well known to the readers of this magazine. Some of you have reported receiving up to 2500 miles on the loud speaker with three tubes, and in my home in Providence, R. I., with the receiver used in these tests I have often heard Texas stations. These stations are thousands of miles from my home. Knowing all this, how far would you say this receiver could be guaranteed to receive?

One thousand miles? No, indeed.

Five hundred miles? Again the answer is *no.*

Fifty miles? *Not even fifty miles.*

Station WNAC, at Boston, is forty-five miles from my home, and I have never heard this station on my receiver. I am in a fairly good location too, with a good antenna, but the reason why I do not hear this Boston station is that there is a "dead spot" between this city and Boston, and so the signals are unable to get through.

And not only is it impossible for me to guarantee fifty miles range with this receiver, *but it is also impossible to guarantee one mile range.* I found this out during my tests while looking for spots unfavorable for radio reception.

In one place I found I was unable to receive signals from a 150-watt station located one-eighth of a mile from the receiver. This, of course, is very unusual, and it is rare indeed to find a spot as near to a station as this without being able to get some kind of signals no matter how weak they may be. But let us suppose that I had sold one of these receivers to a man who lived right there, and guaranteed the range as so many miles. What would he think of me when he found he was unable to hear one-eighth of a mile? Not much, I am sure, nor could I blame him. But it proves that when it comes to guaranteeing the range of a receiver it cannot be done.

The question now comes to mind: "Why cannot the range be guaranteed?"

There are many reasons why, as I have said before, but I will go over them in detail. In the first place, no receiver, no matter how sensitive, can receive good clear signals if they are not above the "static level." By that I mean that if the static is of greater intensity than the incoming signal, no matter how many stages of amplification are used the signal will not become greater in intensity than the static. The limit of any receiver's range is reached when the signals are below the static level.

Of course there are methods of receiving whereby it is possible to get a better signal-to-stray ratio; it is possible by some methods to get a greater intensity of signal-to-static over the whole range of the receiver, but even then the range of the receiver is limited.

Then, too, the location of the receiver has much to do with the receiving range. Given an ideal location—and these are few and far between—I do not believe you would have to use more than three tubes to cover the whole U. S. But how many of us have ideal locations? Not many of us I am sure. I have lived in many places, and operated receivers in many more locations, but as yet I have not discovered an ideal location.

It is interesting to note the way receivers will act in different locations. For instance, when I build a new receiver to be described in *Radio in the Home,* it is tested by myself right here (Continued on Page 49)

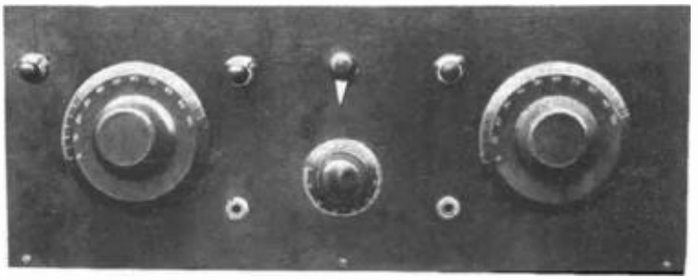
The New Harkness Counterflex Circuit

(Continued From Page 18)

and the remainder of the parts on a baseboard, the various parts being connected together as shown in the wiring diagram.

A receiver using the circuit of Figure 4 can be built using exactly the same parts as listed above, omitting, however, the counterswitch and substituting an ordinary double-circuit jack for the double-circuit filament control jack.

The Counterflex receiver is primarily intended for use with 201A or 301A tubes. With these tubes a 6-volt



filament battery and 90-volt plate battery are required, the plate battery being tapped at 22½ volts for the detector-tube plate circuit. It is possible, of course, to use dry-cell tubes, but it is then usually necessary to change the capacity of the fixed condenser across the secondary of the reflex audio-frequency transformer. A slightly larger capacity than that shown in the diagram is needed. The exact capacity can best be found by experiment.

The same types of tubes must be used throughout; that is to say, use three 201A's or three 199's or three 12's. Do *not* use two 201A and one UV200. If you want to use a 200 as detector you must change the wiring of the filament circuit and insert a separate rheostat to control the filament current of the detector tube.

There is a very simple and infallible test for determining whether your Counterflex receiver is operating with maximum efficiency. Be sure to make this test and correct any mistake it reveals before calling your set "perfect."

To make this test, choose a time when local stations are *not* broadcasting. Connect your antenna, ground and batteries, and plug in your phones or loud speaker. Turn the counterswitch to the "distant" side and turn the counterdon to the *minimum* position (rotor plates out).

Then, provided the secondaries of the two counterformers are tuned to the same frequency, a howl should be heard in the telephones or loud speaker, no matter to what frequency both circuits are tuned. In other words if, by turning the first dial to 10 degrees the circuit is tuned to a wave-length of about 220 meters, a howl should be heard in the phones when the second dial is turned to approximately the same position as the first. There may be a slight difference between the settings of the two dials; for instance, to obtain 220 meters on the second dial 12 degrees may be the correct position. Similarly, if the first dial is turned to 70 degrees, representing, say, the correct position for the reception of 500 meter waves, a howl should be heard when the second dial is tuned to 500 meters.

Furthermore, it should be possible completely to eliminate this howl by increasing the capacity of the counteracting condenser, or counterdon, no matter what frequency the two circuits may be tuned to.

When making this test you may find:

(1) That while you are able to stop howling at all frequencies by turning the counterdon, the receiver *does not howl at all* at some frequencies.

The cause of this may be the length of your aerial. If it is longer than 60 feet, cut it down to that length.

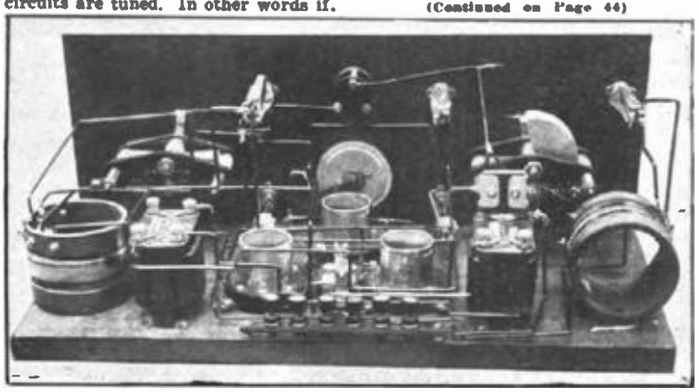
If this does not balance up your receiver the values of some of the parts you are using may be incorrect. This can be remedied by using the correct parts or, in some cases, by increasing the capacity of the fixed condenser across the secondary of the reflex audio-frequency transformer. The correct capacity can be found by experiment.

On the other hand you may find:

(2) That while the receiver howls at all frequencies, you are unable to stop the howl at some particular frequencies.

Again the cause for this may be the length of your aerial. If it is too short, increase it to about 60 feet. Or the cause may be the use of incorrectly designed parts which can be remedied by substituting the correct parts or, in some cases, by decreasing the capacity of the fixed condenser across the secondary of the reflex

(Continued on Page 44)



Tubes—a Survey and a Forecast

(Continued From Page 27)

to be the proper time for them to produce the A. C. tube at an $8 or $10 list price. This is probably what will happen, but only another year will tell.

Because of this situation, there has not been much incentive to try to develop other ideas for accomplishing the same results. *Bring on the new tube!*

As indicated earlier in this article, some future date may see a "cold filament" tube, and this would entirely dispense with the necessity of a source of heating energy—or the "A" supply. This is entirely possible.

But it is the height of folly or misinformation for any one to assume that the "B" source of energy will be eliminated. This would be perpetual motion pure and simple, because the "B" energy is the power that gives the amplification. Let's keep both feet on the ground and control our imaginations!

In making any prediction such as this, one likes to glance about him to ascertain if any progress is being made right now toward these encouraging ends. We have accordingly looked far and wide and, to say the least, the situation is discouraging.

Alas! Most of the world seems to be followers and not leaders. Of all the independent and "bootleg" tubes very few show any signs of headwork or originality. Most of them are the poorest kind of a direct copy of the present standard tube. They appear to be laboring under the impression that it is perfection itself.

The new Magnavox storage battery vacuum tube is the only one which shows originality in conception.

This tube follows an entirely new principle of construction, which, it is said, represents a distinct advancement in tube design with corresponding increase in efficiency.

The Magnavox tube departs radically in every respect from the construction of previous tubes, especially in that it does not make use of a grid or any other kind of electrode between the filament and plate. The effect of this new principle permits the electrons to take an unobstructed passage between the filament and plate. By means of a new and better method of electron control, the tube gives not only higher amplification with greater sensitiveness, but also purest reproduction.

The elimination of the grid allows the spacing between electrodes to be much greater than in ordinary tubes and still maintain the same resistance, with the result that these tubes have less than one-half the internal capacity of other tubes of similar type.

The Magnavox tube is not critical of adjustment either as to plate or filament. The filament consumption is only one-quarter of an ampere. When used as a detector the tube gives sharper tuning with extreme sensitiveness. A grid leak is unnecessary, but its use does not affect results.

There are only four stamped metal parts in the Magnavox tube in addition to the quarter ampere filament. The control electrode, unlike the highly intricate weave of fine wire common to previous tubes, consists of a single stamping of metal which is exceedingly solid and firmly fixed in position. The two plates are so firmly bound together that only a shock strong enough to break the tube itself would dislodge them. The entire inner assembly of the Magnavox tube represents a degree of rugged strength never before attained in a vacuum tube.

The base of the tube has no porcelain to crack or absorb water, nor moulded material to stick in the sockets. The base is made with insulation of the highest quality of cloth-inserted Bakelite, specially resistant to losses.

A special method used in pumping the tube gives a stable vacuum which can be uniformly reproduced in quantity production. The undesirable gasses are removed by a most efficient vacuum process.

To insure delivery to the ultimate consumer in perfect condition, Magnavox tubes are packed in individual wooden boxes with double seal. Each tube is tested by the dealer at the time of sale and the box resealed in the presence of the customer. As shown in the photograph on the first page of this article, the Magnavox tube has a distinctive appearance, its shape having been carefully worked out with a view to resisting accidental breakage while in use.

Notes on the Grimes-Briggs Neutrodyne

(Continued From Page 34)

howled. If we can eliminate this feature, I feel that the overload howl can very easily be overlooked because any one who uses this set for a week or two will very soon learn how to prevent this. It is entirely a matter of the proper setting of the grid tap switch on the loop.

This overload howl comes only when signals are being fed too strongly to the grid of the first tube. It means with local stations that we regularly set the grid switch on the second tap. This is for the Philadelphia stations which are fifteen miles away from us.

When we want to get the New York stations, we set the switch on the fifth tap and this gives us plenty of volume with no tendency to overload at all.

For distant stations, we go up on the switch, sometimes taking in twelve or thirteen taps or the whole loop. If the signals are rather weak, we will get them in good shape that way without an overload howl.

There is another thing that experimenters will notice in moving these grid taps and that is that it changes the setting of the first condenser.

