

September, 1925

RADIO IN THE HOME

10¢

Conducted by HENRY M. NEELY

First
BUYERS' and
BUILDERS'
NUMBER

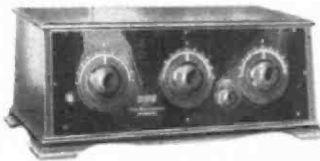




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The Supreme
Radio Reproducer

MUSIC MASTER RECEIVER is the answer to the fact that Music Master Reproducer, by which today all "loud speakers" are judged, was found to be so far in advance of the radio receivers with which it was used that its highest re-creative powers had never been fully utilized.

Music Master engineers laid down the principle that radio receiving sets and radio amplifying reproducers must be made equally effective before New Era Radio programs could be brought into the home in satisfying volume and with true tone fidelity.



TYPE 60
Five Tubes. Two stages of radio frequency, detector and two stages audio frequency. Selective, good volume and distance. Brown mahogany art finish cabinet. **Price \$60**

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Music Master
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AT ANY time within recent years Music Master could have offered radio receiving sets equal to any at that time on the market. But these years have been devoted to intensive effort to achieve in radio reception the same outstanding superiority achieved in amplified radio reproduction by Music Master Reproducer.

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Ten Models
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Guaranteed
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Music  **Master**
RADIO PRODUCTS

EDITORIALLY SPEAKING

By HENRY M. NEELY

SOME weeks ago, the newspapers in various cities printed an article by E. F. W. Alexanderson, chief consulting engineer of the Radio Corporation of America, which dealt with the interesting experiments being conducted in the "polarization" of radio waves. The article was too technical for the average broadcast listener, but a few of our readers who are in the class of what might be called advanced students have written to ask whether this new system is going to change the present method of broadcast reception and render their sets obsolete.

This is an indication of how very "jumpy" this radio business is. The moment a new theory is advanced, hundred of nontechnical listeners-in get the idea that the theory is going to be changed into actuality, and that they will have to junk their present receiving outfit and invest in an entirely new layout.

Dr. Alexanderson indicated very clearly in his article that the experiments were very far from threatening to make any immediate changes to radio transmission or to reception. He was merely outlining the interesting aspect of the experiments and pointing out what they may accomplish when they are better understood and the methods better perfected.

This article was of special interest to me because the idea was brought to me some time ago by David Grimes. Over a year ago, in a speech which I made at the banquet of the Third District transmitting amateurs, I gave a slight hint of this idea when I said that Mr. Grimes had asked our laboratory to co-operate in experiments which, if successful, might make it possible for two stations to broadcast simultaneously on the same wave length just across the street from each other and yet not interfere with each other. I remember very distinctly the smiles of incredulity which met this statement from the ad-

vanced experimenters who composed the audience at that banquet. Nor could I blame them for smiling. So far as I know, nothing had been published about any such possibilities, although Mr. Grimes had been working on his own experiments for a long time before he even mentioned it to me.

Briefly stated and without any technicality, it can be roughly explained by the two words "vertical" and "horizontal."

Mr. Grimes' theory is that all radio transmission today is vertical and that static is also vertical. If you happen to be using a loop receiver, you can prove this to yourself on any night when the static is fairly bad. Simply pick up your loop and turn it horizontally and you will find that almost all of the static will disappear. Naturally your signal will also disappear. That is because both the static and the signal are coming to you vertically, whereas your loop is now arranged to receive horizontally. Now suppose that it were possible for the broadcasting station to transmit horizontally. You would then be eliminating the static but receiving the broadcasting station at its maximum.

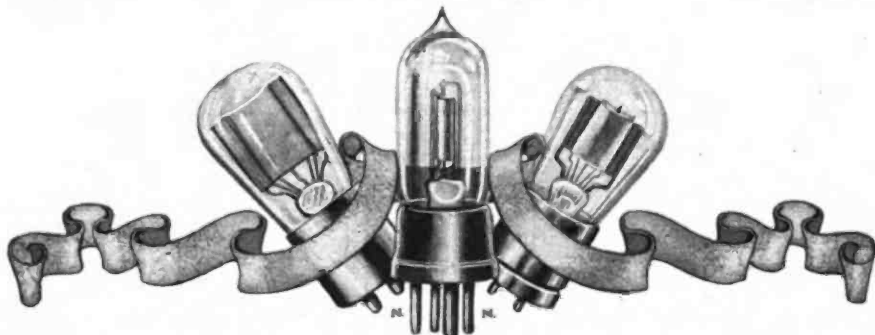
Carried even farther than this, you can easily picture from that example the possibility that some day our radio programs may read something like this:

9:40 P. M.—Station WFI, 395 meters, vertical.

9:40 P. M.—Station WLIT, 395 meters, horizontal.

This will mean that two stations which are directly across the street from each other will be broadcasting simultaneously on exactly the same wave length and yet, by means of our receivers, we can adjust our sets to receive one and not the other. Please

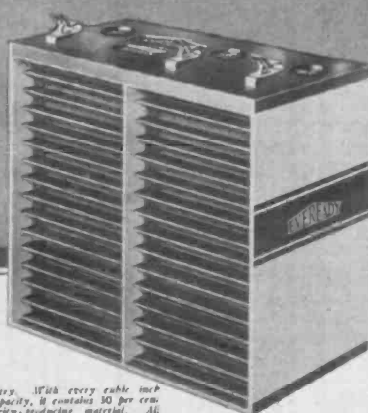
(Continued on Page 25)



NEW! *Radically different!*



No. 486 Eveready Layerbilt "B" Battery. 45 volts. Length, 8 3/16 inches. Width, 4 7/16 inches. Height, 7 1/16 inches. Weight, 14 3/4 pounds. Price, \$5.50.



It's all battery. With every cubic inch packed to capacity, it contains 50 per cent more electricity-producing material. All chance of loose or broken connections avoided by contact of full area of carbon plate against zinc plate. The identifiably correct construction.

The greatest improvement ever made in "B" Batteries

ABSOLUTELY new in construction—perfected through years of research, the new Eveready Layerbilt "B" Battery is as superior to the old type "B" Battery as a tube set is to a crystal.

Heretofore, all dry "B" Batteries have been made up of cylindrical cells—no one knew how to make them any other way. The new Eveready Layerbilt is made of flat layers of current-producing elements compressed one against another, so that every cubic inch inside the battery case is completely filled with electricity-producing material. Layer-building heightens efficiency by increasing the area of zinc plate and the quantity of active chemicals to which the plate is exposed.

After the most rigid laboratory tests, more than 30,000 of these new Eveready Layerbilt "B" Batteries were manufactured and tested by use under actual home-receiving conditions. These tests proved that this new battery is far superior to the famous Eveready Heavy-duty Battery No. 770, which up to now we have ranked as the longest lived "B" Battery obtainable.

- On 4-tube sets, 16 mil drain, it lasts 35% longer.
- On 5-tube sets, 20 mil drain, it lasts 38% longer.
- On 6-tube sets, 24 mil drain, it lasts 41% longer.
- On 8-tube sets, 30 mil drain, it lasts 52% longer.

The new Layerbilt principle is such an enor-

mous stride forward in radio battery economy that we will bring out new sizes and numbers in this Layerbilt form as fast as new machinery is installed. For the present, only the extra-large 45-volt size will be available.

Buy this new Eveready Layerbilt No. 486 for heavy drain service. It far exceeds the performance for which Eveready Radio Batteries always have been famous and is, we believe, by far the most economical source of "B" current obtainable.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
New York San Francisco

Canadian National Carbon Co., Limited, Toronto, Ontario

EVEREADY HOUR EVERY TUESDAY AT 8 P. M.
Eastern Standard Time
Beginning September 29th, 9 P. M. Eastern Standard Time
For real radio enjoyment, tune in the "Eveready Group." Broadcast through stations:

WEAF New York	WGB Buffalo	WWJ Detroit
WJAR Providence	WCAE Pittsburgh	WCCO Minneapolis
WEET Boston	WSAI Cincinnati	WOP St. Paul
WFI Philadelphia		WOCavenport

EVEREADY

Radio Batteries

—they last longer

SETS of the NEW SEASON

WITH the coming of September, the thoughts of everybody interested in radio turn naturally to the radio shows. Apparently these shows in the early fall are going to mark the beginning of the radio season for millions of our people. During September and October there will be exhibitions held in many of the larger cities of the country, and these displays will give the radio fan and the citizen who is not a fan but who is becoming interested an opportunity to see and to have explained the sets and accessories and apparatus which will be featured during the winter.

There is no "revolution" in radio to be expected during the shows this year nor, as a matter of fact, during any other year. This season, as it will be in future seasons and as it has been for many years in the automobile industry, we will see very great improvements in almost all branches of the art—all showing an increased efficiency, a higher quality of design and workmanship, and a decided trend toward the stabilization of radio as an integral part of American home life.

Probably the observant spectator will be impressed this season most of all with the very decided influence that woman is now having in the design of radio sets and accessories. The old day of the tangle of wires and the bunch of junk masquerading under the garb of a radio set are gone and gone forever. Two years ago this unsightly mass of material, probably on a kitchen table, did well enough as a remarkable toy and an evidence of husband's or son's cleverness in putting the set together and actually making it emit sounds that bore some resemblance to speech and music. Then, with the betterment of broadcasting and of broadcast programs and with the very rapid increase in the quality of receiving set reproduction, the woman of the house began to be interested, and

radio entered the living room and left the kitchen and the attic and the subcellar behind it. Today the radio set must occupy the place of honor in the home, and this means that it must of necessity be at least as good to look upon as the piano or the phonograph or the dining room or living room furniture. Nothing less than this will satisfy Milady. Woman, too, has been responsible for a very much greater simplicity in the operation of the radio set. The old days of a dozen or more controls are done; we now have the undoubted trend toward the one-control receiver, although really efficient sets with only one knob to operate are still scarce and can hardly be said to have arrived as yet. Still, all modern sets have the ability to be accurately and permanently logged, so that even with three dials there is no difficulty whatever in finding the desired station and bringing it in.

If anything shows woman's influence more strongly than the beautiful cabinets in which radio sets are now presented, it is the rapidly growing trend this year toward the production of apparatus to eliminate the battery from radio reception. Most men do not mind the attention which a battery requires, but to a woman the sight of a storage battery in her living room is about as welcome as the sight of a muddy pup. Much as she realizes the marvelous work which a good battery does, her housewifely instincts rebel at the thought of acids in the neighborhood of her cherished rugs and furniture.

Therefore it has been her edict that the batteries must go and manufacturers have spent many thousands of dollars and many sleepless nights designing apparatus which will enable Mrs. Fan to run her radio set directly from the socket of her house lighting system. Last year there were a number of B battery substitutes placed upon the market and several of these worked very well. This year we



Radio is now so much a part of the home that it must even be included in the wilderness home, as shown in the photograph above. The set is an Operadio

Volume IV

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 NORMAN NEELY, Art Director

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The Apex Baby Grand Console (shown above) and the Apex Utility Table (shown below) are splendid examples of the present trend in cabinet design. The Apex Console Entertainer is shown below the utility table

have socket power for both A and B batteries and several manufacturers are even putting out devices to furnish A, B and C current. So far as the B battery eliminator is concerned, the day of experiment is about over and the B battery substitute is here. The A battery gives a little more trouble, but there are several successful devices in operation and those that are being put out by manufacturers with an honorable record of past achievement may very well be depended upon to give satisfaction.

Perhaps the shows will give evidence of advance in cabinet design quite as much as in anything else. Many of this season's sets, particularly the larger and higher-priced models, have the mechanical features either entirely hidden or completely disguised. Some are built in exquisite consoles or various period designs, and others, to all outward appearances, may be beautiful writing desks, highboys or library tables. It is possible to get excellent furniture design even in the medium-priced sets and this tendency is the greatest proof we have that the woman is beginning to buy the radio set just as she is buying everything else which becomes a fixture in her home. The majority of the cabinets are so beautifully designed and the finish and workmanship are so superb as to fit in with the most pretentious surroundings and leave the owner nothing to be desired. Many of the cabinets are finished in two tones and others are inlaid or hand carved and a few are finished in lacquer.

Another outstanding feature of the sea-

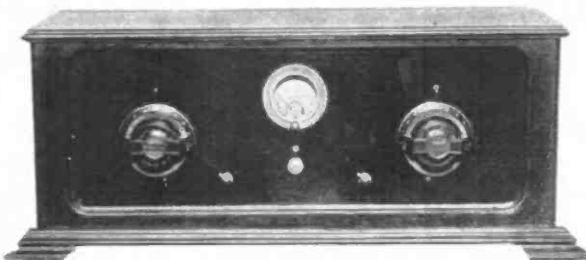
son—and one which also reflects the woman's influence—is the trend in loud-speaker design. The horn type has never been popular with women and manufacturers have evidently been thoroughly convinced of this fact. This season's loud-speakers seem to be deserting the horn type very largely and are being produced in console models, cabinets, cones and exquisitely finished period designs.

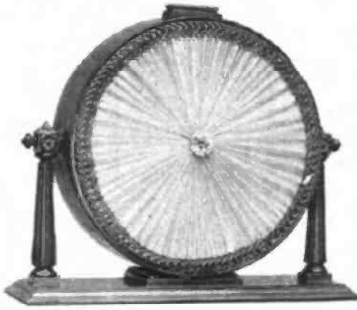
To the man who likes to hook up his own set and who finds delight in the experimental phase of radio, this season will be a constant temptation to spend money. Apparatus has now reached a stage of perfection which is quite in keeping with the advancement of cabinet design. There are new types of coils, condensers, transformers, jacks and switches and everything else which go to simplify and improve the home-made receiver.

Last year's superheterodyne can be wonderfully improved this year by the substitution of straight-line frequency condensers or of one of the clever new dials which are so geared as to move the present type of condenser at a rate which turns it



The Kellogg Wave Master, shown at the lower right, incorporates several new features in tuning control—the broadcast wave band being divided into zones. The new Jewett receiver is shown at the lower left with the Micro-dial, which makes the finest kind of tuning a perfectly simple matter





Unique and attractive is the new Music Master drum type reproducer. The pedestal is of carved mahogany

into a straight-line frequency instrument. Straight-line frequency gives an even distribution of stations over the entire scale and eliminates the crowding of broadcasters, particularly those at the lower end of the wave length scale. With the use of these new instruments, tuning becomes a real pleasure and it will be possible to log a number of stations never heard clearly before.

The design of audio-frequency transformers has also been vastly improved, and the audio side of the set can now be taken care of either by means of regular transformers or by resistance coupling or by the increasingly popular impedance-coupled system.

You who are interested in radio must not miss your local show this year. If you

have friends who are becoming somewhat curious about this new art and who are showing signs of catching your fever, do not let them miss the radio show, because if you once get them inside the door of the exhibition building, it is a safe bet that they will not come out without making up their minds to buy a receiver and join the ranks of radio fans.

Although radio is quite young, as said before, we can expect it to follow the same general lines of development as the motor-car.

After passing through the "one-lunger" stage, the car of today is a thing of beauty. The same applies to the better radio sets of today.

We feel reasonably sure that the car of tomorrow will have a motor with the same number cylinders pre-



Music Master console receiver and drum type reproducer

vailing at this time. In all things there is a limit at which we must stop if there is to be efficiency. The "insides" of the car has a tendency to stay constant with additional improvements.

What can we say about the radio receivers? Manufacturers will always strive for appearance. But what will happen under the "hood" of the set? Car manufacturers will advertise that "seventy miles an hour can be attained." Can we interpret this in radio language "3000 miles DX or bust"?

In other words, "where are we going" in this matter of speed and distance possibilities now that we are on the subject? You and I can go out and buy a car that will do over 100 miles an hour. Who would want to ride in it, you say? Quite true. You do not take your wife and



The Music Master type 140 is of pleasing appearance. Finished in duo-tone with a panel of unusual design



The sloping panel and built-in loud-speaker lend beauty and charm to this Music Master combination receiver and table. Two tuning controls operate this six-tube set



In the Super-Zenith are combined beauty and simplicity—only two controls are necessary to tune this ten-tube receiver



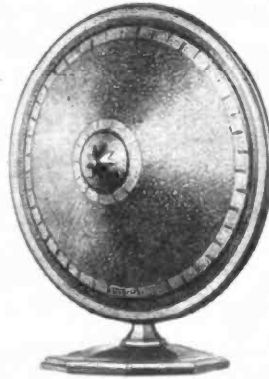
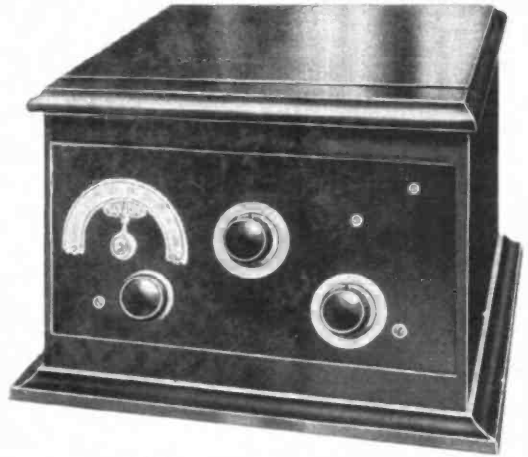
Several new models have been added to the popular Crosley line. In the upper left is the Super-Trirdyn De Luzo combination, consisting of a De Luzo Musicitone, a Super-Trirdyn Special and a very neatly designed table. The Crosley No. 52 Special, a three-tube regenerative receiver, is shown in the upper right. The Super-Trirdyn Special, in a newly designed cabinet of the latest style, is pictured below. The Musicitone, an attractive new type reproducer is shown above the Trirdyn. In the lower left is a receiver which justifies Crosley's sobriquet "Ford of Radio." This is the new Crosley Pup, a very fine single-tube regenerative receiver, which may be bought for less than \$10

children out in one of those cars. Nevertheless, there is a certain small demand for them.

Isn't there a striking parallel here between car and set? Who but the expert wants the terrific speed or the tremendous distance? The average man is not trained to enjoy it.

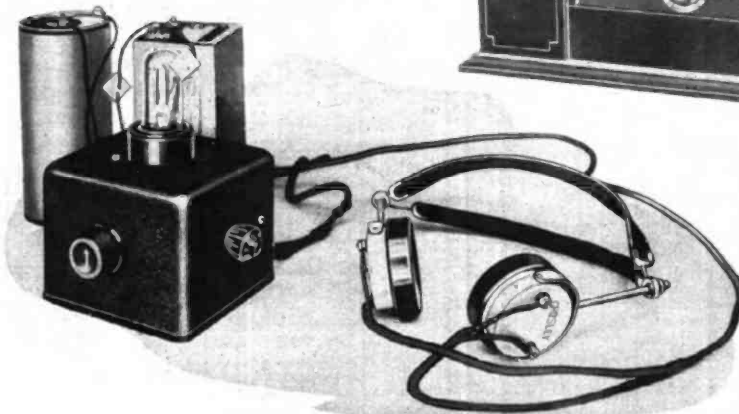
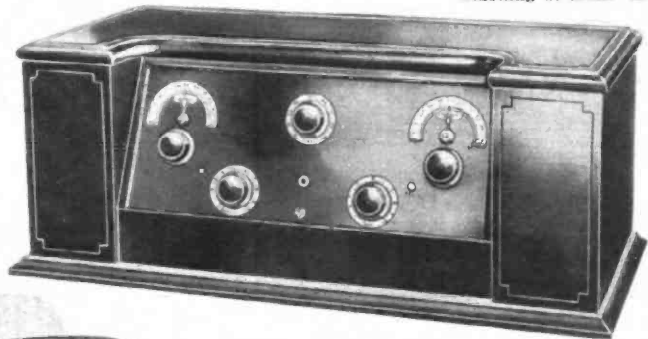
Radio in the home should delight the esthetic ear in the same sense that the well-balanced car delights the body. This should not be construed to mean that I believe in purely local reception. Not at all.

Better roads are urged for comfort. Higher power is urged for better reception. These two improvements are exterior to the car and set. Balloon tires, improved springs, etc., on the other hand, give more satisfaction on the rough places. Rough



places and ether disturbances will always be with us, but who would be so foolish as not to expect devices on the order of balloon tires for the future radio sets? We must expect greater DX possibilities with comfort due to the set itself and not depend upon bolstered transmitters altogether. Again, the inevitable "limit" enters, and past this we cannot go. The future will tell what this is.

Although the general tendency, due to a popular demand, has been to reduce the number of controls on the receiver, we must not expect to perfect sets which will tune by merely whistling at them. A cer-



tain degree of manual labor and slight skill are requisite to any worth-while machine. But the trend will undoubtedly be toward the fool-proof outfit.

You and I may have the same car and the same receiver. You may get better results with yours than I do with mine. You may drive faster than I with the same degree of safety, and you may have greater satisfaction with your set than I do. That is the human element which we sometimes forget. When we do forget we hate to realize that perhaps we do not have that certain innate ability possessed by another



The Dayroyal, housed in a beautiful mahogany vertical-type desk cabinet with old gold ornaments, has the unique feature of being a practical desk, with writing shelf, built-in ash tray and ink well. Space is provided for batteries and charger.

gan last fall. This year it is evidently to set in in an ever-swelling tide of popularity and our vision of a year ago, that there would be twenty million receiving sets in this country before the market could be considered bordering on saturation, is coming true.

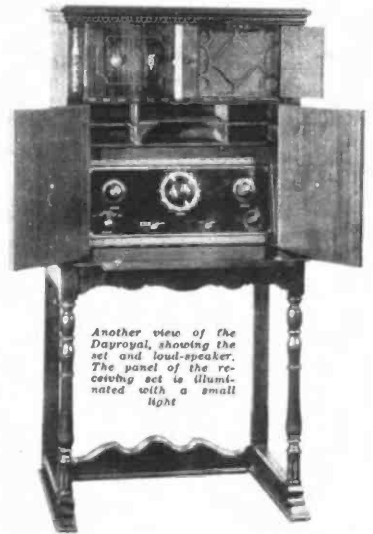
There are several distinct advantages of the manufactured set.

Over a year ago, this magazine stated editorially that, although our laboratory had built hundreds of sets, we still could not match the performance or the satisfaction of a standard manufactured receiver of the better make. That statement still stands despite the protests from many enthusiastic set builders among our readers.

It stands to reason that this should be true. One skilled radio man, who has specialized in a certain type of superheterodyne, said not long ago: "I have built and rebuilt this circuit fifty times and each time I find some place where I can make it just a little better."

That tells the story. The man who makes his own set never rebuilds it fifty times. Consequently he never has it in such shape that it is performing to full efficiency.

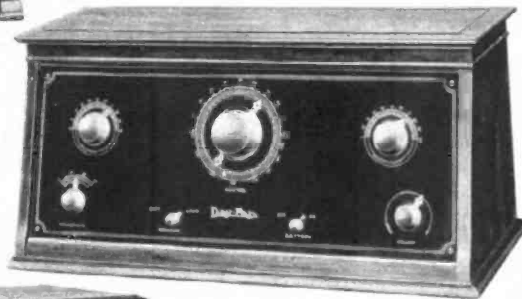
The set manufacturer of the better class has a staff of men who are employed for the sole purpose of building and rebuilding that particular set just to find out these little places where it can be made better. And each improvement is incorporated in the factory product.



Another view of the Dayroyal, showing the set and loud-speaker. The panel of the receiving set is illuminated with a small light.

who has the same machinery or apparatus. Often we liked to blame the manufacturer. What do you think?

The very fine line of manufactured sets offered for consideration this season indicates definitely that the trend of the public is changing swiftly toward radio. This new trend toward the ready-made model in preference to the home-made be-



Many of this season's sets are concealed in writing desks, highboys and library tables. The Dayfan receivers, shown on this page, are typical examples of the new models. All Dayfan sets are logged at the factory and furnished with an "Air Telephone Directory," showing the dial setting of the various stations. In addition, they are graduated for wave lengths for newspaper reference.



The Air-Way console model, shown below, is beautifully finished in two-tone mahogany. The loud-speaker is built in and space provided for batteries and charger.



A simpler model of the Dayfan console type is the Daygrand. The drop-front cabinet is of two-tone mahogany. A small desk pigeonhole is provided at one side. The set is the same as the Dayfan 5, shown in the center of the page.



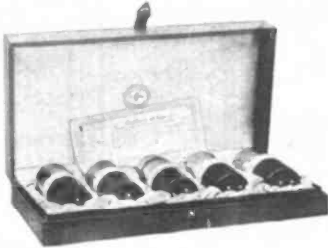
All the power necessary to operate the receiver is obtained direct from the electric light socket with the new Philco Power Unit, type A-B. This unit replaces the A and B batteries and battery charger



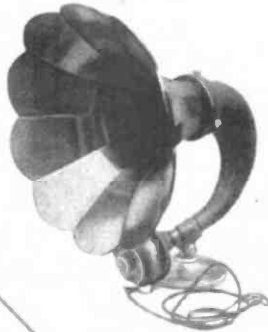
The hornless type loudspeaker is in keeping with the present trend of receiver design. The new Jaynell speaker is shown above



The Philco Socket Power, type B, takes the place of B batteries. It delivers sufficient current for most types of receivers, including eight-tube superheterodynes



Above—The lady radio fan would be just as pleased with a set of Brightston True Blue tubes, packed in a satin and plush lined case, as she would with a new string of pearls. These tubes are excellent detectors and amplifiers and nonmicrophonic

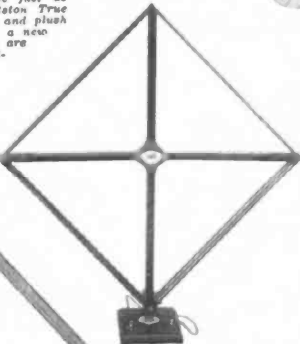


A faithful reproducer of attractive design is the Ampion loudspeaker

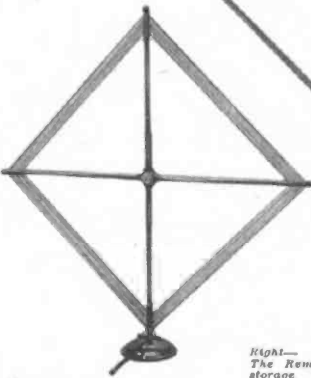


Above—The console model of the Jewett Super-speaker is beautifully finished in inlaid mahogany

Right—The Flat loop is double bank-wound on an attractive mahogany frame

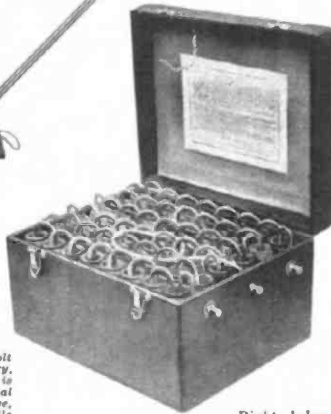


Right—The Jewett Venco unit permits the photograph to be used as a radio reproducer



Above The Metro-Spiral loop was developed especially for use with superheterodyne receivers

Right—The Rempe 100-volt storage B battery, shown on right, is built in a substantial leather-covered case, with carrying handle



Right, below—The Valley Battery Charger can be used to charge either 2, 6 or 12 volt A batteries, or from one to four 24-volt storage B batteries



Above—A specially designed tube is used for full-wave rectification in the Rpm B eliminator. Delivers thirty milli-amperes and operates without hum



Left—The Twin Bulb Handy Charger is noiseless in operation and may be used for charging either A or B batteries

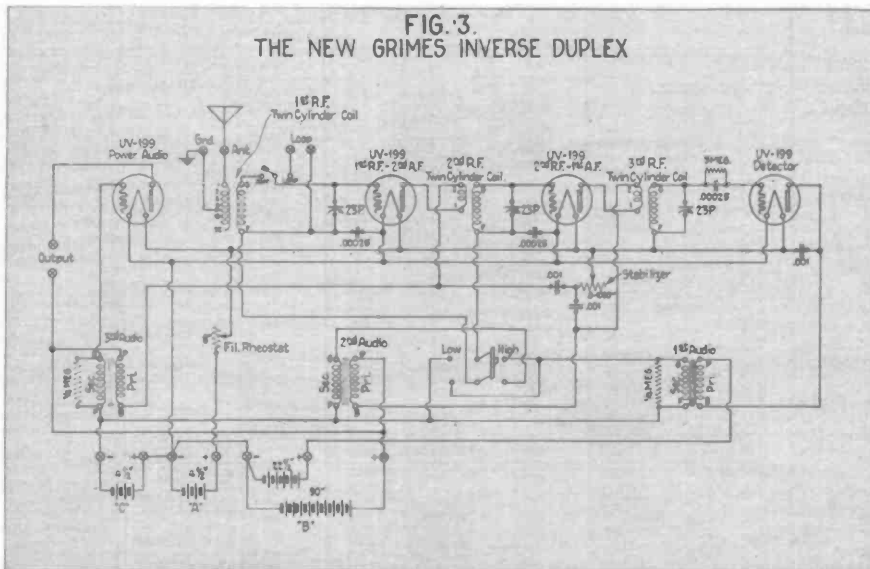


Left—The new Eveready "B" battery utilizes a new principle of battery construction by substitution of flat cells for cylindrical cells, thereby giving 30% more active electrolyte - producing material than in the Heavy Duty Battery No. 770 of identical external dimensions



The New Grimes Inverse-Duplex System

FIG. 3.
THE NEW GRIMES INVERSE DUPLEX



ONCE more to readers of *Radio in the Home* we are outlining still further improvements in the Inverse Duplex System. This we have done from time to time over the past two years so that the various numbers of *Radio in the Home* look almost like our laboratory notebook. To the readers who have followed the development throughout its entire course, this particular article will stand out apart and alone from all the rest. To the new reader who is becoming acquainted with the Inverse Duplex System for the first time, this article will appear complete and compact as describing the new Inverse Duplex System.

In all stages of development work in any branch of industry, there are always improvements, improvements and then more improvements. Necessarily, or rather apparently, in all stages of human progress, we seem unable to hit perfection in our first attempts. There is usually a stage of progress through which we pass where various experiences teach us wherein we have failed. The Inverse Duplex System of the past has not been an exception to this general line of development, and it is to the readers of this magazine that many thanks are due for the rapid discovery and correction of defects in the early Inverse Duplex circuits described in previous issues.

All of this work together has resulted in what we now call the *New Grimes Inverse Duplex System*, and it is the object of this article to cover as fully as possible the salient features of this new system. It is realized that one article alone will probably not be sufficient for those desiring greater detail. So sub-

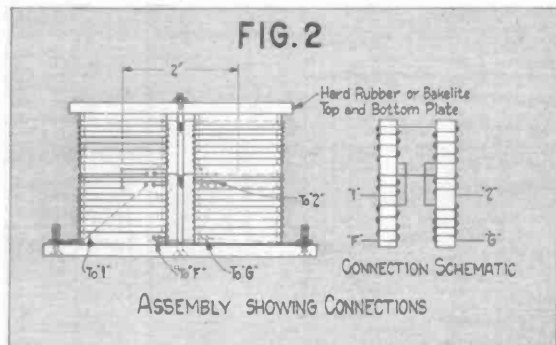
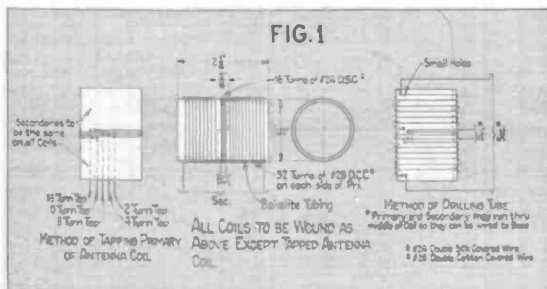
By DAVID GRIMES

sequent articles which may appear will be devoted more to detailed discussions rather than outlining the entire workable circuit.

Inverse duplexing in the past has always been emphasized as a system of amplification—not any particular circuit. This was done in order to emphasize the fact that inverse duplexing could be applied to any circuit—the neutrodyne, the superheterodyne, etc. This, of course, is true, and in the laboratory we have accomplished all of these feats. In doing it, however, we have learned that, at least so far as the amateur experimenter is concerned, great difficulty may be encountered in these various combinations. So out of all the maze of various circuits we have decided, in the new Inverse Duplex System, to choose the best possible radio and audio circuits for the combined arrangement. By best we mean those that will give good efficiency with greatest ease of assembly. For this purpose we have chosen *tuned radio frequency* with a stabilizing device for the radio circuits and low ratio audio transformers for the audio circuits.

