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Vol. 10 No. 2 *Illustrated*

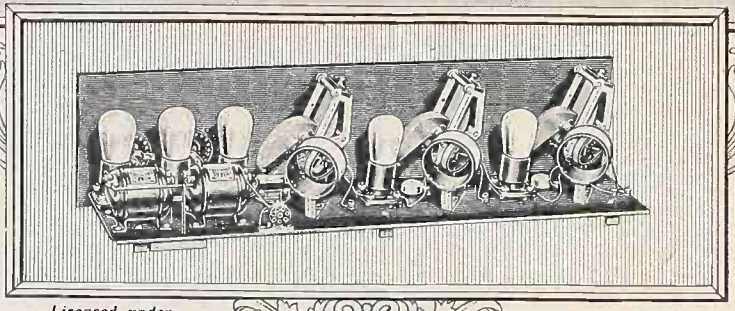
236

(Underwood & Underwood)

STRUCTURAL Iron Workers Have a High Time at High Noon Hearing Low Notes Over the Radio

Something *NEW & AUTOMATIC* in Radio!

The Karas Equamatic Five Tube Sensation



Licensed under King Patents Pending

No Five Tube Set Has Ever Approached It In Tone — Range — Selectivity — or Volume

PICTURE yourself in the studio of a great broadcasting station with musicians seated around the microphone. They take up their instruments and begin to play. Simultaneously in thousands of homes all over the country thousands of radio sets reproduce the music in almost as many different ways. Some are weak and thin in quality. A few are full toned, clear and distinct. Others are weak or strong depending on whether the particular station is on a high or low wave length.

But those who have built the Karas Equamatic Five Tube Sensation enjoy an entirely different kind of reproduction. The tones are clear, pure and natural and the volume is greater than that of any other five tube set. This is true regardless of what wave length the station is operating on because the Karas Equamatic delivers FULL VOLUME and undistorted tone-quality ON ALL WAVE LENGTHS.

What the Equamatic System Does

This remarkably efficient and uniform operation is made possible by a new principle of R. F. Transformer design that keeps the tubes operating always at their highest point of efficiency—just below the oscillation point. Stations from 200 to 600 meters come in with all the volume and tone quality that the tubes and set are capable of delivering.

The Secret of Automatic Variation in Coupling

Karas Micrometric Dial

Radio engineers have strived for a long time to find a means of maintaining at all wave lengths A CONSTANT EQUAL TRANSFER OF ENERGY between primary and secondary coils of the R. F. Transformers. The Karas Equamatic System does this in a simple, automatic, mechanical way.

In the Karas Equamatic Coils the primaries and secondaries are entirely separated from each other, the primaries being mounted, by special fittings, on the ends of the condenser shafts so that they turn with the condenser tuning dials. The secondaries are mounted on the sub-panel by means of a sliding standard that makes it possible to push them toward or away from the primaries. Adjustable features of primary and secondary coils permit perfect control of the degree of coupling as well as the rate of variation.

When all three Karas transformers are properly adjusted the coupling is automatically and continuously varied in exact step with the condenser plates as the condenser dials are turned. The result is that the tubes are kept operating just below the oscillation point ON ALL WAVE LENGTHS.

Selectivity That is New in a Five-Tube Set

This perfect coupling at all wave lengths together with correct placing of condensers and coils has given the Karas Equamatic a selectivity not found in other five tube sets. There is no overlapping of electromagnetic and electrostatic fields to cause broadening or distorting effects. Instead, the circuits of the Karas Equamatic System tune with amazing sharpness. Stations snap in and out with remarkable precision.

Results You Might Expect from Seven Tubes

The NEW Karas Equamatic receiver delivers a volume that you might expect from a seven tube set. It is as sensitive as a regenerative circuit and has the pure clear tone of a crystal receiver. No other 5-tube set has ever approached the Karas Equamatic in range, power and tone quality.