In logging stations with this circuit the second and third dials can be logged accurately and that logging will be permanent. The first dial, however, will log differently with the switch blade on different taps of the loop. The lower the taps, the higher

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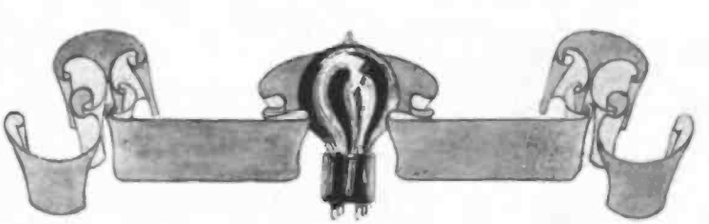
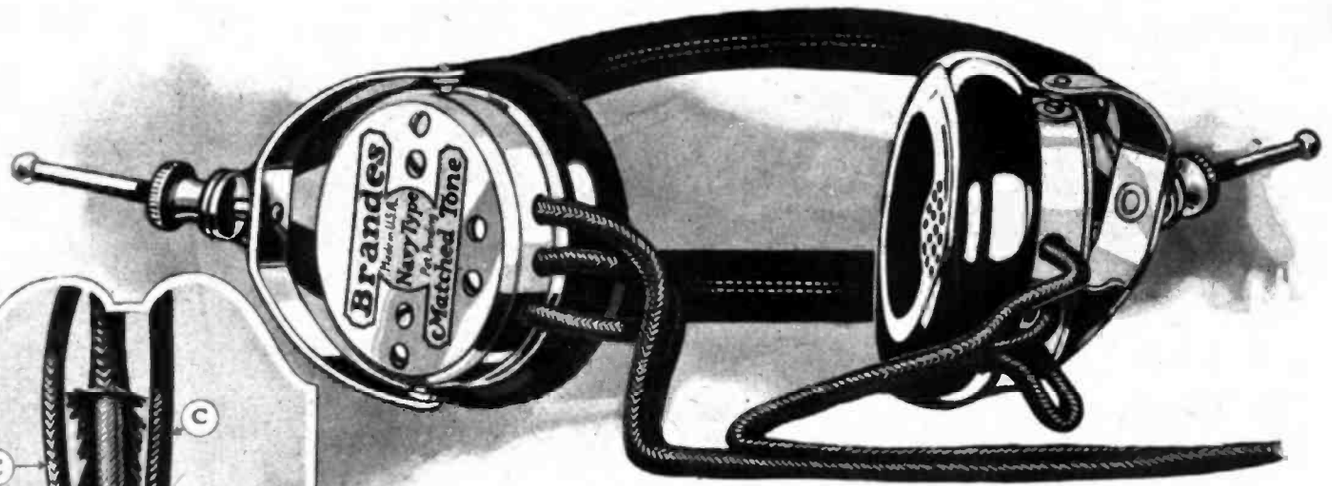




A—*Weather-proof cloth covering*

B—*Braided copper tinsel radio-frequency shield*

C—*Headset conductors (+ and -)*

3 *exclusive features of the* Navy Type Headset

TWO extra technical developments and one extra testing operation! These add clarity and distance. These are the three exclusive features which make the Brandes Navy Type the ideal long distance headset.

1.—The development of the braided copper tinsel radio-frequency shield [shown at the left] surrounds the conductor cords and grounds all radio-frequency currents which might cause detoning effects in the receivers. And in addition, it eliminates cord capacity.

2.—The use of inside terminals, so designed that the cords may be removed or replaced without taking off the cap of the receiver or in any way disturbing the perfectly matched tone.

3.—A very delicate testing operation matches the tone of the two receivers so that both ears hear exactly the same sound at the same instant.

And to assure absolute perfection of every detail, every Navy Type Headset must pass 22 different tests and inspections.

Brandes

Superior *Matched Tone* Headset $6
$7 in Canada

Table-Talker $10.
50¢ extra west of the Rockies
In Canada $14

Navy Type *Matched Tone* Headset $8
$11 in Canada

The name to know in Radio

Editorially Speaking

(Continued From Page 8)

for the services of a premier artist before a method has been evolved of broadcasting the artist's program to the greatest economic advantage. Should a famous operatic group of instrumentalist, hired for broadcasting purposes, make the circuit of hundreds of broadcasting stations in the United States to deliver its program to the public, or must the solution of the problem await the development of national, not merely local broadcasting facilities?

"From a technical standpoint, I believe the answer to the problem lies in super-broadcasting—a system of super-power stations broadcasting with a force that could be distinctly heard in every home in the United States. I mean a national program on a national scale, to be transmitted through the vast conduits of the air from the great super-power stations. In addition, there will be the smaller stations which will provide 'home-town' programs of local interest to all in their vicinity and who may also be provided with facilities for the automatic rebroadcasting of the national programs from distant points. In this way the local stations will also meet a social need particularly for those listeners having receivers of limited range.

"In seeking for an economic solution of the broadcasting problem, broadcasting on a national scale is found to be a very convincing answer. How obvious is the hopelessness of attempting to pay for the services of five hundred groups of high-grade artists broadcasting nightly from five hundred or more widely scattered stations, each serving only a limited audience. How could the small audience of such a station afford to pay for the sort of programs it really desires?

"Consider, on the other hand, the simplicity and feasibility of having six or a dozen groups of artists, each group broadcasting from a super-power station, to a national audience, representing the purchasing power of the radio industry.

"*Super-power broadcasting is the technical development which is needed for the success of broadcasting; and with a satisfactory technical solution of the broadcasting problem, I am convinced there will come a sound economic solution. This solution will make unnecessary the imposition of a special tax on the radio listener by the Government or any one else or the exaction of a system of tollgate payments for the things which are broadcast through the air.*

"I may be told, however, that in this I contradict a fundamental business principle—the principle that a service must be paid for by the consumer to make it economically possible. I do not believe that any solution of the broadcasting problem along the lines I sketch would violate economic realities.

"Now, what is the situation?

"The broadcasting station, unlike the theatre or the opera, cannot offer to individual listeners orchestra, balcony and gallery seats in the air. It cannot charge one price for a program transmitted to the rich man's house and another price for a program sent to the poor man's cottage. And yet some equivalent method should be found whereby every listener at least, in a measure, pays for the service in proportion to what he receives. Fortunately, the receiving set itself is to a considerable extent an index, through its cost, of what and how its owner is receiving. Those who purchase the more expensive receivers get more satisfaction from programs, either in superiority of the quality of reproduction, in more satisfactory operation over greater distances, in greater selectivity, in more ease of manipulation, or in more attractive receivers generally.

"*Broadcasting, in my judgment, will be primarily supported by the radio industry itself and from its returns on the sale of radio apparatus.*

"A fair method of determining the amount to be paid by each member or portion of the industry will be worked out, and this will be based on a percentage of the sales price of radio devices. Such a method is just, since it requires the expensive receiving set of greater capabilities to carry a larger share of the cost of broadcasting. And this plan is not at all a philanthropy nor a method which takes no account of economic facts. In the long run, the public thus supports the broadcasting which it enjoys, and each purchaser does so in proportion to the price paid for the instrument receiving through the air.

"*The radio industry must remain the primary agency for the direct support of broadcasting.* I do not shrink from the responsibility thus placed on the industry. The fact—and the inescapable fact—is that the radio industry has been built up and is dependent on the maintenance of a service to the public. The sooner this is recognized by the industry as a whole and the public as well, the sooner we shall arrive at the true solution of the broadcasting problem."

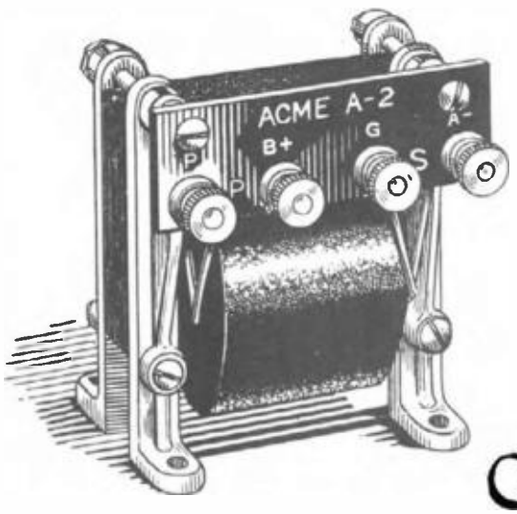
The other paper was another speech by Mr. Sarnoff, delivered before the semiannual convention of the Electrical Supply Jobbers' Association at the Hotel Statler, Buffalo, November the 15th, 1923. In this speech Mr. Sarnoff took so exactly the view that I expressed in my recent editorial that I am printing it here to give certain readers who don't like my stuff, anyway, the opportunity to use it as evidence that my editorial was merely a copy of Mr. Sarnoff's speech, and that nothing original is ever found in this magazine. Mr. Sarnoff said:

"Now, I always like to start my story about radio by discussing the broadcasting station itself, which, after all, is the crux of the situation. If you have not a proper service from the broadcast transmitting station, you have nothing whatsoever in radio. The broadcasting station is the all-important element, and I would remind you, too, that in this scramble for better and newer receivers and devices on the receiving side, the meaning of the broadcast sending station is often lost sight of. Much yet remains to be done there technically, in order to produce the desired result, and the change of the receiver and the improvement of the receiver are directly proportional to the things done technically at the sending end.

"Now, since we are building an industry of this magnitude, dependent solely upon the ability of the broadcasting station to transmit and deliver material in the home, it is perhaps permissible to pause here for a few moments and paint the picture of the present and the future of that phase of the radio situation.

"I believe that the present number of stations, 450, merely represents a transient phenomenon in the march of events. *I believe that most of these stations will go out of business in time.* But I say that with no fear, no regrets, nor any desire that any of them go out, because I think, speaking in a large sense, that they are doing no harm for the moment. But in their place will come a new picture of radio broadcast transmission, which I would like to christen the 'Super-power Broadcast Station'.

"More and more it is evident that the purpose of the broadcast station is to do those things which other agencies cannot do as well or at all. No other agency can speak with a single voice to 10,000,000 people. It is an instrumentality for national events, for high-grade talent, for good music, for good lectures, and the like, and therefore it means, in my judg-



After distance, what do you want?

Amplification without distortion,

OF COURSE, you want to hear the distant stations, but you want these loud and clear so a whole room full of people can understand.

And when you listen to a fine musical program from your local station it certainly is fascinating to get all the notes, all the words, and to be able to close your eyes and just be content.

If you use Acme Transformers in the set you build and insist on their use in the set you buy, you are giving your loudspeaker a chance to reproduce the singer's voice, the violin's notes, the orchestra or lecture, loud and clear, without distortion.

Send 10 cents today for 36-page book "Amplification Without Distortion," containing many practical wiring diagrams and many hints for getting the best out of your set.

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ment, that there will be erected in time a number, possibly half a dozen, possibly three, high-powered broadcast stations, suitably located—say one on the East Coast, another on the Pacific Coast, and a third either in the Southwest or thereabouts—and these super-power stations, joined together either by wire or by radio, preferably the latter, may constitute a chain of national broadcasting stations or a national broadcast service, each of these stations simultaneously radiating the same program, whatever it may be, with a power sufficient to reach every city, every town, every village, every hamlet, every home in the United States, and with power sufficient to give enjoyable loud-speaker operation, and with an organization capable of measuring up to the responsibilities of that character of a national service.

"All of this, gentlemen, is in embryo today, but in my judgment very certain to come about in time.

"In order to translate this picture, which may for the moment appear romantic, into practical technical details, I may tell you that it is not so difficult as it sounds. For example, we know we can send a telegraph message across the Atlantic by radio. We are doing it every day, and are handling more than twenty-five per cent of the business across the Atlantic in relation to the business handled by seventeen cables. We know we can talk across the ocean by radio-telephony. If we can talk across the ocean, we can talk across the continent. We are daily telegraphing by radio between our station in Long Island and our station in California, daily service on official messages. It merely means raising the power of the present broadcast station from half a kilowatt or one kilowatt to one hundred or two hundred kilowatts. This, technically speaking, is not a difficult matter.

"The development of the vacuum tube on the sending side has been entirely comparable to the development of the vacuum tube on the receiving side. We are now able to build vacuum tubes no larger than a milk bottle which radiate twenty kilowatts in the air. Five of these constitute one hundred kilowatts. This has been made possible by the General Electric Company, the Westinghouse Electric and Manufacturing Company and the Western Electric Company, all of whom are doing a tremendous amount of work on the development of the vacuum tube.

"Now, what happens when you get a broadcast picture of that kind? It seems to me that you bring into the fold for the first time the aspects of international broadcasting. You make it possible for people across the ocean to hear our entertainment, or whatever it is we have to send out. And, conversely, it becomes possible for us to hear the broadcast stations on the other side.

"Fortunately for this country, America leads and has led in radio development, not only in broadcasting, but alike in the matter of trans-oceanic and long-distance communication; and since it is possible to take a high-power station in New York and reradiate its output in California by radio, it is likewise possible to take a high-power station in London and reradiate its output to New York. In other words, radio can link these super-power stations until the whole world is covered by this new agency of transmission, which I think for simple reference may be called a one-way communication system. It is the only one-way communication system in the world.

"Now, how about supporting these broadcasting stations? You will pardon me, I hope, if I labor somewhat at length on this phase of the situation, because, as I have said, my feeling is that this is the most important branch of the whole industry. Who should support these broadcast stations? I promise you immunity, to begin with, from any fault-finding on that subject, or any complaints or accusations against competitors or others, *because I believe that the will to support broadcasting exists in the minds of most people who are in the industry.*

"To begin with, I don't think any one, especially an American, wants to get something for nothing. They want to do their share and make their contribution; but the difficulty of the moment is that no concrete plan, no well rounded-out program has been arrived at or submitted which would make it possible and convenient to work the thing out in co-operation.