Outside of this decision on our part, for you, relative to the circuits to be employed with the new Inverse Duplex, we have spent quite a bit of time on the subject of vacuum tubes. Heretofore we have been a staunch supporter of storage battery operation and storage battery tubes because of their greater volume on local stations and because of their uniform and unvarying quality. The 199's, as indicated in

(Continued on Page 22)



The Flewelling Super-Het Converter

By E. T.
FLEWELLING

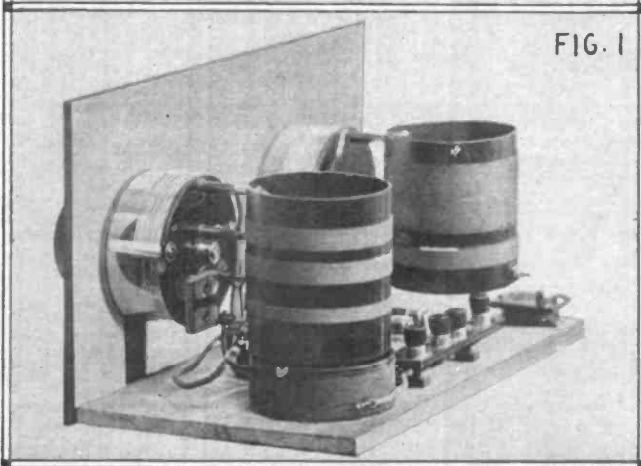
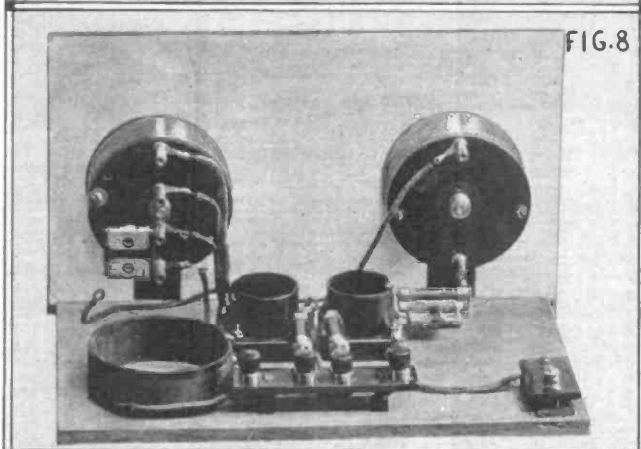
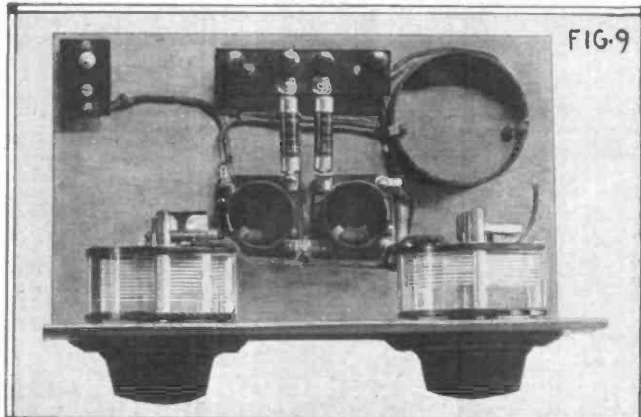
Associate Editor of
Radio in the Home

IF any of my readers are contemplating the building of a super-heterodyne receiver, I hope that they will not be unfortunate enough to use the specifications of a receiver that I came upon the other day. The list of requirements for this receiver specified 200 feet of copper bus-wire for wiring the set. One would think that one was reading the specifications for a power house!

We are not going to describe a complete super-heterodyne in this article, but we are going to explain how to build a complete super-heterodyne oscillator and first detector which can be used in a number of ways, and our layout and specifications are to be very radically different and vastly more simple than those of our friend who specified 200 feet of wire for connections.

Perhaps this is a good place for me to ask you to refer to Fig. 1 of this article. This photograph shows our complete detector-oscillator converter and will give you an idea of the simplicity of the set. It contains closer to 2 feet of wire than to 200 feet, and is as easy to build as it looks.

The converter is the result of our work during the Summer, to develop a detector outfit that can be placed before any five-tube neutrodyne or tuned radio frequency receiver and give them the operating advantages of the super-heterodyne. We know that the two stages of radio frequency in our five-tube set are not equal to the three stages of long wave radio frequency amplification generally used in a super-heterodyne, so we must admit at the start that our super-converter and a



five-tube neutrodyne, for instance, will not equal a well-designed super-heterodyne in general all around ability, but it will give us very decided advantages over our five-tube set alone.

A general outline of advantages might show that the use of the converter will increase our selectivity tremendously, in general fully equaling that of the super-heterodyne; it will increase our ability to pick up distant stations and will operate a bit on a loop antenna. Again, we find that we have a grand total of but two controls to handle as against five to eight controls on our receiver as it is now. No marked increase in volume may be expected, although it will be slightly greater. Volume and distance ability will depend upon how good our present receiver is by itself.

Our super-converter will use the same batteries that we are now using and requires no change whatsoever in our present set. It is perfectly stable, positive in results and greatly simplifies the operation of the five-tube set. It is to be recommended in accordance with this statement of its virtues.

To operate the converter after it is connected to the receiver, it is necessary to set the three dials of the receiver to about 95 and, after tuning in a station with the converter, to adjust rheostats, potentiometers and then the three dials again, to the point of best operation. After this has been done the five-tube receiver is not adjusted again and all tuning is accomplished with the two dials of the converter alone.

It is very strongly recommended that no change whatsoever be made in the layout of the converter and that the exact parts be used as specified. This is because the converter contains

(Continued on Page 18)



Now— The Jewett Receiver

Again Jewett leads the way to new and better radio reception.

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Different—Yes, fundamentally so in design—Even more startlingly so in performance.

Distortion, squeals, whistles and other self-made noises—entirely eliminated—by a new and exclusive method of audio amplification. Top efficiency insured at all points on the dial from 150 to 600 meters.

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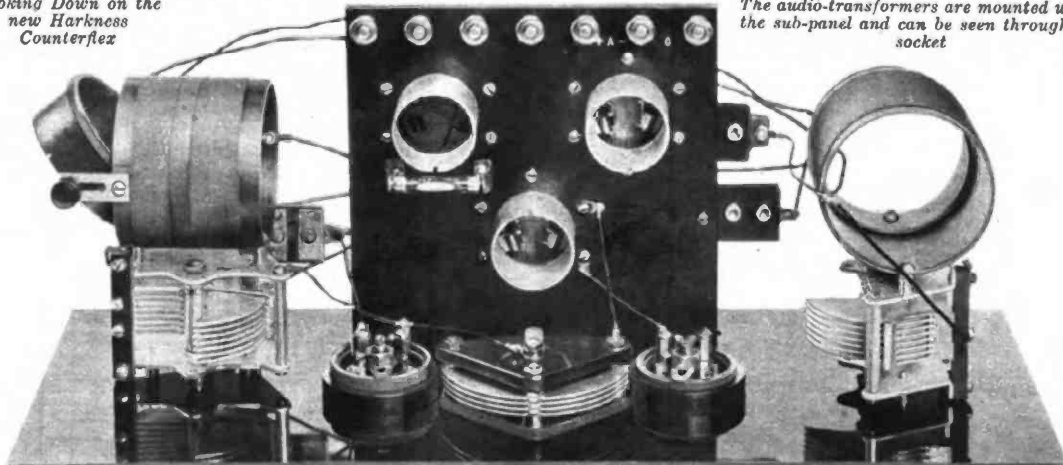
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JEWETT



The Final Three Tube Counterflex

AT THE conclusion of my article in the August issue I promised to devote this month's space to a complete description of a receiver using the four-tube circuit which was published in that issue.

Comparing the merits of this four-tube circuit (in which the reflex principle is not employed) with those of the standard three-tube Counterflex, I explained that the new radio-frequency transformers which I had designed for the four-tube circuit made the latter more sensitive and selective than the three-tube hook-up. At that time I had not tried using these transformers in the three-tube Counterflex. I now find, however, that these new transformers can be employed to great advantage in the three-tube circuit and vastly improve its selectivity without decreasing audibility. I have also made some other changes in the three-tube set which greatly improve its operation.

I have decided, therefore, to postpone my promised description of the four-tube receiver and describe instead the circuit of my latest model of three-tube Counterflex receiver embodying the improvements mentioned above. I shall also show readers who own three-tube sets of earlier design how to construct their sets so that they may enjoy the advantages of the latest improvements at least expense.

The new radio-frequency transformers, to which I have referred, can be seen in the photograph of the complete receiver on this page. Their construction is more clearly shown in the drawing of Fig. 2. These transformers, or Counterformers, as they are called, are designed to possess a high value of inductive coupling and the lowest possible value of capacitive coupling.

It will be noticed that the primary is wound on a separate form, slightly smaller in diameter than the secondary, and is placed inside the secondary at the filament end of the secondary winding. The filament end of the secondary is at a low potential and placing the primary at this end keeps the capacity between primary and secondary low. If the primary were placed at

By **KENNETH HARKNESS**

Associate Editor, "Radio in the Home"

the grid or high potential end of the secondary, the capacitive coupling would be very much increased, but the inductive coupling would not be increased to any great extent.

It will also be noticed that the primary is wound in the opposite direction to the secondary, but that the connections to the primary are also reversed. The plate or high potential end of the primary is directly underneath the end of the secondary winding at the point of lowest potential. By arranging the primary in this way the inductive coupling is just as high as when the two coils are wound in the same direction, and the primary connected in the usual manner (the low potential end of the primary directly under the low potential end of the secondary), but the capacity between primary and secondary is lower.

To reduce capacitive coupling still further, the primary is wound with very fine wire so that the needed value of self-inductance is provided by a coil occupying a small area. A longer coil, having the same self-inductance, but wound with heavier wire, would considerably increase the capacity coupling without increasing the inductive coupling or adding in any way to the efficiency of the transformer.

These transformers, then, possess a very low value of capacitive coupling as compared with inductive coupling, and this has the very desirable effect of sharpening the tuning of the receiver in which they are employed without reducing audibility in any way. When connected in the three-tube Counterflex circuit the improvement in selectivity is very marked.

By referring to the photograph and the drawing of Fig. 2, it will be noticed that the primary of Counterformer T1 is suspended from a slotted bracket. Upon loosening the binding post which holds the coil in position, the primary may be moved out and turned at an angle, thereby reducing the coupling between the antenna and

the tuned grid circuit. This feature is provided so that the selectivity of the receiver may be adjusted to meet local conditions.

These new Counterformers improve the operation of the Counterflex in another way. When a small capacity is connected across the secondary of Counterformer T1 the two tuning dials log exactly alike. For instance, stations which tune in at 20 and 80 on the first dial similarly tune at 20 and 80 on the second dial. In the standard make of Counterformer this little capacity is connected across the terminals of the variable condenser. The added capacity is needed because the capacity between the primary and secondary of Counterformer T1 (with an average antenna attached to the primary) is slightly lower than the capacity between the primary and secondary of the interstage Counterformer T2. The secondary inductances of the two transformers being exactly alike, the higher capacity of T2 would ordinarily cause the second dial to tune a few degrees lower than the first. The added condenser across the secondary of T1, however, equalizes the fixed capacities across the two secondaries and the dials log exactly alike. The balance, of course, is slightly upset if the primary of T1 is turned at an angle to increase selectivity. The difference, however, is slight. Those who like exactitude may rectify this difference by connecting a small vernier condenser across the secondary of T1 in place of a fixed condenser.

For the benefit of those who want to wind their own coils I give the following specifications of the new Counterformers:

Counterformer T1: Primary has ten turns of No. 30 D. S. C. wire wound on a form $2\frac{3}{4}$ inches in diameter and one inch long. The wire is wound at the extreme end of the coil as shown in the drawing. The secondary has sixty-three turns of No. 23 single-cotton or single-silk covered wire wound on a form three inches in diameter and $2\frac{3}{4}$ inches long. The winding is made in the opposite direction to the primary.

Counterformer T2: The primary has

twenty-five turns of No. 30 D. S. C. wire wound on a form 2 3/4 inches in diameter and 7/8 of an inch long. The secondary is exactly the same as the secondary of T1.

And now, if you will refer to the circuit diagram of Fig. 1 you will note certain additions and improvements besides the new Counterformers. The most important is the variable high resistance connected across the secondary of the reflex audio-frequency transformer. This resistance acts as a volume or tone control and completely eliminates howling caused by overloading of the reflex tube. When a very strong local signal is tuned in, a reflex tube is liable to be overloaded and cause howling. The use of a "C" battery, as also

addition of a fixed capacity across the primary, and a high resistance across the secondary, of the second audio-frequency transformer; the use of a "C" battery to raise the negative potential of the grids of both amplifying tubes; the omission of the "phones" jack in the output circuit of the reflex tube and the omission of a separate rheostat to control the detector tube filament.

The fixed capacity across the primary of the second audio-frequency transformer is made necessary by the new Counterformers. The value of this capacity is usually .001 mf although, in some cases, it is better to use a .002 mf condenser. The quarter megohm grid leak across the sec-

efficient three-tube sets in existence. The tremendous amplification (for three tubes) of the original Counterflex circuits is known and appreciated by all who have used the circuit. It is true, however, that it lacked selectivity and sometimes howled when local stations were tuned in. Both these imperfections have been removed. The selectivity of the new receiver is excellent, the howling is eliminated, yet the amplification is just as high as before. Moreover, the quality is much better and the tuning is simplified. I think I can afford to call these the "final improvements" in this three-tube circuit.

Many readers of this magazine have, I know, built the three-tube Counterflex which I described in the March issue. It is not necessary for these readers to scrap their sets to take advantage of the improvements herein described. It is comparatively easy to make the necessary changes and the expense is small. To reconstruct the set the following parts are required:

- 1 Pair of counterformers, new type (without variable condensers).
- 1 Variable high resistance (5000 to 250,000 ohms).
- 1 Vernier condenser, midget type.
- 1 Counterdon condenser with seven plates.
- 1 Fixed condenser, .001 mf.
- 1 Grid leak (.25 meg.) and mounting.
- 2 Binding posts.

I have already given the specifications of the new counterformers. The variable

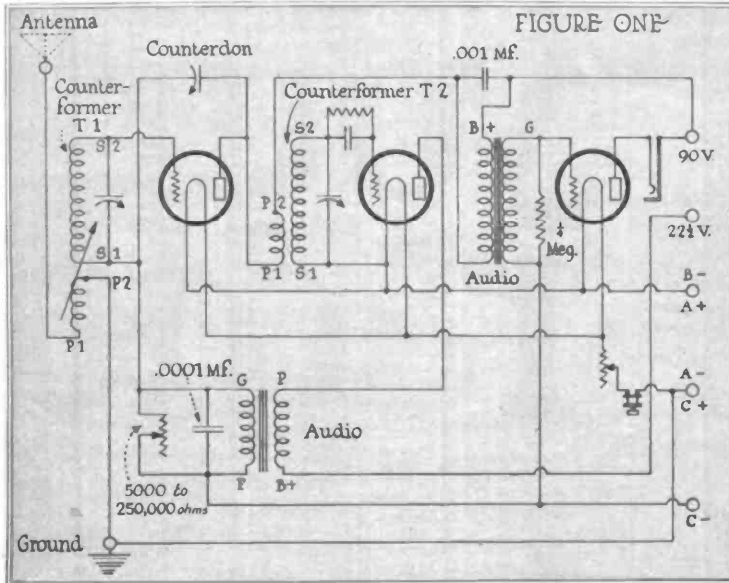


FIGURE ONE

included in the circuit of Fig. 1, helps to avoid overloading but, when the signal is very strong, the "C" battery is not sufficient. This overloading, however, can be effectually checked by adjusting the high resistance across the reflex audio-transformer. As a volume control this resistance is, in any case, a useful adjunct to the set. The resistance used in the new three-tube Counterflex receiver has exactly the same appearance as a wire-wound filament rheostat. The wire, however, is not continuous and is merely used to make contact to a high resistance strip. The resistance can be varied from about 5000 to 250,000 ohms.

Another improvement is the use of a Counterdon with a very much larger capacity than formerly. The new Counterdon has seven plates. The other changes in the circuit and parts make the use of this large Counterdon necessary. Moreover, the control of self-oscillation is simplified, the large counteracting capacity taking care of any small discrepancies in the values of the other parts in the circuit which would unbalance the system and make the control of self-oscillation difficult with a small Counterdon.

Other changes in the circuit include the

secondary of this transformer is inserted to improve the quality of reproduction. Formerly a fixed capacity was used. The high resistance leak, however, prevents any squealing or whistling in the audio-frequency amplifier just as effectually as the fixed condenser, and improves rather than impairs the quality of reproduction.

The "C" battery also greatly improves the quality of the system, eliminating all distortion. Three volts is usually the correct value for the "C" battery, although 4 1/2 volts can sometimes be used. The "phones" jack, which was included in the original three-tube Counterflex circuit, is now omitted as the volume can be controlled by the variable resistance across the reflex audio-transformer, leaving the phones or loud speaker in the output of the second audio stage. The detector filament rheostat is also omitted as this is no longer needed.

In one of the illustrations the antenna coil of Counterformer T1 is turned at an angle to show how the coupling between the antenna and tuned grid circuit may be adjusted. If desired, the primary coil may be turned at right angles to the secondary, in which case the coupling is practically zero. This new, improved three-tube Counterflex is, I believe, one of the most

high resistance need not have the exact value specified. The minimum value, however, should not be more than 5000 ohms and the maximum should not be less than 100,000 ohms or more than one megohm.

Any type of vernier condenser may be used, so long as it has small dimensions.

The new Counterdon, with seven plates, can be purchased or, if you have the facilities and skill, you may add the four extra plates to the Counter- (Continued on Page 15)

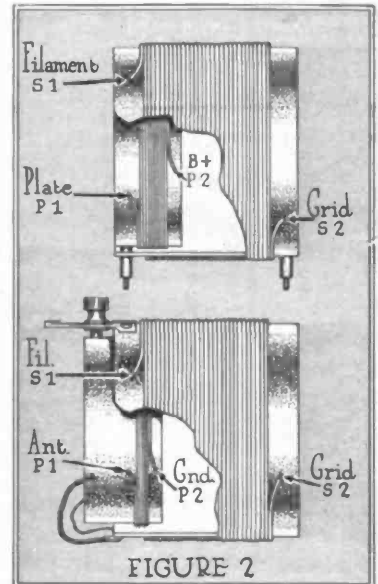


FIGURE 2

Run your radio



For 50-60 cycle 105-125 volt
alternating current \$47.50
For 25-40 cycle 105-125 volt
alternating current \$52.50

Philco Socket Power "B"—eliminates your "B" batteries

Thousands of radio owners have been asking—"Why can't we use our house current for radio power? Why can't we operate our radios as easily as we operate our electric lights?" Now they can!

Philco Socket Power "A" and Philco Socket Power "B" are the answer. Used together they make radio operation so simple that a snap of one switch does everything—turns on both "A" and "B" power and turns on your set. No more dry cells to buy. No more thought about battery charging.

Philco Socket Power "B" eliminates both dry cells and storage "B" batteries. It rectifies, filters and smooths out the house current. There's no hum—no distortion—no falling off in reception. Cost of operation less than ¼ cent per day.

No filaments in it to burn out—no high-voltage transformers—no ground wires running to radiators or water-pipes—large enough to "work" next month as well as this month, and fits into the same space as 90 volts of large dry "B" battery. Assembled in attractive Adam-brown, metal case. Can be used on any set.

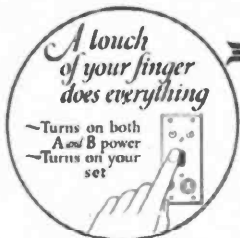
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from your house Current

Easy as
turning on an
electric light



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Philco Socket Power "A"
—eliminates all thought of battery charging



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Philco Socket Power "AB" is a combination of the "A" and "B" Power Units built into one case—and also controlled by one switch. Costs only one cent per day in average service. No hum. Reception at its best at all times. Eliminates dry cells and all thought of storage battery recharging. Automatic in operation. A touch of your finger turns it on or off.
For 50-60 cycle 105-125 volt alternating current...\$65.00.
For 25-40 cycle 105-125 volt alternating current...\$68.50.

Philco Socket Power "A" is a complete "A" power unit for storage battery tube sets. Plugs permanently into a light or wall socket. Eliminates dry-battery replacements—eliminates all thought about storage battery charging.

Snap the switch "ON" and you get a steady flow of power while your set is in operation. Snap it "OFF" and your power is shut off—your radio is silent—and current begins gently feeding back into the Socket Power from your lighting system.

Philco Socket Power "A" occupies less space than last season's storage battery and charger—looks better—costs little if any more—and is easier to use because everything is automatic.

Further, it provides for using Socket Power "B" in the simplest and most convenient manner imaginable. Simply insert "B" plug into the receptacle built in the "A". The one "A" switch then controls everything—"B" power as well as "A". You even leave the radio switch "ON" at all times. Nothing to think about but the one "A" switch.

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Philco Radio Batteries are Dynamic-DRY but CHARGED. Their life doesn't start until the dealer pours in the electrolyte. You are sure to get the full life of the battery.

Final 3-Tube Counterflex

(Continued From Page 16)

don you already possess. The quarter megohm grid leak and mounting are optional. This is intended to take the place of the .00025 mf. condenser across the second audio-frequency transformer secondary. While the grid leak slightly improves the quality, the condenser may be left in place if desired.

With these parts on hand the instructions given below should then be followed:

Remove the old Counterformer coils and substitute, in their places, the new coils. The latter are longer than the old type and extension brackets are required to mount them if the same mounting holes in the end plate of the condensers are used. These brackets can be purchased or, if you have the facilities, you can make them out of strip brass. When rewiring the counterformers follow the circuit of Fig. 1, paying particular attention to the terminals P1 and P2. The method of connecting these terminals is clearly shown in Fig. 2.

Remove the amplifier filament rheostat (to the left of the Counterdon) and substitute, in its place, the vari-

able high resistance. Connect this resistance across the secondary of the reflex audio-transformer.

Remove the old type Counterdon and substitute the new, wiring as before.

Drill a hole in the front panel, directly under the first dial, and mount therein the midjet vernier condenser. Connect this vernier across the main tuning condenser of Counterformer T1.

Drill two holes in the subpanel, on the top left-hand side (looking down into the set) for the two "C" battery binding posts. With a screwdriver punch plus and minus signs in the rubber opposite these posts. Then rewire the filament circuit to conform with the diagram of Fig. 1, using the remaining "detector" rheostat to control all three tubes. Connect the filament leads of both audio-transformers to the negative "C" battery binding post instead of to the filament as before. Connect the positive "C" battery binding post to the negative "A" battery post.

Connect the fixed .001 condenser across the primary of the second audio-transformer and, if desired, substitute the quarter megohm grid leak for the fixed condenser across the secondary of this transformer.

If you think these changes are too difficult for you, or if you experience any trouble, it might be a good idea to take your set to a competent set builder, show him these instructions, and ask him to make the changes for you.

After the changes have been made, check the operation by turning the Counterdon to its minimum position and testing for "oscillation" at all frequencies. If any difficulty is encountered in producing strong oscillations at all wave lengths you may either have a poor amplifying tube in the reflex stage or it may be necessary for you to use a .002 fixed condenser instead of a .001 across the primary of the second audio-transformer.

In operating the receiver, by the way, do not try to stop howling caused by self-oscillation with the high variable resistance. Self-oscillation must be controlled only with the Counterdon. The howling controlled by the high resistance is the howling caused by overloading of the reflex tube when a very strong local signal is tuned in.

I shall be glad to hear from readers who reconstruct their sets or who build new receivers embodying these latest improvements.

The Fleucelling Super-Reflex Converter

(Continued From Page 18)

a tube that is oscillating continuously and the design is such that this is carefully taken care of. Also, if the design is followed it will enable you to build a simple outfit that you can be sure of, and one that by plugging in other coils you may make from time to time will cover any wave length desired. You will be able to follow any further development in the converter very easily. It seems quite possible to reduce the two dials to only one, and if this is worked out as successfully as we have been doing it, then our reception will be even further simplified. One dial control is an ideal that seems to have been reached. I might even suggest that you use a cheaper panel in your first converter and change it for a more satisfactory one a little later on.

If you are planning on building a complete superheterodyne receiver this winter, our converter can be strongly recommended as a detector and oscillator of the highest order and the description in this article may be followed with confidence.

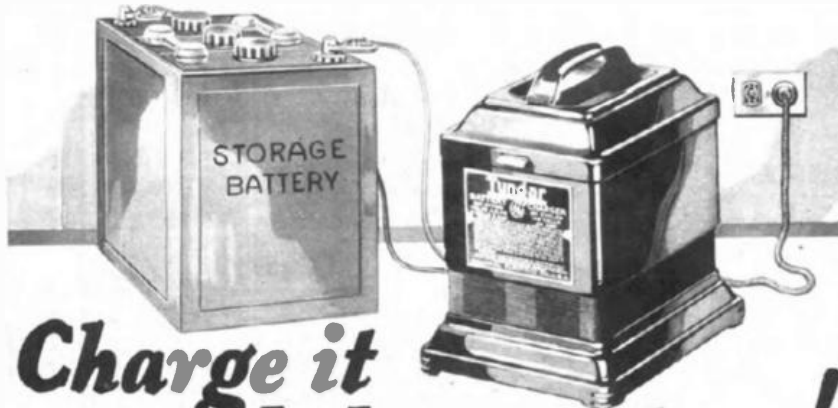
First, then, in our description of how to build the converter, is the list of parts required.

- 1 Celoron tube, 3 inch diameter by 1 inch long for choke coil.
- 2 Celoron tubes, 3 inch diameter by 3 1/2 inches long.
- 2 Sockets for 201-A tubes.
- 2 Amperites for filament control.
- 1 Rathbun variable condenser, .00025 mf. capacity for oscillator.
- 1 Rathbun variable condenser, .0006 mf. for tuning.
- 1 7 inch by 12 inch panel.
- 2 4-inch dials (vernier).
- 3 .00025 fixed condensers.
- 1 Suitable grid leak for tube used.
- 6 Headphone cord tips.
- 6 Phone-tip jacks to screw onto condenser terminals as shown in photographs.
- 7 Binding posts.
- 1 Base panel.

Soldering lugs, No. 24 DGC wire and No. 30 DSC wire sufficient for set.

All of the parts are easy to secure. There are now several types of phone tip and jack combinations on the market. The jacks are screwed onto the condenser terminals (two holes are drilled in the end plate of the oscillator condenser in order to mount the four shown and they are located exactly one inch on centers from the present terminals. One jack on each terminal and two between them makes a total of four jacks in a line on the oscillator condenser). Phone tips are soldered to the terminals of the coils and plug into these jacks. This construction results in short direct connections with minimum wiring, interchangeable coils, rigid construction and proper location of parts. These phone tips and jacks are adaptable to any radio set that one may care to build, as when the coil is plugged into the jack the connection is automatically made with the condenser without any wiring.

The circuit diagram of the con-



Charge it while you sleep!

Last thing at night—concert over—time to lock up. Radio battery low? Just clip on the Tungar, and plug it in. Or if you connect up the Tungar permanently, just throw a switch. Charge the battery while you sleep. The Tungar is simple—makes no disturbing noise. And the low cost of Tungar recharging cuts battery upkeep to next to nothing. It means top notch performance—clear, full-volumed reception—all the time!



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60 cycles—110 volts

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BATTERY CHARGER

Tungar—a registered trademark—is found only on the genuine. Look for it on the name plate.
Merchandise Division
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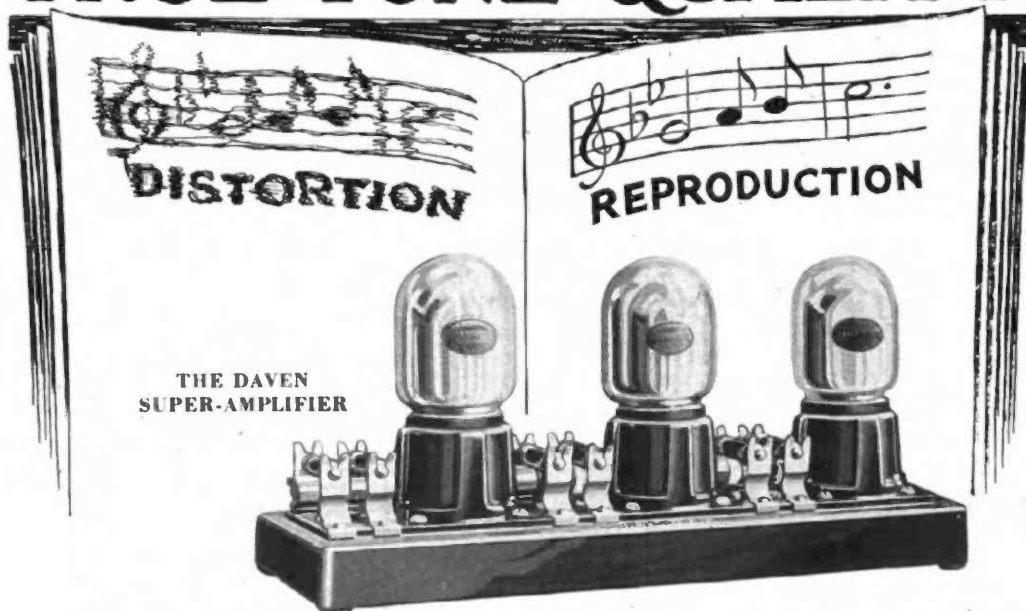
GENERAL ELECTRIC

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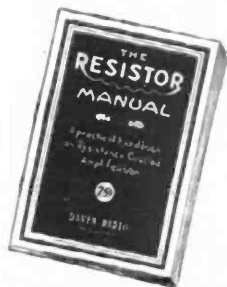
Tunes straight through the locals, sets distance. Brings in more stations—clearly and with volume—no given length of time than any other set. Direct connections invited. Zenith receiving sets *see more*, but they do more, the extensive choice of MacMillan for his North Polar Expedition.

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TRUE TONE QUALITY



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RESISTOR MANUAL

The Handbook of Resistance Coupled Amplification. At best Radio Dealers 25c. Direct by mail, postpaid 35c.

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Please send me the following on Resistance-Coupled Amplification:

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FOR DEALERS: Send your letterhead or card, or this coupon and we will have our nearest distributor communicate with you.

VOLUME was formerly the goal of radio engineers. The blare of discordant trumpets succeeded the tinkling of the harp. The goal had been reached.

But true tone quality is the star we now are shooting at. This explains the phenomenal growth of the demand for resistance coupled amplification. The end of the era of distortion is in sight.

Daven engineers have pioneered in resistance coupled amplification. Daven Resistors and Mountings, Ballasts, Amplifier Kits and Super-Amplifiers are standard everywhere.

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KENNETH HARKNESS,
President Harkness Radio Corporation.

There's only one safe way to build the Counterflex

THE successful operation of the Counterflex depends just as much upon the design of the parts used in its construction as upon the hook-up itself. The parts must conform exactly to my specifications; otherwise the receiver will be unbalanced and will not operate satisfactorily. The best and safest way is to build it with the complete kit of balanced parts which I have designed for the purpose. The set you build with this kit will be an exact duplicate of my own and will perform in the same unusual manner, affording you the receiving range, volume and

selectivity of a costly receiver at moderate expense. "Genuine Harkness Counterflex Kits are manufactured only by the Kenneth Harkness Radio Corporation, under my personal supervision. No other manufacturer is authorized to make parts for my circuits, or to use my name in any manner in connection with the sale of radio products. You can recognize genuine Harkness kits by my signature and the words 'Manufactured by Kenneth Harkness Radio Corporation, Newark, N. J.' which appear on the labels of the only genuine Harkness products."

Kenneth Harkness



Complete 3-Tube Counterflex Kit with new type 6A transformers and all latest improvements.

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verter is shown in Fig. 2, and will be seen to be very simple indeed, but it is very important to remember that all coils are wound in the same direction, and that they are spaced no less than one-quarter inch from each other.

The most important part of the converter is the coils, and they are best described at this time. The antenna coupling coil L1, Fig. 3, is of ten turns wound on the same tube as the tuning coil, spaced one-half inch from it. The tuning coil L2 has fifty-five turns and each end is connected to a phone tip which is soldered to a 6-32 screw through the tubing. This tube or coil carries but two plugs or tips and they are spaced the same distance apart as the ter-

dered into a phone tip which it will just fit, and the end of the windings are carried through small holes in the tubing, to the soldering lugs which are on the inside of the tubing. Fig. 5 shows a detail of this.

In winding the oscillator coil, note that the two windings for the plate and grid coils are spaced closely together and that the grid coupling coil from the detector tube is spaced a bit farther apart. This spacing is clearly shown in Fig. 4 and the connections of the terminals are clearly shown in Fig. 7. The coils are the grid and plate coils for the oscillator, each coil of sixteen turns and the coupling coil of ten turns.

The third coil or tube in our layout is the detector tube choke coil. This choke coil consists of as many turns

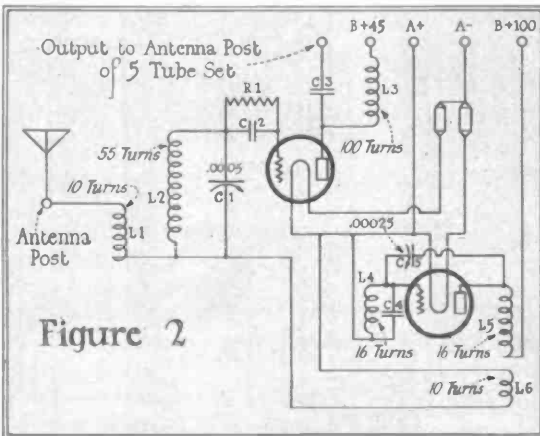


Figure 2

The five-tube set is already grounded so that none is used on the converter.