The Karas Equamatic Is Easy to Build

Anyone can build this powerful, clear-toned, long-range set easily and quickly by following our simple instructions and manual packed with every set of Karas Equamatic Coils. They show you where to place every part and how to make every connection. The manual also completely illustrates and describes the system. To build this receiver you will need the Karas parts listed below, plus other standard parts that you can easily secure.

Order from Your Dealer or Direct from Us

Karas Equamatic parts are carried in stock by reliable dealers in most cities. If your dealer happens to be out of stock order direct from us by using the coupon below. Send no money. Just pay the postman the price of the parts plus a few cents postage.

Essential Parts of the Karas Equamatic Sensation

KARAS EQUAMATIC INDUCTANCE COILS are packed three in a carton, and come to you with complete manual of simple diagrams and instructions, all necessary nuts, screws and binding posts, ready for mounting in your receiver. Price, set of three coils, $12.00.

KARAS SPECIAL 17 PLATE ORTHOMETRIC CONDENSERS, three of which are used in the Equamatic Receiver, have special extended shafts upon which to mount the primary coils of the Inductances. Price, each $7.00.

KARAS HARMONIK AUDIO FREQUENCY AMPLIFYING TRANSFORMERS are essential to the tone quality success of the Equamatic receiver. Two of these are used for the two stages of Audio frequency amplification. Price, each $7.00.

KARAS EQUAMATIC RETARD COILS, two of which are used, were designed especially for the Equamatic System. Price, each $1.00.

KARAS EQUAMATIC SUB PANEL BRACKETS. To insure the necessary exact positions of primary and secondary coils these brackets are essential. Price, set of three, 70c.

KARAS MICROMETRIC DIAL. It has a 63 to 1 vernier and tunes to 1/1000 of an inch. Price, $3.50.

KARAS ELECTRIC CO.,
1146 Association Building, Chicago, Illinois.

Please send me a set of 3 Equamatic Inductance Coils, $12.00; 3 special Orthometric Condensers with extended shafts, $7.00 each; 3 Micrometric Vernier Dials, $3.50 each; 2 Harmonik Audio Transformers, $7.00 each; 2 Equamatic Retard Coils, $1.00 each; and 3 sub-panel brackets, 70c., for which I will pay postman $60.20, plus postage, upon delivery. It is understood that I have the privilege of returning any of this apparatus for full refund any time within 30 days if it does not prove entirely satisfactory.

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New Equamatic System

Ingenious Mechanical Device Enables the Same Motion Invoked for Operating the Tuning Condenser to Serve for Adjusting Primary for Continuously Equal Energy Transfer to Secondary at All Broadcast Frequencies — Primary a Distinctly Separate Coil and Is Secured to Condenser Shaft

For maximum efficiency a coupling effect equal to a variety of number of turns of a fixed primary is necessary. By rotating the primary properly, it is possible to get full efficiency on all waves without changing the number of turns.

Oscillation Is Prevented Over the Entire Band Without Impairment of Efficiency — King's Invention Affords Degrees of Coupling Exactly Consistent With the Frequency, Provided Straight Line Frequency Condensers Are Used— Revolutionary Advance in Coil Design

By Capt. P. V. O'Rourke

THERE has come upon the radio horizon something new and revolutionary —a coupling system whereby over-oscillation is prevented and continuously equal energy transfer between primary and secondary achieved at all broadcast wavelengths, due to an ingenious mechanical device. This development, known as the Equamatic System, and invented by Louis G. King, of Brooklyn, N. Y., consists, generally speaking, of a separate primary coil which is rotated by the same motion that turns the tuning condenser, the inductive coupling, like the condenser's capacity change, being on a straight line frequency basis. The benefit derived is maximum amplification at all broadcast wavelengths, instead of the usual shortcoming of diminished amplification on the higher wavelengths. And, besides, the system is self-neutralizing, requiring no external means of balancing nor the introduction of losses to subdue oscillation. I can best explain the merits and advantages of the system by drawing attention to the inefficiency of existing methods of controlling oscillations in tuned radio frequency circuits.