"I do not despair of the future possibility of doing that very thing. But I do want to establish this point of view, and if there are those who differ with me in that point of view, let them be heard, because we need all the points of view we can get on this situation.

"It has been said by a great many people and a great many corporations, some very large and able, that broadcasting depends upon a solution of the problem whereby the consumer will pay for the entertainment which he receives. In other words, it has been said that unless some method is provided whereby a means is created for collecting revenue from the user of a broadcast machine, the whole industry is founded on sand, and that it is bound to collapse in time, because there will be no means of supporting it.

"I do want to go on record very definitely this morning, and for the first time, in saying to you that it is my firm conviction *that that sort of solution to the problem is not necessary, that broadcasting can be made commercially practicable without any means being found for collecting from the consumer*, that the greatest advantage of broadcasting lies in its universality, in its ability to reach everybody, everywhere, anywhere, in giving free entertainment, culture, instruction and all the items which constitute a program, in doing that which no other agency has yet been able to do; and it is up to us, with intelligence and technique and broadness of spirit and vision as to the future, to preserve that most delightful element in the whole situation—the freedom of radio.

"Just as soon as we destroy that freedom and universality of radio and confine it to only those who pay for it—those who pay for the service, in other words—just so soon as we make a broadcasting "narrowcasting," we destroy the fundamental of the whole situation. And, therefore, I believe very definitely *that broadcasting as constituted today is commercially sound, and that it will remain so in the future*, although there may be selective methods and narrowcast methods which will do no harm. These may supplement the situation. There may be wired-wireless and the like. All of these will make their contributions. But fundamentally there will remain and there must remain and be preserved that element of the broadcast situation which makes it possible for grand opera to go to the slums and to the districts of the poor as well as the rich, everywhere in the world, without any charge. The real picture of a $15 or a $25 set in the home of the slums, if you please, receiving the magnificent things in the air, is the picture we must preserve, and, I think, can preserve, without being entirely altruistic, and can do it on a business basis and through the means I have suggested, namely, the super-power station.

"If we get this chain of super-power stations and cover the entire country, then we create an entirely new problem as to the question of copyright music, paying for talent, handling the artist, and the like.

"I think, you will agree, it will be

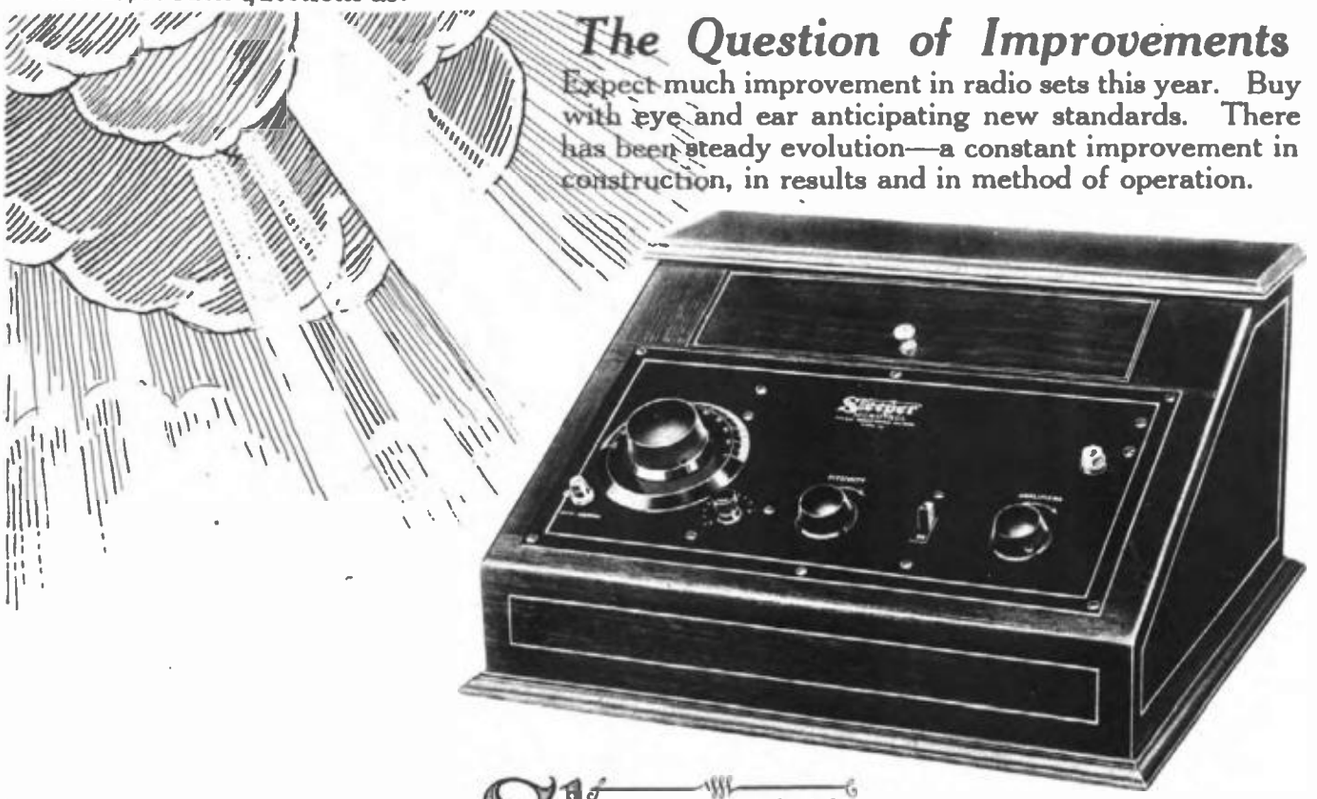
(Continued on Page 58)

How to Choose a Radio Set

Avoid the usual mistakes when buying your radio set. Write for a FREE copy of our book—"How to Choose a Radio." It tells how to judge by all important standards and discusses such questions as:

The Question of Improvements

Expect much improvement in radio sets this year. Buy with eye and ear anticipating new standards. There has been steady evolution—a constant improvement in construction, in results and in method of operation.



The New Sleeper TYPE 54

MONOTROL

REG. U.S. PAT. OFF.

Twenty-four important improvements have been added to the Sleeper Monotrol, Type 54.

A new principle in amplification has set an entirely new standard of tone quality.

A new type of tuning dial is calibrated in **wave lengths.** Simply turn to a known wave length and you get your station. You no longer have to "log" your set.

The advantages of tuned radio frequency have been added to the advantages of the Inverse Duplex System. The noisy detector tube has been eliminated—replaced by the Sleeper Rectiformer.

In fact, so much that is good has been added, that we cannot tell you all in this space. Write at once for booklet mentioned above and by all means, see, hear and operate the Monotrol before you buy a set of any kind. Any Authorized Monotrol Dealer will install the Monotrol in your home for a FREE trial. Buy it on **the most convenient terms of monthly payment,** if you wish.

DEALERS—under our Authorized Monotrol Dealer Plan you receive the strongest co-operation, greatest profit and protection against illegitimate competition it is possible to furnish. And the Sleeper Time Payment Plan enables you to offer convenient terms. Write your jobber, or to us, for details.

SLEEPER RADIO CORPORATION

Established 1919

432 Washington Ave. Long Island City, New York

CHICAGO
10 South La Salle St.

SAN FRANCISCO
110 New Montgomery St.

"The Most Perfect Radio Set in America"

The New Harkness Counterflex Circuit

(Continued From Page 37)

audio-frequency transformer. The correct capacity can be found by experiment.

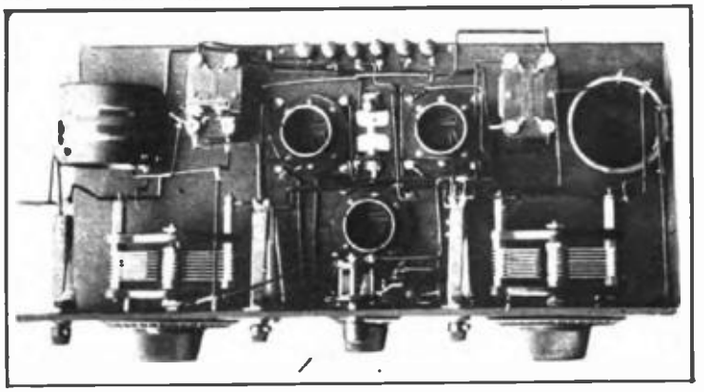
There are two methods of operating the Counterflex receiver. Both are simple, but the first method is absolutely fool-proof, viz.:

(1) After the manner of the neutrodyne receiver, adjust the counterdon so that it is impossible to make the receiver howl, no matter what the frequency to which the two circuits may be tuned. The counterdon can then be left permanently in this position and different stations tuned in by merely revolving the two tuning dials.

(2) After tuning in a station by means of the tuning dials, accurately adjust the counterdon so that the correct amount of counteraction is obtained to insure maximum sensitiveness for the reception of the particular frequency to which the circuits are tuned.

The second method is, of course, the preferable one as the receiver can be brought to the state of maximum sensitiveness by controlling counteraction.

I am particularly anxious to hear from the readers of this magazine of the results they obtain with this new circuit. Let me know how it compares with other receivers you own or have built. I think you are going to be somewhat amazed by the ease with which you are able to pick up distant stations with this system. I am inclined to be conservative in making claims for any circuit, but I have no hesitation in saying that I have yet to find the three-tube receiver which can approach the three-tube Counterflex for sensitiveness, selectivity and ease of operation. If you have any questions to ask, please do not hesitate to write me. I only ask that you tabulate your questions and make them as clear as possible. If I am unable to answer all questions individually I will answer them en masse in a future issue of *Radio in the Home*.



set your switch on tap five and then bring in some of the potentiometer so that there is no howl. This will give you more volume of signals than if you set your switch on tap four.

I believe, however, that the potentiometer for this set should be very much higher than the standard 400-ohm make. On our next set, we are going to use the very high resistance Federal potentiometer, and I think that that will be much more satisfactory.

And let me interrupt right here to explain again a part of Mr. Briggs' article which many readers overlooked. Dozens have written me that we showed no connections to the primary of the radio-frequency transformer. Certainly not. The primary is not used at all. The secondary is used only as a choke coil. A Ford spark coil secondary will do just as well.

One thing that I noticed which is very much in favor of this circuit and which I cannot quite understand, and that is the seeming absence of spark signals. I have never heard any spark signals on this set except from NAI, the United States Navy Yard, at Philadelphia, and this very powerful station is so close I would not expect to eliminate it with any kind of hook-up. Even at that it very seldom annoys us. This is a mystery to me because I cannot see why spark signals should be eliminated when radiophone signals come in with such very fine strength.

I have had a great many letters asking for detailed specifications of

(Continued on Page 59)

Notes on the Grimes-Briggs Neutrodyne

(Continued From Page 38)

will be the reading on the first condenser dial.

For the first week or two that I had this set, these overload howls were quite annoying until I learned this trick of coming down on the grid taps of the loop. Now, I never get a howl out of the set. Once you log most of the stations which you get regularly, you will set your grid tap first and then do your tuning. In this way there will be no howl.

The potentiometer is also an excellent assistance in regulating a finer adjustment between the taps on the loop. In other words, if you find you do not get a howl on tap four, but do get some howl on tap five, you can

Railroad President's Wife Teaches Bible by Radio

(Continued From Page 17)

of the Union Pacific Railway, and an authoritative student of the Bible.

Mrs. Gray for many years had whole-heartedly concentrated her being and her life upon the dispassionate and simple study of the Bible. She had early conceived a devotion to religious affairs due to the inspiring Christian traditions of her parents. These traditions were linked with the Christianity of the old Holland people; the strongest characteristic for which they are internationally reputed is their strength of character in standing by the truth regardless of consequences.

In spite of the fact that she was a little girl five years of age when she lost her mother, she grew to maturity firmly impressed with the necessity of preserving the religious standards of her forebears and of cultivating the old-fashioned home to the highest degree.

Through the broad commercial experience which she derived from immediate association with her husband in the administration of his office as chief executive of one of the largest railroads in the country, she had a splendid opportunity to study first hand the relations of business and of religion, and, incidentally, the newer

List of Leading Articles Which Appeared in

RADIO IN THE HOME

FROM JUNE, 1923, TO MAY, 1924, INCLUSIVE

The twelve issues contain many miscellaneous articles, editorials and numerous illustrations, in addition to those indexed below.