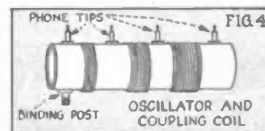
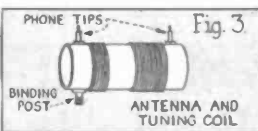
- L1—10 turns No. 24 DCC wire
- L2—55 " " " "
- L3—100 " " " "
- L4—16 " " " "
- L5—16 " " " "
- L6—10 " " " "
- L3-70 to 100 turns No. 30 DSC wire
- C1—.0005 mf.
- C2—.00025 mf.
- C3—" "
- C4—" "
- C5—" "
- C6—" "

minals of the variable condenser on which they are to be mounted. Now note that the antenna coil is connected to a binding post mounted on the tubing, on the side opposite to the plugs, and its other end is connected to the nearest plug or tip. This plug should, then, always be plugged into the filament or coupling coil side of the tuning condenser—that is, to the rotor side. The method of connecting is shown in Fig. 6.

Having constructed the tuning and antenna coils with their mounting plugs, it will be comparatively simple to build the oscillator coils and the coupling coil. This coil is shown in Fig. 4, and it will be seen has four plugs and a binding post for the connections. The two extra plugs are just one inch from each end or outside plug. Soldering lugs are fastened under each 6-32 screw, the threaded end of which is then sol-

dered into a phone tip which it can conveniently wound upon the one-inch by three-inch tube. This coil, which is L3 in our diagram, is not at all critical and if you have a 75 or 100 turn honeycomb coil, it will fit in very nicely here, and any easy method may be used to fasten it to the baseboard directly under the oscillator coil, as shown in Fig. 1.

After the coils are wound, the next step is the assembly of the converter, and it seems good to know that the word assembly better fits our case than the words "wire our set" would. The two variable condensers are mounted just seven inches apart and so that they clear the base panel by holes for the extra jacks. Having done this the terminal nuts, two on each condenser, are removed and a jack screwed on in their place. Care with its four plugs is mounted on the right with the stationary or stator



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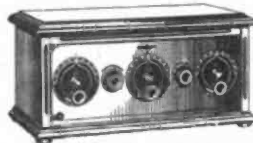
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THE STERLING MANUFACTURING CO.
2831-53 Prospect Ave. Cleveland, Ohio



Sterling Tube Reactivator



Sterling Tube Tester



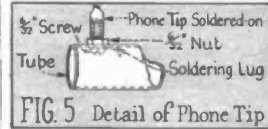
Sterling Battery Charger



Sterling Pocket Meters

plates up. It will be necessary to remove the end plate of the oscillator condenser in order to drill the two 1/4 inch. The .0005 mf. tuning condenser with its two jacks is placed on the left of the panel with the stationary or stator plates down and the .00025 mf. oscillator condenser should be taken that the jacks line up in a straight line, as shown in Fig. 8, which shows the rear of the converter with two coils removed.

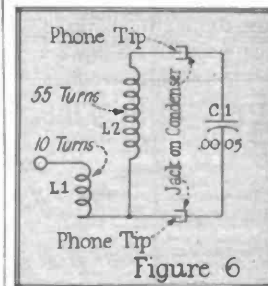
Fig. 9 is a view looking down upon the converter, again with two coils removed. An inspection of Figs. 8



and 9 will show how the grid condenser C2 with the grid leak is mounted directly upon the socket and tuning condenser terminals, again without any wiring. This will determine the location of the detector tube socket, and the oscillator tube socket is lined up just one-half inch from it.

Again without wiring we mount our filament control amperites directly upon the terminals of the two sockets and the binding post strip, as shown in Fig. 9. It will be noted that no filament switch has been shown. This is due to the fact that none was used in the converter that we photographed. Should a switch be desired, it should be placed at this time directly between the two dials of the tuning condensers in the plus "A" battery lead. It will not then interfere with the design as shown.

Fig. 9 also shows the arrangement of the binding posts for the batteries. The two center posts are for the plus and minus "A" battery, while the two outside posts are for the plus "B" battery. The minus "B" battery connection will be taken care of in the



present five-tube receiver and has no connection in the converter as it is always returned to the "A" battery. With the method of construction which we have used the wiring of the converter becomes an exceedingly simple matter, because most of our connections are already made for us. It is preferred that no bus-wire be used in the converter. I would recommend that you use well insulated copper wire that can be tied or bunched together in the manner shown in Figs. 8 and 9.

With the finished converter connected to the antenna and to the five-tube set the first attempt at tuning may be made. Make sure that the five-tube set is not oscillating and you can then readily locate any trouble that may arise in the converter. The two tuning dials will run fairly close (Continued on Page 29)

Sangamo Mica Condensers



"See the Sangamo Exhibit at the National Radio Exposition, Chicago the week of Sept. 28"

Nothing will change their accuracy

"WHAT'S wrong with my set?" asks many a puzzled builder, forgetting that inaccurate fixed condensers throw the whole circuit out of electrical balance.

Perhaps this is your trouble. With Sangamo Mica Condensers you can be sure of dependable accuracy no matter how severely they are used.

For here is a condenser that is guaranteed to be accurate within 10 per cent of marked capacity, and to sustain that accuracy under all conditions of service. It is solidly molded in smooth brown bakelite; impervious to moisture, acid fumes or salt air.

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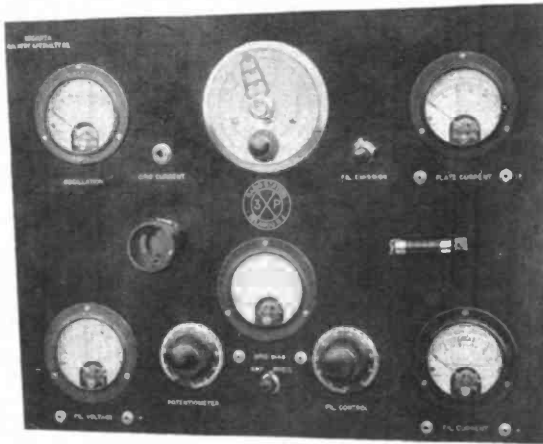
50 and 52 North Seventh St. Philadelphia, Pa.

Hammarlund CONDENSER

All capacities: plain and variable. Single, Double and Triple Models. Also "HAMMARLUND, JR."—the Precision Midset.

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Notes from the Lab at Station 3XP



Tube-Testing Panel

All vacuum tubes are thoroughly tested at 3XP Laboratory. The meters and instruments on this panel are used to determine the oscillation factor, grid characteristic, filament emission, mutual conductance, gas content and the usual static curves. The panel is of Micarta, a Westinghouse Electric product, and the meters used are Weston Instruments. The panel was engraved by the Calvert Specialty Company, of Philadelphia

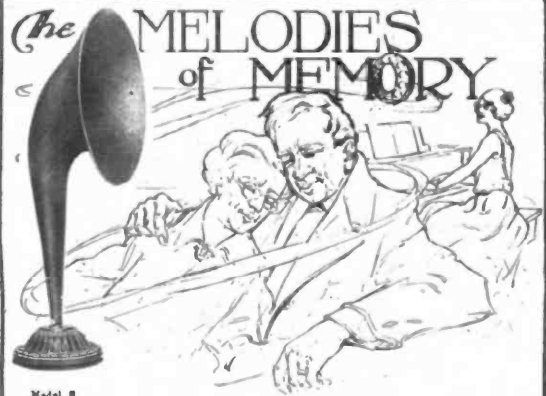
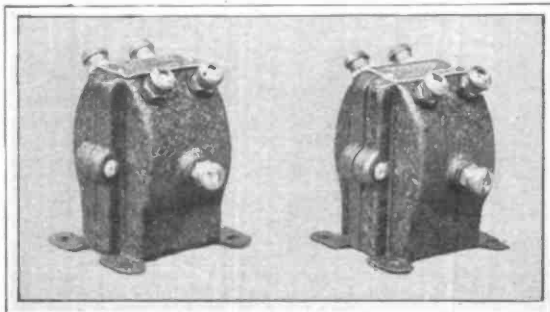
Washburn Interchangeable Coils

Washburn Burner Corp., Kokomo, Ind. Interchangeable coils for tuned radio-frequency receivers eliminate much of the "crowding" at the shorter wave lengths. Kit No. 1 covers the wave band from 40 to 180 meters; kit No. 2, 100 to 300 meters, and kit No. 3 covers the present broadcast band—224 to 550 meters. The coils are of the low-loss type, mounted in bakelite bases for use in standard tube sockets

Precise Push-Pull Transformers

Precise Mfg. Co., 254 Mill St., Rochester, N. Y.

Push-pull audio-frequency amplification increases the volume and minimizes distortion. A pair of these transformers, used in conjunction with a Precise audio-transformer, gave excellent results in both quality and volume



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10 1/2 inches in
diameter. Mat
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of bronze and
gold. Classic
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NOTE:—Models S and C (the Cabinet Model) are equipped with the new Super Unit which contains a specially designed diaphragm of broad pitch range, reproducing perfectly the high as well as the low notes.

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Waterbury, Conn.

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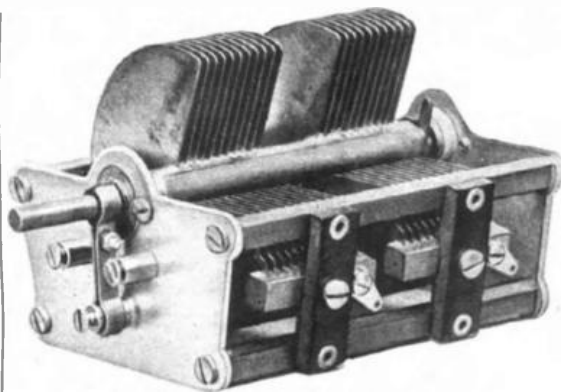
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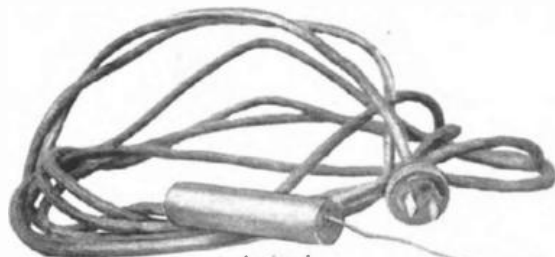
THE HOME OF NO-DIAL.

The Ohio Stamping and Engineering Co.
DAYTON, OHIO, U. S. A.



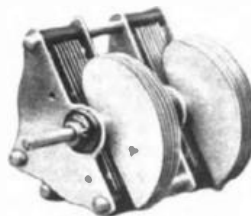
Hammarlund Dual Condenser

Hammarlund Mfg. Co., 424-428 W. 22d St., New York
This instrument contains two variable condenser units mounted on a single shaft. May be used in any radio-frequency circuit for tuning two circuits simultaneously—thus simplifying the tuning

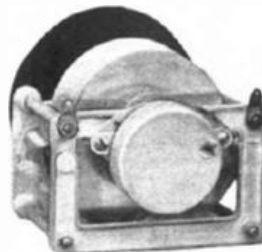


Aericoord

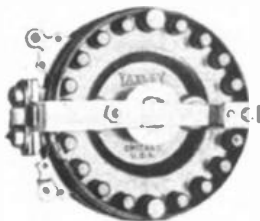
William Peruletrus Products, Philadelphia, Pa.
An excellent substitute for an aerial. The Aericoord plugs into the electric light socket and gives virtually the same results as an outside antenna



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Alden Mfg. Co., Springfield, Mass.
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The Sangamo fixed condenser, being completely encased in bakelite, is not



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Unitrol Filament Control
The Unitrol Co., 1011 Chestnut St., Philadelphia, Pa.



Frost Filament Switch

Herbert H. Frost, Inc., Chicago, Ill.

The Frost toggle switch is small and neat in appearance. Engraved for "on" and "off" positions

The Unitrol Filament Control mounts directly on the filament terminal of the tube socket. The resistance range is from .2 to 35 ohms and the carrying capacity 3 ampere. The resistance is varied by means of the large adjusting screw



Editorially Speaking

(Continued From Page 3)

understand that this picture is entirely theory, but the experimental work which Mr. Grimes has been doing on it for a long while and which Professor Alexanderson and his associates have so evidently been doing, points very strongly to the probability that something of that kind will some day be possible.

Mr. Grimes has already transmitted horizontally and vertically for a short distance from his laboratory on Staten Island. It may interest the readers of this magazine to know that, as this is being written, we are installing two special transmitting sets at Station 3XP. These sets are designed to duplicate exactly the condition which I have outlined in the word picture. We are going to transmit simultaneously and on exactly the same wave length with the two transmitters, but one will send horizontally and the other will send vertically. Mr. Grimes and his assistants, on Staten Island, are going to use two receivers to find out whether the two signals are absolutely distinct and different from each other at a distant of seventy miles.

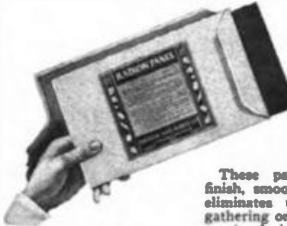
The benefits of such a system, should it prove adaptable to broadcasting, may easily be imagined.

Our greatest problem in radio today is the terrible congestion in the ether due to the fact that we have licensed entirely too many broadcasting stations. The Department of Commerce is utterly helpless to solve this riddle, and there are still broadcasters upon broadcasters knocking at the door for admission. The answer is that no wave lengths are available.

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THE first choice of thousands of successful set builders is Radion Panels—made of Radion, the insulating material built to order by our engineers for radio exclusively.

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These parts have the wonderful Radion finish, smooth and high polished. This finish eliminates those losses caused by moisture gathering on the surface of ordinary insulation, causing leakage paths. The high-resistant characteristics found only in Radion Panels also mark these new parts.

You can now get Radion Sockets, Radion Dials, the new Radion Loud Speaker Horn, Radion Tubing, Radion Binding Post Strips, Insulators, etc. And, of course, Radion Panels (made in black and Mahogany) come cut in standard sizes for whatever set you wish to build.

Ask your dealer to show you these new Radion parts. Practically every radio store carries Radion Panels and will gladly get any of the new Radion parts if it hasn't them in stock.

Send for Booklet, "Building Your Own Set"



The Radion Built-in Horn takes up small space in the cabinet and gives a clear, rounded tone



The new No. 10 4-inch Radion Cloo-Tuning Dial, built to conform to the Angora. We believe it is the most beautiful dial yet designed.

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Helps you to tune in clearer, quicker, more contact with no binding posts. For such above mentioned advantages, it is the most beautiful socket yet designed.

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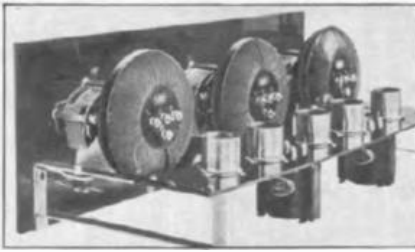
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Amazing new receiver

NOW anyone can build it in an amazingly short time this new easy way. Experts assemble it at factory. You simply wire. Note revolutionary new principle it contains.

NO excuse now for not having a fine radio. At a surprisingly low cost, too. For a remarkable plan is showing thousands a new way to build their own. It is so easy that anyone can do it in an hour's time. So fascinating that many continue to build them for others. No wire bending or soldering. Merely attach a few ready-cut, flexible cycled leads, and the job is done.

And in addition to the fun and pride of building your own, the finished receiver actually contains a phenomenal feature not yet found in the most expensive sets; that brings results otherwise impossible.

This feature follows the discovery of a new inductance principle that overcomes many vital weaknesses of present day sets. It is based on an entirely new type coil—the Erla *Balloon *Circluid.

Circluids are the backbone of the Erla kit and are largely responsible for the striking improvements this kit alone offers. Note these four advantages in particular:

- 1. Greater distance.** Circluids have no measurable external field to affect adjacent coils or wiring circuits. This makes possible higher amplification in each stage, with increased sensitivity and greater range.
- 2. More volume.** Higher r.f. amplification enables Circluids to bring in distant stations scarcely audible in ordinary sets with volume enough on the loud speaker to fill an auditorium.

3. **Increased selectivity.** Circluids have absolutely no pick-up qualities of their own. Only signals flowing in the antenna circuit are built up.

4. **Finer tone quality.** The self-enclosed field positively prevents stray feed-backs between coils. Hence no blurring or distortion. Tones are crystal clear.

Circluids are sold singly and in sets of three; also in kits containing three Circluids and three .00035 condensers.

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mit horizontally just as well as vertically, and suppose that the horizontal transmission would not in any way interfere with the vertical transmission regardless of wave lengths. What a godsend it would be to the Department of Commerce to be able to assign stations duplicating every present wave length but specifying horizontal transmission instead of vertical. It would double the number of broadcasting stations which can be accommodated by the band of wave lengths not aside for this purpose.

But please remember what I said in the very beginning, this is all absolutely experimental and theoretical, and you need not hesitate to buy that receiver that you were looking at in the store last week. Get it now and enjoy the vertical broadcasting and when the horizontal transmission comes along you can probably use the same receiver with simply another aerial which will be switched in when you want horizontal reception.

The New Grimes Inverse Duplex System

(Continued From Page 11)

previous articles in this magazine, had been more or less of an experiment in the past. However, "practice makes perfect" again, and the new 199's are increasingly more stable, more uniform and longer lived.

We have therefore decided, in this first article on the New Inverse Duplex System, to incorporate the use of the 199 type of tube, thus answering the long cry of Inverse Duplex fans for a dry cell set.

The honeycomb type of coil was suggested last year because it was easy for the experimenter to purchase and easy for him to build a radio transformer therefrom. It was not, however, the last word in tuned radio-frequency transformer design, and to obtain the desired selectivity this year, we must not compromise on this feature of the circuit. Therefore, we are describing and explaining fully the design of an efficient, nearly tuned radio-frequency transformer, which will require a little patience to build, but when once put together, will give results well worth the effort.

This transformer we have "christened" the "Twin Cylinder Coil," and a picture of it is herewith shown. Fig. 1 shows the constructional details of such a transformer and Fig. 2 shows the connection details for its proper operation. It will be noted in Fig. 3, wherein is shown the schematic diagram of the circuit, that three of these twin cylinder coils are employed—one for tuning the grid circuit of the first radio tube, another for tuning the grid circuit of the second radio tube, and the third for tuning the grid circuit of the detector tube. These three coils are identical as far as the secondary winding is concerned. The primary windings vary in the three coils as can be seen from the sub-circuits in Fig. 1. The antenna coil or the one used to tune the first radio tube has a primary winding of 22 turns, 16 split on each spool. This is tapped at 2, 4, 8, 16 and 22 turns. Of course, the thirty-second turn is the end of the primary and the sixteenth turn is the middle where the two split coils are connected together. This leaves only one side of the primary to be actually tapped at 2, 4 and 2 turns.

This coil has several decided advantages, among them being high selectivity, high efficiency and elimination of certain feed back and oscillation noises. The three coils may be mounted as close as within six

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Hear the Amplion in comparison—let your ears tell you why this creation of the actual originators and oldest makers of loud speakers leads in sales throughout the world. Not only is The Amplion superior for clarity, realistic tone and high dynamic volume. It also has "selectivity"—the ability to separate distinctly the different instruments in an orchestra, or the various voices in a quartet. Instead of jumbling them together, interesting Amplion literature will explain why. Write for it and dealer's name.

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MAGNATRONs are built with the precision of a fine watch, and tested just as carefully before they leave the factory. You can always count on MAGNATRONs to get the most and the best out of your set.

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Piano music, the most difficult to reproduce, sounds so natural that you are completely carried away by its beauty.

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Orchestra music is indeed a recreation, every instrument can be heard, clear and full.

Magnetic diaphragm control—used exclusively in the Kellogg unit—is the new principle that performs wonders in the radio reproduction.

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Parts are identical with those used by GRIMES, and described in this issue. Kit includes panel, baseboard, all instruments, Collette Wire, etc. THIS SET IS A WONDER.

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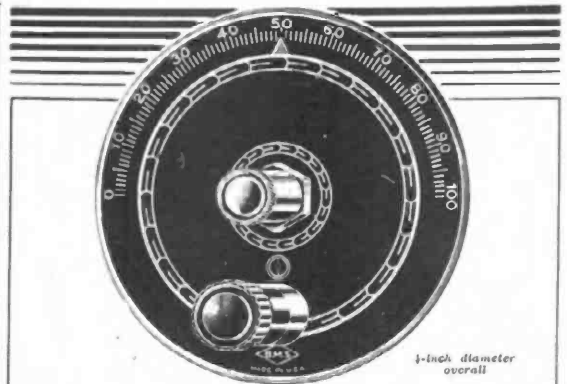
"Sets of the New Season"

Some of the Sets and New Parts shown in this issue under the above heading are hard to find in some parts of the country. I can get them, and if you will write me, I will be glad to quote prices.

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1/4-inch diameter overall

New! B. M. S. VERNI-JUSTER!

THIS new dial will enhance the beauty of your set. Its action is positive, with a 15:1 gearing. An insulated friction clutch eliminates hand capacity. No tools are required to attach it.

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is absolutely shockproof. Shielded of bakelite in a beautiful keystone design. They are held and released automatically, the key being totally concealed when inserted. Positive and 50c negative are marked.

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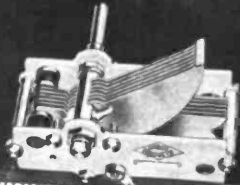
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inches of each other in a straight line.

The stabilizing device has been added to this radio-frequency circuit because of past experience with commercial variations in vacuum tube. It was found in the 3XP letters coming in from the readers that some fans experienced oscillation while others did not, even though all of them followed specifically the design details given in the articles. Investigation in our laboratory revealed the cause for this apparent inconsistency—variation in tubes. It, therefore, became necessary to install in the circuit a variable control to be adjusted according to the emergency. This is merely a straight noninductive variable resistance running from 0 to 1000 ohms. It is rarely necessary with the present type of tube to run more than half of this, or 500 ohms, but the design of tube may be changed before this article can reach the field, and we are playing safe this time.

In order for the stabilizer to work properly and be a source of stabilizing rather than a source of oscillation, it is necessary to have the primary of the second twin cylinder coil reversed from its normal method of

connection. If this primary is connected in the normal manner, the stabilizer will increase the tendency to oscillate as more and more resistance is added. If this primary is connected in a reversed manner, the stabilizer will immediately cut out the oscillation as resistance is added.

For the sake of uniformity and, incidentally, slightly more stability, the primary of the third twin cylinder coil is also reversed. Whether this primary is reversed or not has no effect on the operation of the stabilizer, but does tend to reduce magnetic feed-back into the first twin cylinder coil if reversed. It is therefore shown connected similarly to the second twin cylinder coil. These twin cylinder coils outlined are designed to operate with a 23 plate (.0005 mf) variable condenser. With such a condenser the wave length range of the set will be something under 200 and well up to 600 meters. At this point it seems unnecessary to bring out the necessity of using good low loss variable condensers if maximum results are to be obtained.

One thing is to be watched with the grid leak type of detector tube and that is the mounting of the grid leak and condenser. These must be placed as near the detector tube as possible



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Heavy advance orders from dealers, who last year sold thousands and thousands of B-Limitators, allow us to go into production which makes this reduction in price possible.

During the past few months hundreds of purchasers of B-Limitators have written us telling of the smoothness of the reception which they say the B-Limitator makes possible. One of these was Henry M. Neely, editor of this publication.

A B-Limitator will possibly improve the reception of your set; in addition it will do away with the annoyance of B batteries forever. Just plug it in on any 110-volt 60-cycle circuit and turn it on. We'll be glad to send B-Limitator literature, and remember, if you wish to assemble your own B-Limitator, there are B-Limitator Kits, price \$20.00; at your dealer's.

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Write for list of other models

and as far away from other tubes and apparatus as possible. It has been found with certain types of audio-transformers that it is often necessary to cover the detector tube and grid leak itself with a metal can; this can be grounded. This stunt will eliminate the high-pitched whistle caused from the grid leak picking up stray audio currents, and will also reduce the hum sometimes found when placing the set near electric lights and wires.

With the 199 type of detector tubes here recommended, such a precaution is seldom necessary. Another thing to note with the detector tube is microphonic troubles. Some microphonic tubes have a tendency to pick up any noise in the room, causing a ringing in the loud speaker. This ringing sometimes builds up into a slowly increasing roar. The remedy, of course, is mounting the detector tube in a spring socket rather than a rigid one, and interchanging the various 199 tubes about from socket to socket. In this way a non-microphonic tube will be found for use as a detector.

Now comes the part of the circuit that has undoubtedly caused in the past the greatest amount of grief. It is the audio circuit. Fans can always design and construct their own radio transformers, but they have to rely on audio transformers which they can buy. Unfortunately, there are audio transformers and audio transformers. Some are and some aren't. We have endeavored in the past to avoid difficulty in the audio circuit by generally recommending low ratio types. We are still doing this. It is absolutely best to use 2 to 1 transformers in the first and second stages, with possibly a 3 to 1 in the third straight audio stage. Even then a definite circuit arrangement cannot be given to you. You will probably need to experiment in the hook-up, particularly with the by-pass condensers and the phase connections on the primaries.

There are two difficulties in the audio circuit which present themselves:

First—The ordinary tendency in any audio circuit to howl at certain pitches. This is particularly true of three audio stages which, by the way, are necessary for best volume and quality.

Second—The tendency of the audio currents either to aid or oppose the radio currents, according to their "timing."

The first difficulty produces a continual whistle whether the aerial is connected to the set or not. The second problem is one concerned with overloading the tubes. If the audio currents are improperly timed, the set will overload and howl very easily on local stations. If properly timed, considerable volume can be obtained up to the limits of the 199 tube before overload howl occurs on local stations. The overload howl with improper timing is usually low pitched, while with proper timing it is high pitched.

This question of proper timing was first intimated in articles appearing over two years ago, and to many fans who read between the lines this question is an old subject. To overcome the ordinary howls in audio circuits, irrespective of proper timing, it will be necessary to experiment slightly with the values of the by-pass condensers in the secondary or grid circuits and the grid leaks across the secondaries of the audio transformers. Fig. 3 shows .0005 and .00025 for the values of the by-pass condensers in the grid circuits. These have been found, usually, to be the best. The by-pass condensers in the plate circuits shown as .001 near the stabilizer do not need to be changed. The grid circuit by-pass may be increased slightly to prevent audio

How You Can Vastly Improve the Musical Qualities of Your Radio Set

JUST one year ago the Karas Harmonik Audio-Frequency Transformer took the radio world by storm. Nothing like it had ever been known before.

For the first time, scientific study had been devoted to perfecting an audio-transformer for the reception of broadcast music. The problem of amplifying high, low and medium frequencies to an equal degree was finally solved. The vital harmonics had rich overtones formerly lost, were brought out in their full beauty by this marvel of audio-transformers.

Music critics, who had always condemned a radio music as false and distorted, approved the results of Karas Harmonik amplification with great enthusiasm. Prominent radio engineers subjected Karas Harmonik to exhaustive laboratory tests—and pronounced it a technical master

piece. Technical editors who promulgated the season's most successful hook-ups specified Karas Harmoniks in their circuits. The triumph of the Karas Harmonik was complete!

But, for all of this, the enjoyment of Karas Harmonik amplification was too greatly confined to one class of radio enthusiasts. Home set builders bought Karas Harmoniks by the tens of thousands. They were free to pick and choose. They were most exacting in their demands for the newest and best developments.

It was the owners of factory-built sets who missed the delightful pleasure of real, true radio music in their homes. Set manufacturers

were prevented by price from adopting Karas Harmoniks for their sets. So the ready-made set buyer, unless he undertook to switch transformers,

had to do without Karas Harmonika. Today there are in use hundreds of thousands of sets — good sets — which could be vastly improved in musical quality by the simple operation of replacing the old transformers with Karas Harmonik Audio-Frequency Transformers. Perhaps YOU own one of these sets. If so, are you going to be content any longer with anything short of the most perfect music your set is capable of giving?

Your set may be all you desire from the standpoint of selectivity, range and other tuning qualities. BUT if it is not equipped with Karas Harmonik Audio-Frequency Transformers, you are NOT getting nearly the musical qualities you can just as well enjoy.

You can install Karas Harmonika yourself! It's a short, easy job. Or any radio repairman can do it for you. Make up your mind to do it now—at once!

Get a pair of Karas Harmonika TODAY! In large cities, most good dealers carry Karas Harmonika—and in many small towns, if YOUR dealer is out of them, order direct of us. Send no money. Just use the coupon.

KARAS ELECTRIC CO., Dept.
404 N. Rockwell St., Chicago, Ill.
Please send me a pair of Karas Harmonik Audio Frequency Transformers. I will pay the postage and insurance, plus postage, on delivery. It is understood that I am privileged to return the transformers any time within 30 days if they do not prove entirely satisfactory to me, and my money will be refunded at once.
Name
Address
If you send cash with order we'll send transformers postage prepaid.

"More Than Just a Name" CALVERT RADIO EQUIPMENT

WE are pleased to announce that the services and facilities of our laboratories are now available to the Radio Public and that Mr. Henry M. Neely has designated this laboratory as the official Service Station of "Radio in the Home." Working in close contact with the elaborate research laboratory of "Radio in the Home," we are in a position to offer their readers first-hand information and service on sets that have been built from circuits published by them. If you are having trouble with your set, no matter what circuit or make, ship it to us. We are fully equipped to test, repair or build sets, parts or accessories, and we carry a complete line of Radio from the smallest nut to the largest set. Mail orders will receive prompt attention.

12th Floor, Jefferson Bldg.
1015 Chestnut St., Philadelphia

Obsolete The HEART of the Circuit is AMPERITE

The "Self-Adjusting" Rheostat
AMPERITE controls the flow of current through the tubes automatically just as the heart controls the flow of blood through the body. Does away with band rheostats and filament meters. Eliminates guessing and all tube worry. Prolongs tube life. Lowers set cost. Proved and adopted by more than 50 set manufacturers. For perfect, most economical you must use AMPERITE. \$1.10 everywhere.

RADIALL COMPANY
Dept. K. R.-11, 50 Franklin St., New York, N. Y.
Write for FREE Hook-ups
AMPERITE
The "SELF-ADJUSTING" Rheostat

The Show You Can't Afford to Miss!



PHILADELPHIA RADIO EXPOSITION

October 3rd to 10th 1925

EVERYTHING new in Radio—the latest complete sets, the newest parts, designed for the one-tubes as well as the Supers. Broadcasting afternoons and evenings by your favorite artists appearing in person. Set-building contest for the Amateur with substantial cash prizes; entries to be displayed during the Exposition. A show that the "Fan" and the "Ham" will enjoy. Don't miss it!

The ARENA
46th & Market Streets

Sponsored by the
PUBLIC LEDGER
and the
Philadelphia Radio Trade

Admission
Afternoons 25c
Evenings 35c

howl if necessary. Greater than .001 is not recommended. It is better to decrease the grid leaks slightly to about 1 meg. This will kill the squeal and will not interfere with quality.

The question of properly timing the audio transformer is slightly more complicated. We have shown a primary reversed from its normal connection because the great majority of audio transformers are so wound as to give our desired phase when the primary is reversed. It will be noted that the secondary is connected in the normal manner, the grid posts of the transformer, connecting eventually to the grid of the tube, while the filament terminal of the transformer finally returns to the filament of the tube. In the primary the plate post of the transformer is connected to "E" battery while the "E" post of the transformer finally reaches the plate of the tube. This will ordinarily give the proper timing or least overload.

The whole art of properly timing the audio and radio currents is somewhat similar in analogy to timing the explosions in an automobile engine. If the audio currents are not of a proper polarity at a given instant they may do great harm to the radio currents flowing through the same tubes. Of course, only the first and second audio transformers need be connected for this proper timing as the last audio transformer works into a free audio tube having no radio currents therein.

One way to make sure that you have properly timed your audio transformers is to tune in on a local station and obtain the overload howl by boosting up your antenna taps. Then reverse the primary connections of the first audio and then the second audio. By trying different combinations of these primaries the least overload howl and the highest pitch howl will be obtained. Meanwhile, care should be taken to see that in reversing the primaries no regular ordinary howl is built up with the third audio transformer. This can always be checked by merely unhooking the aerial to see if there is a continuous audio howl present. If, upon reversing the primary of one of the first two audios, it is found that a continuous audio howl is built up with the antenna removed, then reverse the primary of the third audio and reduce the amount of grid leak resistance. A future article will discuss this art of timing very fully and in such a manner that it can be definitely checked in a transformer before it is installed in the set.