Oscillation Analyzed

Let the upper horizontal line in Fig. 1 represent the point of oscillation of a radio frequency tube. Let the lower horizontal line represent a point just under the point of oscillation. This is the point at which radio frequency tubes operate at their highest efficiency on the reception of broadcast signals.

Let the left-hand end of the line represent 200 meters. Let the right-hand end represent 600 meters. Let the center represent 300 meters. Since the frequency of a 200 meter signal is 1,500 kilocycles, and since the frequency of a 600 meter signal is only 500 kilocycles, and since impedance varies with frequency, and since the amount of energy transferred from primary to secondary varies with impedance, it is conceivable that we require a much greater inductance in a primary coil to tune to 600 meters than we require to tune to 200 meters. It is also

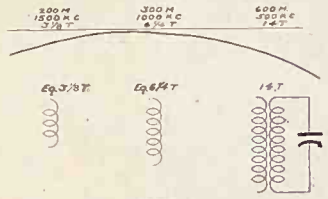


FIG. 1

Oscilation is represented at the top (horizontal) line, while the point just under oscillation is the lower line. The wavelength-frequency range is designated. The coil diagrams represent the theoretical numbers of turns for three respective frequencies or wavelengths.

conceivable that in order to obtain the practical maximum transfer of energy at every wavelength setting we require an increased primary for every ten kilocycle decrease in frequency; in other words, we would require an increased amount of primary for every successively longer wavelength setting.

How About 100 Primaries?

Since there are 100 broadcasting channels between 200 and 600 meters we would require 100 separate primary coils, each having the exact number of turns, even to the fractional portion of a turn, if we were to obtain the maximum transfer of energy between primary and secondary for every wavelength setting.

Of course, it isn't practical to haxe 100 separate primary coils, or even 50, or 10, or 2. We must do the best we can with one primary coil. Let us consider for the sake of this argument that the proper number of turns on the primary at a given coupling and a given secondary and a given condenser to tune to 200 meters is 3⅛ turns—and that under the same conditions to tune to 300 meters we require 6¼ turns of primary—and that under the same conditions to tune to 600 meters we require 14 turns of primary.

If we choose the coil of 3⅛ turns we will get the highest efficiency on a 200 meter signal. We will get successively lower efficiency on every successively longer wavelength. By the time we reach 600 meters in our tuning we have probably less than one-third of the energy transferred that we had at 200 meters.

Conventional Compromise

Using 3⅛ turns is therefore quite impractical, so we have compromised by using anywhere from four to six turns. Let us consider for the sake of this argument that the compromise is on 6¼ turns, and let us consider that 6¼ turns is the proper number to tune to 300 meters. We now have high efficiency at 300 meters and a lower efficiency for every wavelength longer than 300 meters —poor efficiency at 600 meters.

Now let's see what happens at wavelengths shorter than 300 meters. Having too much inductance for increased frequency the consequence is the tube plops into oscillation.

In order to keep the tubes from plopping into oscillation we have resorted to the so-called "losser" methods, all of which have a decidedly broadening effect on tuning and cause the tubes to be less sensitive and less selective.

It is agreed, I think, that the highest sensitivity, highest selectivity and greatest power occur simultaneously with the practical maximum transfer of energy between primary and secondary at every dial setting.

Where the Loss Lies

When anything is done to interfere with this practical maximum, either by providing too great a transfer of energy or too little transfer of energy, we lose sensitivity, selectivity and volume.

Referring back to Fig. 2 and our 6¼ turn primary for tuning with highest efficiency to 300 meters, we find we have an ever-increasing loss of energy for all wavelengths longer than 300 meters, and since, even with the "losses" methods to control oscillations we cannot control them automatically at every dial setting, we have in effect a dropping off of efficiency for even the wavelengths shorter than 300 meters.

As a matter of fact we have real efficiency at one dial setting only—not a very enviable state of affairs.