The price of the complete set of twelve issues is $2.00. Individual copies are 25 cents. We have only a few hundred complete sets available and advise prompt action if you wish to possess a complete set of back issues of *Radio in the Home.*

RADIO CIRCUITS, RECEIVERS AND APPARATUS

BROADCASTING STATIONS

DESCRIPTION AND ILLUSTRATIONS

THE RADIO KINDERGARTEN SERIES

The form below is for your convenience in ordering.

RADIO IN THE HOME,
608 Chestnut St., Phila., Pa.

Date .....

Enclosed find $2.00 for which please send me the 12 consecutive issues of *RADIO IN THE HOME*, from June 1923, to May 1924, inclusive.

Name..... Address.....
(Please print name and address to avoid error)

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tasks of womanhood, now engaged in industry and commercial production. After years of effort in the study and analysis of religious problems, she came to the simple but profound conclusion that the truths of God as they are written in the Bible are the sole constituted basis of true religion, and she immediately set out to establish this spiritual truth not through any particular creed, doctrine, sect or manner of organization, but through the simple, unaffected and sincere study of the Bible.

Mrs. Gray is a woman of great magnetic personality. Her vital, positive and constructive presentation of the contents of the Testaments soon met with a hearty response, and increasing demands for her services in the pulpit, on the platform and in the classroom soon began seriously to tax her physical capacities, and largely to encroach upon her home life.

It was at this moment that Mrs. Gray received the opportune offer from the executives of Radiophone WOAW to broadcast her lessons from this nationally famous station. In fact, radio solved all the critical problems which confronted Mrs. Gray, offering to her an audience of unprecedented numbers and of character varied, critical and anxious for her message.

Mrs. Gray then proceeded to bring into the homes of thousands of listeners in every part of the United States the simple, positive faith which seems so necessary in a world of unbelief and dissension. She made no pretense to any subtle metaphysics or any intricate method of reconciling modern evolutionary doctrines with ancient religious faith. She showed in her weekly broadcast lessons that the Word of God as written in the Bible is the basic truth of all Christian beliefs.

Then came the positive proof that the executives of WOAW had not erred in their choice of Mrs. Gray as the one person adequately equipped to carry out their conceptions of the need for the study of the Bible.

The thousands of letters which poured into the studio not only confirmed this choice, but indicated that all over the country men, women and children were waiting for some such development as this, showing that they intensely desired a simple interpretation of Biblical data in their original form.

Because of this inspiring response, Mrs. Gray has been impelled to continue her spiritual career with increased confidence and vigor. She has come to appreciate radio as an important factor in the development of that old-fashioned home which she conceived as the basis of her religious faith, and through radio she is bringing to unlimited numbers of homes her regenerating, religious message, contributing in the field of church organization as important and significant a service as that of her husband in the great system of national railways, serving in an economic way the needs of millions of people. This is really a fitting parallel of service—service which begets prosperity on one hand and service which begets morality on the other, and both are indispensable.

Mrs. Gray, as has been said, is the wife of Carl R. Gray, president of the Union Pacific Railway System, one of the highest salaried railway officials in the United States. The Union Pacific Railway is to the West what the Pennsylvania is to the people of the East.

Howard Gray, their son, is a graduate of Princeton, and was captain of the football team for 1923, being chosen as an all-American star.

The Grays are truly a wonderful family, and we are exceptionally fortunate in being able to get Mrs. Gray to handle the Bible Study Period which is a regular feature of this station every Sunday evening from 6:00 to 7:30 o'clock, with the exception of the months of July and August, at which time she in company with her family and friends go to their summer home in Maine.

Mrs. Gray devotes three days each week to the preparation of the lesson she prepares for broadcast. The balance of her time is principally spent in preparation for her Bible Class at the First Baptist Church, of Omaha, which she directs every Sunday morning.

A Cooking Class of a Half-Million Pupils

(Continued From Page 23)

Mrs. Nena Badenock, of the University of Chicago. This contains the favorite recipes and answers the problems of simplified cookery which have been so often asked for.

A cooking class of half a million is a responsibility which might cause some to hesitate, but with a personality like Mrs. Peterson, the home is strengthened, and hearts are happier, for you and I know the time worn adage which says, in context—

"The way to a man's heart is the way of three well-cooked meals a day."

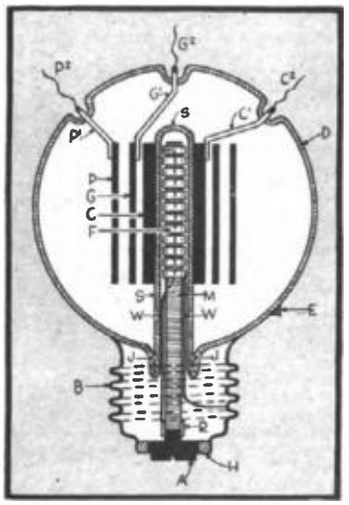
Miss Vivette Gorman, who broadcasts the children's luncheon menus as well as the Sunday night supper hints

New 110-Volt Tube Has Replaceable Filament

(Continued From Page 28)

the thin walls of the quartz glass stem and immediately heats the oxide impregnated cathode. As soon as the outer surface of the latter becomes a dull red in color, it will profusely emit the electrons so necessary in the operation of any vacuum tube. It is then only necessary to connect the grid, plate and cathode leads in practically any circuit, and we are ready to enjoy reception equal to the best "A" battery tube on the market.

When, after a long and strenuous life, the heating element does burn



out, it is only necessary to unscrew and remove contact stud A. This carries with it the heating element and support.

A complete replacement will be purchaseable for about seventy-five cents, and it is simply substituted for the one just removed, thus giving a practically new tube.

This tube, as well as the one illustrated previously, will work in practically any receiving circuit known. It should be remembered, however, that in no case should the cathode be grounded for, if it is, the chances are that an A. C. hum will be developed that will entirely defeat the object of the tube.

Parts Designation for 110-Volt Refillable Tube

A —Contact stud, threaded to screw into insulating material H.
B —Edison lamp base permanently fastened to bulb D.
C —Oxide impregnated cathode.
C' —Cathode support.
C"—Cathode connecting lead wire.
D —Glass bulb.
E —Exhaustion tip.
F —Heating element wound with "nichrome" ribbon.
G —Grid.
G' —Grid support.
G"—Grid connecting lead wire.
H —Insulating material.
P —Plate.
P' —Plate support.
P"—Plate connecting lead wire.
M —"Alundum" form for supporting heating element F.
R —Metallic collar for attaching M to A.
S —Quartz glass stem.
W —Lead wires, copper, from heating element.

3XP Style Wire-Ups of the New Harkness Counterflex

(Continued From Page 16)

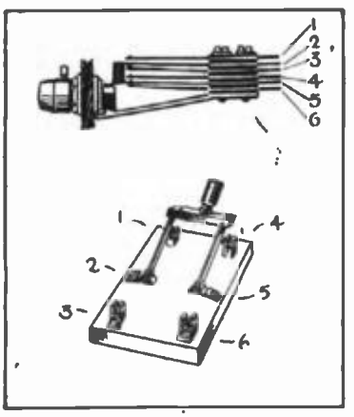
leak. The condenser should be about capacity .00025, and the grid leak about one megohm or more.

Number 10 is the second counterformer, directions for winding given by Mr. Harkness.

Numbers 11, 13, 14, 16 and 18 are jacks and "jack switches." These can be either the new Yaxley or the well-known Carter type or any other standard type.

Numbers 11, 13 and 18 are jack switches—that is, they are switches made in the form of a jack for convenience in mounting on a panel. The knob on the front turns from one side to the other and changes the contacts. Both Yaxley and Carter make very fine jack switches of this kind and they are most convenient.

In this particular case, number 11 is a single pole, double-throw switch. You can use the ordinary knife blade if you want to in this connection, in which case you can easily figure out the contacts for yourself. Number 13 is merely a single pole single-throw switch for making contact for filament lighting. Here again, a knife type of switch can be used if desired. Number 16 is an ordinary filament lighting jack for the last stage of amplification. Plugging in here lights the tube in socket number 9, and when you withdraw the plug, that tube is disconnected from the batteries and



you can put your plug into jack number 14 to listen in on one stage of audio only.

Number 18 is a jack switch which is equivalent to a double pole double-throw switch. Here again the regular knife type can be used and we are showing a drawing of this particular jack switch and also of the ordinary knife type, and the numbers on the contacts are identical.

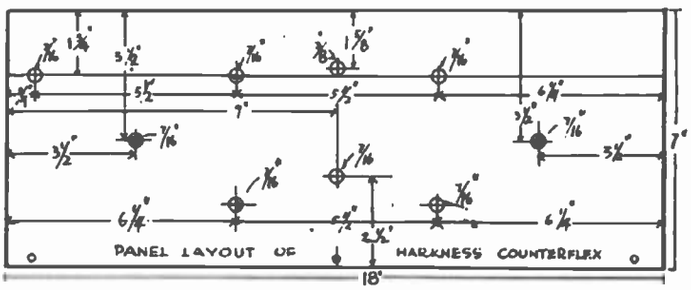
Numbers 12 and 19 are variable condensers and should not be greater than .0003 mfd. capacity.

Number 15 is any small vernier condenser. Our photographs show the Chelten midget, but we also used the Marco and the Rathbun three plate. Number 17 is an ordinary rheostat for controlling all of the tubes.

Once more we have used Celatsite wire in this hookup—in fact, we now use it exclusively in hooking up all of our stuff at 3XP.

Now that we have everything laid out, let us get at the wiring, following the diagrams closely and then, after the set is all wired up, have somebody read to us the following checkup lists while we go over the actual set and see that every wire is put in as it should be. Here are the checkup lists:

Diagram Number 2: Positivt filament leads—from plus A binding post



on binding post block number 1 to minus B binding post on the same block.

From plus A binding post on block number 1 to positive filament connection of socket number 6.

Positive filament connection of socket number 6 to positive connection of socket number 8.

Positive filament of socket number 8 to the top blade of jack number 16. From next to the top blade of jack number 16 to the positive filament post on socket number 9.

Diagram Number 3—negative filament leads: From negative A binding post block number 1 to filament connection on transformer 3.

From filament connection on transformer number 3 to the right-hand contact of fixed condenser number 2.

From the left-hand contact of fixed condenser number 2 to grid binding post on transformer number 3.

From the negative A binding post on block number 1 to the filament binding post on transformer number 4.

From the filament binding post on number 4 to the top blade of jack switch number 13.

From the lower blade of number 13 to left-hand contact of rheostat number 17.

From the right-hand connection of rheostat number 17 to negative filament connection of socket number 9.

From negative filament socket number 9 to negative filament connection of socket number 8.

From negative connection of socket number 8 to negative connection of socket number 6.

Diagram Number 4 — B battery leads: From detector B binding post on block number 1 to B battery binding post on transformer number 3.

From plate binding post on transformer number 3 to plate connection of socket number 8.

From amplifier binding post on block number 1 to the bottom blade of jack number 16.

From bottom blade of jack number 16 to bottom blade of jack number 14. (When I say bottom blade of any jack I mean the blade which is nearest to the frame.)

From the next to the bottom blade

on jack number 14 to B battery binding post on transformer number 4.

From next to top blade on jack number 14 to plate binding post on transformer number 4.

From next to bottom blade on jack number 16 to plate connection on socket number 9.

Diagram number 5—coil secondaries: From grid connection on transformer number 3 to S2 on counterformer number 5.

From S2 on counterformer number 5 to rotor connection of variable condenser number 12.

From rotor connection of variable condenser number 12 to rotor connection of counterformer condenser number 15.

From stator of counteracting condenser number 15 to number 3 contact on double pole, double-throw switch jack number 18. (Number 3 meaning number number 3 from the bottom.)

From S1 on counterformer number 5 to stator plates of variable condenser number 12.

From stator plates of variable condenser number 12 to grid connection of socket number 6.

From grid connection of transformer number 4 to grid connection of socket number 9.

From grid connection of socket number 8 to front connection of grid condenser and grid leak number 7.

From back connection of grid leak and condenser number 7 to S2 on counterformer number 10.

From S2 on counterformer 10 to stator plates of variable condenser number 19.

From rotor plates of variable condenser number 19 to S1 on counterformer number 10.