The rear-shift switch is a device that is becoming more generally used on all radio sets for reducing the amount of audio amplification to suit the conditions. In old days various interstage jacks were used, and when a person desired to cut the audio amplification he merely cut his loud speaker or phones into various jacks, labeled "First stage," "Second stage," etc. This is not nearly so convenient as a switching device in the form of a double-pole double-throw switch as shown in Fig. 3.

This switch is merely connected in such a manner as to cut out one audio-amplifying stage, giving two stages of audio or three stages of audio as desired. It is rarely necessary on local reception to employ more than two stages of audio, as it will be found that the 199 tubes will not stand the excessive volume delivered by three audio stages. The audio stage cut out when throwing this switch is the first audio tube, leaving this free for radio amplification. It is so wired that the first audio transformer is removed from the first audio tube and shifted to the second audio tube, which happens to be the first radio tube. The second audio transformer that formerly went to the second audio tube is disconnected

from the circuit and remains idle when the switch is in low volume.

The switch, of course, does not cut out the filaments of any tubes because the tube not used for audio with the switch in low volume is still being used for radio amplification. This switch has been christened the "Gear-shift switch" because of its analogy to the automobile industry.

A single pole double throw switch is shown in Fig. 3 to permit the set to be operated on a loop. Loop operation, of course, does not pick up as much distance as antenna operation. Loop operation will give, however, greater selectivity under certain extreme conditions where it is necessary. The kind of loop to use with a 23 plate condenser is about 18 inches square, with about fifteen turns of wire, spaced a quarter-inch apart.

In certain desirable locations it is possible to operate this set fairly well on a ground wire only. In this case, merely connect the ground wire to the antenna post, leaving the ground post free. This will often work as far and will be as selective as the loop and, of course, is much more compact.

The batteries required by the New Inverse Duplex System are listed below, all being dry cells:

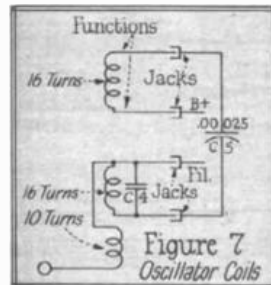
1. 4 1/2 volt "A" battery, consisting of three No. 6 dry cells.
2. 4 1/2 volt "C" battery of the standard small size.
3. 90 volts of "B" battery, medium size.
4. 2 1/2 volt separate detector "B" battery, small or medium size.

As the "B" battery drain is very little when using a "C" battery and 199 tubes, it is not necessary to have the young power plants usually employed with multi-tube storage battery sets. The separate 2 1/2 volts on the detector greatly reduces the tendency for audio howl and will greatly increase the length of life of the 90 volt "B" battery.

The Flewelling Super-Het Converter

(Continued From Page 22)

together and should be moved very slowly, as it is extremely easy to pass over stations. The oscillator dial is extremely sharp and the tuning dial will be sharp in proportion to the antenna used, the set that you are using and the coupling condenser C3. This condenser, C3, is the first place to look for trouble or in case of poor results. It is recommended that



several condensers be tried, inasmuch as the marking .00025 doesn't always mean what it says, and again the condenser used might not match up exactly with the choke coil, L3.

In closing, let me say that the converter is just like a superheterodyne in that it is almost useless unless you log very carefully every station as it is tuned in. This is because of the extremely fine tuning obtainable, making it so difficult to remember the exact dial settings. When you log a station you will need to read in half divisions or less.

CARTER

New "IMP" Pilot Switch \$1.50

Eliminate possibilities of going away and leaving tubes burning. Red light shows all the time tube filaments are lit. Complete with quarter turn snap switch and light in one. Simple to install. Single hole mounting. Lamp operates on 5 or 6 1/2 volts. Consumes only 15-100th Amp. battery drain negligible. One of the latest Carter radio advertisements.

ASK YOUR DEALER TO SHOW YOU, ANY DEALER CAN SUPPLY.

In Canada—Carter Radio Co., Ltd., Toronto

Carter Radio Co.
300 W. MADISON ST. CHICAGO, ILL. U.S.A.

Protection

Isn't your home and radio worth the best protection you can buy?

Safety demands the

BRACH VACUUM ARRESTER

STANDARD FOR 15 YEARS

Riga Prevents Trouble

Order Now

No. 100 RIGA-Fine-Wire A & B-Battery Cable with type A Battery Clips and Soldered Lug Terminals. Each conductor is distinctively colored, making easy identification of each battery element.

AT YOUR DEALER (Or Sent Postpaid, \$1.15)

BIRNBACH RADIO CO.

270 Seventh Avenue New York City

A guide to what is right and standard in Radio

Guaranteed Airline RADIO Sets and Parts

Ward's sets are easy to install

MONTGOMERY WARD & CO.

Send for your free copy

Ward's New Radio Catalogue

The 52 fully illustrated pages of this new catalogue are simply invaluable to everyone interested in Radio. And one copy is to be yours Free—merely for the asking!

It shows guaranteed Radio sets, one tube sets that give remarkable results, and sets of every variety up to Ward's new five tube one dial control. Think of tuning in one station after another by turning a single dial!

It shows guaranteed, tested parts, batteries, cabinets, a list of stations, a radio log for recording stations. It is a complete radio manual—sent entirely free!

Ward's is Headquarters for Radio

And best of all, the catalogue offers you everything new in Radio at a big saving in price.

At Ward's, everything for Radio is sold without the usual "Radio Profit". Thousands of pleased customers write us of their constant delight with Ward's Radio products.

Our 53 year old Policy

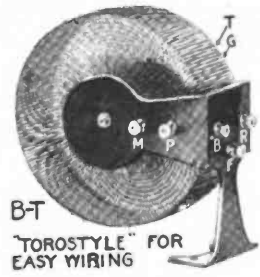
For 53 years we have sold only quality merchandise under a Golden Rule Policy. You can rely absolutely upon the quality of everything shown in this Radio Catalogue.

Be sure and ask for Radio Catalogue No. 3-R

ESTABLISHED 1872 Montgomery Ward & Co

The Oldest Mail Order House is Today the Most Progressive
Baltimore Chicago Kansas City St. Paul Portland, Ore. Oakland, Calif. Ft. Worth

Built to B-T Standards



NOTHING so startling about this kind of winding—been used by telephone engineers for years—but a real triumph for B-T in their successful adaptation of the "toroid" to radio. A lot of little details unnoticed in telephone work are real obstacles at radio frequencies. Over a year and a half of good, stiff research by B-T engineers has resulted in the B-T Torostyle Transformer, which eliminates local pick-up, intercoupling and stray feed-backs, yet retains all the selectivity demanded by B-T Standards.

It took real design to do it—and it is a worthy successor to a long line of B-T Inductances that have satisfied the radio fan since broadcasting began. The "Torostyle" is used in B-T's own patented circuit.

Descriptive circulars on request.

Keep in Touch With the Latest in Radio

Is the answer to Station Separation Straight Line Frequency or S. L. Wave Length Condenser? B-T build both kinds—and tell both sides in "Better Tuning"—as well as much more of value on current problems. Send 10c for a copy, or 60c for a year.

BREMER-TULLY MFG. CO.

532 S. Canal St. Chicago, Ill.

ACME WIRE RADIO PRODUCTS

The New CELATSITE

Flexible stranded wire for "point to point" and sub-panel wiring—latest method of wiring sets. 5 colors, black, yellow, green, red and brown, one for each circuit.

Original Celatsite Wire



Celatsite is a tinned copper bus bar wire with a non-inflammable "spaghetti" insulation in five colors. Supplied in 30-inch lengths.

Flexible Varnished "Spaghetti"

A perfect insulation tube for all danger points in set wiring. Costs little more and is worth a lot more than the cheaper substitutes offered. Black, yellow, red, green, brown; for wires Nos. 16 to 18; 30-inch lengths.

Celatsite Battery Cable

For connecting A and B Batteries for current supply to radio set. Silk braid covering. 3 flexible Celatsite wires—5 feet long—a different color for each terminal. Prevents messy wiring and "blow" tubes.

Send for folder
THE ACME WIRE CO.
Dept. R New Haven, Conn.

Also makers of fine enamelled magnet wire and coil windings for Audio Transformers, Battery chargers, "B" Battery Eliminators.



Enamelled Antenna Stranded

The best outdoor antenna you can put up—7 strands of enamelled copper wire; maximum surface for reception. Enamelling prevents corrosion and consequent weak signals. 100, 150 or 200 foot coils, boxed.

Loop Wire

You can make a good loop with Acme wire made of 65 strands fine copper wire, green silk covered. Flexible; non-stretching; heat.

Easy to Turn—No Backlash!



PACENT Rheostats and Potentiometers turn smoothly and freely. There's no sticking or binding. That is why more than 40 leading manufacturers of receiving sets use them as standard equipment.

The sliding contactor is set at the factory and needs no further adjustment.

The winding is so spaced that there is no danger of burning out. The attractive dial can be fixed in a variety of positions.

There are two models—one with a black knob and silver dial, the other with a mahogany knob and gold finished dial.

Pacnet Rheostats and Potentiometers are supplied in various resistances and capacities.

Pacnet Rheostat, \$1.00. Pacnet Potentiometers, \$1.25.

Your dealer carries a full stock of Pacent Parts. Let him fill your needs.

Write for catalogue of complete Pacent line.

PACENT ELECTRIC COMPANY, INC.

91 Seventh Avenue, New York City

Washington Minneapolis Boston San Francisco
Chicago Birmingham Philadelphia St. Louis
Buffalo Jacksonville Detroit Pittsburgh

Canadian Licensees: White Radio, Limited, Hamilton, Ont.

Pacnet RADIO ESSENTIALS

DONT IMPROVISE - PACENTIZE



EFFICIENT On Long or Short Waves

For 2 to 60 meter receivers, such as are being built at the Brighton Laboratories to communicate with WNP, the MacMillan expedition, the tubes must be dependable. They must be well matched, noiseless, and have a high amplification constant. Ordinary uniform tubes cannot be expected to work efficiently on such short wave lengths.

Brightson True Blue Tubes have been developed with characteristics making them more efficient on low wave lengths than any other tube available to the

amateur. Constant short-wave experimentation in the Brighton Laboratories has shown the possibility of making a tube, which, while more efficient than ordinary tubes on broadcast wave lengths, is also more efficient on extremely low wave lengths. A mutual conductance value, efficient on very low wave lengths, will not function properly on high-powered low frequency work. Brighton True Blue Radio Tubes have that happy medium which fits a tube for both types of reception.



All Brighton True Blue Tubes are Storage Battery Tubes

Whether sets have 3-volt sockets or 6-volt sockets all the economy, volume, distance, and freedom from trouble of 6-volt storage battery operation is to be had with Brighton Tubes. The Standard Type fit 6-volt sockets, the Power Plus type fit 3-volt sockets, giving 6-volt results with less B Battery drainage than with dry cell tubes. They greatly increase the range and volume of any set equipped for 3-volt dry cell tubes and can be used in 6-volt sockets with adapters. Both types are cased singly or in sets.

Price for either
Standard or Power
Plus Type

\$3.50
EACH

Write for Our Short-Wave Receiver Blue Print

The Brighton Laboratories Inc. are offering to the public free of charge a blue print showing the construction of the short-wave Reinartz receiver which will shortly be placed in operation. Any authorized True Blue Dealer can get it for you.

60-Day Guarantee

Whether you buy one True Blue Tube or a set of three, five, six or eight in a safety case, each individual tube is covered by its own Brighton guarantee. If within 60 days a mechanical defect prevents any True Blue tube from operating perfectly, you can return it for replacement.

Unless True Blue Tubes prove interchangeably uniform, noiseless, crystal clear in tone and the handsomest, finest quality tubes you have ever used, you can return them in ten days for refund.

BRIGHTSON LABORATORIES, Inc.
Waldorf-Astoria Hotel, 16 W. 34th Street, New York City

Philadelphia Office:
50 N. Eleventh St., Philadelphia, Pa.



BRIGHTSON *True Blue* TUBES



The new Kellogg 7-tube receiver, shown at the left, with single-station selector, represents one of the latest developments in radio engineering



The new Kellogg 7-tube receiver, completely concealed in a beautiful cabinet of unique design, is shown at the right

The standard model of the Kellogg 7-tube receiver is shown at the bottom of the page. No tuning is required beyond the turn of a single-station selector. The second control is to regulate the volume

the family or group of friends who may be present. Certainly, when we wish to dance the loud-speaker is essential. Even the most enthusiastic pigmy-set builder would hardly recommend having each dancer carry one strapped on his back with a pair of headphones clamped over his (or her) ears. And no continuity program can be justly appreciated unless the signal strength, without distortion, is ample for loud-speaker use.

We have come to an appreciation that this loud-speaker demand reaches back into the broadcasting station, and through that back to the Department of Commerce in Washington. This demand creates a need for higher power at all stations so that the signal strength in the antenna is adequate without that tremendous amplification of many tubes which almost inevitably produces some distortion. Thus we strongly commend Uncle Sam's radio inspection service for its encouragement of higher-power stations.

This means that even "super-power" may be needed. We are not at all afraid of that bugaboo. We are quite content to let the decision rest with the Department of Commerce, where we know the experts will make the decision on the basis of such power permits for the stations as will give us, the broadcast listeners, the best possible service.

5. We Want No Radio Interference.

Some of us wish "the latest fashion hints," and others would like to hear the baseball scores. But neither group cares to hear both at once. The World Series description with McNamee at the microphone would not be worth much if his brilliant descriptions were intermingled with frills and tucks of even the finest fashion editor whom America affords. In other words, each broadcasting station must operate without interference with others. Planning of the ether channels and policing the air to this end is no easy task. We assume that this job belongs to Uncle Sam, and we expect him to carry out the job just as we expect the traffic force to keep things moving with dispatch, yet with safety, even at the busiest hour in the year.

Unfortunately we did not soon enough appreciate that this requirement for our pleasure and profit imposed upon us also

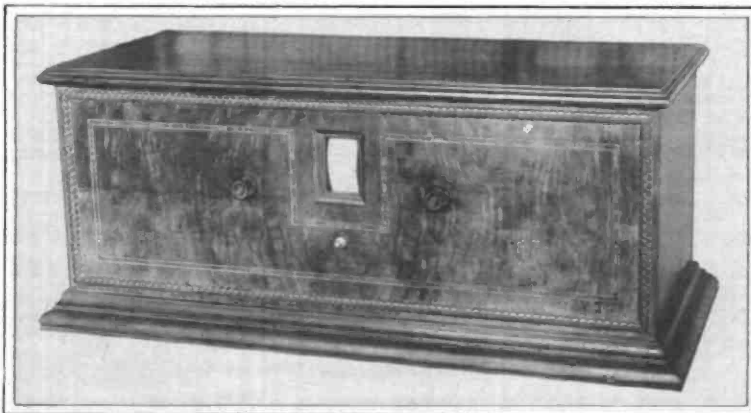
a responsibility. We must not expect too many radio stations. In no other line is the crude phrase more true, "Enough is a plenty." We now have about 100 Class B stations. If would-be broadcasters had their way there would be 200 or more. And 200 would be worth about one-tenth as much to all of us as the present number, and fifty would be worth at least ten times as much as our present 100.

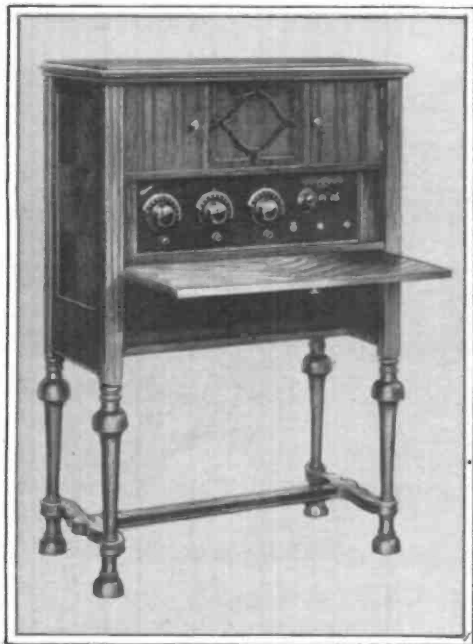
It is not easy to say how Uncle Sam is going to work out the problem of eliminating the less desirable and encouraging the best. All we can say is that we want the best to stay. We want the others to move on out of the Class B group. We do not care much where they do go, but if they interfere with maintenance of the best, they must go somewhere.

And among the other radio disturbances which we would like to eliminate are those heat notes which sometimes enter to the ruination of a splendid program. This problem was discussed at length in a recent article. It is enough here to repeat that every moral force which we can exert is back of the inspectors who have the problem of cutting out these heterodyning whistles.

And we cannot talk of radio interference without mentioning another of our wants—

6. We Want to Get Rid of Static.





The Phanstiel receiver pictured to the left is mounted in a richly finished cabinet, with built-in loud-speaker. Space is provided for all batteries



The Barrett-Lloyd Co. "Hi-Power" receiver pictured to the right is installed in an attractively designed cabinet. The loud-speaker is built in a separate compartment at the bottom, which is concealed when the door is closed

This interloper of the air, who is particularly vicious in his maraudings during the summer, will be more or less a minor factor by the time this issue of *Radio in the Home* is before the readers. But the memory of the summer trials and losses suffered through his activities will still be fresh in mind.

In our demand that the influence of static be overcome we are placing one of the most difficult problems of all radio before our scientific men. No one knows just what static is or from whence it comes. There are many false varieties of disturbance caused by loose connections or faulty hook-up that are blamed on static, but, even cutting out all of these through better attention to our sets, there remains still a multitude of occasions on which the crackling, sputtering noises distress us, or, perhaps, get so bad as completely to spoil the program.

The only promising answer to the problem yet devised is higher power in broadcasting. If we can raise the strength of signals wanted high enough above the so-called

"static level," then the commotion which static makes may become negligible. We can ignore it. Hence it behooves us all not to be unreasonable in voicing our desires against high-power stations. The big hullabaloo created a year or so ago when super-power was first proposed had no real foundation. Many of the small broadcasters who anticipated an overshadowing by mighty giants of the air gave thousands of us the wrong impression as to what was

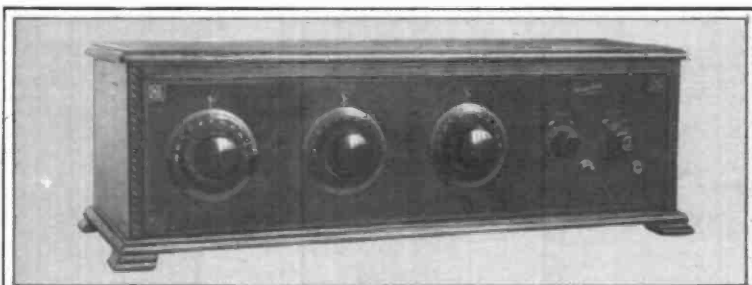
planned. The real fact is there was simply in the minds of the leaders of the industry a plan to try out stations of higher power in the hope that thereby they could give us freedom from static trouble and greater choice of programs.

So long as higher power is the only answer to the static bugaboo, we must accept this remedy, for certainly some overshadowing of the lesser stations is far better than persistent crackling interference.

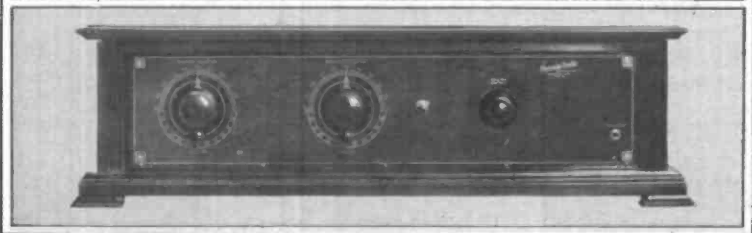
7. We Want Sets of High Selectivity.

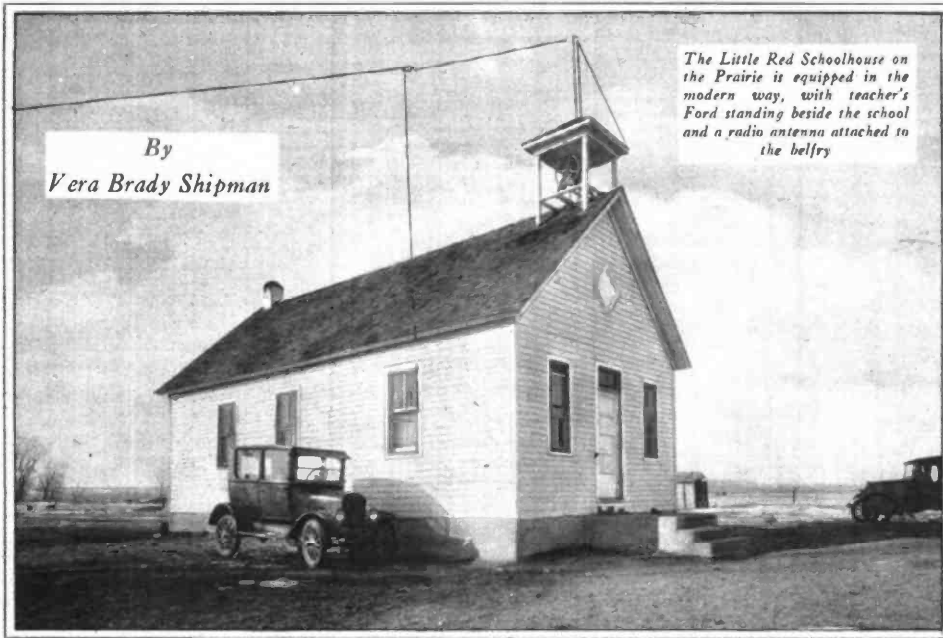
If, within range of our pocketbook, this desire for high selectivity in sets can be granted, we have still less reason to fear the bugaboo of super-power. If station PDQ, or any other one, is prone to spread over 20 or 30 dial divisions, that is not the fault of this broadcaster. It is the fault of our own set—or vary possibly, the way we operate the set. There are many reasonably priced dependable sets on the market which will cut down within a range of two or three dial divisions this blanketing effect.

(Continued on Page 22)



The new Premier receiver, pre-logged at the factory and furnished with a chart showing the dial settings of the different stations. The Premier 6-B, shown above, is a five-tube tuned radio-frequency receiver. The Premier 7-B, shown below, is a five-tube reflex receiver with crystal detector. This set operates either on a loop or antenna





By
Vera Brady Shipman

The Little Red Schoolhouse on the Prairie is equipped in the modern way, with teacher's Ford standing beside the school and a radio antenna attached to the belfry

The Little Red Schoolhouse Adds Radio



Mrs. David Elliott Martin, chairman of the Bay District Committee for the California State Department of Education, who has created a new way to teach the geography of the rivers of the earth by radio

DING, DONG! It's 9 o'clock. The lines of school children are marching into thousands of schools all over America. There is no "diller, dollar, ten o'clock scholar" in the schoolhouses which are equipped with radio sets, for the children hurry in to nine o'clock broadcast of morning exercise, or a penmanship drill or geography class, or perhaps in the afternoon they listen to another school giving a program from the nearest broadcasting station.

Out on the Kansas prairie the country school children are tuning in each morning to KSAC, at Manhattan, when Mike Ahearn, athletic director for the Kansas State Agricultural College, gives five minutes of "setting-up" exercises before a short classroom program.

"I call it muscular control and health exercise," said Ahearn, "because it's a joke for me to say to those children that I am giving them *exercise*, when they've been up for hours and have walked a mile or more to school. So I call it calisthenics or muscular drill."

"Sit erect, stand up, straighten arms at sides, dropping, to sides at second count, forward on three, down on four. All ready—one, two, three, four."

And this continues with as many exercises as can be done in the time allotted.

In Kansas, the 9000 country schools are being radioized. A state-wide campaign has been launched for equipping these schools with receiving sets so they may listen to educational and other programs from KSAC.

"When these schools are all equipped (a good per cent is already accomplished)," said Sam Pickard, director of radio exten-



"Uncle Ben" Darrow, head of the boys' and girls' club work of the Sears-Roebuck agricultural foundation, who originated the Little Red Schoolhouse of WLS
Photo by Drake Studio

Absolute freedom from all self-made noises makes Jewett performance a revelation. Due to the Jewett Clarifier (Patent applied for) there is no B-Battery current in the telephone circuit.



PROCEEDING, step by step, along the path of deliberate and consistent progress, the Jewett Radio & Phonograph Company now offers a Receiver reflecting, in its every detail, that originality and close approach to perfection which you have so thoroughly enjoyed in the Jewett Superspeaker.

Deliveries are being made to pre-arranged schedule. Distribution is through wholesalers and retailers who are under direct contract, with full territorial protection.

JEWETT RADIO & PHONOGRAPH COMPANY
5682 Telegraph Road - - - - - Pontiac, Michigan



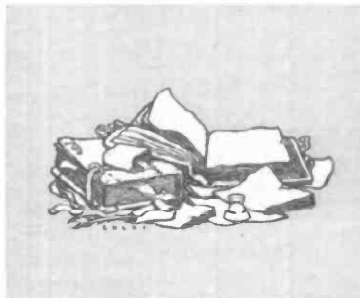


A typical Kansas district school taking its morning exercises by radio from KSAC

sion for KSAC, "they provide meeting places for farmers who wish to attend state-wide radio meetings of various farm organizations which emanate regularly from KSAC."

The school morning program includes morning songs, a short inspirational talk and calisthenics. Radio in the country schools is available at night for boys' and girls' clubs as well as farmers' meetings and on Sundays, is often used to listen in to a church service broadcast—for church is often held in schoolhouses on the prairies.

The superintendent of Cleveland, O., city schools, R. G. Jones, recently predicted, in an interview, that in a few years the school children of America would be receiving 10 per cent of their lessons by radio. Already many stations are making studied efforts in this direction, and several have made notable strides in schoolroom broadcasts. Three American stations are outstanding pioneers in this—KGO broadcasting to the Oakland, Calif., public schools; KSAC at Manhattan, Kan., broad-



Pupils in the Melrose Heights School, Oakland, Calif., receiving a physical education lesson by radio

casting morning exercises and talks to the Kansas country school children; and WGS, Chicago, whose Little Red Schoolhouse, broadcast by "Uncle Ben" Darrow, of the boys' and girls' clubwork of the Sears-Roebuck agricultural foundation, is a weekly broadcast into approximately 150 Cook County district schools.

From Oakland, Calif., the earliest direct school broadcasts have been made and their surveys contain interesting information. Twenty thousand California school teachers scattered over the valleys and mountains of the State are now aided by radio broadcasting. Their problem has been to get the children to school on time. Monday mornings, since November, 1924, a series of weekly programs furnished by the California State Board of Education, broadcast through KGO, was interesting enough to show a marked improvement in punctuality. Schools throughout that State report great enthusiasm for the new venture, according to Miss Grace C. Stanley, commissioner of elementary schools, who



CLARITY

THE OBEDIENT SLAVE TO YOUR DESIRES

FROM the mellow depth to the highest pitch of harmony the improved APEX Receiving Sets bring in, with startling clarity and naturalness, all of the delicate gradations of the entire range of sound—whether the highest soprano or the deepest of basses profundo.

The charm of naturalness, combined with greater distance getting ability, positive selectivity and full volume, plus the enchanting elegance of design and finish, present radio receiving sets that are most satisfactory in every element of operation and a real delight to all whose choice of home furnishings is guided by true appreciation of artistic and refined beauty.

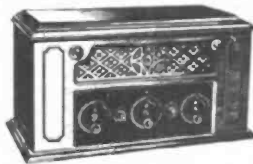
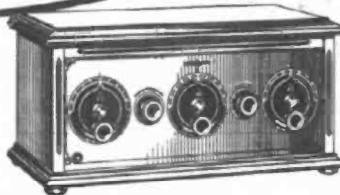
Only a dependable merchant is given the APEX dealer franchise. Your APEX dealer will gladly make personal demonstration of APEX Quality Radio Apparatus.

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Also makers of the famous APEX Vernier Dials and APEX Rheostats, which are sold by every good dealer in Radio.



Upon request, we will gladly mail you descriptive folder.



Prices West of Rockies slightly higher. Canadian prices approximately 40% higher.



Attending the "Little Red Schoolhouse" over WLS, Chicago. Pupils of the Lincoln School, at 95th street and Kenzie avenue, Chicago, listening in

has charge of this work. The first experiments to determine the feasibility of classroom instruction by radio were conducted by Dr. Virgil Dickson, deputy superintendent of Oakland schools.

"We wondered," said Dr. Dickson, "if the teacher would be willing to stand before the microphone for the first time in his life, risking his reputation by teaching invisible classes in fifteen specified schools (no way of knowing how many more were listening in), realizing that invisible critics were actually stationed in every school and thousands of people at home and at work were listening in, or could if they wished. Eight teachers were asked to prepare lessons. All agreed."

KGO offered its services to broadcast eight lessons. The experiment was planned to find out what kind of lessons would interest classes in many parts of the city, and if a teacher or supervisor could give a demonstration lesson of value without the influence gained by actual presence in the classroom. A committee



arranged the following program, each part to be supplemented by appropriate music.

Miss Blanche Bowers talked to the high eighth and ninth grade graduates on "What the high schools have to offer."

Miss Alice Brumbaugh, with pupils taking part, discussed the development of English art and folk songs for the eighth, ninth and tenth grades.

Miss Armeta Kaiser handled a subject in geography—"Petroleum as one of the great California resources."

Miss Beatrice Burnett gave a lesson on Shakespearean literature preparatory to the Shakespearean festival for the junior and senior high schools.

Mr. Howard Welty presented for seventh and eighth grades a history lesson on Indian folklore.

Mr. E. E. Washburn taught an arithmetic lesson to the ninth grade classes.

Miss Myrtle Palmer gave a lesson in penmanship for seventh and eighth grades. Miss Palmer used rhythm of music to teach rhythm of writing, making loops and letters by count, followed by an inspiring march to add impulse in the invisible class.

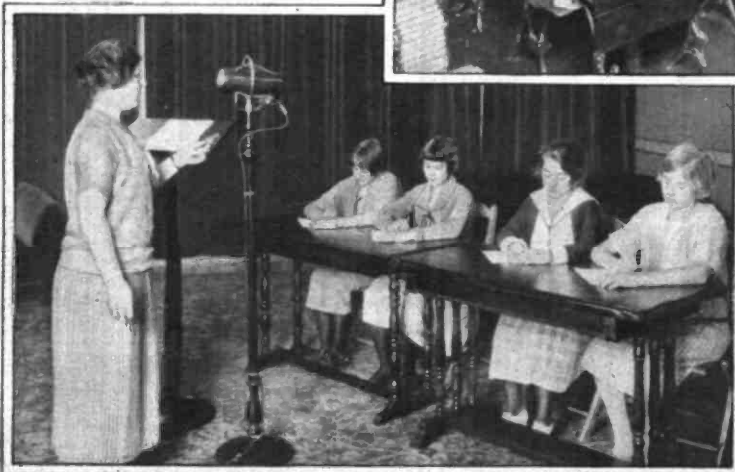
The arithmetic and penmanship lessons were among the best of the series, pupils following instructions of the radio teacher and turning in their papers at the close of the recitation period, to be graded.

Miss Palmer, instructing supervisor of penmanship in the Oakland schools, stepped before the microphone, for example, at a given time, with watch in her hand, waiting the KGO signal to begin. Four pupils, with pens, paper and ink, sat at a table before her and near the microphone. From written instructions, which she had

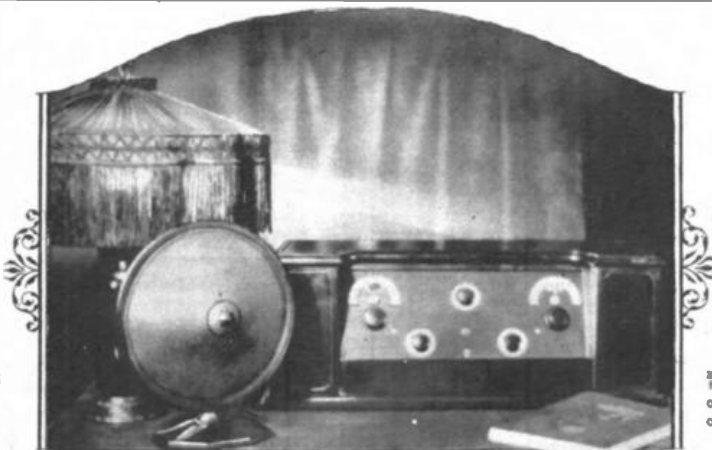


Circle—Mike Ahearn, director of athletics of KSAC at Manhattan, Kan., who broadcasts 9 o'clock setting-up exercises to the country school children of Kansas

Above—Pupils in the Melrose Heights School, Oakland, Calif., receiving a penmanship lesson by radio as it is being broadcast from KGO



Left—Miss Myrtle Palmer, penmanship instructor, and her studio class before the microphone in the KGO studio during a recent test broadcast into the Oakland Public Schools



**Crosley
2 Tube 51 S. D.**
Mahogany finished cabinet
holds all batteries... \$22.50



Crosley Pup
A portable low-range
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3 Tube 52 S. D.**
Eight controls; unusual
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Combination**
Mahogany De Luxe \$27.50
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Special \$9.00
Console Table \$5.00
Complete \$41.50



Better Results From 3 Tubes Than From 5

Sounds improbable, doesn't it? But it is a scientific truth, first demonstrated in the Crosley laboratories and then confirmed by the performance of thousands of Trirdyns the country over.