From S1 on counterformer number 10 to positive filament connection on socket number 8.

Diagram Number 6—switch connections: From aerial binding post on binding post block number 1 to center blade of jack switch number 11.

From top blade of number 11 to P1 of counterformer number 5.

From P2 the mid-tap of counterformer number 5 to bottom blade of jack switch number 11.

From P3 of counterformer number 5 to ground binding post on binding post block number 1.

From blade 1, or bottom, on double pole, double-throw switch jack number 18 to blade 6 on that same switch jack.

From number 3 on that switch jack to number 4 on that same switch jack.

From plate binding post on socket number 6 to number 2 blade on switch jack number 18.

From blade number 5 of jack switch number 18 to top blade of jack number 14.

From P1 of counterformer number 10 to blade number 1, or bottom, of switch number 18.

From P2 of counterformer number 10 to connection between blades 3 and 4 of jack switch number 18.

There; that's all.

How Far Will This Set Receive?

(Continued From Page 36)

and results are carefully noted. This is a fairly good location. Then I send the set to one of my friends in a better location and note the results he gets. Next time the set goes to another friend in a poor location and his results are noted. In this way I am able to check up on the receiver and see how it compares with other receivers.

Let us take, for example, the spider-web portable set I described in one of the past issues of this magazine. When tested at my home I found that it was a fairly good receiver—not as good as some I have—but here it had a range of about nine hundred miles.

I sent it to one of my friends in a good location, and he reported ex-

(Continued on Page 62)

New Sets of The Season

(Continued From Page 21)

trouble to become even moderately expert.

This Pfanstiehl set, by the way, embodies the nearest approach to a new principle that is in sight at the present time. And yet, while there is considerable originality in Pfanstiehl's system, it also is a refinement and advancement rather than a revolution.

Mr. Pfanstiehl, in studying other sets using radio-frequency amplification, became convinced that most of the radio engineers of the present day were working along the wrong line in trying to overcome some of the troubles developed when more than one stage of tuned radio-frequency amplification is used. The principle trouble was that the tubes had a tendency to feed back into the various circuits and thus cause squeals and whistles or instability of operation.

Radio engineers have always said that this was caused by what they called the "inherent capacity" of the tubes themselves—that is, that the elements inside the glass bulb of the tube formed a small condenser, and this condenser was sufficient to pass radio-frequency currents and allow them to get back again into other circuits where they were not wanted.

Pfanstiehl was not satisfied with this explanation. Neither did he consider it scientifically correct to introduce into the circuits any element which would cause a loss of energy merely to overcome this tendency for the tubes to feed back. He felt that it was wrong to devise a system which was designed to deliver the greatest possible amount of energy from the least energy received, and then to introduce into the circuit apparatus or methods which would cause losses and reduce the amount of energy which could be delivered.

Pfanstiehl felt that the explanation of the inherent capacity in the tubes was not sufficient to account for all of the feed back that was causing so much trouble. He himself is a physicist and went at the problem from the physicist's viewpoint.

He designed an extremely delicate form of electrophorus by means of which he was able to explore all of the invisible electro-magnetic and electro-static fields inside of the radio set itself while it was in operation. He discovered just what he had expected—a clashing and interference of one field with another and consequent distortion of all fields.

In other words, as Mr. Pfanstiehl expressed it to the writer not long ago, if each field could have been made visible and could have been stained a different color, the inside of a radio set in operation would look very much like a kaleidoscope.

He, therefore, assumed that these clashing and distorting fileds were responsible for most of the trouble, and he attacked the problem with the viewpoint of so designing coils and

Another make of the Radiola line suggests the receivers which are so familiar in England

Here is the famous Fada "One-sixty" which was such a favorite last season, and is again on the market this year

so placing apparatus that each piece of apparatus could have its own electro-static and electro-magnetic fields to itself without having the fields of any other instrument clash with it and distort it.

His investigations led him to the belief that the coil wound upon a cylinder was bad in the cramped room made necessary because of consideration of space in the modern radio set. These cylindrical coils have very large electro-static and electro-magnetic fields which are likely to become almost as big as a football. It is therefore impossible to use them in a set of ordinary size without placing other instruments inside of this field and so introducing distortion.

Pfanstiehl himself has for many years been a manufacturer of flat spiderweb self-supporting coils. He came into prominence in this particular phase of radio first when he designed the standard flat spiderweb coil used originally in the famous Reinartz tuner, and he has ever since made a special study of these coils.

With this thought in mind, he began exploring the fields of these flat coils, not only around the outside of them but within the circular space inclosed by the windings, and he soon figured out the size and type of coil which could be used in a radio set, and which had a field so flat and disc shape that nearby instruments were not likely to interfere and cause distortion.

That is the principle upon which Pfanstiehl has built this new model 7. It consists of two stages of tuned radio-frequency amplification, detector and two stages of audio-frequency amplification. As there is no necessity for introducing instruments which cause losses in the radio-frequency circuit, this arrangement brings to the detector tube a stronger signal than would ordinarily be brought there, and so Mr. Pfanstiehl is able to use low ratio transformers in his audio-frequency stages and so attain the same amount of volume with the better quality which low ratio gives.

This Pfanstiehl set is one of the outstanding features of this season and is considered by engineers who have studied it to be likely to take its place among the best of the standard radio systems.

This, then, is the situation as we face it at the present time for this season.

We have passed the craze stage; we have gone beyond the day when it required an expert to operate a radio set, and we are now in a position where we can stand face to face with the advocates of the talking machine and defy them to equal the results which we can achieve in pure reproduction, and we can claim also the added fascination of the miracle of radio together with the fact that radio can bring to our homes events which are totally beyond the possibilities of any talking machine.

To revert, then, once more to the editorial in which we said that radio would never become what it should be until it was able to produce the quality of the phonograph together with its ease of operation;—

This season has seen that time arrive. We can surpass the phonograph in quality, and although we cannot claim quite the ease of operation, still we have many sets that are so extremely easy to tune and handle that it would really be a shame to make them any easier because they would then become nothing but merely mechanical instruments, and there would be none of the personal joy of finding new stations which is one of the most fascinating parts of radio reception.

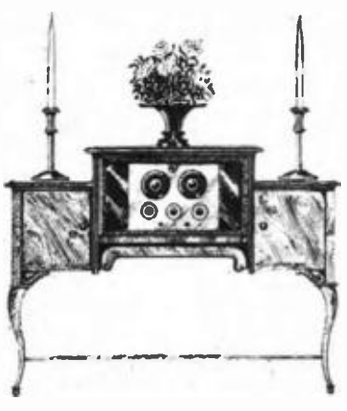
Fada now makes a neutrodyne with only two main controls

Our Favorite Loop at Station 3XP

(Continued From Page 35)

is used. The insulating strips on which the loop is wound are advisable in the case of all loops made on wooden frames. Never wind a loop on wood, even though the wires may be well insulated. Wood absorbs dampness and dampness between the turns causes losses of energy. If you varnish the wood to prevent the dampness, the varnish is likely to cause more losses than the dampness—and there you are.

Use strips of Radion or formica.



OFFICERS OF RADIO MANUFACTURERS' ASSOCIATION

Left—Frank Reichmann, Vice Pres. Above—Major Herbert Frost, Pres. Right—A. J. Carter, Secy. and Treas.

Manufacturers Organize a National Association to Protect the Industry

CHICAGO, Sept. 15.

A FEW weeks ago six Chicago radio manufacturers, meeting at dinner, decided that the time had come to organize an association of manufacturers for the purpose of improving and stabilizing the industry. Several nights later they saw the plan carried well forward toward success when the Radio Manufacturers' Association was organized at a meeting in the Hotel Sherman, attended by representatives of more than forty concerns representing more than one hundred million dollars in the industry. Manufacturers as far away as New York were represented in the organization, which is to cover the entire United States and Canada.

Major Herbert H. Frost was unanimously elected president, Frank Reichmann, vice president, and A. J. Carter, secretary-treasurer. They, with A. A. Howard, E. N. Rauland, Philip Lenz, Jr., and J. McWilliams Stone, form the Board of Directors. Charles H. Porter was named as executive secretary, and the law firm of Urion, Drucker, Reichmann & Boutell as counsel to the association. Two vacancies were left on the board to allow for future growth of the association.

"Between the time we first decided on the association and the time we effected the permanent organization we had to go through the tax fight in Washington," said President Frost. "The proposed tax of 10 per cent, collected at the source, would have meant an increase of more than 20 per cent to the consumer, and would have cost the manufacturers many thousands of dollars in accounting, etc. That fight taught us that the interests of the manufacturer and the listener and the broadcaster are identical. We are organized, the listeners are organizing and so are the broadcasters. Then all can work together with the other elements in the industry to prevent these attacks.

"Our association is open to every reputable, financially responsible manufacturer in the United States and Canada, and we want them all to join. We are not using any promoters to form this association. It is a case of the manufacturers organizing themselves, and we are going to do a good job of it. The officers and the committees have been selected from the men who will give their time and thought to the association. There will be no figureheads."

Among the firms already in the association, with the applications of many others pending, are:

American Art Mach. Co.
Multiple Electric Products Co., Inc.
The Reichmann Co.
Belden Manufacturing Co.
Herbert H. Frost, Inc.
Howard Radio Co., Inc.
Carter Radio Co.
Rauland Manufacturing Co.
Premier Electric Co.
Dudlo Electric Co.
Trimm Radio Mfg. Co.
Runzel-Lenz Electrical Mfg. Co.
Electrical Research Laboratories
The Operadio Corp.
Walbert Electric Co.
Central Radio Laboratories
Globe Electric Co.
Raven Radio, Inc.
Leslie F. Muter Co.
Jefferson Electric Co.
Bremer-Tully Mfg. Co.
The Ekko Company.
Rathbun Mfg. Co.
Western Coil & Electric Co.
American Electric Co.
Walnart Electric Mfg. Co.
H. G. Saal Co.
Thordarson Electric Mfg. Co.
Fansteel Products Co.
Columbia Radio Corp.
Buell Mfg. Co.
French Battery & Carbon Co.
Pfanstiehl Radio Service Co.
Puritan Distributors, Inc.
Seaman Container Co.
Howard B. Jones
Willard Storage Battery Co.
United Mfg. & Distributing Co.
Zenith Radio Corp.
Crosley Radio Corp.

Standing committees are as follows:

Officers

President, Major Herbert H. Frost, Herbert H. Frost, Inc.; vice president,

(Continued on Page 62)

J. McWilliams Stone, Director

A. A. Howard, Director

E. N. Rauland, Director

LESSON XII

The Radio Kindergarten

By H.M.N

YOU will hear many people say that they are not going to buy a radio set "just yet" because radio is only in its infancy and is likely to change completely almost overnight. This impression is very widespread and is unquestionably hampering the growth of our hobby among the general public.

Now there is no denying that radio, as we know it today, is truly in its infancy. But to say that it is likely to undergo a complete change almost overnight is to shut our eyes to the most significant facts in the case. While radio—as radio—is in its infancy, we must not forget that the science is, to a certain extent, an assembly of instruments which have been in wide use for many years. These instruments have been developed by the greatest specialists, with the most ample resources of finances and scientific opportunities, and, as we know the instruments now, they are fully matured and the best that science has been able to give us. It is not likely that there will be any radical change in them unless—and until—some totally new principle is discovered.

Let us take just one phase of this as the subject for this lesson in our Kindergarten series.

The great, crying demand in radio today is for *quality* in reproduction. We want the concerts reproduced so exactly that we can really close our eyes and listen without being able to detect the slightest difference between what our sets give us and what we would hear if the concert were actually being given in our home.

You will hear a great many ardent fans declare that their sets do actually give them such reproduction. In order to avoid the use of a short and ugly word, we will admit that the power of auto-suggestion is a tremendous factor in radio. In the old days when I was a ship's operator, we use to call it "imaginitis."

Unfortunately, it is impossible to get really perfect reproduction from a telephone, a phonograph, a dictating machine or a radio set. This is a sweeping statement, but we will prove it scientifically in this Kindergarten lesson.

The reason is summed up in one word—*the diaphragm.*

Until science develops a reproducing device based upon a totally different principle, the telephone, the phonograph, the dictating machine and the radio set will all give us distorted and unnatural reproduction except within extremely limited ranges of notes and tones. And right here is where I think there lies the most useful and the most profitable field for original research and inventive genius. Manufacturers today have developed most wonderful head phones and loud speakers, considering the handicap which the necessary use of the diaphragm imposes upon them. But unfortunately we also use a diaphragm in the broadcasting studio, and even if we did have the perfect reproducer in our homes it would reproduce the distortions and defects of that transmitting diaphragm.

Only recently, I had an excellent proof of the influence of psychology on the listeners-in. Station WIP, Gimbel Brothers, in Philadelphia, has this summer been operating a remote control station on the Steel Pier in Atlantic City—incidentally, one of the very best things that that fine station has ever done. One of its regular features has been the broadcasting of the sound of the breakers on the shore.

Before putting this daily feature on, the announcer has told what was coming, has described the delightfully cool breezes of the seashore while the cities sweltered and then has invited the listeners to take an imaginary dip in the surf while the sound of the waves was transmitted.

And then the microphone among the breakers was switched on and the listeners-in, their imaginations properly attuned by the announcer, were prepared to swear by the Koran, the Bible and the writings of Confucius that the reproduction was perfect. But was it? One night I had it on my set when a neighbor dropped in for a visit. After greetings he turned to the radio set, listened a moment and then said. "Gee! Static's frightful tonight, isn't it?"

And, as a matter of fact, that is exactly what it sounded like. WIP's transmitting diaphragm and my receiving diaphragm were scientifically incapable of reproducing the sibilant, swishing sounds of the waves, with their complicated "overtones," and it was only because the announcer had told us what it was that our imaginations were able to supply the missing sounds.

If you have been a "radio fan" for any length of time perhaps you have noticed that:

1. The much despised crystal set, in point of clearness, is away above any tube set yet devised, whether or not the latter uses a regenerative circuit.

2. Next to a crystal set, the clearest reception is that obtained on a set using but a single tube in a non-regenerative circuit.

3. Making the circuit regenerative or adding more tubes, instead of preserving the clearness obtained on the non-regenerative detector, only serves to cause distortion, more or less pronounced.

4. When listening to a local broadcasting station with any type of receiving set, exclusive of the crystal, the clarity of reception is increased in direct proportion as the signal strength is diminished.

5. On the same station, and under the same conditions, almost any kind of a phone gives clearer reproduction than almost any kind of a loud speaker.

6. A single instrument played by radio comes through clearer and much more easily understood, either on phones or loud speaker, than does an orchestra.

7. There is a vast difference between the voice that issues from the human throat, or a tone played by a single musical instrument, and that which comes from the best, present day loud speaker or phonograph. If you don't believe it, just compare them!

Most manufacturers endeavor to remedy these short-comings in one or more of the following ways:

1. By improving their receiving sets.
2. By improving existing phones.
3. By improving existing loud speakers.

Dr. Alexander Graham Bell used a diaphragm in his early telephone. There is no more reason for us to continue its use, however, than for us to continue using the oil lamps of our grandparents.

An ordinary telephone instrument, while admirably suited to the transmission and reproduction of the human voice, *was designed for that specific purpose—and for that purpose only*—no thought could possibly have been entertained by its inventor

that his receiver would be called upon, in the future, to render music!

Every loud speaker, phone or phonograph reproducer is esentially alike in that they all, without exception, depend for their operation upon the action of some form of diaphragm.

A diaphragm, whether used on a loud speaker, head telephone or phonograph reproducer, to be of any use, must vibrate; and the *amplitude* of its vibrations governs the intensity of the sound it emits. The greater the distance traveled by the center of the diaphragm during any one vibration, the greater the volume of sound.

Let us assume that we have our radio receiving set tuned to our favorite broadcasting station and that we are listening to a violin solo. At a given instant, the violin is striking a note that is equivalent, let us say, to 1000 cycles or vibrations per second, and that the microphone and associated apparatus at the broadcasting station are capable of transmitting this note without distortion.

In order that the diaphragm on our phones or loud speaker reproduce this particular note with fidelity, it, too, must vibrate 1000 times per second. This it can readily do, and the resultant note is pleasing to the ear—an exact reproduction of the note played at the transmitting station.

If, however, the diaphragm vibrated at any other frequency, the note received would not be the same as the one transmitted.

Suppose, now, that instead of the violin playing alone, there is a saxophone accompanying it. At the same instant that the violin is playing a 1000 cycle note, the saxophone is sending forth a note that is equivalent to only 300 cycles per second Following the above reasoning, it will now be necessary for our diaphragm to vibrate both 1000 and 300 times per second at the same time; a condition which is, manifestly, impossible.

Due to its "inertia," a diaphragm can vibrate efficiently at but one frequency at a time, which, in this particular case, would be governed by the comparative strength of the two notes. If the violin were the louder, the diaphragm would tend to vibrate 1000 times per second, repressing the 300 cycle note. If the saxaphone were the louder, the tendency would to toward the 300 cycle note, repressing that of 1000 cycles. If both notes were of equal strength, the diaphragm would try to compromise with a note of about 650 cycles per second. In any case we would have a mild form of distortion.

This applies, greatly augmented and much more pronounced, if, instead of a violin and saxophone, we are listening to an orchestra. Here we have, not two, but upwards of 40 instruments being played at the same time, each with an individual, different frequency. Imagine the feat in mechanical acrobatics the diaphragm would have to undergo to reproduce them all!

If we have an undistorting, fully modulated transmitter, advantageously located with respect to the receiver, and an undistorting receiving set connected to the best loud speaker or phone now on the market, the clearness of reproduction will be in inverse proportion to the signal strength.

This statement does not presume that there will be no distortion on the lesser volume; only that the distortion and signal strength will decrease at the same rate. The distortion is, nevertheless, present but, since both signal strength and distortion are reduced in volume, it is not as perceptible or objectionable.

Neglecting the distortion inherent in many multi-tube receiving sets, this is the reason why no amplified reproduction designed up to the present time can compare in clarity and faithful reproduction with the crystal set and head phones of almost by-gone days!

Please do not gather from this article that there is going to be any immediate revolution in this matter. The diaphragm method of reproduction has been the best that science has been able to evolve in a good many years of experimentation and I doubt if there will be a change until some totally new method is devised.

The inefficiency of the diaphragm as a means of converting electrical vibration into sound has been pointed out in many places and nowhere more emphatically than in a paper published in the Journal of the Franklin Institute for May, 1919, by Lewis Z. King.

In the five years which have passed since the publication of this paper, loud speakers, head telephones, phonograph reproducers and microphone transmitters have all been very much improved and yet the principle is the same and the defects which Professor King pointed out are still inherent in all of these instruments.

Professor King's paper was highly technical and full of mathematical formulae which would be totally beyond the average pupil in this kindergarten but the conclusions which he reached are understandable by anyone.

We all know that every diaphragm has what we call a "natural period" of vibration of its own. This is what we call its "resonance frequency." Professor King showed that when the incoming signal is the same as the natural frequency of the diaphragm, the diaphragm gives out its maximum efficiency in the form of sound.

Considering this resonance frequency, or maximum efficiency, as 1, and assuming that the frequency is somewhere around 1000, Professor King showed that when the frequency of the signal is raised to 1043, the efficiency drops down to .857 and when the frequency of the signal is raised to 1137, the efficiency drops to .018.

A similar condition takes place when the frequency of the incoming signal is lower than that of the resonance frequency and, with a resonance frequency of 1020, a signal frequency of 429 lowers the efficiency of the sound production to .0016.

These figures are all on the assumption that resonance frequency is represented by figure 1 and form an excellent basis for comparison between the efficiencies of the diaphragm reproducing sound at various other frequencies.

Professor King summarized his experiments by saying:

"Keeping in mind that the resonance efficiency as already deduced is in the neighborhood of .004; it will be deduced from the above table that the efficiency over the ordinary range of frequencies is extremely low, amounting to only a few parts in a hundred thousand or a million.

"It is thus evident that the telephone receiver, considered as a means for transforming electrical energy into acoustic output, is an extremely inefficient instrument. It remains for future research to determine the location of the energy losses and to remove their cause if possible."

Since Professor King's experiments, science has done almost marvels in improving the quality of the output of various instruments using diaphragms. Improved diaphragms have very much lessened the great inequalities of signals at different frequencies.

All of this has been an improvement, however, and does not alter the fact that the diaphragm is inherently incapable of perfection.

In radio, we are absolutely at the mercy of the diaphragm.

At the transmitting studio, there is the diaphragm in the microphone which picks up the original sound of the music or voice. This diaphragm,

(Continued on Page 58)

Slant of the Trade on Radio

"TRADE-IN" VALUES SET FOR RADIO RECEIVERS BY LOS ANGELES DEALERS

By DR. RALPH L. POWER

LOS ANGELES, Sept. 20.

THE radio division of the Music Trades Association of Southern California has thoroughly investigated the local situation in regard to allowances for radio sets returned in partial exchange for new sets. The prevailing custom of doing this in the automobile, piano and phonograph business has literally driven the radio dealers to follow suit. Their recommendations are embraced under the following schedule:

Allowance on radio set one month old—less 15 per cent today's list price.

Allowance on radio set two months old—less 30 per cent today's list price.

Allowance on radio set three months old—less 45 per cent today's list price.

Allowance on radio set four months old—less 50 per cent today's list price.

Allowance on radio set five months old—less 55 per cent today's list price.

Allowance on radio set six months old—less 60 per cent today's list price.

Allowance on radio set seven months old—less 65 per cent today's list price.

Allowance on radio set eight months old—less 70 per cent today's list price.

Allowance on radio set nine months old—less 75 per cent today's list price.

Allowance on radio set ten months old—less 80 per cent today's list price.

After ten months the committee states that it believes that the allowance—if given at all—shou'd be 90 per cent or more off today's list price.

The new radio station for Hollywood to be operated by the Los Angeles Evening Express will be known as the Associated Broadcast Station, although official call letters have not as yet been designated for the station. The equipment will be Western Electric Company, 500 watts, with a wave length of 337 meters.

The Radio Jobbers and Distributors' Association of Southern California now holds its meetings bi-monthly.

The radio division of the Music Trades Association is sponsoring a series of twelve five-minute talks Saturday evenings from the Examiner Studio, KFI.

Prices of receiving sets have been materially decreased locally due primarily to the drop in certain types of loud speakers as well as batteries and other parts.

The Los Angeles stores find it advantageous to keep open house at least two evenings a week for out-of-town customers from the outlying regions.

Charles Wellman, one of KYW's favorite songsters, has left Chicago for Los Angeles, where he is connected with a local radio shop. He will soon be heard from a local station.

Increased power of sending stations and more sensitive receivers are materially assisting radio activities here. The so-called summer slump is passing into history. One of the radio jobbers has just said, "If business were never worse than now we could not kick."

New sets on the local market include the Gilfillan neutrodyne, Californian, Wright radio and A-C Dayton receiver.

Uncle Remus, of KHJ—the Times—who has entertained thousands of radioland people with his droll Negro stories, songs and harmonica selections, has opened Uncle Remus' Radio Service Stations.

With the advent of the new Express station all Los Angeles newspapers broadcast through their own station or through remote control with the exception of the Record.

Bands galore have entertained Southern California's radioland lately, Paul Biese's champion Victor Recording Band, Vincent Lopez and his orchestra, and Isham Jones and his Brunswick Recording Orchestra being the most popular.

Among the new local radio stores is an international establishment where three languages are spoken by the salesmen and technicians.

The San Francisco Radio Show, held from August 16 to 21, inclusive, proved satisfactory both in point of attendance and interest shown. Complete sets and parts were shown in nearly 150 booths by manufacturers and dealers. The Navy Department also occupied an exhibition booth. Mornings were used for trade meetings and afternoons and evenings the show was open to the public.

The American Radio Exposition Company, which manages a radio show annually in New York and Los Angeles, will hold the next Western gathering in Los Angeles the week of January 25. The first show, held in the Biltmore Hotel early last February, was well attended. It is believed that the former quarters will hardly be adequate to accommodate the next exhibit.

The prevailing shortage of power in Southern California, due to insufficient rainfall, has been a matter of considerable local concern. Street-car stops have been eliminated, street lights have been discontinued on moonlight nights, and other electrical services seriously curtailed. Radio announcements have been made to ask householders to shut off the electricity and listen to the radio in the dark. The shortage has also encouraged moonlight dances at the various dance pavilions.