These astonishing results are simple to explain. Instead of passing the incoming signal once through each of 5 tubes Crosley design passes it through two of the three tubes several times, each time building up its strength and adding to its volume.

Even the technically uninitiated can see the advantages: simplicity instead of complexity; fewer dials to adjust; sharper accuracy in selecting stations; greater clarity; greater volume.

Yet that is not all. Simplicity of design and fewer parts make manufacturing costs lower and bring about a lower cost to you. This, combined with the economies of

gigantic production, makes possible a price of \$60.00 on the Super-Trirdyn Special, the most efficient and beautiful of all Crosley receiving sets. For Crosley is the world's largest builder of radio sets—owning and operating parts factories, cabinet wood-working establishments and assembly plants.

Listen to a Crosley Super-Trirdyn under the most exacting conditions. Make an unbiased comparison with the most costly receiver you have ever heard. Forget the radical difference in price.

Then will you understand why the Crosley Super-Trirdyn represents a genuine achievement in radio performance and value which all America was quick to recognize and reward with increasing sales.

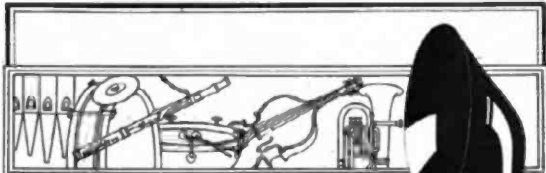
Write for an illustrated catalogue of the complete Crosley line or see them at your Crosley dealer's.

Crosley manufactures receiving sets which are licensed under Armstrong U. S. patent No. 1,113,149, and priced from \$9.75 to \$60.00 without accessories.

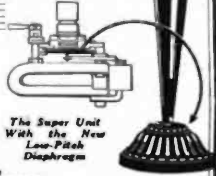
Add 10% to all prices west of Rocky Mountains. Crosley owns and operates WLW, first remote control super-power broadcasting station.

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The New Large Diaphragm



Brings in the Deep Bass Notes

The new Super Unit is a diaphragm of broad pitch range, especially designed by Bristol engineers. It reproduces the high and low notes with equal truthfulness, and, therefore, evens up the entire musical scale of either voice or instrumental music. Often the harmonies of a wonderful ensemble have been destroyed by the persistent loss of high or low notes, and the annoyance attributed to a faulty receiver when in fact the trouble lay wholly with the loud speaker. The Bristol Audiophone Loud Speaker with its new Super Unit of broad pitch range, and its exceptional voice of scientific development tells the whole tonal truth and nothing but the truth.

The Super Unit With the New Low-Pitch Diaphragm

Model S Audiophone, \$28 Rubber horn 14 1/2 inches in diameter. Black mat finish with silvered base decoration. Models S and C (the Cabinet Model) are equipped with the new Super Unit.

BRISTOL AUDIOPHONE LOUD SPEAKER

There are four Bristol Loud Speaker models, both horn and cabinet type, priced at \$15.00 to \$30.00.

If your dealer does not carry the Bristol line, send for our illustrated folder 3025-Q. We will also send free a most instructive booklet, "How to Select Your Loud Speaker."

THE BRISTOL COMPANY WATERBURY, CONN.



carefully prepared in advance, Miss Palmer read to her control class before her and to some 600 other pupils scattered over the city of Oakland in ten different schools. When the papers from the control class and the various schools were sent in for grading, they all looked very much alike.

The lesson began like this— "You will understand when I say 'move' I refer to the paper. Now let us take our position

your wrist to test your position —"push-pull"—six times, then tap with two little fingers six times."

And so on through the entire writing period, and while a phonograph played the rhythms desired loops and ovals were made in unison. One mother at home sent in her paper to be graded. Parents were grateful that there was a way to keep in step with their children in school.



Jay B. Nash, director of physical culture, and a studio class before the microphone at KGO, broadcasting a test lesson into fifteen Oakland Public Schools

drill by signals. When I say one, sit erect, feet on floor and directly under the seat, arms hanging loosely at sides; 'two' arms should be held in a limp, relaxed condition over the desk ready to drop into position; 'three' arms should be dropped

A striking point is the lack special direction, that he forgot to be restless.

Since these experimental lessons, regular Monday classes have been broadcast, featuring California history and geography. Professors of the vari-



And down at Stickney, Ill., in the public school, the children listened outdoors to Coolidge's inauguration speech on a Operadio loaned for the occasion

into position and the movement on the muscles begun.

"Now you may follow as I give the signals: 'one'—'two'—'three'—start the push and pull with the empty hand.

"Slip a piece of paper under of discipline problem in a radio class. Every mischievous boy or girl who listened in to the radio was so intent on the voice from the loud-speaker, expecting it might call his name for a

ous universities and colleges of the State, eminent educators and story-tellers contribute. No lesson is longer than twenty minutes, using the story-telling method, illustrating each country with stories of historical and geographical features of the place, to entertain as well as instruct. Before and after each lesson story, music lends charm to the story-telling appeal. Arthur S. Garbett, a composer and musical authority of San

ANNOUNCING

the

new

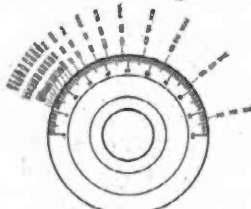


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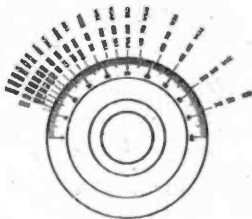
RATHBUN STRAIGHT LINE FREQUENCY CONVERTER

THE modern radio receiver has abundant tone, volume and power—now it may have *perfect, simplified control.*

The Rathbun Straight Line Frequency Converter is adapted for use on your receiver—every receiver—without change of equipment—except the condenser dials. Each station is given a distinct reading at a uniform distance from the next. Real logging becomes a fact. The stations are distributed with flawless precision over 360°—one complete revolution of the Dial. There is no limitation or crowding as on controls using only half a dial. Radio control is simplified.



Stations indicated in kilocycles and wave lengths showing crowding with an ordinary capacity condenser.



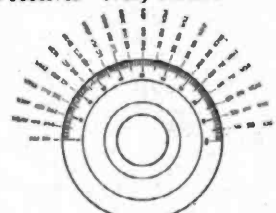
Stations partially separated and tuning slightly improved with a Straight Line Wave Length Condenser

The Rathbun Straight Line Frequency Converter provides straight line frequency tuning with ordinary capacity condensers. It is interchangeable with any dial—on any receiver. It is sold with the guarantee of reliability and satisfaction attached to all Rathbun Radio Apparatus.

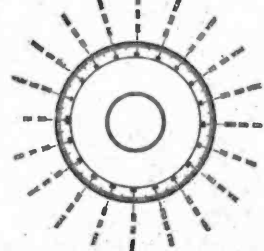
See and Try It—at Your Dealer's

If your dealer cannot supply you, send Money Order (\$3.50 each) and your order will be shipped promptly by Parcel Post prepaid.

Rathbun Manufacturing Co., Inc.
Jamestown New York



Practically even separation over half the dial with a Straight Line Frequency Converter



Complete and equal separation of stations over the entire dial with the Rathbun Straight Line Frequency Converter

Francisco, furnishes a musical episode for the story, such as rivers of the world. Some instruments, characteristic of the country through which the river flows, are first heard in each episode. In the instance of the story lesson of the Volga River, cathedral bells were used in the opening of the musical scene. Then followed the song of the Volga boatman. After the story more Russian music ended with distant bells, completing the picture in the child listener's mind.

Under the supervision of Mrs. David Elliott Martin, chairman of Bay Section Committee on School Broadcasting for the State Department of Education, an interesting new geography lesson was introduced on the radio in these river stories. Fascinating stories of the Mississippi, Hudson, Rio Grande, Yukon, Rhine, Danube, Seine, Nile, Tigris and other rivers

were told by the character "The Old Man of the Rivers." He told his stories to a boy and girl before the KGO microphone, painting word-pictures of scenes along the river banks as the little party drifted on. The boy and girl asked him questions as the story progressed, which he in turn answered in his own interesting way.

These early tests were received at eight Oakland schools. The members of the committee were distributed among these schools to observe the lesson effect and suggest improvement. Each principal was asked to report the results of the school-room reception.

One mother wrote in, "I am not a pupil, but a mother of three pupils. I have often been interested in my children's lessons, and have tried to help them in arithmetic, writing and reading, but am told 'Mother, we

don't do it that way now.' I am tied down so that I cannot go to school and radio brings the school to me."

From the beginning, KGO experiments were conducted with not more than ten classes in as many schools listening in, so that observation might be made of how the listening was done and results tabulated. There are about five hundred pupils in an average KGO school test lesson. The problem of the country school teacher is lessened as they, too, are instructed and benefited by the broadcast.

And now in the Middle West, every Friday afternoon at 2, at WLS, Chicago, "Uncle Ben" Darrow comes on with something like this:

"Hello, boys and girls. This is the Little Red Schoolhouse radio program of WLS, the Sears-Roebuck station, broad-

casting from its Hotel Sherman studio, Chicago."

A poster sent to all Cook County schools by Edwin J. Tobin, superintendent of Cook County WLS school broadcast, with programs and an appeal to see that pupils listen in at school or at some nearby home, urges teachers as well to have their pupils write compositions after listening in on the radio school program, mailing these to his office.

The enrollment in Cook County alone is at least 10,000, and there are many more down



Elmer J. Tobin, superintendent Cook County schools, who heads a radio committee to provide through WLS educational weekly programs for the Little Red Schoolhouse



Partners for Power

If you want distance and clear tone from your radio set, your storage battery must have its partner—the Tungar Battery Charger.

Two clips and a plug to connect to the house current. That's all there is to it. Or you can make permanent connection and just throw a switch.

The Tungar charges while you sleep—it makes no disturbing noise—keeps your batteries at top notch. For power there is nothing like a good storage battery—with a Tungar to keep it good.



The Tungar is a G-E product developed in the great Research Laboratories of General Electric.

The new Tungar charges 4, 6 volt "A" batteries; 16 to 60 volt "B" batteries, in series; and auto batteries, too. No extra attachments needed.

Two ampere size (Best of the Reclies) - \$15.00
60 cycles - 110 volts

Tungar

REG. U.S. PAT. OFF.

BATTERY CHARGER

Tungar—a registered trademark—is found only on the genuine. Look for it on the name plate.

Merchandise Division, General Electric Company, Bridgeport Conn.

GENERAL ELECTRIC

State and in adjacent portions of Indiana, Michigan and Wisconsin. Sessions are held every Friday. From 10:20 to 11 is for high school students, and from 2 to 2:30 is the Little Red Schoolhouse for children of the lower grades and from 2:30 to 3 is the grammar school session. There are more than 150 schools in Cook County listening in regularly. Schools in thirty-four other Illinois counties are enrolled. Wisconsin schools rank next in number, followed by Indiana and Michigan.

While the Little Red Schoolhouse caters particularly to the country school—the one-room institution, of which there are 10,600 in Illinois alone, its program is generally acceptable to the city grade school.

The grammar school program is equally acceptable to the country school. On each high school program is a popular speaker. Musical numbers are given by school musical organizations or soloists. Musical appreciation as well as art will be conducted beginning this fall, and a travelogue each week—all these capably conducted by some eminent authority.

Supremacy



The Magnatron DC-201-A, DC-199 and DC-199 (large base) now list for only \$2.50 each.

MMAGNATRONS have achieved supremacy in the vacuum tube field, but the constant vigilance which has brought these tubes to the fore has not for one moment been lessened. Every part, from contacts to filament, is tested, constantly tested.

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THIS plug is entirely shock-proof. For the entire length of the cord tips is encased by the plug shell and no metal parts are exposed. The shell is made of genuine Bakelite. No screws are used in its assembly, and there is nothing to work loose or cause trouble.

Pacents are used by 40 leading manufacturers in the construction of their sets. It will profit you to get in touch with us.

See your dealer, and write us for the new Pacent Catalog of complete line of Pacent Essentials.

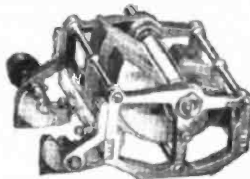
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RADIO ESSENTIALS

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"DON'T IMPROVISE - PACENTIZE"



All the efficiency of the well-known B-T "Lifetime" Condenser now available in tandem. (Used in the new B-T "Counterphase").

And Now the B-T Counterphase

Even better than the "Nameless," the "Counterphase Six" gives the added sharpness and efficiency you've been waiting for. Three stages of "radio-frequency," full efficiency over the entire broadcast range, only two tuning controls—a short indoor aerial sufficient for distant reception. Anything less than such improvements would not justify B-T in offering a new circuit and new apparatus to build it.

Kits containing essential parts for building the "Counterphase" five or six tube set—two or three stages of "R. F."—on sale wherever dealers handle the best.

Non-Inductive Resistances

New circuits require non-inductive high resistances. B-T Resistances give stepless resistance from zero to maximum. Resistance element is not subjected to wear, therefore not affected by continued service.



Nameless—Smooth in operation—Constant. Made in 7 types, from 400 to 500,000 ohms maximum resistance. Send for descriptive literature. 10c will bring a copy of "Better Tuning," 8th Edition.

BREMER-TULLY MFG. CO.

532 S. Canal St.

Chicago, Ill.

Better reception this season than last!

WOULD you like better radio reception this fall and winter than last? Better distance? Better volume? Better tone? You will enjoy better results in every way, this season, if you keep your tubes at full efficiency with the Jefferson Home Tube Rejuvenator.

All tubes deteriorate rapidly with use. The Jefferson Tube Rejuvenator "brings them back" in 10 minutes! Use it once a month—keep your tubes like new. Completely restores paralyzed or exhausted tubes. Doubles and trebles tube life, quickly paying for itself through this great saving.

Takes large or small tubes—types 201-A, 301-A, UV-199, C-299, 5-VA. Attach to any alternating current electric light socket in your home. The Jefferson Home Rejuvenator for tubes is as essential for satisfactory radio reception as a charger for storage batteries. Get one now; start the season with your tubes in perfect condition. Sold by leading dealers in radio supplies, and fully guaranteed.

\$7.50
\$10 in Canada

JEFFERSON ELECTRIC MANUFACTURING CO.
501 So. Green St., Chicago, Ill.

Makers of Jefferson Radios, Bell Beaming and Toy Transformers, Jefferson Spark Leads for Automobiles, Stationary and Motor Engines, Jefferson Oil Burner Ignition Coils and Transformers.



JEFFERSON TUBE REJUVENATOR

Keeps radio tubes like new



for
HOME
Use



JEFFERSON
Radio Transformers

Your radio, no matter how costly, can be no better than its transformers. Our experience as the world's largest manufacturers of small transformers is everywhere recognized by leading radio engineers who carefully specify "Jefferson." If you want amplification without distortion—clear, pure, sweet, natural tones from your radio—make sure it is equipped with Jefferson Transformers. Sold by the better radio dealers, used by leading set manufacturers.

What Do We Want From Radio?

(Continued From Page 11)

If we will see to it, with expert advice if necessary, that we have such sets in our homes, then much of our radio trouble is a thing of the past.

Fortunately, these sets of high selectivity are usually ones which have a good distance range. In fact, if they did not have this distance range, the high selectivity would not be of much value. With such a set, any Class B station of 1000 watts or more, that is within 300 to 500 miles, can be counted upon regularly. Perhaps, when air conditions are a bit bad the loud-speaker results will not be all that we would ask, but our choice of programs and our accessibility to all good things of the air are tremendously increased in this fashion.

There is as much difference between these fine sets and the best that could be bought only three or four years ago as exists between the splendid player-grand pianos electrically operated and the toy piano on which the 4-year-old gleefully pounds and thinks that she is playing a piece. Radio has grown up within so short a space of time that we listeners have had a tremendous job mentally in keeping pace. That fine set which we bought three or four years ago is now really out of date. This is not our fault in selection nor the fault of the industry. It is the simple and natural result of rapid improvement in the art.

The question in our minds often is, "Will another three or four years make a similar change?" Personally I doubt it. I think we can safely today invest any reasonable sum of money in a set of a large and reputable maker with the assurance that it is good for many years to come. The instruments and art have matured as rapidly as the industry. It is not to be expected that there will be anything like as many changes in the next twenty years as have been made in the past two.

This question of sets brings us logically to our next want.

8. We Want Sets Easy to Operate.

In this respect I think likely that we are a bit unreasonable. Our ideal is a set having three knobs and no other wheels, handles, switches or pulls to manipulate. The first knob would simply turn on the set; the second knob would choose the station that we want; and the third would adjust the loudness or the tones to suit the program coming in and our particular mood of the minute.

Such simple control of the set is probably a bit too much to ask today. Some sets claim it, but not many have attained this

ideal, and perhaps none with perfect success. I think it will be well for most of us to postpone pressing this demand for it is a very little thing on our part to turn an extra dial or two in order to offset those internal complications which may or may not (usually will not) succeed in eliminating this minor complication.

But, however, this feature of radio instruments may be solved there is no question as to the importance, especially with the ladies, of our ninth demand—

9. We Want a Good-Looking Set.

It is no longer at all necessary to have a bunch of loose or dangly wires and weird collection of mismatched batteries, or a crudely assembled group of accessories in order to have as complete and fine a radio set as can be made. The very best instrument now comes dressed in cabinets, which are ornamental in any room. The living room, the study, the parlor or the reception hall will be just a bit "better furnished" with such a set. This is as it should be. There is no reason why the radio set should be any less ornamental than the phonograph, the piano, or the bookcase. Each is a means to an end—recreation, entertainment, information—but each can also be artistic and in keeping with the color scheme and decoration of the room.

10. And We Want to Hear Every Event of National Importance.

No longer can the President of the United States be inaugurated with an audience of less than ten million. No longer can election returns be delayed more than three or four minutes after assembled by the news agency before we must have them in our home. No longer is grand opera confined to the stage or the studio. And this opera must be sung for each of us by the artists of international, or at least of national fame.

This means that we demand a linkage of broadcasting stations into great net-works for simultaneous transmission of events of national importance. We, American citizens, demand this right. Fortunately, it is entirely a practical thing to provide us with our wish. Two great and constantly growing groups of stations are furnishing this type of service. They are making it possible for each of us with a little imagination to participate in events almost as effectively as if present in person.

This want, more than all others, is making for the nationalization and solidification of radio. These linked systems regularly give the more important national events to every one who wishes to listen in, from Maine to Texas, from Florida to the Dakotas.

ROXY-He'll Be On *the* Air Again

By Henry M. Neely

SOME time ago, somebody started the rumor that Roxy would never be heard by radio again. I don't know where the rumor originated; I imagine it was simply a misinterpretation of the farewell which Roxy said to his audience the last time he broadcast with his "gang" from the Capitol Theatre in New York. That was not, however, a good-by; it was merely an au revoir.

So many readers wrote in to ask whether the rumor was true that I ran in to see Roxy at his office in New York the other day and asked him point-blank.

"Give up radio!" exclaimed Roxy. "God love you, I couldn't live without it."

He reached into a big drawer in his desk and drew out several architect's water-color drawings of details of the magnificent new theatre for which ground has already been broken at Broadway, 7th avenue and 45th street in New York City.

"Do you see this?" he asked. "This theatre is going to be an institution such as you and I will not live to see equaled. I say that, not because it is mine, but because it isn't. It is the public's. It belongs really to the radio audience. I have been three years on the air and this is my reward. Without the radio listeners, this would never have been possible.

"I'm going to keep faith with my radio listeners if it is the last thing I do. I'm going to provide radio programs such as never have been attempted by any one. I am going to take personal charge. It will be my hobby and my playground."

It was only a few days after my talk with him that Roxy sailed for a brief eight weeks' vacation in Europe. He should be home about the time that this is printed and he expects to be on the air again the middle of November.

Naturally, the huge new theatre will not be ready by this time. It is going to be so immense and so elaborate that it will take much longer than that to complete the edifice. During Roxy's absence in Europe, his partner, Mr. Atkinson, has been busy building a studio for him "somewhere on Broadway," and from this studio for the next year Roxy and his "gang" will entertain the radio public.

It will not be the same gang that Roxy had at the Capitol Theatre. These artists have been carrying on since Roxy's retirement from that house, but, though plans are not yet definite, there seems little doubt that some of them who best fell into the spirit of the Roxy program will be taken over into the new gang.

"I suppose," said Roxy, "that we will have to continue to call it the 'gang.' Somehow that name 'Roxy's gang' has become so closely associated with me that it would be impossible for me to put any other aggregation of artists on the air without the public instinctively feeling that they were still Roxy's gang."

Roxy speaks of his gang much as a father would speak of a large family of children. Some of them have been loyal to him; other have been artists. Any one



who has dealt with artists will understand this distinction.

To the man or woman who has simply met these artists by means of radio, it will be almost impossible to convey a sense of the very vital necessity of Roxy's own personality in conjunction with the artist's talent in order to bring out the best that is in the performer. I have sat in the studio and watched some of these singers or players before the microphone. Most of them, when Roxy took them into his gang, were merely talented amateurs. Many of

them had the worst kind of stage fright when they went up to the microphone for the first few times. I have seen one, starting to sing, grow tense and strained through sheer terror. I have seen Roxy quietly walk up, take the two writhing hands in his, separate the fingers and gently stroke them until, reassured and imbued with his own confidence and certainty, the fright was gone and the singer's voice floated out through the microphone across thousands of miles of country and into the homes and hearts of the great public beyond. Yet the

ROXY AND HIS "GANG" —



Roxy and his gang have made their last "appearance" together. When Roxy starts his new broadcasting in November, it will be with a new "gang" which will probably include some of the artists formerly with him at the Capitol Theatre. This photograph was made in Worcester, Mass., March 23, 1924, and is published here for the first time as a fitting souvenir of a radio feature that was the favorite of hundreds of thousands of listeners-in. It is well worth framing because the same "gang" will never be together again. In the photograph are, from left to right:

A Souvenir for the Radio Fan



First row (sitting)—T. J. Dowd ("Tommy Dowd"), Frank Moulan, William Robyn ("Wee Willie").
 Second row (sitting)—Douglas Stanbury ("Doug"), Mlle. Maria Gambarelli ("Gamby"), Miss Espree, Margaret McKee ("Mickey"), Julia Glass, S. L. Rothafel ("Roxy"), Gladys Rice, Marjory Harcum, Louise Sherer, "Betsy" Ayres.
 Third row (standing)—Peter Harrower ("Peter the Great"), Snedden Weir, Joe Wetzel, Alva Bombarger ("Bomby"), Yascha Bunchuk ("The Sheik"), Dr. William Axt ("Dr. Billy"), Dr. Eugen Ormandy ("The Blue Blond"), Jim Coombs (Daddy Jim"), Roger de Bruyn, Newell Chase, Max Herzberg.

In the two back rows are members of the Capitol studio orchestra, organized by Roxy especially for broadcasting.

All the thrill of building your own —and an exact duplicate of the famous Harkness Laboratory Model

THE remarkable results obtained with the Harkness Counterflex Circuit are due to a novel principle which enables tremendous amplification to be secured and eliminates the squeals of self-oscillation.

Counterflex Receivers also employ a new type of radio frequency transformer which is so efficient that the 3-tube counterflex actually has a greater receiving range, more volume and more selectivity than most 5-tube sets. It is now possible to build an exact duplicate of the set Mr. Harkness has built for himself and use parts made under his direct supervision.

The important thing is to get Genuine Harkness parts made by the Kenneth Harkness Radio Corporation. A complete kit of these parts is now available at radio stores, and each set bears the signature of Kenneth Harkness Radio Corporation on the cover of the container.

Read some opinions of people who have built a Harkness Counterflex:

"I have been experimenting with all kinds of Radio sets up to six and seven tubes. I secured a Harkness 3-tube Counterflex, wired it up myself, and was amazed at the result."
H. J. KRICK, Allentown, Pa.

"We like our Harkness Counterflex very much. Have listened to programs all over the United States." DAYNE DOCHESOFFER, Roseland, Neb.

"Have erected and operated seven sets and the Harkness Counterflex has them all tied in a line. So far I have logged seventy-four stations including one in California."
L. W. LILLARD, Danville, Pa.

"Have logged a total of forty-two stations including two in Mexico City, four in Canada, three in New York and three in California. To say I am pleased with the Counterflex is understating it very mildly."
EUGENE F. BROWN, Des Moines, Iowa.

"I am exceptionally well pleased with the three-tube Counterflex. It has done all that I anticipated it would. Great to coast reception on loud speaker with an exceptionally clear tone."
E. D. LUTBAK, Pierce, Mo.

After experimenting with the Counterflex for more than a year, Mr. Harkness has now written a booklet giving a thorough explanation of its fundamental principles and a complete description of different models of Counterflex receivers. We will send you a FREE COPY of this booklet on request. Just mail the coupon below, enclosing 10c to cover postage and cost of mailing.



With this complete kit of genuine Harkness parts you can assemble the 3-tube Counterflex in just a few moments—with only a screw-driver. A series of special step-by-step diagrams shows how to wire the set. It is not necessary to understand or follow the usual type of circuit diagram.
Complete 3-tube Kit, \$26.00
In Canada \$44.00

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HARKNESS
RADIO PRODUCTS

KENNETH HARKNESS RADIO CORP.

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Please send me free copy of your booklet explaining the new Harkness Counterflex Circuit. I enclose 10c (cash or stamps) to cover cost of mailing.

Name

Address



Kenneth Harkness

public did not know that it was Roxy who made this song possible. I think the whole effect of these programs was best summed up by a friend of mine—a musical critic—with whom I was once discussing them and whom I asked for a frank opinion of them.

"Well," he said, "if that fellow Roxy would only keep out of it, I should say that they are average first-class studio programs. I should further say that there is nothing about them to raise them above the level of a number of other programs broadcast from other good stations."

"But Roxy won't keep out. I'm glad he doesn't. The moment he comes on, the whole thing attains a personality which is irresistible. There is a friendliness and a homyness about it all that absolutely disarms a critical viewpoint and makes you feel that you are simply spending an evening with a crowd of very talented friends and that the whole thing has been most chummy and enjoyable. It isn't the artists who do this; it's Roxy."

I told this to Roxy when I had my last talk with him.

"I'm glad to hear that," he said. "I have really worked hard at this thing and put my whole heart and soul into it and it is mighty gratifying to know that my part of it is not overlooked by the listeners."

"That matter of personality, it seems to me, is the most important thing in the world in dealing with the public. I am going to keep it in mind in my new theatre. In fact, I think it would not be a bad scheme to speak of it as *the theatre with a personality*."

"That's it—the theatre with a personality. That is exactly what it is going to be. I have often said in discussing it, that we should not call it a theatre at all but rather an institution. I cannot tell you all of the very many activities which it is going to represent, but the theatre will be only a part of it. Look here."

He spread out before me a large water-color drawing of the rotunda—a magnificent conception which is quite in keeping with the magnitude of a theatre which is going to cost close to eight million dollars.

The rotunda will be 89 feet wide, 114 feet deep and 70 feet high. It will be the most magnificent and elaborate approach to any public building in existence today. The entire Capitol Theatre is not as high as the inside of this rotunda. As a matter of fact, the rotunda itself would be big enough to constitute a good-sized theatre.

Here, when the building is completed, will be the entrance to the studios which will be perhaps the most elaborate radio institution yet planned.

There will be, of course, a great symphony orchestra of 110 players. There also will be a new "pick-up" device which will insure better broadcasting of this organization than has ever been done with an orchestra before. It is now being perfected and will be reserved for this Roxy orchestra.

There will also be an unusually complete syncopating orchestra, a chorus of one hundred voices, a huge set of cathedral chimes, a great organ with two consoles in the theatre, a separate organ available for broadcasting at any time and a third pipe organ in the studio especially for radio broadcasting. The whole plant will be equipped to put across almost anything in the world that can be broadcast by radio. There also will be another great advantage in the prestige which this new theatre will have because that will make it a drawing card for artists who have been hitherto unavailable for radio work.

"They say the age of miracles is dead," exclaimed Roxy when he told me of all this. "God love you, it isn't at all. This is the miracle."

And then he told me of some of the personal experiences which had come to him through the immense mail he has received on account of his broadcasting. Stories sad and gay, stories illuminating and deadening, stories inspiring and heart-breaking—all have come to him through his mail, and it is remarkable to know that a man so busy as he is has devoted as much time as he has managed to devote to individual cases which seemed to be unusually deserving of his personal attention.



Here bands, orchestras and other large groups do their broadcasting. The ceiling is suspended and deadened, the floors built upon cork and covered with a heavily padded carpet. The heavy drapes shown may be moved upon a track, thus making the room acoustically adjustable



By
Earle R.
Buell

STATION WCCO is said to be the only thing upon which the two cities of Minneapolis and St. Paul have ever agreed. The bitter rivalry of these twin cities has become a tradition in American life. Not long ago I heard a man speaking from Station WCCO and was surprised to hear him say that he would not advocate a widespread reading of the Bible, but I understood better when he explained that the Bible was full of things about St. Paul but not one word about Minneapolis.

When the station first started, there was even a rivalry as to which city should be named first in the announcements. This difficulty was cleverly solved by having a card on one side of which was printed "Minneapolis-St. Paul" and on the other side "St. Paul-Minneapolis." This card is always placed on the stand under the microphone and, as the announcer finishes his announcement, he turns it over so that when he makes his next announcement the order of the cities will be reversed.

Under such circumstances, it is all the more remarkable that Station WCCO is functioning not only so efficiently but apparently so harmoniously. H. M. N.



Gertrude O'Neil Gaules, "the best Irish Swede in the land of the Scandinavians"

THE Gold Medal radio station—Minneapolis-St. Paul, WCCO—never mentions the name of the company that owns it.

Neither does it name the commodity its company manufactures.

That is why it is gradually digging deeper and deeper into the good graces of the Northwest.

You might listen for hundreds of nights or days without learning that WCCO stands for Washburn-Crosby Company.

You might listen a lot longer without hearing that Gold Medal is the trade name for a kind of flour and a brand of foods.

Isn't this the answer to the question of broadcast advertising?

There is much argument over commercial broadcasting, but if a station confines its programs to entertainment and legitimate instruction, can there be any objection to its use of a simple trade-mark in the station call?

The Twin Cities of Minnesota enter their station for the championship in avoiding commercialism.

These cities at the head of navigation on the Mississippi River believed that they had solved the broadcasting problem when ten companies, divided between the

two, united in support of WLAG, "the Twin City station in the Land of Ten Thousand Lakes," but the vicissitudes of one of the companies—that which actually owned and handled the station—brought it into difficulties.

It was this historic institution, once known as "The Call of the North," which was succeeded by WCCO.

When the two cities were left without presentation in the nightly ethereal chorus, radio fans and radio dealers determined to "do something about it."

The Northwest Radio Trade Association was most vitally interested and took the matter seriously. The man who is now president of this organization, Don C. Wallace, and the man who has been its secretary since the beginning, H. H. Cory, began figuring the thing out one night and laid out a plan which they considered ideal for broadcasting in connection with two centers of population like Minneapolis and St. Paul.

WLAG had encountered the usual difficulties of stations not properly located because of persons who were unable to "tune it out." If the station was "on the air," it made some of the long-distance



Mrs. Eleanore Poehler, musical director of the Gold Medal Station
Photo by Gene Garrett, Mpls.



Miss Mildred Simons, assistant to the musical director of the Gold Medal Station
Photo by Gene Garrett, Mpls.



Eleanore Freemantel, accompanist. Her name is heard oftenest from WCCO

fans angry. If it was "off the air," several thousand crystal set owners wanted to know what was the matter.

Something had to be done with the ideal station to enable it to please both factions, and nightly, as it takes the ether now, this problem seems to have been solved.

For Mr. Wallace and Mr. Cory planned a powerful station (one of the brand-new 5000-watt outfits then being proposed) and suggested that it be located about twenty miles from both Twin Cities, with remote control studios in each.

The scheme met theoretical approval on every hand.

But when the tentative budget was laid before a luncheon meeting of the Radio Trade Association in the old West Hotel in Minneapolis, an eloquent gasp escaped the crowd as it nearly choked on its final spoonful of ice cream.

A 500-watter had fizzled. What was to be done about a 5000-watter?

Pooh and a couple of bahs!

And then Wallace and Cory went further with their plan. They suggested that the money be raised by popular subscription in the Twin Cities and that it be in fact as well as in name a Twin City station.

Still there was much tapping of the forehead and shrugging of shoulders.

Then somebody sicked Harry Wilbern onto the job.

Harry Wilbern raised most of the Minneapolis contributions to the Red Cross and sold most of the Liberty Bonds during the war. He calmly and rather curtly informed them that he had raised a lot more money in the Twin Cities than they had even thought about yet and that he would see what could be done.