NEW EVEREADY BATTERY LEADS ALL OTHER ITEMS IN PHILADELPHIA'S SALES

PHILADELPHIA, Sept. 20.

WITH the summer almost ended and cooler evenings becoming more frequent, there was a decided improvement in business during the latter half of last month in the Philadelphia district.

Vacationists are returning and then those receivers which were so foolishly "wrapped in camphor for the summer" are being resurrected and preparations are being made to overhaul or remodel last year's outfit. These preliminary activities have been quite noticeable in the accessories and parts trade.

One of the sustaining features of the buying market is the new Eveready "B" battery, No. 770. The new model is almost twice the size of the previous 45-volt batteries and has made a very strong appeal to the ever-increasing army of multi-tube set operators.

At the present time the demand far exceeds the supply, and each fresh shipment is being sold almost as soon as received.

This almost unprecedented demand for a new product probably expresses the present attitude of the Philadel-

phia experimenter. The local set builders have been fooled so often by the "David Harums" of the radio business that today they are more discriminating and refuse to accept products of unknown manufacture.

Time was when apparatus sold on appearance and "cut price," and not infrequently was the buyer stung. Often the layman was induced by some glib salesman to accept a piece of apparatus of questionable origin, offered at a "cut price," in preference to the standard article asked for.

This order of things is rapidly changing, and the buyers of today are accepting the products of established manufacturers—concerns who by selling honest goods at a fair price have earned a reputation for fair dealing.

Eveready batteries are well known to all radio fans, so when the new "double life" battery was announced, it found a ready market.

While the market generally has not yet developed normal business, the betterment during the last few weeks has given encouragement to dealers. When the time comes for an active buying movement, there will be a great number of large orders placed with wholesalers and jobbers, as stocks on the shelves of the retailers have been permitted to fall to negligible quantities.

From present indications and the increasing number of inquiries, there is sufficient evidence to predict that this will be a radio-frequency season.

Leading factors of the trade say that receivers employing radio-frequency amplification will predominate. Neutrodyne, reflex, tuned and untuned radio frequency, inverse duplex and superheterodyne parts and complete sets will be among the "best sellers."

One prominent jobber declared that superheterodyne parts and kits will be sold in large quantities. He said:

"The superheterodyne receiver is unquestionably one of the finest yet developed. It is true that the early models of last year were not all that could be desired, but due to the many refinements and improvements, the 'super' is now a real success.

"The chief difficulty with the heterodyne receiver," he said, "is traceable to the misleading statements that have been published about the wonderful performance of the set. Such statements as 'London to Honolulu on a one-foot loop,' 'working above the static level' and 'stations two thousand miles away can be heard as clearly as locals,' are not only untrue, but have been detrimental to the sale of parts.

"The chief advantage of the super lies in its ability to bring in signals from real distant stations more consistently than is possible with other type receivers. The super will also reward its operator with some increased DX range and intensity of signals.

"A demonstration will prove to the most skeptical the real merits of the super-het, and thousands of kits will be sold. As a matter of fact, such kits as the Ultradyne, Rubicon, Victor-Kellogg and Capt. Adams are in good demand for this time of the year."

Another large dealer expressed virtually the same opinion. "The early models of the superheterodyne," he said, "were boomerangs. They were crude, had too many controls, were difficult to operate, and many of them were no better than the average good three-tube set.

"The ridiculous statements about the results obtainable with the superheterodyne led the public to believe that it would perform miracles. The present improved apparatus, however, will prove the superheterodyne a superior receiver."

That the interest in radio has been revived was demonstrated this month when Gimbel Brothers' department store advertised the sale of 20,000 complete three-tube sets, in-

cluding tubes, batteries and loud speaker, for less than $50 for the complete outfit. Their entire first stock was sold the first day of the sale. They are now booking orders for future deliveries. There is a ready market for a good, reliable receiver at a popular price.

There has been a consistent, steady sale of those parts which have become known as "standard." Federal, Acme, Kellogg, Thordarsen, All-American and other well-known makes of transformers continue to hold favor.

Apparently every manufacturer of radio apparatus seems determined to enter the race for the best "low-loss" condenser, with the result that at present the market is flooded with variable condensers of all kinds—"low-loss," "no-loss" and "all-loss." One buyer summed up the condenser situation in a few words, saying, "If I don't see or hear of a new 'low-loss' variable condenser every five minutes of the day, I'm sure that I've missed a few, and I feel disappointed."

Most dealers report good sales of the old-reliable make condensers, such as Hammerlund, Cardwell, General Instrument, etc. The new Yaxley line of jacks, switches and rheostats is meeting with the approval of the discriminating buyer.

The technical men of some of the larger jobbers, who have had the opportunity to test the new Sodion and Magnavox tubes, are very enthusiastic in their praise of these new products.

Many enterprising stores, realizing the need of tubes with similar amplifying characteristics for superheterodyne and other radio-frequency circuits, have installed the "tube tester," advocated by and described in *Radio in the Home*. Many dealers requested advance copies of the hookup for this tester. Progressive Radio Company, 306 Market street, was among the first to advertise the installation of the tester. The characteristics of every tube sold are "plotted" at the time of sale. Tubes, other than those purchased from the Progressive, are tested at a very small charge—thirty-five cents per tube. This bit of foresight on the part of the Progressive management has resulted in greatly stimulating their tube sales.

The trade generally is looking forward to and anticipating great things from Philadelphia's Third Radio Show. This year the show, which will be the biggest event of its kind ever staged in this section, will be held at the Second Regiment Armory, Broad street and Susquehanna avenue, October 18 to 25.

DAVID GRIMES INCORPORATES COMPANY TO MANUFACTURE MEDIUM-PRICED RECEIVERS

NEW YORK, Sept. 20.

FOR more than a year the Grimes' Radio Engineering Company, owner of the Inverse Duplex patents, has been working out a design of the Grimes' system for application to a rather inexpensive model.

This design reached its perfection in the "3XP" model as brought out through the laboratory of *Radio in the Home*." This was fully covered by David Grimes in the June and July issues.

Several efforts were made to have the various licensee companies under the Inverse Duplex patents, manufacture and sell this "Ford Model" radio set. Due to extensive business on the larger types of sets, the facilities of the several organizations were crowded to the limit and they therefore could not seriously consider the 3XP set.

The parent company, the Grimes Radio Engineering Company, therefore decided to use its own resources to make this set available to the public

at a reasonable cost. To do this it had to secure men of large manufacturing experience. Negotiations were finally closed with Henry W. Waterson, and a new manufacturing company was formed called David Grimes, Inc.

The new company, David Grimes, Inc., is manufacturing and selling this "3XP" set for the holding company. They have opened up a factory at 148 Morgan street, Jersey City, with sales offices in the Strand Theatre Building, at Times Square, New York.

Henry W. Waterson is president of the organization. He has gained a national reputation as president of Waterson, Berlin and Snyder, music publishers, and as president of Cameo Record Corporation, manufacturers of Cameo phonograph records.

Hawaiian music seems to be even more haunting during the long, quiet summer evenings. Scarcely a program hereabouts but some plaintive Hawaiian melody goes to radioland. There are many Hawaiian trios—the West Coast Trio, the Variety Three, the Junior Novelty Three, Mackay's Queens, and Alika's Syncopators—all Hawaiian aggregations of musicians.

Editorially Speaking

(Continued From Page 42)

a mark of distinction for an artist to be able to say, 'Last night I sang in the National Broadcast Station and was heard by the United States.' Thousands of people would give all they possess to be permitted to go on the Metropolitan Opera House stage and be heard by a select few thousand. Many more than that would like to go on the stage which gives them the whole nation as a forum. It will bring out possibilities of latent talent residing in those who have never had the opportunity to approach the public.

"But if that is impracticable, if that should not prove to be the desire of budding artists, why, then, suppose we do have to pay for it? That does not frighten me. If we have a National Broadcast Station whose voice reaches over the country, and if we have to pay for the talent, we will do it. If we have to spend $2,000,000 or $5,000,000 a year in giving the very best and only the best which can be had from that single point, making it possible for every one in the United States to hear it, an industry of half a billion dollars could support it if the burden were equally and equitably distributed. Suppose the industry taxed itself two per cent or one per cent, or whatever the percentage might be; that percentage would be more than would be necessary to run a first-class national entertainment institution, paying more liberally than any theatre or any opera can pay at the present time.

"Gentlemen, that is the picture as I see it, and if we live for the next five years, and meet again, as I hope we shall, we will be talking of that as belonging to the past as well."

And so that sums up the situation as it stands at present. But, personally, I go on record as reiterating my opinion that the sooner Mr. Sarnoff's vision becomes a reality the better it will be for all of us connected with radio.

Radio Kindergarten

(Continued From Page 34)

being in itself inefficient, cannot put into the transmitting set a perfect reproduction of the speech or music. It puts into the set the best that it can and the set transmits it broadcast by radio.

Again during this process of transmitting, there are certain instruments involved which have not yet been brought to the point of perfection in reproduction. In other words, there

is certain distortion every here and there, and this distortion, added to the inefficiency of the microphone diaphragm, is sent out into the air as the signal.

This signal, distorted and inefficient, is received upon our aerials and is brought into our receiving sets. Here, again, on account of faulty home construction or else inevitable imperfections at the present stage of our instrument development, the distorted signal is further distorted and is brought to the diaphragm of our head telephones or our loud speaker. Here again we have inefficiency of reproduction.

What is the consequence?

A sound which left the speaker's throat perfectly, has been first imperfectly reproduced, then distorted, then again distorted, and again imperfectly reproduced.

It is only the unreasoning enthusiasm of the radio fan which permits him to sit back and say, "If you closed your eyes you would think it was right here in the room with you."

This is not only true of radio; it is equally true of talking machines.

When radio first became popular, I had many novices listen to my set and in a great many instances their comment was, "It sounds like a phonograph, doesn't it?"

Some day we will discover a new method of sound reproduction. At present let us thank heaven for the marvels which our scientists have already accomplished with our limited knowledge.

Notes on the Grimes-Briggs Neutrodyne

(Continued From Page 44)

the correct kind of loop to use with this set. In order that all of these readers may have the information they want, I am printing on a separate page a special feature on our "old war horse" loop at Station 3XP. We found this loop to be about the most useful type we have yet built.

I have also had many requests for methods of adapting the circuit to the outdoor aerial. This probably can be done, but, of course, it broadens the tuning considerably. Still, it unquestionably does produce a tremendous volume of signal, and with certain methods, we have had stations which ordinarily are just about audible and have had them so loud that we have had to tune down on them.

This result was achieved by connecting the outdoor aerial to the outside turn of the loop and connecting the ground to the tap next to the outside turn. When we did this we still left the three connections of the loop connected to the set. This made the loop what is known as an "auto-transformer"—that is, that one of the windings is used both as primary and secondary.

This method is the most efficient that we have tried, but it has the disadvantage of bringing in a tremendous amount of static and other noises along with the signals. Therefore, it is not a desirable method for the summertime, but is the best method for winter nights when there is no static. It certainly is the best method for DX work if you are not particular about the quality of your signals.

We have also had good results with a coil of wire consisting of about thirty turns substituted for the loop, with the two outside ends connected to the regular outside loop connections and with taps for the grid take-off as frequently as possible. Directly over the top of this coil and down at one end of it, we wound eight or ten turns of wire and this outside winding was connected to aerial and ground.

I should like very much to hear from readers who are working with this circuit as I think it would be an excellent one for us to develop for the benefit of other radio fans.

On Resistance-Coupled Amplification

(Continued From Page 6)

one transformer stage of audio, it is practically impossible to increase this without distortion. Two stages of straight audio would not work. One stage of straight audio and one stage of push-pull following your own hookup in *Radio in the Home* and using grid leaks as a resistance across the primary of the input transformer certainly increased the volume, but the quality was such that my wife and the neighbors both threatened to get out an injunction if I ran the set after 7 o'clock at night, as it sounded like a combination of a boiler factory and a cheap phonograph.

"Two stages of resistance-coupled amplification, using Daven resistors, has solved my problem, and I am now getting all the volume I want with no distortion whatsoever.

"I am not writing you this letter in any spirit of criticism, but merely to tell you that I believe for once in your life you are wrong. I shall continue to read *Radio in the Home* with the same amount of pleasure and profit that I always have.

"Wishing you continued success with your publication, I am,

"Yours very truly,
"W. L. Morley."