In the meantime, the commercial associations of the Twin Cities were called into conference on the matter. The Civic and Commerce Association of Minneapolis thought it would be very nice if somebody were to do something about it. And so did the St. Paul Association.

Still the time was not exactly propitious and there were lots of ifs, ands and buts.

The plan was discussed and the newspapers printed news about it and wrote editorials about it.

Then it was whispered that one of the big companies in Minneapolis was interested and the little group of serious radio thinkers held its collective breath for nearly two days.

Suddenly, out of a clear sky and some interesting conversation on the part of Mr. Wilbern, the Washburn-Crosby Company and A. E. Zonne, president of the Civic and Commerce Association, came a pronouncement.

Washburn-Crosby Company would buy the station, locate it as suggested, fit up studios in both cities and pay half the running expenses as well, if Minneapolis and St. Paul would pledge the remaining \$50,000 a year for three years and if it might be called the Gold Medal station of Minneapolis and St. Paul.

Without even the formal organization of a money-raising campaign, Minneapolis ambled out and brought in its share of the \$50,000 a year and St. Paul did the same thing.

The old equipment of WLAG was taken over.

Mr. Wilbern was made manager. And he with one representative from



Harry Wilbern, manager, Gold Medal Station
Photo by Gene Garrett, Mpls.



E. S. Harrison, assistant manager, Gold Medal Station
Photo by Gene Garrett, Mpls.



Henry Adams Bellows, new director of WCCO programs



Englebert Roentgen, solo cellist, Minneapolis Symphony Orchestra



Carlo Fischer. His announcing of numbers played by himself is unique
Photo by Sweet, Mpls.



Rollo Wells. Business took him from the vaudeville stage. Radio gives him back to the national audience

the St. Paul association and one from the Civic and Commerce Association of Minneapolis became the executive board.

Today the 5,000 watter proposed by Mr. Wallace and Mr. Cory is a reality.

A new Minneapolis studio and general offices are located on the top of the new Nicollet hotel with a colored boy in a handsome green uniform at the door. And in the grand concourse of the new St. Paul union station it was arranged that similar studios should be established immediately.

All over the back of the letterhead used by this station are names of persons and companies that have contributed to the maintenance fund and WCCO is one of the big national hookup of stations which heads up in WEA, New York, and helped take the summer curse out of radio.

The voice best known from this station was first recognized by the fans in the old slogan "The Call of the North." It is a voice of both pleasing and distinctive quality belonging to Paul Johnson, bred of a long line of Viking ancestors.

Although from his service at the Minneapolis and Twin City stations, Johnson is one of the best known announcers in the United States, the broadcasting business is a sideline with him and his main concern is plowing through a stiff medical course at the University of Minnesota.

He is so tall he has to lean over wherever they put the microphone, and his principal other distinguishing characteristic is a forehead that marks him at once as a student. Probably no other university boy in the United States is so familiarly known to America.

A new voice is making itself known from the station nowadays, the pleasant tones of a slightly Bostonese accent, which cannot be disguised. This, if you do not know, is Henry Adams Bellows, the new director of the Gold Medal programs.

Mr. Bellows took the job early in April, leaving his active directorship of the largest trade magazine in the milling business, the Northwestern Miller. During the lifetime of the Bellman, once a nationally known Minneapolis publication, Mr. Bellows was its most active editor. He has long been known as one of the music critics of Minneapolis, but what actually won him the place after all was his qualifications and his high standing in the milling industry was the quality of certain program notes he has been writing for the Minneapolis Symphony orchestra. He has a knack for helping the music lover to a keener appreciation of the musical numbers played by this organization, Minneapolis' best known musical body, and it is said there is hope that he may be able to do the same thing for radio music.

Every now and then the Gold Medal station broadcasts without previous announcement a concert of this great orchestra. In spite of the inability of present equipment to transmit or receive accurately the full quality of a symphony concert, this is always a big event in the Northwest. Did the recording contracts of this orchestra permit its coming concerts to be announced, it is probable that several million persons would be tuned in to hear it.

But a frequent and favorite feature of the WCCO schedule is the Verbrugghen quartette of symphony players which is led by Henri Verbrugghen himself, the director of the great orchestra. A flute



George Lamb, impersonator of the Old Soak
Photo by Reynolds Studio, Mpls.



Karl Schenrer, of the University of Minneapolis.
Photo by Golling Hesse Studio.



Don G. Wallace, of Minneapolis. He helped start WCCO

Perfect Simplicity!

NO-DIAL

5-Tube Receiver



*A touch of the
finger
brings
'em in!*

Licensed under Westmore Patents and
Patents Pending, Hogan Patent
No. 191699.

Think of a receiver without dials; so simple that any child can operate it; so sturdy that he cannot break it! That's NO-DIAL, the newest thing in radio!

Features You Have Waited For!

Utmost Simplicity without sacrifice of other desirable features has been attained by NO-DIAL engineers thru the most careful correlation of all parts. Adjustments which the listener himself in ordinary sets must make are in NO-DIAL completed at the factory.

Better tuning is made possible because the condensers are permanently kept in step. The cover of NO-DIAL is rotated, bringing in station after station loud and clear, far and near. That is all the listener need do—even filament control is automatic.

Better logging is made possible through the physical shape of NO-DIAL Receivers. The entire edge of the cover is a Station Register. Stations always come in at the same places where you locate and mark them.

Sensitivity of NO-DIAL is equal to that of higher-priced receivers. In many tests it has received stations from coast to coast with loud-speaker volume and fine tonal quality. Tube for tube, it recognizes no superior. NO-DIAL does not re-radiate.

Cabinets of NO-DIAL Receivers are of spun aluminum, finished in mahogany brown crystalline, matching the most beautiful loud speakers and harmonizing with distinctive furniture in any home.

Circuit of the five-tube NO-DIAL is the latest and newest radio hook-up, a most remarkably efficient combination of tuned radio frequency and resistance coupling.

OUR GUARANTEE

We guarantee NO-DIAL Receivers against defects in workmanship or material, and will promptly replace any receiver which in our judgment is defective, or refund the purchase price.

THE OHIO STAMPING & ENGINEERING COMPANY
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Use This Coupon for Detailed Information

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I am a (distributor) (dealer) (agent)
..... (user) Without any obligation on my part,
send me full details of NO-DIAL Receivers.

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City and State

quartette of the symphony players is also heard from time to time, not to mention other artists from it who appear as soloists.

The person whose name is mentioned oftenest from WCCO's microphones is Eleanor Freemantel. That is because she is the official accompanist of the new station. She was equally well known to hearers of the old.

They say she never takes off her hat in the studio and is seldom known to rehearse any number. Called on suddenly at odd moments of the day or night, she slips quietly into the studio and reads at sight compositions of Grieg and Verdi, Haydn and Mozart, Strauss and Irving Berlin as nonchalantly as one might strum a ukulele.

Carlo Fisher, once principal cellist and business manager of the symphony orchestra, who now gives more of his attention to training new musicians, although he is still a standby of the cello section, occupies an unusual place in the affections of WCCO listeners.

In solo work as well as with his favorite MacPhail trio (William MacPhail and Harrison Wall Johnson) he has a method all his own, for he entertains almost as much by his delicious anecdotes of the composers and their compositions as by his playing.

It has long been the custom to give him the microphone and let him do his own announcing whenever he appears in the studio, and so far he has handled every broadcast of the symphony orchestra.

The other day a request program was put on, one in which the numbers as well as the artists were named by the station audience, and first on the list of requested artists was the Gold Medal radio quartet.

The organization was born about the time of the opening of WCCO. It consists of Ted Kline and Kenneth Johnson, tenors; Neils Swenson, bass, and Clarence Scheibe, lead.

More and more as they sing together their voices blend, their co-ordination is perfected, and they gain stronger and stronger hold upon the appreciation of their listeners.

The capacity of a voice to create an entire atmosphere is the constant marvel of radio, and the principal exponent of this at WCCO—with the possible exception of Gertrude O'Neil Ganley—is George Lamb.

It is getting so there is nothing in the way of notable amateur theatricals in the Twin Cities in which Lamb does not do a striking comedy characterization besides possibly directing the whole show.

But his greatest successes have been in the impersonation



WHY ARGUE ABOUT IT ?

If

you are not satisfied with your present receiver

Send 30 Cents
(Stamps Will Do)

for the July, August and September, 1925, issues of

RADIO IN THE HOME

containing full directions for building Flewelling's

SUPER-HET CONVERTER

Hooked up to your present receiver, it gives the volume and selectivity of a Super-Heterodyne.

The supply of these issues on hand is limited, so send at once to the

**CIRCULATION
DEPARTMENT**

Radio in the Home

Public Ledger Building
Philadelphia

of Don Marquis' "Old Soak" in the "Battle of the Keyhole" and "The Searching Foot," from WCCO.

As for Mrs. Ganley, she is called "the best Irish Swede in the land of Scandinavians," and none of her radio programs is complete without her portrayal of "Tillie at the Photographer's."

In the list of the Gold Medal humorists there is a singer of comic songs named Rollo Wells, who graduated from the big-time vaudeville stage into business in Minneapolis, and who is always called upon in the featured programs of the station.

Wells exemplifies one of the answers to the question, "Where does radio get its multitude of stars?" If he were not one of the champion insurance salesmen in the Northwest, he would probably still be trouping in vaudeville or musical comedy. He is one of many whom successful business has stolen from the entertainment world, and radio has given him back to it by enabling him to be heard throughout the United States without leaving his job.

There are two other Minneapolis Symphony players in the Gold Medal audience. One is Engelbert Roentgen, the Dutch cellist, who was heard in his home town in Holland on one of his programs. He is solo cellist of the symphony. The other is Henry J. Williams, the symphony harpist, who reveals from time to time the excellent broadcasting quality of this king of all instruments as well as his own great proficiency.

From the University of Minnesota, situated in Minneapolis, WCCO draws many soloists and orchestra players, but the radio fans rejoice most when it is able to book Karl Scheurer, of the music faculty. His name is a

"The Gold Medal Radio Quartette." They are, from left to right: "Choppie" Kline, first tenor; Kenneth Johnson, second tenor; Nels Swenson, bass, and Cal Schiebe, baritone



tough one for Paul Johnson to announce, but his handling of the violin makes up for that and the name can always be spelled.

Since the prosperity of the Northwest is dependent upon its crops a great deal of attention is paid at the Gold Medal station during the daytime to the market reports. These are read by Miss Wildred Simons, who, in addition to these duties, is much sought after to preside over the station's reception room, because, it is said, she knows by sight and telephone voice more of the artists who have appeared there than any other person.

Eleanor Poehler, who has been musical director of the Twin City institution since the beginning of its career on the air in the days of WLAG, is recognized by every regular listener to its programs both for her announcing and for her soprano voice, with which she is accustomed to grant requests for special numbers, particularly the old songs which she learned from her grandfather, one of Minnesota's pioneers.

The voice of the assistant manager of the station is never heard at the microphone. He is Major E. S. Harrison, formerly of the United States Army. The reason he put succinctly:

"That's not my end of the business."

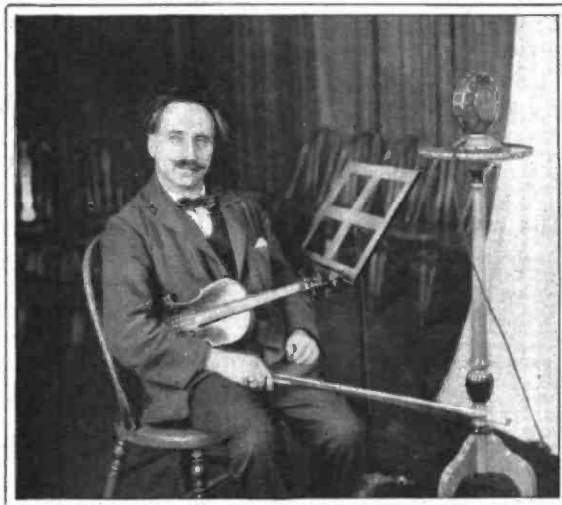
It is not quite clear yet what Mr. Bellows is going to do with WCCO, but so far it has been a station that took itself seriously and tried to serve its community as well as entertain and build up its large audience.

One thing is quite likely—that it will bear watching (or harkening) for the next year or so.

Circle, left: Henry J. Williams, harpist, Minneapolis Symphony Orchestra and WCCO

Circle, right: Paul Johnson, announcer of the Gold Medal Station. "The best-known medical student in America"

Left: Henri Verbruggen, director of Minneapolis Symphony Orchestra, who has been converted to radio



The latest developments in low-loss parts

*Built of this special insulation
made to order for radio*

NOW you can get a complete line of low-loss parts made of Radion, the special insulation which our engineers created for radio purposes exclusively.

These parts embody the very latest developments in radio. They are as efficient as the well-known Radion Panels and have the same high-resistant characteristics.

Radion Panels, made in black and Mahogany, come cut in 18 standard sizes for whatever set you wish to build. And in addition, you can have Radion Sockets, Radion Loud-Speaker Horns, Radion Tubing, Radion Binding Post Strips, Insulators, etc.

*New Sockets for Both
New and Old Tubes*

OF PARTICULAR interest are the new Radion Sockets. Nos. 4 and 5 are for the new-style UX tubes exclusively. Nos. 2 and 3 are designed to take both new and old style tubes.

All Radion Sockets are highly efficient, due to the principle of their construction and the low-loss characteristics of Radion. Ask your dealer to show them to you.

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OUR booklet, "Building Your Own Set," gives clear, complete directions for building the most popular circuits. Mailed for 10 cents (stamps). Send the coupon today.

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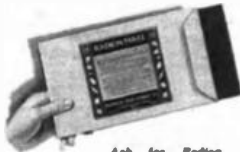
New York City

Chicago Office: Conway Building

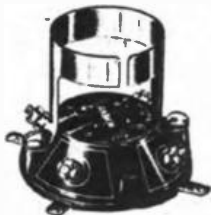
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San Francisco, —Furthard



Ask for Radion Panels by name! Look for the stamp on the panel and the name on the envelope.



This is the Radion No. 3 Socket, designed for both old and new tubes. Equipped with binding posts. Other Radion Sockets come equipped with binding posts.

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Write today for the QUADRIFORMER BOOK. It will bring you a new radio experience. Profusely illustrated with photographs, drawings. It takes you step-by-step through the making of the SUPER-FIVE, an exceptional 5-Tube Receiver developed by engineers of the Gearhart-Schlueter Radio Corporation.

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714 Voorman St. Fresno, Calif.



"The new 5-Tube Set with all the proper and none of the superfluous" — so wrote Henry M. Woody, Editor of Radio magazine, Philadelphia.

Editorially Speaking

(Continued From Page 4)

You must pay us \$1000 a year."

"All right," we say. "We will sign the contract giving us the right to broadcast all of the music whose copyright you control."

Here he smiles again.

"Oh, no," he says, "you cannot broadcast all of our music. We reserve the right to notify you from time to time that certain selections are not included in the contract. Furthermore, you are not to broadcast any music published by certain members of the society under any conditions."

"What?" we exclaim, "how are we to keep track of all of the numbers which we are not allowed to broadcast even though we pay you a fee?"

"That's your business," he says.

"All right," we agree reluctantly, "for how long a period will this license last? As we understand it, we can renew it at the end of the year for the same figure."

"Not at all," he says, "we are not talking about next year. We are only getting you to sign the contract for this year. That will be a legal admission on your part that we have the right to make our demands on you, and next year we will talk about the matter all over again. Next year's license will undoubtedly cost you considerably more."

Of course, this confronts us with a very serious problem. It means that we have not the slightest idea how much money we will have to provide in our business next year to continue our broadcasting, and when we attempt to get approximate figures from the gentleman, he still smilingly declines to make any guess about it. He tells us very frankly that he will charge us just as much more as he thinks we can pay next year.

NOW, suppose that we want to broadcast an orchestra from the best moving-picture theatre in our town. The proprietor of that theatre has already paid to the society a license fee which is fixed by law at so much per seat in the house. You would naturally suppose that, as that license fee had already been agreed upon and paid, the performance by that orchestra of the society's compositions would be unrestricted from then on. That is not the case, however. The moment we put a microphone in that theatre, the society demands that we make an entirely new deal. As a broadcasting station, we must take out another license, at any price which they choose to make us pay. If we do not, we must go to the trouble of getting the program of that orchestra in advance, finding out as best we may which numbers are copy-

right by members of the society and which are not, and then we must stand by the switch and pull the orchestra off the air the moment they start to play anything which is copyright by the society.

Let us carry this illustration further. Suppose the National Carbon Company, for one of the Eveready Hours, desires to broadcast this orchestra in the theatre. According to the present demands of the society, the theatre must pay a license fee, the National Carbon Company must pay a license fee, the station which picks the music up originally must pay a license fee, and then every one of the ten or fifteen stations of the chain doing the broadcasting must each one pay an additional license fee.

Other clients on this link of broadcasting stations may want to broadcast other orchestras on that same evening. It is not beyond the realm of possibility that there may be five or six firms using that link that night and giving us the very best possible entertainment that we can get by radio. If each one of these firms should put out a musical program—and almost all of them do—each one would have to arrange to have all of these license fees paid separately for each of the broadcasts, and yet it is quite within the realm of possibility that each program might include one or more of the same numbers. Figure out on that basis how many times the society will be paid for that one composition and on that one night.

And also remember that the society reserves the right at a moment's notice to refuse to permit us to broadcast any certain one of these selections. In other words, this clause simply means that they can tighten the screws up as much as they want to. The moment they want to collect more money from us, they simply proceed to send us a weekly list of compositions which are withdrawn from our license agreement, and the first thing we know, our license means absolutely nothing to us because all of the compositions may have been withdrawn after our fee has been paid.

This is an actual condition, and no broadcaster has the power or the right to do anything about it. If he attempts to object, as one or two of them have done, he is promptly met with the answer, "Well, if you don't like it, cancel the license and stop broadcasting our selections." Powell Crosley, Jr., tried to fight them and now they demand a \$3000 fee from him, while they give the same license to another Cincinnati station for \$250.

Now you may say that the solution of the problem is not to broadcast anything which is

(Continued on Page 40)

The Design of a Short Wave Receiver

THERE seems to be all sorts of short-wave broadcasting planned for this coming winter in all parts of the world and this, taken with the tremendous amount of interest in the short-wave work of the MacMillan expedition near the North Pole, makes the short-wave field by far the most interesting for the man whose hobby is radio. The almost uncanny manner in which short waves cover tremendous distances, the really simple receivers that yet have proved to be the best of all for the work, and the midget antenna that can be used, have caused an interest in short-wave reception that reminds one of the early days of broadcasting. Every one seems to be clearing the decks, so to speak, to hear MacMillan, England, and so forth, not to forget KDKA, which on 63 meters or thereabouts is putting wonderful signals into practically every country in the world.

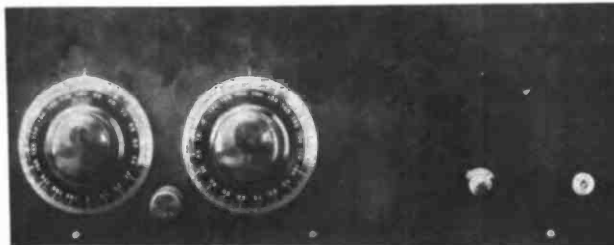
In response to the many requests for the design of a suitable short-wave receiver, we are going to describe one that is rather unique in more ways than one as will be seen. First of all it is best to call to your mind that the most important thing about a receiver nowadays is the design of it, how it is put together. They may all use the same hookup, but the manner in which the hookup is put together determines just how good the receiver is. Remember that; it is important. If built exactly as I shall describe, this receiver will do things that perhaps will surprise you. We are using it at our farm in Michigan and the receiver alone without any external loop or antenna will work a loud-speaker by short-wave signals from KDKA or WGY and amateur or commercial code signals from all over the United States and Canada are also copied in this manner. This will serve as a guide to the sensitivity of the receiver, but of course louder and more reliable signals are obtainable by using 10 to 30 feet of wire around the picture moulding in the room. For the reception of regular broadcasting and the longer waves an antenna of the common 100-foot variety is the best. It is important to remind you here that the best short-wave reception is accomplished with the short midget antenna of 10 to 30 feet in length, and that vernier dial controls and careful choice of grid leaks are very necessary for successful operation.

Because the most sensitive type of hookup known must be used because reception of continuous wave code means an oscillating tube as a detector and reception of phone broadcasting is accomplished with a non-oscillating regenerative tube, our hookup must be of the plain regenerative type.

The best regenerative hookup for all general purposes is the Weagant circuit, which we will use as shown in Fig. 3. All tuning is done by means of the condenser C1 and the regeneration and oscillation, volume, etc., are controlled by the conden-

By E. T. Flewelling

Associate Editor, "Radio in the Home"



The panel of the short-wave receiver as Mr. Flewelling built it makes a neat and simple design

ser C3. To insure all absence of body capacity effects, etc., the rotor and stator plates of both condensers must be connected as shown. 201-A tubes are used in the receiver, with 45 volts on the plate of the detector tube and 60 to 100 volts on the amplifier. Our receiver as shown in Fig. 1, 2 and 3 does not use a phone jack on the first stage of the amplifier because

we use the receiver mostly for phone work or without any antenna.

If you desire to do much reception of long distance code, however, it will be better to insert a phone jack on the first stage of the amplifier because such reception is always accomplished with the head phones, and one's ears could never stand two stages of amplification. However, my own personal choice is for one jack as shown. We are most concerned that the detector circuit be built in strict accordance with the design as given, but the amplifier circuit may be constructed as the individual builder may desire.

No detailed list of parts is given because the hookup is so simple that one can see at a glance just what is needed. In order to adhere strictly to the design of the receiver, special parts as follows must be used:

- 2—.00025 MF or .0003 MF Condensers.
- 2—Vernier Dials.
- 1—Hard rubber Strip, 3-16-inch by 1-inch by 6 inches for mounting condensers as described.
- 4—Brass jacks to screw on to condenser terminals, described under coil mounting.
- 1—Battery switch to shut off all filaments.
- 2—Amperites to control amplifier filaments.
- 1—Phone jack.
- 1—.00025 MF capacity grid condenser.

The panel dimensions are as shown in Fig. 4. Note the two small holes for the condenser shaft. These holes are for mounting the National Vernier Dial. Two long screws are substituted for the short ones furnished with the dial and are used with spacing washers to fasten the insulating strip on which the condensers are mounted. This strip and the spacing washers may be seen in Fig. 2, running between the two condensers and just above the rheostat.

After the panel is drilled the phone jack, filament control switch, detector rheostat and condenser dials are mounted. Note that only the base of the vernier dial is mounted until the condensers are fastened by means of screws through the two inside holes for the dials. I believe that the method that is used to mount the condensers with vernier dials is the most simple and easiest to handle that I have yet seen. First a hard rubber strip 3-16 of an inch thick is drilled as shown in Fig. 5, and the two condensers mounted upon it through holes "A." It will be found that the small holes "B" are spaced the same as the two inside holes for the dial mountings so that the same screws with spacing washers are used to hold both the dial mounting and the condenser mounting.

It will be noted that the condensers are of the single hole mounting type and therefore are very easily turned around to line up with each other, as will be described. After temporarily mounting the condens-

How We Built the Set at 3XP

By H. M. N.

MR. FLEWELLING'S article gives all of the information that is necessary for those who happen to have variable condensers with bakelite or hard-rubber end plates.

We thought at Station 3XP, however, that there were a great many fans who already had metal-end plate condensers who would like to build this set, and so we constructed it at our laboratory using other parts in order to give all of the data necessary for any one no matter what make of parts he had.

We chose Hammerlund variable condensers for our set because they are typical of better class metal-end plate condensers. The photographs show how we mounted them. It is a simple matter to take off one of the nuts which hold the condenser together and to insert in its place an 8-32 machine screw to hold the hard-rubber strip which serves as a mounting strip for the phone-tip jacks. Mr. Flewelling has been on a farm in Michigan for a number of months past, and since his retirement to the wilds, Carter, Yazley and several others

(Continued on Page 36)

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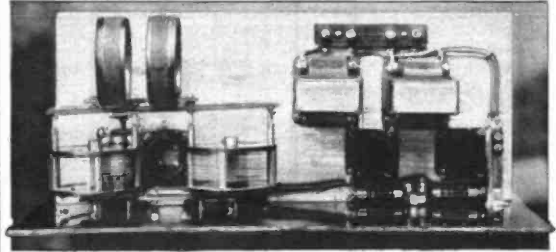
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ers, it is a simple matter to locate the detector tube socket between them and they can then be removed while the socket is mounted, connected to the rheostat and the socket filament

no fastening and unfastening of wires. This means "plug-in" type coils, and as there are no such coils of a suitable nature on the market it becomes necessary to "roll your own." For-



Looking Down on Flewelling's Short-Wave Receiver

wiring completed. Use No. 18, well-insulated wire for all wiring in the receiver. Note in Fig. 2 how it is bunched together and tied with thread in accordance with best engineering practice. This is true for

unately, this is very easy indeed to do.

You will have to decide upon what method you will use to plug the coils into or onto the condensers in such a manner that they are readily inter-

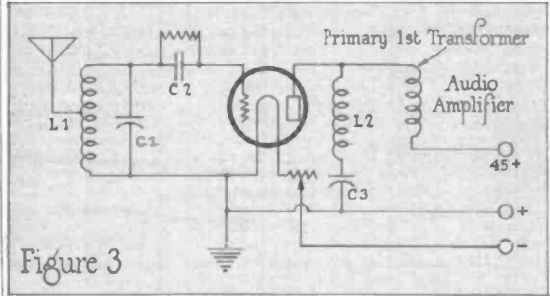


Figure 3

all battery and filament leads, but you will find that your detector circuit is built in such a manner as to have practically no wiring in it.

changed, but Fig. 2 shows the method that we used very satisfactorily and a hard rubber strip 1/2 inch wide by 7 inches long is used to mount the dif-

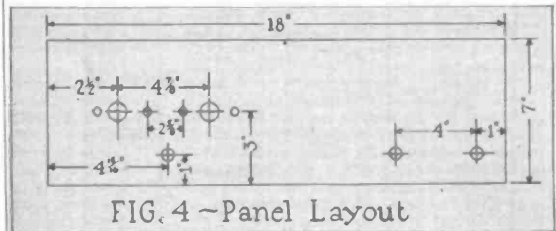


FIG. 4 ~Panel Layout

Because our receiver must cover a tremendous range of wave lengths efficiently it is necessary that the coils be readily interchangeable with

ferent coils in pairs. Fig. 2 shows two separate pieces of Celeron tubing 3 inches in diameter, on which coils are wound. They are separated for experi-

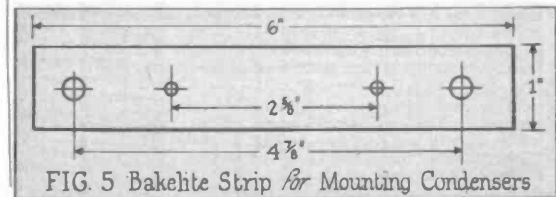


FIG. 5 Bakelite Strip for Mounting Condensers

mental purposes and can just as well or better be one single piece of tubing carrying the two windings L1 and L2 of Fig. 3, spaced 3/4-inch apart for all coils. The hard-rubber strips were drilled for 6-32 screws, which just fit into head-phone cord tips and are soldered to them. Small brass rod was then drilled to fit the cord tips snugly on one end and tapped

necting them by a multitude of wires is rapidly passing, being forced out of use by the more advanced types in which each part works with each other part. Our receiver would not be different from any other of its type were it not for the design shown. The method of plugging in the coils shown in Fig. 2 might be a little out of the ordinary, but it results in a ship-shape, workmanlike type of receiver.

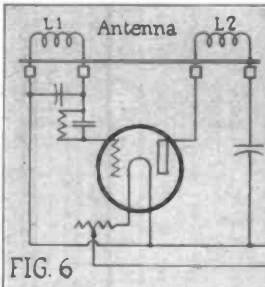
Standard Celeron tubing, 3 inches in diameter, should be used to wind the coils on and only one length is necessary for all windings, that is, 3 inches in diameter by 6 inches long, and such tubing is available by the carload. Shorter lengths can of course be used if desired for the short waves, as only a few turns of wire are necessary and they are easily fastened to the hard-rubber strip by screws and nuts in a neat and strong manner. All coils are wound with No. 22 DCC wire, and with coils of up to 25 turns it is best to space each turn by the diameter of the wire used. This is easily done by winding two wires at the same time and then removing the unused wire. A few drops of any of the standard "dopes" will serve to keep the spacing.

Coil Values

- 20-Meter Band
L1-L2-3 turns each
- 40-Meter Band
L1-L2-5 turns each
- 75-Meter Band
L1-L2-10 turns each
- 150-Meter Band
L1-25 turns
L2-16 turns
- Broadcasting
L1-40 turns
L2-20 turns

The antenna connection to the coils is made by a binding post mounted directly upon the tubing and does not show in our photographs.

For broadcasting reception the coils are tapped at 15 turns from the filament side of the coil for antenna connection, as shown in Fig. 3. For all other wave lengths the antenna post is di-



with a 6-32 thread for screwing onto the condenser on the other end. This method has worked out excellently, but unless Mr. Clark, who does the buying for Radio in the Home readers, can furnish them, I am afraid that it is a job for your own work bench. (Note—See my article herewith. H. M. N.) The brass rod is 1/4-inch stock cut in 1/4-inch lengths, drilled and tapped as explained. This method of mounting was described in the writer's September article on a Superhet Converter and is worth its weight in gold because it offers such a convenient way of handling coils, eliminating wiring and securing direct "wireless" connections.

It is well to emphasize again that development in radio receivers this year is almost entirely along the line of design and assembly. The great values gained from properly designed and assembled receivers have been well recognized. The old order of promiscuously placing parts about a receiver and con-

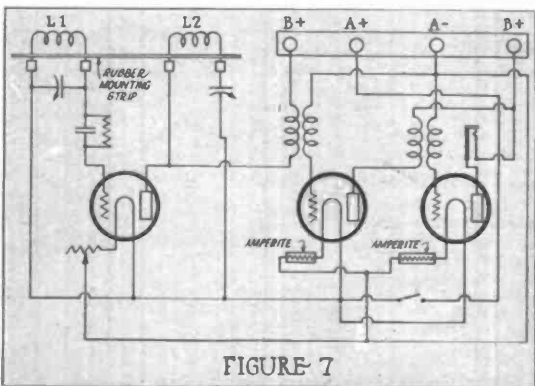


FIGURE 7

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rectly connected to the grid side of the coil. Under "operation" I shall explain more fully this connection.

If you will refer to Fig. 3, the circuit diagram of the short-wave receiver, you will note that the condenser C1 is connected in parallel or directly across the coil L1 with its fixed plates or stator connected to the grid condenser. If one of the brass jacks or plugs which we have described is screwed onto the rotor terminal of the condenser and another jack is screwed on the stator terminal directly across the condenser, and the coil with its phone taps is plugged into these jacks, you can see that you have completed quite a bit of connecting without using any wires.

Condenser C3, however, you will note in Fig. 3 is connected in series with the coil L2, and it becomes necessary with this condenser to mount one of the brass jacks by means of a screw through the bakelite end plate of the condenser. One jack is mounted upon the stator of the condensers, while the other is mounted upon a separate screw through the endplate. This is the only confusing part of our assembly. Condenser C3 now has three terminals, that is the rotor plates and the two jacks.

Having located the detector-tube socket between the two condensers as shown in Fig. 2, our next step is to mount the grid condenser C3 with its grid lead. Soldering clips are mounted on the socket terminals and condensers are turned until the jacks are in a straight line, as shown in Fig. 2, and it will be found that the soldering clips on the grid condenser can be soldered directly to the soldering clips on the tube socket and to the condenser C1.

In accordance with the 3XP method of illustrating you should have completed, and connections made, and it is very simple to complete the wiring of the detector by making the filament and plate connections to agree with Fig. 6. Now it becomes necessary to arrange for plate voltage to the detector tube, and this is done through the primary of the first stage audio-amplifier. Fig. 7 shows the completed receiver with two stages of audio exactly as laid out and shown in Fig. 2, the amperites being used to control the amplifier-tube filaments and to furnish biasing voltage for the amplifier-tube grids.

In operating a short-wave receiver one of the greatest factors that influence the receiver is the resistance of the antenna and the natural period or wave to which it and surrounding objects might be tuned. These things are very likely to make it impossible for the receiver to oscil-

late if they are directly connected into the receiver circuit. This is one reason why short-wave sets must be handled a bit differently than is usual. Ease of handling, flexibility, etc., recommend that the receiver be connected to the antenna by capacity coupling. If two pieces of insulated wire are twisted together, even though the wires do not actually come in contact, they will act as the plates of a miniature condenser. The more the two pieces of wire are twisted together, the greater the capacity of the condenser, and we can thus adjust the coupling of the antenna to the receiver. A short piece of insulated wire is connected to the antenna post on the coil L1, and an insulated wire from the antenna is wrapped around it five or six times. (Note—See our 3XP method as given in the accompanying article.—H. M. N.) If a large antenna is to be used it should always be connected to the receiver in this manner, but a short ten to thirty foot antenna may be connected directly.

The receiver will oscillate violently, evenly or not at all in accordance with the antenna or antenna coupling used and in accordance with the grid leak used. These two points, antenna and grid leak, then are the points to watch if you are to get the most out of your receiver. The shorter the wave to be received the shorter the antenna or the weaker the coupling should be for best operation, but a good medium antenna and coupling may be found to operate very well indeed over the entire range from 20 to 100 meters. Above this range it is better to enlarge the antenna and tighten the coupling or connect the antenna directly to the receiver.

This article describes a method of assembling or building nothing but a plain regenerative receiver, but the method of assembly is a guarantee that the utmost sensitivity and volume will be secured, and after all is said and done there has not been found, so far, a more sensitive type of receiver than the one we have described. If you cannot hear MacMillan or other long-distance stations it will not be because of your receiver, but because of your location, time of listening, interference, etc.

How We Build the Set at 3XP

(Continued From Page 23)

have put on the market very excellent phone-tip jacks for the very purpose outlined in Flewelling's article. We show some of these clips and jacks.

In building our set, we made the connections just as short as possible for the purpose of using the Brighton True-Blue tubes. Quality on these short waves is

at best very poor, and we felt that it was wise to use tubes which in themselves are as pure in quality as possible so as not to add further distortion to signals that are already none too good.

We have never cared to listen in on these short-wave broadcasts just because of this lack of good quality, but we realize

many cases this will not be necessary, but we thought that it would be wise because, with certain combinations of audio-frequency transformers and tubes, the choke coil is necessary to guarantee perfect control of oscillation.

This choke coil can be 100 turns of No. 28 DCC wire wound on a piece of cardboard mailing

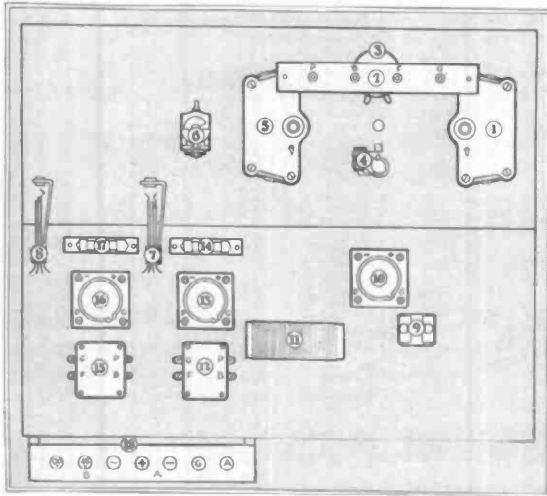


Figure 1—Panel and Baseboard Layout

that a great many fans who like to experiment will wish to put this set together, and so we are giving the data here.

We followed the Flewelling diagram and instructions except that we inserted a radio-frequency choke coil in the plate circuit of the detector tube. In

tubing or it can be a 100-turn spiderweb or honeycomb coil. The number of turns is not important. One hundred or more will answer.

This makes about as satisfactory a short-wave set as it is possible to build at the present time. It is virtually the circuit

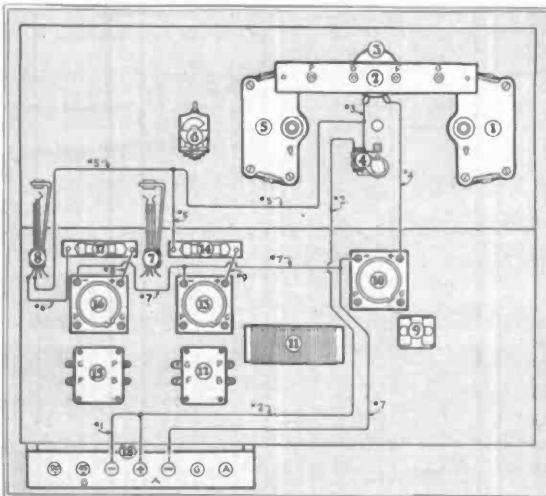
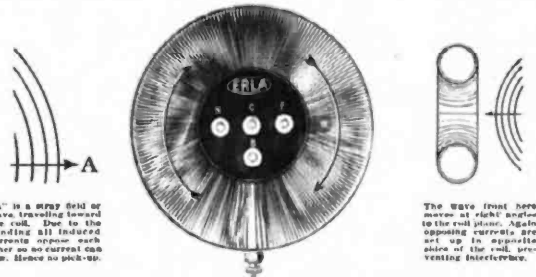


Figure 2—Filament Wires



"A" is a stray field or wave traveling toward the coil. Due to the winding all induced currents oppose each other so no current can flow. Hence no pick-up.

The wave front here comes at right angles to the coil plane. Again opposing currents are set up in opposite sides of the coil, preventing inductance.

New kind of coil

Instantly brings four amazing improvements to your present set—greater distance, more volume, increased selectivity, finer tone quality. Send for remarkable new book, *Better Radio Reception*.

SCIENCE has discovered a new inductance principle that is bringing astounding results. Now you can apply it to your present set through new type coils known as ERLA "Balloon" "Circloids".

Thousands of tests and experiments were necessary before the circloid was finally perfected. Leading radio engineers worked night and day in order to develop a coil that would correct the four vital weaknesses of present sets. At last they were successful.

When circloids are used, results you think impossible are obtained with surprising ease. Note especially the four that follow:

1. **Greater distance.** Circloids have no measurable external field to affect adjacent coils or wiring circuits. This makes possible higher amplification in each stage with increased sensitivity and greater range.

2. **More volume.** Higher r. f. amplification enables circloids to bring in distant stations scarcely audible in ordinary sets with volume enough on the loud speaker to fill an auditorium.

3. **Increased selectivity.** Circloids have absolutely no pick-up qualities of their own. Only signals flowing in the antenna circuit are built up. (See diagram above.) This explains total absence of static.

4. **Finer tone quality.** The self-enclosed field positively prevents stray feed-backs between coils. Hence no blurring or distortion. Tones are crystal clear.

Write for new book, *"Better Radio Reception"*

You will be amazed at the difference circloids will make in your present receiver. Get a set and test them out today. Go to your ERLA dealer or write direct.

Also send for remarkable new book just published. It explains the Circloid principle with diagrams and drawings and tells you many things you ought to know about reception. Send 10c to cover postage and cost of mailing.

ELECTRICAL RESEARCH

LABORATORIES

2523 Cottage Grove Ave., Chicago, U.S.A.
20-A, Cottage Grove Ave., Chicago, U.S.A.

ELECTRICAL RESEARCH LABORATORIES



30-A Cottage Ave., Chicago, U. S. A.
I send no fee info. This does constitute an authorized unit on the Circloid. ERLA distributors. I enclose 10c for postage equipped to give you the best "Better complete radio service."

Name

Address

City

State

Dealers—Exclusive franchises are available to high-class dealers in localities still open. Write or wire immediately.

—results are truly amazing!—

NATIONAL
Browning-Drake
Transformer

A tuned radio-frequency transformer of highest efficiency

Write for Bulletin 106 R117
NATIONAL COMPANY, Inc.
110 Brookline St., Cambridge, Mass.

Pilot Light Switch



A combination of Pilot Light and Midget Battery Switch. Constantly indicates whether the radio set is "on" or "off." The pilot light bulb-eye is furnished in a choice of red, green or amber.

Pilot Light Switch, No. 210, \$1.00, Lamp Extra
Pilot Light Bracket same as the Pilot Light Switch except that bracket is set up in the same panel hole as the glass bulb-eye instead of being mounted in the switch.
Pilot Light Bracket, No. 310, 50 cents, Lamp Extra

YAXLEY
YAXLEY MFG. CO., Dept. K
217 N. Desplaines St., Chicago, Ill.

Perfect Control



CAN you handle your radio set as easily as your automobile? Slip through radio traffic without bumping into unwanted stations, throttle down on the locals, or speed up to full volume on distant stations? Control your radio receiver with a Centralab Radiohm for greatest flexibility and power. Gives smooth variation of resistance from zero to 200,000 ohms. Ideal for plate circuit control of oscillation. Now used as a standard unit by more than a score of prominent radio manufacturers.

\$2.00 at your dealer, or mailed direct. Write for literature and circuits describing this and other Centralab patented controls.

CENTRAL RADIO LABORATORIES
18 Keefe Avenue Milwaukee, Wisconsin

Centralab

Known as the Reinartz circuit, which is based on the famous Weagant circuit. The right-hand condenser shown in our hook-up is the one which is intended to control regeneration. We used the Hammerlund five-plate condenser, but the exact size of this particular condenser is not important, although it should not be smaller than five

the oscillation and, in cases where the regeneration condenser is not of exactly the correct size, the use of this midget condenser as an antenna coupling will compensate very largely.

For the condenser shown on the left-hand side of the panel, it would undoubtedly have been better to use a straight-line fre-

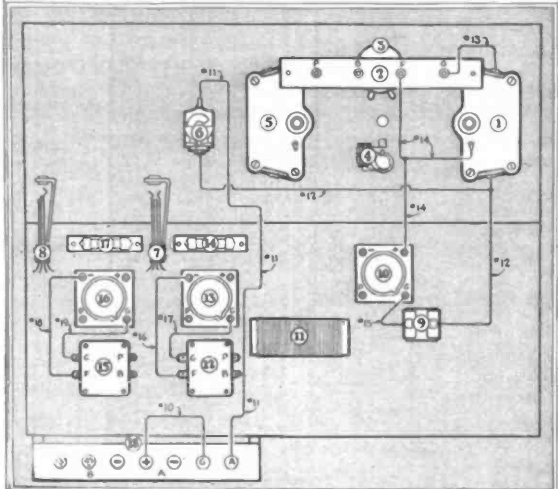


Figure 3—Grid, Grid Return, Aerial and Ground

quency or, as the Amsco Company calls it, an "allocating" condenser. Karas puts this type of condenser out under the name of "orthometric." Unfortunately, at the time of building this set, we had not received any of these condensers. If we had, we would have put one in in this left-hand position. For those who do not

plates. You can use a condenser up to thirteen plates if you wish. We also did not particularly care for Mr. Flewelling's idea of twisting two wires together to get capacity coupling to the antenna. We much prefer the use of a midget condenser such as we show in our own hook-up. This gives an added control of

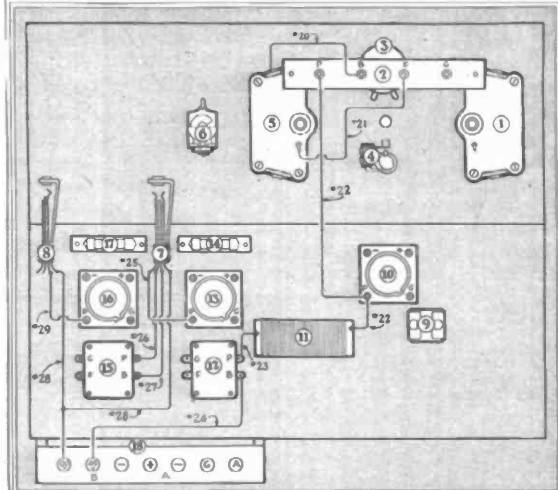


Figure 4—Plate and "B" Battery Wires

EBY
PATENTED
BINDING POSTS
Twenty-five Different Engraved Tops

They Don't Lose Their Heads!
15c AT ALL DEALERS 15c

DEALERS/MAKE MORE MONEY!

Buy all your stocks from us and make more money.
Get this big catalog
The most complete dealers' catalog ever compiled. Standard parts, kits, and sets at better prices. Write now for your copy.

W.C. BRAUN CO.
32-34 S. Clinton St., Chicago

"Long Distance"

No better tube made for getting distant stations than the SCHICKERLING. Tube noises and distortion eliminated by patented stabilizing plates.

Model S-4000
5 volt, Stand. and Base, 9/16 inch Detector-Amplifier in this package.
\$2.50

Mail orders filled promptly
SCHICKERLING PRODUCTS CORP.
401-407 Mulberry Street
Newark, N. J.
Write for list of other models

intend investing in new condensers, very much the same effect can be had by using the regular semicircular plate condenser with the Rathbun or the Radial straight-line frequency dials.

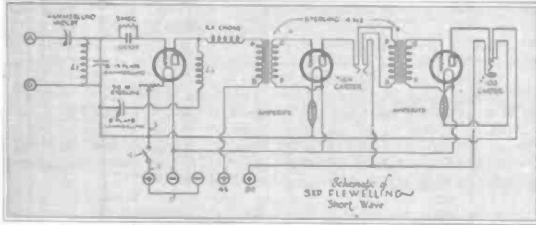
We used No. 18 DCC wire for winding the coils, but I really

No. 2—Jack strip, 7 inches by 1 inch by 3-16 containing four Yaxley Midget phone-tip jacks.

No. 3—Sterling 30-ohm rheostat.

No. 4—Yaxley pilot switch.

No. 5—Hammerlund 5-plate condenser.



believe that ordinary bell wire, wound on a piece of standard Celeron tubing three inches in diameter, makes as good a coil for these low-wave lengths as it is possible to build. This is not because bell wire has any inherent merits, but because the

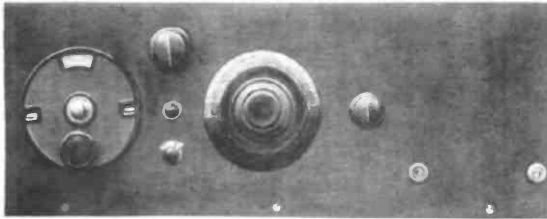
No. 6—Hammerlund Jr. condenser.

No. 7—No. 104 Yaxley jack.

No. 8—No. 103 Yaxley jack.

No. 9—Dubilier grid condenser and 3 meg. Daven leak.

No. 10—No. 13—No. 16—Tube sockets.



The Panel of the Short-Wave Receiver as we built it at Station 3XP

thickness of the insulation is such that the actual wire is spaced apart the exact distance for best radio efficiency. Any possible losses in the insulation are more than compensated for by the accurate spacing. I am a great believer in coils wound with bell wire on Celeron tubing.

Parts List

No. 1—13-plate Hammerlund condenser.

No. 14—No. 17—1A Amperites and bases.

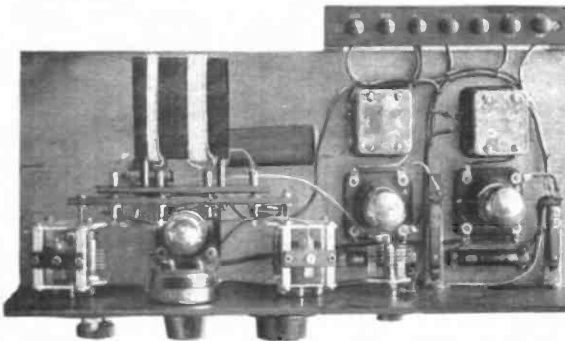
No. 12—No. 15—Sterling 4 to 1 Audio transformers.

No. 11—Choke, 100 turns, No. 28 D. S. C. on 1 1/4-inch form.

No. 18—Eby binding posts on 8 inch by 1 1/4 by 3-16 hard-rubber strip.

L1—7 turns No. 20 on 3-inch tube.

L2—13 turns No. 20 on 3-inch tube.



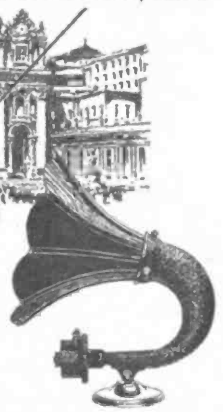
Looking down on the 3XP version of the Short-Wave Receiver

Amplions chosen to reproduce Papal Ceremonies

throughout Saint Peters, Rome



His Holiness the Pope seated on his throne upon the occasion of the recent consecration of St. Peter's. The microphone is on the right arm of the throne.



Of ALL loud speakers, Amplions enjoy the honor and high compliment of having been installed throughout the famous Cathedral of Saint Peters, Rome, that important ceremonies conducted by His Holiness the Pope may be clearly audible to great multitudes of people.

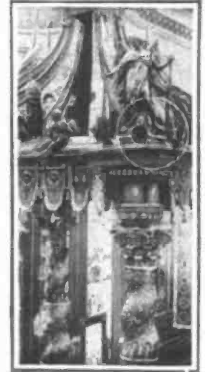
Supreme clarity of reproduction was the prime requisite. It is only logical that The Amplion—creation of the actual originators and oldest makers of loud speakers—should have been chosen. Amplions outsell any other loud speaker throughout the world, chiefly because of unrivaled clarity of tone. "The clearness of the reproduction of the Pope's voice was an outstanding feature," writes a witness to the first ceremonies.

Hear The Amplion in comparison with any or all other reproducers. Prove to your entire satisfaction that it is the world's finest loud speaker. Amplion Loud Speakers, \$12.00 up. Photograph units in two sizes. Write for interesting literature and dealer's address.

THE AMPLION CORPORATION OF AMERICA
Executive Offices: Suite U, 240 Madison Ave., N. Y. C.
Canadian Distributors: Brampton of Canada, Ltd., Toronto
Alfred Graham & Co., London, Eng., Patentees

AMPLION

The World's Standard Loud Speaker



A portion of the magnificent ceremony over Saint Peter's Tomb, showing two of many Amplions installed for amplifying Papal services to vast assemblages of pilgrims.



333 RADIO Storage "B" Battery
New! Lasts Indefinitely—Pays for Itself
Economical and performance unobtainable of others. Recharged at a negligible cost. Approved and listed as Standard by American Radio Manufacturers Association, Radio Engineers, and other leading radio organizations. Contains special "B" type cells, no mercury, no acid, no gas, no heat, no noise, no odor, no fumes, no leakage, no danger. Enter your name on our "SEND NO MONEY" list. Just state number of batteries wanted and we will bill you upon receipt. Extra delivery charge for express. 30 days free guarantee after receiving battery. 5 per cent discount for cash with order. Rush your order now.

WORLD BATTERY COMPANY
1219 So. Wabasha Ave., Dept. 86 Chicago, Ill.
Members of the Famous World Radio "A" Storage Battery Program. 6-cell, 10-cell, 15-cell, 20-cell, 25-cell, 30-cell, 35-cell. All covered under World Radio Plan.

This It means HILCO

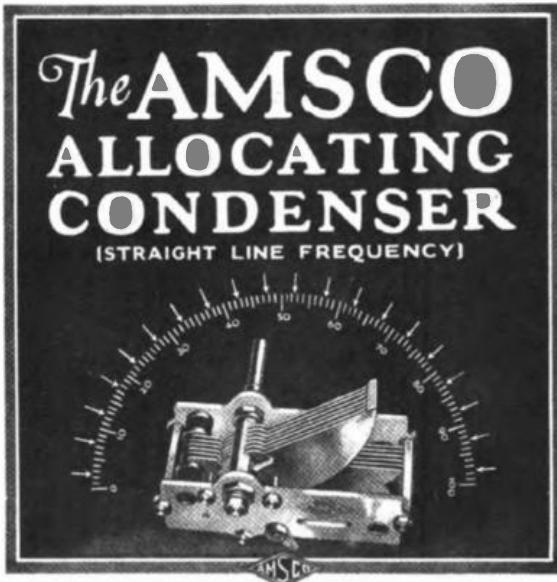
Five HILCO's (underneath, installed in 18 minutes, will make a 3-tube circuit equal a 5-tube circuit—without more money.

That don't expect it from any other make. It takes 10; it's dynamo-tested, water-tight, built HILCO thus to clear frequency paths, stop factory heat and make low-loss a reality.

You never know a good conductor like HILCO's (underneath) and no more than insubstantial.

Hilco's dealers and jobbers will get HILCO's Condemners for you from

A. E. HILL & CO. ATLANTA



Spreads the Stations Over the Dial

—The new AMSCO Allocating Condenser is the triumphant combination of electrical engineering and mechanical ingenuity. Electrically efficient in unscrambling the stations on your dials. Each dial degree from 1 to 100 will be found to represent 10 broadcasting kilocycles accurately over the entire scale—"a station for every degree". Mechanically ingenious in correcting the fault of other S. L. F. Condensers—it conserves space! Scientific low-loss construction. Rigidity with light weight.

Made in three capacities—Single or Double. Ask your dealer, or write for details of the entire AMSCO line of engineered radio parts.

AMSCO PRODUCTS, INC., Dept. 4
Broome and Lafayette Streets, N.Y.C.



New!—a hand-cranked arrangement at a low price. The AMSCO Variable Dial gives choice to your fingers. Step-down 13 to 1, backwards or forwards, fast or slow without momentum or back-lash.

A BOOSTER For the Super-Het Converter

By E. T. FLEWELLING

Mr. Flewelling's Super-Het Converter described in the September issue is proving tremendously popular. He has now designed a Booster to make it doubly efficient. Full details in the November issue. Better place an advance order with your news-dealer.

Editorially Speaking

(Continued From Page 22)

copyright by the society. That is—theoretically—a very good plan, but practically it is impossible.

Every broadcasting station has among its favorite features remote control stations which pick up good dance orchestras, motion-picture theatre orchestras, church services, grand organs and features of that kind. It is impossible to have all of these programs made up according to a hard and fast schedule in sufficient time in advance to give us the opportunity to check up on all of the selections and find out which are copyright and which are not.

Suppose that we should cut into a fine concert orchestra playing in a hotel and broadcast it for a dinner music program. The leader plays several selections and one of them is so popular that the audience demands an encore. He plays an encore not previously arranged. We have no time to check up on any list—furthermore we probably cannot get a complete list. If it so happens that this selection is not included in our agreement, we are subject to a damage suit by the society, and the society will not be slow in collecting.

As a matter of fact, such an instance actually happened at 7:35 P. M. on the evening of Thursday, August 20th, when WJZ had to pull the switch while broadcasting the Vanderbilt Hotel String Ensemble. The announcer came on and apologized and took all of the blame, explaining that he had suddenly discovered that the number the orchestra was playing was barred from broadcasting.

He was not to blame, however. No announcer and no studio director can possibly keep track of all of the numbers which are or are not copyright by the society. However, the mere fact that a part of this number went out before the switch was pulled gave the society a chance to become extremely nasty with the Radio Corporation and I have no doubt that they took full advantage of this opportunity.

TIN-PAN ALLEY is in a very strong position in this matter. They have elected to Congress from the Tin-Pan Alley district a gentleman who used to be a song publisher in Tin-Pan Alley himself and who has frankly stated that he proposed to back up the society and is not interested in any question as to whether they are right or wrong. Anything that Tin-Pan Alley does is all right with him and he does not care a hang about the rest of the public, because so long as he does the bidding of Tin-Pan Alley he is

absolutely certain of re-election by Tin-Pan Alley for the rest of his life. He should worry about you and me and the rest of the radio fans!

Tin-Pan Alley has actually boldly dared the larger broadcasting companies to try to make a fight about this in Congress.

"If you do," they said, "we will go down to Washington and draw a pathetic picture of the starving music composer and you know that the public always favors the under dog. You people are big corporations and we represent the starving composer! What chance have you got to arouse public sentiment against us?"

Now just a word in conclusion about this "starving composer" aspect of the case. Out of every one hundred dollars collected by the society from broadcasting stations, sixty-five dollars goes to pay the high-salaried officials who are putting into execution this hold-up plan to squeeze one million dollars out of radio. Of the remaining thirty-five dollars, the very largest portion goes to the biggest firms of publishers. This is divided on a pro rata basis, the firm which publishes the largest output getting the largest share of the thirty-five dollars.

Out of the original one hundred dollars, not more than two or three dollars goes to the composer. This also is divided pro rata. No composer can get the benefit of it unless he has had published a certain number of popular songs. Now, you and I all know that a man who has published four or five popular songs is not by any means a "starving" composer. The royalties from a popular song are tremendous and you and I would probably be very well satisfied to get the returns from just one song hit. It is probably safe to say that there is not one single "starving" composer represented in all the compositions owned by the society. If there is, that composer has been brought to starvation by his facility in spending thousand of dollars of easily earned royalties and not because he has never had a fair return from his efforts.

WHAT are you and I going to do about it? Probably nothing. So far as any of us can see, there are only one or two possible methods of stopping this menace to radio.

One of these methods is to get all of the broadcasting stations together under a definite plan to stop broadcasting entirely until the society makes a reasonable arrangement. There is a swell chance of that!

Can you imagine certain of the department store broadcasting stations or the stations run

(Continued on Page 41)

Notes from the Lab at Station 3XP

STERLING RHEOSTAT—Sterling Manufacturing Company, Cleveland, O.

If you have ever had the misfortune to let a wire from the "B" battery drop over on your rheostat and blow your tubes, the chances are you will certainly be very much interested to know that this rheostat is entirely clad in a composition armor which hides all the wire. It is one of the smoothest-running rheostats we have seen. You will find it pictured in the Flewelling short-wave set which we built at Station 3XP.

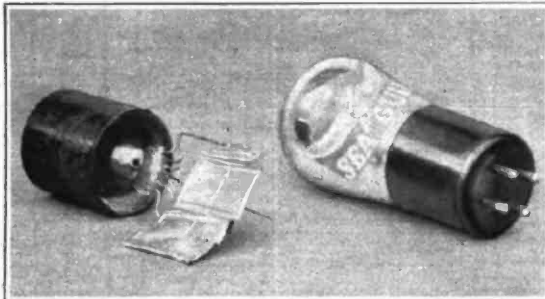


The Jefferson Tube Rejuvenator

The Jefferson tube rejuvenator certainly puts "pep" in old tubes and brings them back to life in about ten minutes. Several tubes were rejuvenated with this handy device and in practically every case it was possible to obtain a higher filament emission reading than when the tubes were new. It can be used to reactivate tubes which have

STERLING A. F. TRANSFORMER—Sterling Manufacturing Company, Cleveland, O.

While many manufacturers have been contented just to put out a quality piece of apparatus, never worrying particularly about its looks in case it went into the inside of the set, Sterling has taken a transformer that was good to start with and put it in a very beautifully de-



The Sea Gull Tube. The photograph to the left shows the "inner works" of the tube

signed shell. The quality of music from this transformer is good and its volume excellent. It is safe to say that the future transformers and other apparatus for inside mounting on a radio set will be articles of beauty. The manufacturers are reaching the point in perfection of their products which will allow them more time in the future for design work. This transformer is shown in the 3XP Flewelling short-wave set in this issue.

TUBE REJUVENATOR—Jefferson Electric Manufacturing Company, 501 South Greene street, Chicago, Ill.



The Carter "Imp" Rheostat

been paralyzed or whose filaments have become exhausted.

SEA GULL TUBES—Aberdeen Specialty Company, Inc., 1520 Chestnut street, Philadelphia, Pa.

The Sea Gull tubes have been tested in virtually every type of receiver at the laboratory and found to be very efficient de-

tectors and amplifiers for both audio and radio frequency. They are also excellent oscillators. It will probably be interesting to know that the curves in Fig. 3, Page 25, of the August issue of *Radio in the Home* were filament emission curves of Sea

Gull tubes under test at 3XP laboratory. When you consider that Government specifications require a filament emission of only ten milliamperes at 500 hours, it will be seen that these tubes were performing splendidly when these curves were

made for reproduction. Tube G12 showing an emission of about 25 MA and Tube G11 showing about 40 MA. At the end of 1762 hours (the equivalent of about eighteen months' operation in a receiver) these tubes show a filament emission of about 26 milliamperes, and still give excellent results when placed in a receiver.



The Carter "Imp" Switch

(Continued on Next Page)

Get Ready NOW for the Best in the Air This Fall and Winter

Sterling RADIO SERVICE EQUIPMENT

simplifies the task of maintaining perfect reception.

THE quality of your radio reception lies in the health of your tubes and batteries. Every set owner, by devoting a few moments of his time to servicing these life-centers of the set, can get more joy out of radio with less cost for upkeep and less replacements. Equip yourself completely with Sterling service instruments to serve the tubes and batteries—and save money in the end.

- † Pocket meters to test "A" or "B" batteries accurately and without unnecessary drain on the battery.
- † Tube testers to determine the efficiency of the tubes and locate wiring, socket and transformer troubles.
- † Battery chargers to charge "A" and "B" batteries at a safe and certain charging rate by the most up-to-date and simplest method. No bulbs, no liquids.
- † Tube reactifiers to renew the filament of UV-201A, C-201A, UV-100 and C-209 types of vacuum tubes. Meter tells when tubes need treatment and their exact condition after reactivation. Keeps amplification at its best. Invaluable for matching tubes in the set.
- † Each Sterling Radio Service instrument is meter-equipped. The Tube-Servicing instruments are furnished with handy charts to show you exactly and truthfully the condition of the tube.

The Sterling Manufacturing Company
2831-53 Prospect Ave., Cleveland, Ohio
Dept. K.

Sterling Radio Service Equipment

Battery Chargers

Modelled on same models for "A" and "B" Batteries

\$15.00 to \$15.00

Pocket and Panel Meters

Prices, \$1.00 to \$4.50

Home Tube Tester

Price, \$9.50

Tube Reactifier

Prices, \$15.50 & \$16.00



These Service Instruments are a necessary part of every set owner's equipment.



A Separate Circuit for Each 40 Meter Wavelength Band!

KELLOGG—for 28 years makers of precision telephone instruments—producers of quality parts since radio began—Kellogg has perfected a radio receiver worthy to bear the Kellogg name.

In the new **WAVE-MASTER** there are nine separate circuits—one for each 40 meter wavelength band. Each circuit gives that maximum efficiency heretofore found only in one short section of the dial of ordinary radio frequency sets. Each circuit brings within the range of the tuning dial a different group of stations.

Merely set the pointer to the wave group in which you are interested and tune in with the one dial. This dial actually has a tuning

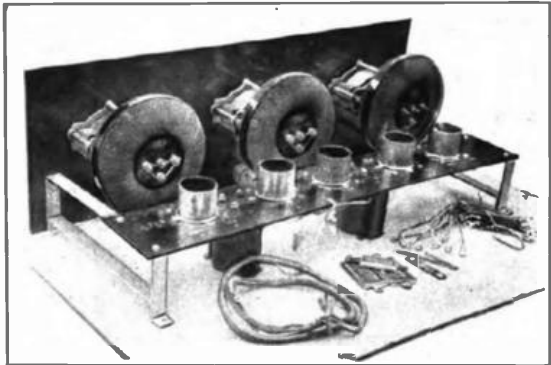
range of 540 degrees—over three times the range of any other set. All other radio frequency sets have variable capacity which must be tuned, usually with three different dials, to balance with their inductance coils.

The **WAVE-MASTER'S** inductance is not fixed but variable and is easily and quickly tuned, with the one dial, to balance the fixed capacities.

Write for full description. Please mention your radio dealer's name.

Kellogg Switchboard & Supply Company
1069 W. Adams St., Dept. H, Chicago, Ill.

WAVE MASTER
SWITCHBOARD & SUPPLY CO.



(Continued From Page 41)

CARTER "IMP" RHEOSTAT —Carter Radio Company, Chicago, Ill.

Carter has realized the importance of condensing those parts that can be condensed, it seems. Their "IMP" line is a series of small pieces of apparatus. The rheostat in question is but slightly larger than an American half dollar! One-hole mounting greatly facilitates its being incorporated into a set in quick time at little trouble. It is strongly made, a very neat unit, and takes up much less space than the larger makes, allowing its incorporation in a portable set or any regular set, at absolutely no risk of inferior quality.

ALL-AMERICAN TOROID COIL — All-American Radio Corporation, Chicago, Ill.

This is an exceptionally fine model of the well-known Toroid

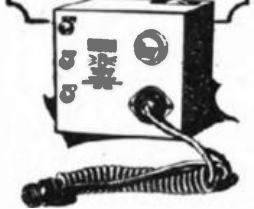


The All-American Toroid Coil

coil. While some manufacturers have rushed their models of this coil on the market to meet the early demand, a good many other manufacturers have waited in order to make their coil mechanically perfect, as well as electrically so. All-American has done just this. It comes in two models, antenna coupling coil and radio-frequency transformer. A kit containing one of the former and two of the latter coils is put out and makes a dandy set of

The Erla Balloon Circloid Kit partly assembled

YOU don't need "B" Batteries
if you use the **FRESHMAN MASTER "B" Battery Eliminator**



Connects from any electric light socket right to your radio set— that's all there is to it.

With the Freshman Master "B" Eliminator your set will always be supplied with constant and uniform power. Noiseless in operation; your reception will not be marred by the snap and crackle due to chemical action in "B" batteries.

- A. C. Model \$20.00 for alternating current
- Freshman Rectifying Tube is required for operation of the A. C. Model. Price \$2.50
- D. C. Model \$17.50 for direct current

Costs less than one-tenth of a cent per hour to operate.

Sold by AUTHORIZED FRESHMAN DEALERS only

Chas. Freshman Co., Inc.
Radio Accessories and Parts
FRESHMAN BUILDING
240-242 WEST 40TH ST.—NEW YORK, N.Y.
CHICAGO OFFICE — 237 & 242 LAKE ST.