I can only say that I am very glad indeed that Mr. Morley gets such satisfaction from his resistance-coupled amplifier. It just happens that the makers of the Daven resistors, which he praises so highly, were also very much incensed by my few remarks, but were not satisfied simply to write me a letter and to tell me that I was all wet. Without giving me a chance to get an umbrella or a mackintosh, they immediately withdrew their advertising from this magazine.

I have also been very effectively jumped upon by Zeh Bouck, one of the best-known writers on radio in this country. Mr. Bouck says in his letter:

"Dear Mr. Neely,

"Will you permit me, as one who has devoted considerable time and research to the possibilities of resistance-coupled amplification, to take exception to your prefatory remarks to 'Audio-Frequency Amplification,' by Kenneth Harkness and to the article itself?

"The resistance-coupled amplifier is not 'obsolete,' Mr. Neely. On the contrary it is just coming into its own. From an engineering standpoint, I tell you that it is (as far as quality is concerned) the most perfect amplifier available to the fan. G. Y. Allen has written to the effect that (I quote him from memory): 'Fundamentally the transformer can never give distortionless amplification. For the enthusiast who would have perfect amplification at all cost, the resistance-coupled amplifier is doubtless ideal.' Likewise I might refer you to Morecroft and Ballantine, not to mention a score of other prominent engineers, to whose works I am unable to refer specifically from memory. It is also a very efficient system—contrary to rather archaic beliefs.

"From the standpoint of one who appreciates the subtleties of fine music, I also vouch for the excellence of the resistance-coupled amplifier. I am a music lover, somewhat of a critic, I am told, and this system is the only amplifier employed consistently by me.

"I fear that you have done an injustice to several reputable manufacturers of apparatus associated with resistance - coupled amplification, doubtless losing, yourself, through a natural cessation of relevant advertising (not however, that the effect on advertising should be considered in expressing an honest opinion).

"I appreciate that it will be difficult for you to make a direct retrac-

tion of your editorial comment, should you be inclined to do so. I suggest—for doubtless you will be convinced of the actual excellences of resistance-coupled amplification—that you scout around for an article that you might run under a sort of compromise title such as 'a resistance-coupled amplifier that works.' "Cordially yours,

(Signed) "Zeh Bouck."

I only want to say that I am not looking for any compromise at all. Just as soon as I find a resistance-coupled amplifier that proves to me that my statements were wrong, I shall come out perfectly frankly and say so. I have never claimed to be right in 100 per cent of my statements, and if I claimed to be right in 50 per cent of them, I should expect to find myself wrong in half that number.

The theory of resistance-coupled amplification is undoubtedly as nearly ideal as we can get. My statements were that I had never found a practical application of the theory that satisfied me. I never have. Just as soon as I do, I will be perfectly frank to say so.

Bring 'em along. I'm really anxious to find myself wrong, because, if resistance-coupling improves the quality of radio reproduction, I'll welcome it with open arms.

Quality is what radio needs.

Who's Who at WEAF

(Continued From Page 31)

difficult road before attaining success an an orchestra leader. Her first ambition was to be a pianist, and she pursued her studies with intense application. Finally after considerable study she attained her goal, and an important recital was arranged for her. Just preceding it she was stricken with paralysis of the hand, the result of overwork, and thereby compelled to give up concert work. Her next step was to develop her soprano voice. After months of application she became soloist with the Aborn Opera Company. Again overwork took its toll and a throat trouble developed which ended the operatic career.

Miss Byrne was not one to give up. Within a year she was conducting a successful dancing school with some of society's most famous families represented at her studios. They flocked to her from all parts of the East. By means of her musical abilities she inspired many to learn to dance who had previously demonstrated absolutely no sense of rhythm whatever. Little by little she acquired the art of adapting dance music to the dancer rather than to forcing him to follow rhythm set for him by orchestra. She believes that a tuneful melody with inherent rhythm is more conducive to natural dancing than rhythm forced by banjo, drum and saxophone. When Anna Byrne conducts medicore dancers often dance divinely, while long-standing failures are spurred on to new endeavors.

Miss Byrne's ability as a musician gradually forced her into the musical field. Her society friends requisitioned her services for important social affairs. Gradually she has devoted herself exclusively to fulfilling dance music engagements, abandoning the teaching work. Miss Byrne and her B. Fisher Astor Coffee Dance Orchestra broadcast their program following that of the Happiness Boys each Friday.

Our list of WEAF celebrities is by no means complete, and to do them all justice it would be necessary to continue indefinitely. It seems that good artists always have interesting histories and that skill is always the product of overcoming difficulties. When you hear an artist, whether through WEAF or any other station, who does his "stuff" well, you may be certain that years of persistent study and practice have been rewarded by the ability to entertain you and thousands like you.

How Far Will This Set Receive?

(Continued From Page 49)

captional range and volume. He said that he could go out in the street and listen to this receiver on the loud speaker with *ONE* tube. He proved it to me, too, and has one of these receivers for his own set.

I was very pleased with this showing, and sent the receiver to a friend in a poor location. He could not hear anything at all except local stations, and those were very faint. Needless to say, I was not quite so pleased with that showing, but it proves location has a great deal to do with receiving range.

The skill of the operator has much to do with the range of a receiver. Of course you have noticed how easy it is for you to tune your own set after you have had it a while. It's as easy as falling off a log. But when you change to some other receiver, that for some reason or other is supposed to be better than the one you have, the first time or two you use it, don't you wish you had your old receiver back? Seems as though you can't cover any distance at all with the new receiver. But when you finally do get wise to its tricks, then you begin to pull in those DX stations that you knew were there.

What was wrong? Was it the receiver? No, it was you; you simply had not had the receiver long enough to get used to tuning it.

Let us take another example: Let us suppose that a man who has never owned or operated a radio receiver in looking over his newspaper sees in the radio programs that a friend of his is to come on the air at a station 500 miles from where he is. Perhaps he wants so much to hear this friend that he is willing to buy a radio set right away in order to hear him.

Well, he goes to a radio store and is shown several radio sets. He tells the salesman he wants to hear a station 500 miles away. The salesman tells him it would be wise to buy a receiver with a guaranteed range of 1000 miles so as to be on the safe side. He does so, and takes a short lesson in tuning in, perhaps on a local station. The salesman says that he will be able to pick up stations within 1000 miles in the evening.

The man takes the set home and gets it all ready for the program he wants to hear. Some time before it is time for his friend to come on, he turns the dials, trying to pick up the station he wishes to hear. As he has had no experience in tuning a set, even if his location is good, the chances are that he will not hear that station that evening. He will, of course, be very disappointed and will no doubt become convinced that radio isn't what it's cracked up to be. And it isn't.

No one thinks more of radio than I do. As a source of entertainment and education it cannot be beaten, BUT I am afraid that manufacturers are hurting radio and themselves by letting advertisements as to the guaranteed range of their receivers appear in magazines. Perhaps they will realize this some day, but as yet they do not appear to have realized it.

In closing, I would like to say that this article is not written to discourage any one from purchasing a radio set. You will find that you will get a great deal of enjoyment from one, and it will be well worth the money spent on it; but when you buy one, have it demonstrated in your own home first and then you will know just what to expect from it in that location. But wherever you live, be it in Maine or California, when you are told by the salesman the guaranteed range of a receiver, tell him you're from Missouri; you know—"You've gotta show me."

I expect to receive quite a few letters from manufacturers about this article, insisting that they can guarantee the range of their receiver, and to them I will say that if they can maintain their advertised range in any location I pick out, I will take back every word I have said in this article.

That's a challenge—let's go.

Manufacturers Organize a National Association to Protect the Industry

(Continued From Page 52)

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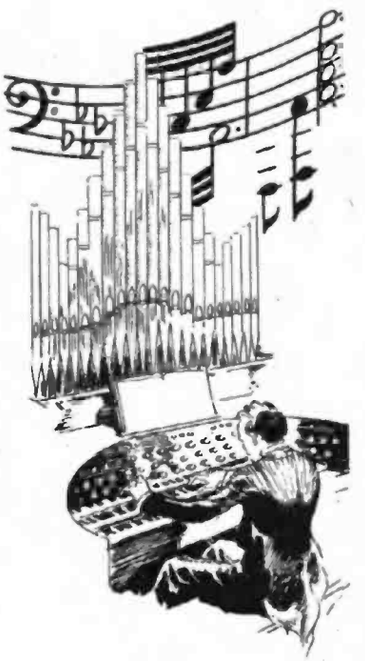

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You who have deferred buying a radio set—waiting for someone to produce just your combination of price, performance, cabinet design and finish—need wait no longer. In the new complete line of FADA Neutrodyne receivers you can find exactly what you want.

See your dealer. He will show you a FADA Neutrodyne that will delight you—in appearance, performance and price.

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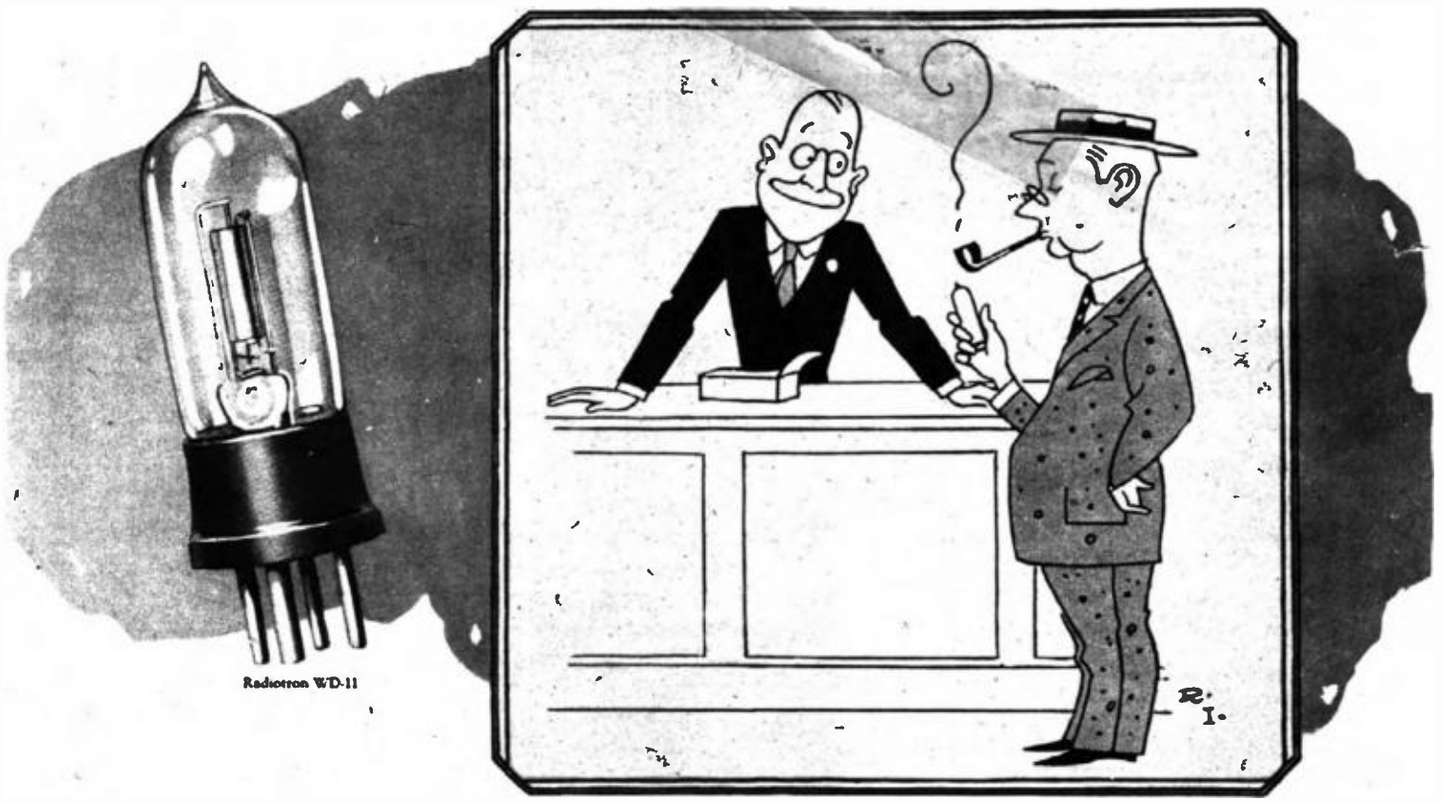

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