ACME WIRE RADIO PRODUCTS

Celatsite Battery Cable
For connecting A and B Batteries (or current supply) to radio set. Still braided covering 5 flexible Celatsite wires—5 feet long—a different color for each terminal. Prevents messy wiring and "shorts" tubes. Adds greatly to the appearance of your set.

The New Celatsite Wire
Flexible stranded wire for "point to point" and sub-panel wiring—latest method of wiring sets. 5 colors, black, yellow, green, red and brown, one for each circuit.

The Original Celatsite Wire
Celatsite is a tinned copper braze bar wire with a non-soluble "spaghetti" insulation in five colors. Supplied in 10-foot lengths.

Enameled Antenna Stranded
The best outdoor antenna you can get up. 1 strand of enameled copper wire; maximum surface for reception. Enameling prevents corrosion and consequent weak signals. 100, 150 or 200 foot coils.

Flexible Varnished "Spaghetti"
A perfect insulation tube for all danger points in set wiring. Costs little more and is worth a lot more than the cheaper substitutes offered. Black, yellow, red, green, brown; for wires Nos. 10 to 10; 36-inch lengths.

Loop Antenna Wire
You can make a good loop with Acme wire made of 65 strands fine copper wire, green silk covered. Flexible; see stocktaking; nos.

THE ACME WIRE CO.
Dept. H New Haven, Conn.
Also makers of fine enameled magnet wire and coil windings for Audio Transformers, Battery Chargers, "B" Battery Eliminators.

You Can Make \$100 Weekly Selling Radio



Demonstrate once—results mean sure sales! Sell what everybody wants—radio at low prices. Coast to coast reception—5 and 7-tube instruments. **13 Selling FREE! Lessons** Establish a business of your own. Start in spare time—evenings. Sales course in 12 lessons and 10 radio service lessons teach you everything.

A. Hoffmann, Sell, Pres.

3100 Men Are Now Doing It! Success with over 3,100 men proves merit of our proposition. 3100 men try not unusual—many Ozarka men make more in spare time!

Free Book! Write me personally—tell me about yourself. I'll see that my 64-page book, Ozarka plan No. 100, is sent you without cost. Please mention the name of your county. Mail the coupon!

OZARKA **INCORPORATED**
124 Main Street, Chicago, Illinois

Gentlemen: _____

I am greatly interested in the FREE BOOK "The Ozarka Plan" whereby I could sell radio sets monthly.

Name _____ City _____

Address _____

State _____



FREE! In Each Package of a WORLD BATTERY

12-Cell—24-Volt Storage 'B' Battery
Positively gives free with each purchase of a WORLD "A" storage battery. You must send this ad with your order. WORLD Batteries are famous for their guaranteed quality and service. Backed by years of successful manufacturing and thousands of satisfied users. Enclosed with each battery, check the important instructions and book. You must save and read it.

3-Year Guarantee

Send in Writing WORLD has full trade credits. That's why our best proof of performance. Based your order in books.

Sold Rubber Case Radio Batteries
12-Cell, 15-Plate \$11.25
6-Cell, 10-Plate \$6.50

Sold Rubber Case Auto Batteries
12-Cell, 15-Plate \$11.25
6-Cell, 10-Plate \$6.50

Send No Money Very simple and we will ship the order for you. You will receive C. O. D. to your residence. 25¢ delivery charge. In full with order. They show and get a guaranteed battery at all our prices.

WORLD BATTERY COMPANY
1219 So. Wabash Ave., Chicago, Ill.

World STORAGE BATTERIES

only **\$3.50** C.O.D.

THE RABAY SENIOR
2100 15th St., Astoria, Oregon

THIS most amazing offer ever made on any "B" battery. Rabays are used with any type radio set. They produce stronger, clearer tones. 12 cell 24 volt only \$3.50. 24 cell 48 volt 7.00. Fully charged ready to use.

Rabay Super "B" Charger Only \$3.00

Rabay Double Duty A & B Charger \$1.00

1925 NO. 100 is out today. After examination and approval your expression small, a.d. charges. All prices L.A.H. factory. These gold medal Rabay Batteries are sold on an absolute money back guarantee. Over 100,000 satisfied users.

THE RABAY CO., 1281 Oregon Street, Clatskanie, Or.

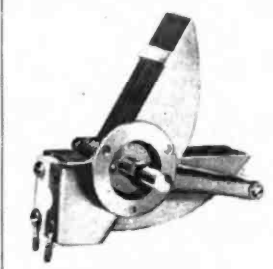
coils for a five-tube radio-frequency set.

PACENT SLF CONDENSER
—Pacent Electric Company, 91 7th street, New York City.

To meet the increasing demand for a "straight-line frequency" condenser, Pacent has put out a special piece of apparatus of that nature. Our curves of this condenser show that it helps very much in separating the low-wave stations that now crowd around your dial within the first ten or twenty degrees. Strongly built as well as being very neat and electrically efficient, it is a very good piece of apparatus.

ERLA "BALLOON CIRCLOID" KIT—Electrical Research Laboratories, Chicago, Ill.

When this kit came to 3XP, it sat around the lab until we



The Pacent Straight Line Frequency Condenser

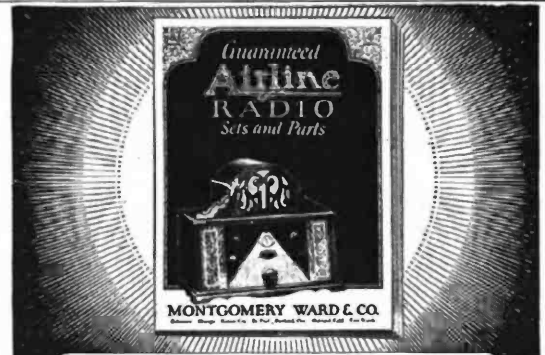
could "spare the time" to put it together. What we were really figuring on was a day to build it. We looked at the time claimed by the maker as necessary and saw that he specified "forty-five" minutes! Well, that's how long we were! Can you imagine taking a five-tube kit set with all the parts loose and assembling it according to the maker's directions in forty-five minutes? We couldn't either until we tried it.

Furthermore, we decided that, inasmuch as it was assembled so quickly there must be something wrong with it. However, although it has been working a month, it still performs as a real competitor of any of our other five-tube sets.

All we can say is, "Just another case where Erla has greatly simplified the set-building game without taking away a bit of the set's selectivity, volume or sensitivity!"

CARTER "IMP" SWITCH—Carter Radio Company, Chicago, Ill.

If you have ever been bothered by "the kids," the servant or some one else molesting your



Ward's New Radio Catalogue Is Yours Free

Yours Free—the newest, most interesting book published on Radio. A book prepared by Radio experts—a complete Radio manual. 52 fully illustrated pages showing what is new in Radio and what has been approved by the best experts. It shows sets from one tube to five tubes, the new one dial control, parts and supplies, batteries and cabinets. It gives a list of stations, a radio log for recording stations.

Headquarters for Radio
Ward's is today one of the greatest

Radio stores in the world—selling everything in Radio without the usual Radio profits. And besides, we sell only the tested and approved equipment—selected and tested by our own experts, who are up to the minute in Radio. Thousands of customers write us of their delight and saving on Ward's Radio sets.

Our 53 year old Policy
For 53 years we have sold only quality merchandise under Golden Rule Policy. You can rely absolutely upon the quality of everything shown in this Radio Catalogue.

Write for your free copy of Ward's new Radio Catalogue
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ESTABLISHED 1872

Montgomery Ward & Co.
The Oldest Mail Order House is Today the Most Progressive
Baltimore Chicago Kansas City St. Paul Portland, Ore. Oakland, Calif. Ft. Worth

PHILADELPHIA RADIO EXPOSITION

October 3rd to 10th 1925

EVERYTHING new in Radio—sets and parts for the one-tubes as well as the Supers. Your favorite artists in person.

The Show You Can't Afford to Miss!

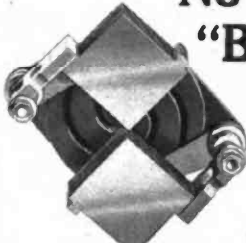
Set-building contest with cash prizes. A show that the "Fan" and the "Ham" will enjoy. Don't miss it!

The ARENA
46th & Market Streets

Sponsored by the **PUBLIC LEDGER** and the **Philadelphia Radio Trade**

Admission
Afternoons 25c
Evenings 35c

No More "Bunched-up" Stations!



The Signal Spiral Cam Condenser Distributes Them Evenly Over the 360 Degrees of Your Dial

Yes, sir, you get absolutely even distribution with this condenser. Other types simplify tuning. But the Signal Spiral Cam Condenser is perfect insurance against conflicting stations.

The Signal Spiral Cam Condenser uses the full 360 degrees on the dial—yet is so compactly designed that it needs no more space than the old type semi-circular unit. There's no backlash. The perfectly balanced assembly accounts for the smooth action. See one at your dealer's—then you'll understand why thousands of fans will use no other condenser. Built in three capacities for single or three-hole mounting and all one price.

We show an interesting chart showing the efficiency of this condenser. Write us for it today—also for literature on the new Signal Spiral Type Loop Aerial, the ideal loop for class quarters.

"Where Millions of Good Radio Parts Come From"



Signal Electric Manufacturing Co.

Dept. 113

Menominee, Michigan

Branch Offices in All Principal Cities

Send for this RADIO BOOK FREE



1926 Catalog of RADIO BARGAINS
Save 1/3 to 1/2

The World's Largest Exclusive Radio Mail Order House Will Send You This Wonderful Book FREE

64 illustrated pages containing thousands of bargains in radio sets, semi-finished sets and radio kits of all styles, sizes and approved circuits. Beautiful models of the very latest designs and types. Elaborate console models with loud speakers built right into cabinets of genuine mahogany and walnut. **ALL SETS GUARANTEED.** Coast to coast receiving range. Catalog also contains everything in radio supplies, including batteries, chargers, loud speakers, transformers, condensers, rheostats and any other parts you may want for improving your set or building a new one. Guaranteed saving to you of 1/3 to 1/2.

OUR GUARANTEE
Every article represented. Every article is tested before shipping. Complete satisfaction or money cheerfully refunded.

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"I got a lot of good ideas from this book and am very glad to see it with such a complete list of radio sets, kits and parts. It is a wonderful book and I will be sure to get it." — *W. H. Jones, N. P. D., N. Y.*

"My radio hobby is making me a collector of radio sets and I am sure that the same night I bought a complete set from you. I am very glad to see it." — *Mr. J. L. Smith, N. Y.*

"The Radio Book is a wonderful book. I received my American set and I am very glad to see it. I am sure that the same night I bought a complete set from you. I am very glad to see it." — *Mr. J. L. Smith, N. Y.*

Thousands like this.

You must have our catalog no matter what set or kit you want. Our line is complete and includes all popular sets, such as Superheterodyne, Neutrodyne, Ultradyne, Reinartz, Regenerative, Radio Frequency, Browning-Drake, Reflex and all other latest circuits. Kits, sets and parts manufactured by all well known manufacturers such as: Frost, Howard, Baldwin, Strand, Western Electric, Columbia and others.

Our semi-finished sets come with all parts mounted on panel and bussed ready for wiring. Do not fail to send for our catalog. Remember, we are the largest exclusive radio mail order dealers in the world and carry the best of everything in radio.

Our Catalog
Includes complete list of broadcasting stations and general information and facts about our free service division. Our radio engineers will help you solve all your radio problems. Send your name and address on a card or in a letter. We will send catalog FREE.

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RANDOLPH RADIO CORPORATION
The Largest Exclusive Radio Mail Order House in the World.
159 N. Union Ave., Dept. 25 Chicago, Ill.

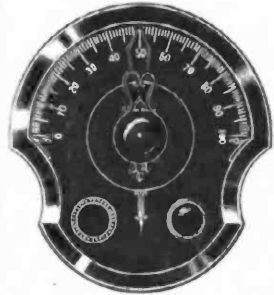
radio, leaving the tubes burning when they went away, you will be greatly pleased to know that here is a small filament switch which can be hooked up in any set, commercial or otherwise, with very little trouble and which you can lock, taking the key with you. One hole only required to mount it, diameter much less than an American quarter, sturdily built, self-indicating "ON" and "OFF" arrangement. The price is but a fraction the cost of a set of "B's," so don't blame the kids unless they break the lock (which looks as if it would be a hard job)!

MARCO VERNIER DIAL—
Martin-Copeland Company,
Providence, R. I.

Here is a dial that will interest the most hard-hearted DX hunter in these days of sharp tuning. The small openings in the sides are for the purpose of logging your stations. The opening at the top shows the numerical scale which is divided to one-half a degree, and which may easily be read to a fourth very accurately by use of the hair-line indicator. The dial is shown in this issue in the photographs of the Flewelling short-wave set which we built at Station 3XP.

"TUNE RITE" STRAIGHT-LINE FREQUENCY DIAL—
The Radial Company, 50-52 Franklin street, New York, N. Y.

With the present tendency toward "straight-line frequency,"



The "Tune-Rite" Straight Line Frequency Dial

which can best be accomplished by means of variable condensers with their plates so shaped as to give this graduation, the man who already has a radio set built with the regular semi-circular plate condensers is up against the problem of continuing to find his low wave-length stations so closely crowded together on the lower side of the dial as to make them almost impossible to separate, or else to

ANNOUNCING "The Wilson B" Radiopower Unit



In WALNUT CASE

This new unit will eliminate all "B" battery troubles. Supplies plate current from light socket. Guaranteed to operate without the slightest hum. Furnishes the uniform voltage which is necessary for perfect reception. Uses the minimum of current. Nothing to adjust. No moving parts to get out of order. Will not affect your neighbor's set. Requires no attention whatever, except to switch it on and off as you want to use your receiver. It fits all sets.

The Wilson "B" Radiopower Unit is one of this season's most important developments in the field of radio. It is the ideal plate current supply, because of its dependability, convenience and economy of operation.

In handsomely finished combination walnut case. Price \$35

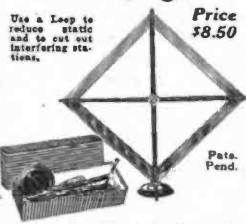
The Andrews Paddlewheel-Coil

Use this superior coil for improved tone quality, greater selectivity and maximum range and volume. Has exceptionally high ratio of inductance to resistance. Losses are negligible.

This coil has been given unqualified endorsement by the testing laboratories maintained by leading radio publications and newspapers. It is exceptional in that it increases range, volume and selectivity with entire freedom from distortion. It is used in such well-known receivers as the Andrews DERESNADYNE and BUCKINGHAM. It can be used in any hook-up requiring a high-grade R. F. transformer-inductance. Price \$3.00.

Ask your dealer for blue-prints of receivers and circuits using this coil, or write direct to us. Our Technical Dept. will answer inquiries.

Duo-Spiral Folding Loop



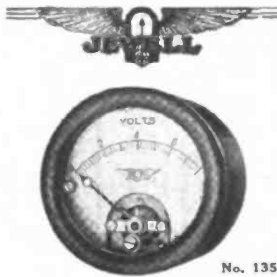
Price \$8.50

Use a Loop to reduce static and to cut out interfering stations.

Handsomely finished in silver and mahogany to harmonize with the finest set. Neat and compact. Folds readily and can be used anywhere. Replaces unsightly and troublesome outside aerial. Has long insulated handle and silvered dial marked for calibration. Can be used on any multi-tube set. A special model for every circuit.

See these standard products at your dealer's or write for complete information.

Radio Units Inc.
Hawwood, Illinois
1314 First Ave., Maywood, Ill.
PERKINS ELECTRIC LTD.,
Montreal-Toronto-Winnipeg



No. 135

NEW

We want to send every set owner our circular No. 776 describing our new line of 2-inch radio panel instruments.

No. 135 is made in single range voltmeters, ammeters and milliammeters. No. 140 is made double range, using our patented self-contained switch.

The voltmeters are of the high resistance type.

JEWELL ELECTRICAL INSTRUMENT CO.

1650 Walnut St. Chicago



invest in a whole set of new condensers.

In order to meet this particular man's problem without compelling him to junk his three variable condensers and buy new ones, the Radiall Company, manufacturers of the famous Amperite, have designed a dial to fit on any of the standard semi-circular plate condensers and, by means of a very cleverly designed cam and gear arrangement, the turning of the dial gradually changes the speed with which the rotating plates are revolved, and this change is so graduated that it turns the old-fashioned condenser into a straight-line frequency unit.

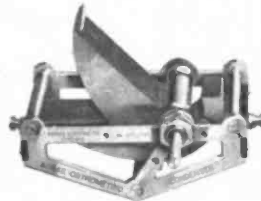
Furthermore, this dial has been so constructed that it will act as a shield to the set and will not allow hand-capacity to interfere with the tuning.

KARAS "ORTHOMETRIC" VARIABLE CONDENSER—Karas Electric Company, 19 South La Salle street, Chicago, Ill.

Karas Orthometric condenser is a contribution to the present tendency toward straight-line frequency tuning. Mechanically, it is one of the best jobs we have seen and it shows the present tendency among the best manu-

facturers to make the various items of apparatus within the radio set have as good and high-class an appearance as the set manufacturers are giving to their cabinets and loud-speakers.

This condenser is of the true low-loss type and its mechanical construction shows the very best of engineering design and prac-



The Karas Orthometric Condenser

tice. It comes in the three popular sizes, .00025, .00037 and .0005.

KARAS "HARMONIK" TRANSFORMER—Karas Electric Company, 19 South La Salle street, Chicago, Ill.

This audio-frequency transformer made a most enviable reputation for itself during the latter days of last season. This year, it comes on the market fully prepared to take its place with the very leaders in transformer-coupled audio-frequency amplification.

Any fan who wishes to hear for himself just what the quality



The Karas Harmonik Transformer

of this transformer is need only do what we have done at Station 3XP. We built a two-stage unit with these transformers and hooked it up so that we could plug it into the detector stage of any of a number of different sets, listening to the music first on the transformers already in the set and then listening with the same set using these Karas transformers. We make this suggestion because it has been evident to us that the Karas transformer has nothing to fear from such a test.

NEW JERSEY to CALIFORNIA on Loud Speaker
 With **NEW** **Quadroformer**
6-TUBE CIRCUIT
 As described in May Issue
Radio-in-the-Home
Complete Parts \$47.25
 BASE AND PANEL INCLUDED
 REGULAR PRICE \$60.50

One of the most interesting circuits ever described—one that will give results never thought possible—2500 miles on land, more than 3000 miles across the Atlantic.

A set built of our parts, according to our specifications, brought in Europe for one of our patrons, Henry M. Neely, himself, in May issue, tells how it picked up California from New Jersey with ease, on loud speaker.

A tried and proved circuit with new coil that kills self-oscillation, the drawback of every radio-frequency circuit. No radiation. Dials always log. Simple to hook up and operate. Tested and tried out by our radio engineers, and on demonstration. **Parts** neatly packed and ready for you anywhere.

As described by Henry M. Neely in his feature article in the May issue

The M. & H. Radio Engineering Service Will Supply Parts or the Complete Set of Any Hook-Up Ever Published in Any Issue of This Magazine at No Extra Charge

Our prices are the same on all circuits advertised in previous issues
This Service is Recommended by HENRY M. NEELY

Still Another Special COMPLETE PARTS BROWNING-DRAKE

3-Tube Set... \$34.75
 Described in the April "Radio in the Home." Regular value, \$46.40.

Only One Kind of Quality here—the best. Radio Sets that give satisfaction demand quality parts. We use no others.
 Our reputation built up by 20 years' faithful service, is back of each sale



The Unit of Absolute Dependability



MacFADDEN B-Power Generator

Price \$35 Furnishes an unfailing supply of correct B-Power to any set.

Manufactured by an organization of radio engineering and mechanical experts.
 Sold under a guarantee that really guarantees

No Acids
No Odors
No Noise

Operates on 110 V. 60-cycle A. C. current. Turn on the juice and forget B-battery troubles for life.

Dealers can sell this dependable unit with assurance for continued satisfaction.

MacFADDEN & CO., Inc.
 22d and Arch Sts., Philadelphia

It's a Real Job

I will buy for you!

Free 24-Hour Shipping Service for Readers of Radio in the Home

I will buy any apparatus mentioned in this magazine and send it to you at its Regular Price plus only Parcel Postage and Insurance.

ARE YOU ACQUAINTED WITH THIS SERVICE?

It is conducted in co-operation with Radio in the Home, and is for the convenience of its readers.

It is more than just a place to buy parts. Hundreds of my customers look to me to save them money and time. I sell parts for only those hookups that I HAVE TESTED and know to be good, and every instrument I send you bears my personal guarantee of immediate replacement if defective.

QUADRAFORMER

Of all the sets I have come in contact with recently, this one stands out prominently. It is easy to build, and it is a certainty that the one you build will "work" if constructed of the proper parts. I have prepared complete kits of parts for building it in two grades.

The Standard Quadraformer Kit

Contains Radion Panel, Cardwell Condensers, board, wire, genuine Gerhart-Schleuter Eby Binding Posts, Amperites, Uni-rotor Dial, and everything needed for the set exactly as shown in June Radio in the Home, at the special price of.....

\$48.50 Complete

The De Luxe Quadraformer Kit

Has Mahogany Panel, Hammarlund Condensers, genuine Gerhart-Schleuter Quadraformer, Jumbo Cable Connector, Vanley Rheostat, Amperites, the new Marco or National Vernier Dial, and everything in loading to make a set that will grace any living room at the very special price of.....

\$65.00 Complete

Genuine Solid Mahogany Cabinets for these Sets, \$14.00

Write for descriptions of these kits before buying. Also information on Harbrace J Tube, Browning-Dials & Tubes, and a REAL Superheterodyne, all of which I have TESTED and found SQUARELY behind. I have done the experimenting. YOU buy a 'CERTAINTY'.

E. M. CLARKE
1523 Chestnut St. Phila., Pa.



"More Than Just a Name"

CALVERT LABORATORIES

SPECIALIZING in coiling and re-winding the Highest quality of Radio Sets and Accessories. Sets in stock and built to order in keeping with your pocketbook and Home.

Fluorizing Super-Hot Converters in stock and built to order.

Official Service Station for "Radio in the Home."

Mail orders promptly filled.

1212 Jefferson Bldg.
1625 Chestnut Street Phila., Pa.

Improving the Quadraformer Receiver

By E. J. GEARHART

THE Quadraformer transformer does remove all electro-magnetic coupling between the transformers in the various stages, but the use of the Quadraformers without attention to the other causes of coupling in a radio-frequency amplifier will not remove all tendency toward self-oscillation.

Regarding tube-capacity, which we have proved has little to do with the cause of instability in such circuits, there are three other causes of trouble, even when Quadraformers are used:

- (1) Coupling between stages due to the impedance of the leads of the "A" or "B" batteries.
- (2) Coupling introduced by the improper connection of grid returns.
- (3) Coupling introduced by inductive loops in the wiring.

The hook-up given by Mr. Neely in the May issue, page 23, for instance, violates (1) and a set constructed according to that diagram will oscillate on a short aerial, or if the filaments of the radio frequency tubes are turned higher than a certain point.

The preferred hook-up for the Quadraformer set, with either resistance or transformer coupled audio-amplification, is shown by Fig. 1.

Notes by-pass condenser C1 on this diagram.

Now let us trace the direction of flow of the radio-frequency current produced by tube No. 1 if the by-pass condenser C1 were omitted. Remember, it must flow in a closed path.

Starting at the plate the current passes through the primary of T1 and then to the B battery, through the B battery and back to the filament, where the electron stream completes the circuit to the plate.

The current from tube No. 2 flows from the plate through the primary of T2 and then through the same B battery leads and battery as the current from tube No. 1. This common im-

pedance causes coupling between the two circuits.

Condenser C1, which should be .5 mfd. or larger, placed where shown, which is not across the battery binding posts as I have seen some constructors use it, by-passes the current from tube No. 1 directly back to its filament, preventing its passage through the battery leads with the current from tube No. 2.

The plate of the detector tube also carries radio-frequency current and a by-pass of about .002 mfd., as shown, should be connected directly from the plate to the filament. It should not be placed, as is common practice, across the phones or primary of the first audio-transformer, as this would force the current to travel through the common B battery, causing coupling with tube No. 2.

The by-pass condenser C1 was omitted from the May diagram.

A set constructed according to Fig. 1 will not oscillate.

Adding Regeneration to the Quadraformer

Fig. 2 shows the result of many experiments to improve the original hook-up of the super-stve.

Notes that the stator of a three-plate condenser is connected to the plate of the detector tube and the rotor to what was the filament connection of the third Quadraformer. A 200 turn honeycomb or duolateral coil is connected between the stator of the three-plate condenser and the primary of the first audio transformer. The plate by-pass condenser of .002 mfd. is moved to the new position shown.

A new grid return connection is made from the A battery lead to the secondary of the third Quadraformer between the third and fourth of the series coils, so that three of the secondary coils are between the tap and the grid end of the secondary. See Fig. 2.

Set the three-plate condenser

New! this season

Bring control of high resistance to the panel.

DURHAM

Variables

Panel Mount, \$1.00
Standard, 75c

Both types in three sizes. No. 200, 1000 to 100,000 ohms. No. 100, 0.1 meg. to 5 meg. No. 501A, 0 to 10 meg.

ALWAYS a one finger control and now at your finger-ends—that's the new DURHAM Variable. The familiar ease and accuracy of these standard high-resistance units in their latest form may be placed anywhere on your panel, preferably near the tube they control. Only a 1/4" hole required.

For most hook-ups you'll need two Durhams—detector and audio.

Look for the Plunger

The patented Durham combination of sliding plunger and non-wear compound is your protection and guarantee for accurate, high-resistance control.

DEALERS: Get This! Order from below now, specifying type, panel mount and standard.

DURHAM & CO. Inc.
1930 Market St., Philadelphia

This style Big slotted condenser. Via DURHAM No. 20

with the rotor plates all the way out.

Tune in a station in the usual way, then slowly increase the capacity of the three-plate condenser, adjusting the dial of the third .0005 mfd. condenser slightly to compensate for the added capacity in the circuit.

You will find that the little (Continued on Page 47)

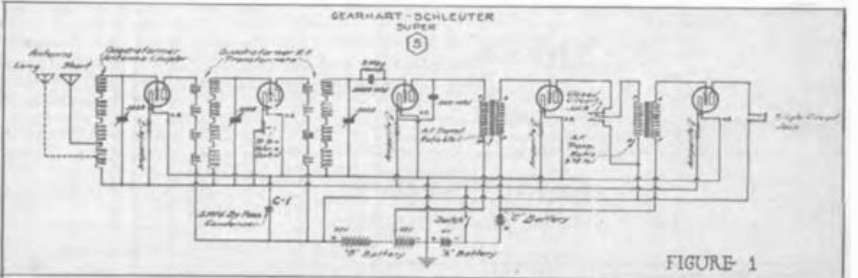


FIGURE 1

Sangamo Mica Condensers



Accuracy guaranteed within 10 per cent. of marked capacity. Resistor clips 10c extra.

In reflexing - - where accuracy brings results

BECAUSE of their high accuracy, Sangamo Mica Condensers give perfect results in reflex circuits, where exact capacity is necessary to success. Any receiver, whatever the circuit, is improved by the use of Sangamo Condensers.

They are accurate, and they stay accurate. All nationally recognized radio laboratories have approved Sangamo Condensers. The accuracy of these condensers is not affected by heat or cold, moisture or acid fumes, soldering or electrical surges. They are solidly molded in smooth brown bakelite which will not chip or crack even if dropped several feet to a hard cement floor. The edges are rounded, and substantial ribs increase their mechanical strength.

All in all, Sangamo Condensers are as fine condensers as money will buy, not only on account of their sustained precision, but because their workmanship and finish is in harmony with the beautiful construction of the highest quality of radio parts on the market. Yet they are not expensive. Quite otherwise, in fact.



All standard capacities. Your dealer should have Sangamo Condensers. If not, insist and he'll get them for you.

Sangamo Electric Company
Springfield, Illinois

RADIO DIVISION, 50 Church Street, New York
SALES OFFICES—PRINCIPAL CITIES
For Canada—Sangamo Electric Co. of Canada, Ltd., Toronto.
For Europe—British Sangamo Co., Portland, England.
For Far East—Asiatic Engineering Co., Yokohama, Japan.

Editorially Speaking

(Continued From Page 46)

for the personal benefit of their owners joining in any such movement? These stations are the ones which are paying the smallest fees and they would immediately take advantage of the silence of the big stations to come on the air with long tirades about the wrong that was being done to the starving composer and self-laudation because they were paying the composer a proper return for his genius and were also protecting the radio public. That would be the veriest kind of balderdash, but that kind of stuff makes a hit with about fifty per cent of our so-called intelligent public.

The other way is to stir up public sentiment to let Congress know definitely that this hold-up of radio is not to be tolerated. But there again you have almost an insurmountable difficulty. *The public simply will not get together and Tin-Pan-Alley knows it.*

Do you think it could be done? Would you do it? How many of my readers would even go to the trouble to write one or two letters demanding a reasonable settlement of this question?

The copyright law provides that all music which is published under protection of copyright shall be available to mechanical musical reproducers, such as piano players and phonographs, at a certain fixed fee per record. That is all that the broadcasters ask. We want to know what is a reasonable fee and we want to have it fixed so that we know that we can pay it this year and next year and the years following. The broadcasters do not want to get out of paying a reasonable fee. They merely want to have a business proposition in front of them which will let them know where they stand and what they can do.

Until the broadcast listeners-

in appoint some one to represent them in Washington with full power to insist upon this reasonable arrangement, Tin-Pan-Alley can go on squeezing the broadcasters until it will no longer be possible to put out the high grade of entertainment which is the only thing which you and I want.

I wish that the readers of this magazine would only give some indication that they are solidly behind such a movement. With such an indication in the form of letters it would be possible to put up a fight to save radio from the most serious danger which has confronted it.

But will you take the trouble? I doubt if you, who are reading this now, will even take enough personal interest in it to sit down immediately and write me a letter telling me that you want your interest in radio protected.

Will you? This magazine might undertake to do something about it if we could get adequate support from our readers.

Improving the Quadriformer Receiver

(Continued From Page 46)

three-plate condenser will double the volume, and that it is the smoothest working regeneration control you ever handled. The tuning of the set is also much sharper.

If the circuit oscillates with the three-plate condenser set with the rotor plates all the way out it is because it has too large a minimum capacity.

If the circuit does not oscillate with the rotor plates of the regeneration condenser all the way in the maximum capacity of the condenser it is not large enough.

It is suggested, to reduce the number of controls on the panel, that all tubes be controlled by Amperites and the three-plate condenser used as the volume control of the set instead of the RF rheostat.

NOW YOU CAN UNDERSTAND RADIO!

Know all about it—build and repair sets—explain the vacuum tube—operate a transmitter—be a radio expert!



514 PAGES
100,000 SOLD

Compiled by HARRY F. MARY, E. E. Formerly with the Western Electric Co. and U. S. Army Instructor of Radio. Technically Edited by F. H. DOANE

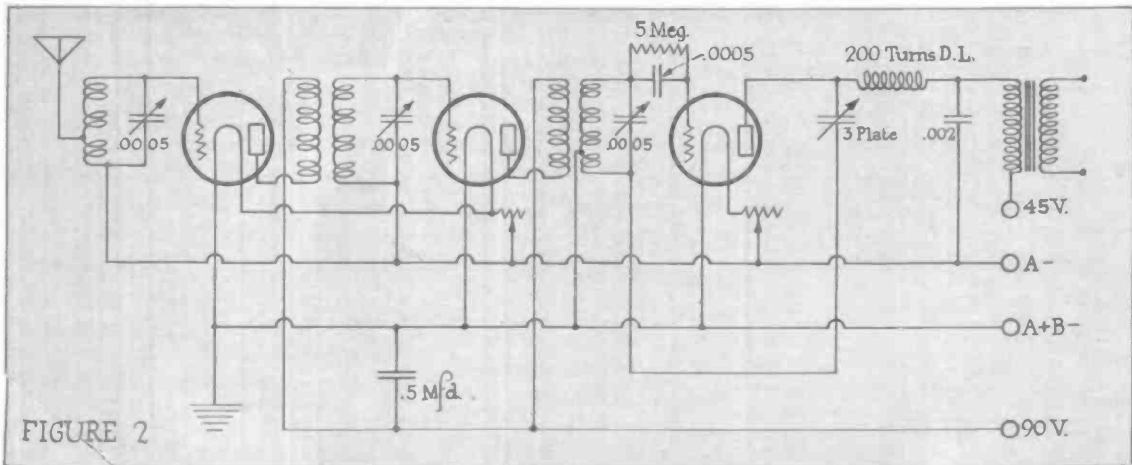
More than 100,000 radio fans rely on this I. C. S. Radio Handbook to take the mystery out of radio. A wonderful value at \$1. Hundreds of illustrations and diagrams explain everything so you can get the most out of whatever receiver you build or buy.

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A practical book. Written by experienced radio engineers in language that you can understand. Something useful on every page of its 514 pages. A book that will save you many times its small cost.

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