On the lower part of Fig. 1 is a tuned circuit showing a 14-turn primary at close coupling with the secondary. Let us consider that this combination tunes to 600 meters with highest efficiency.

A Mechanical Problem

It is conceivable that if the 14-turn primary were drawn away from the secondary that at a certain distance from the secondary it would be the equivalent of a 6¼ turn primary at the same coupling occupied by the 14 turn primary be-

Full Pep Marks All Waves

fore it was drawn away from the secondary.

It is conceivable that if you draw the 14-turn primary still farther away from the secondary that eventually you reach a coupling that would be the equivalent of 3⅛ turns at close coupling with the secondary.

It is conceivable that if some sort of mechanical arrangement could be provided that would draw the 14-turn primary away from the secondary automatically at exactly the proper rate to keep in step with the change of capacity that we would have a highly efficient tuning contraption.

It has been realized by radio engineers generally for a long, long time that this sort of thing would be desirable. But it has been quite a different matter to work it out mechanically. As a matter of fact, it hadn't been done until Mr. King did it.

There have been certain attempts to do it, but none of them has been totally successful.

Mr. King, like all other radio engineers, realized that to accomplish this equal transfer of energy at all wavelengths he would have to devise some means for varying the primary coil at a certain definite, ever-changing rate of variation. His problem was to devise some mechanical means to do it.

He was aware of the various methods of varying the primary with the tuning of the condenser shaft. But all of these methods lacked uniformity. They are better, of course, than fixed primaries, but since none of them provides for the variation of the entire primary at exactly the proper ratio to keep the tubes just under the oscillation point at a constant setting of the rheostat, they are considerably less efficient at certain dial settings than they are at others.

Efficiency Varies

Generally they are rather efficient at the shortest waves and at the highest waves, but very considerably inefficient at the middle range. In Fig. 2 line 1 represents the line of oscillation; line 2 represents a point just under the oscillation point—the Equamatic Line; line 3 represents the performance of primary coils that are attached to condenser shafts, half of the winding being on the secondary tubing and half on the tubing connected to the condenser shaft.

In the King Equamatic System, for which the Karas Electric Company at present is the sole manufacturing licensee, the primary is entirely separate from the secondary. The primary is attached to the shaft of a condenser having an extended shaft for this purpose and is angularly adjustable on this shaft.

The secondary is an entirely separate coil and is angularly variable with respect to the position of the shaft of the condenser and is also adjustable (by pushing forward over the primary or backward away from the primary) so as to afford any practical useful degree of coupling with the primary. On account of tubes getting old and their electron emission decreasing and on account of A batteries running down, it is often desirable to compensate for these losses. In the Equamatic System all that it is necessary to do is to tighten the coupling between the primary and secondary.

The Controlling Angle

In fact, in the Equamatic System the primary and secondary are so completely

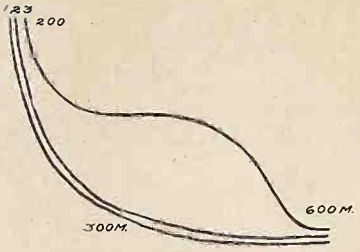


FIG. 2

Line 1 represents oscillation, line 2, point just under oscillation (Equamatic); and line 3 primaries connected physically to the condenser shaft, part of the winding being on the secondary. The curves plot amplification against wavelength.

variable with respect to each other and with respect to the axis of the condenser shaft that practically any degree of coupling and any rate of variation of coupling is obtainable by simple, quickly-made adjustments of the primary and secondary coils. When once adjusted the variation of the coupling is provided automatically by the turning of the condenser dial.

The correct rate of variation is determined by the angle at which secondary coil is placed with respect to the axis of the shaft of the condenser. This angle happens to be 58 degrees. This is also the proper angle at which to place the coils so as to eliminate the overlapping of their magnetic fields.

This absolutely correct rate of variation of coupling can be secured only when the coil is used in connection with a 180 degree straight frequency line condenser. The system cannot be made to work with a straight line capacity or straight line wavelength condenser.

As it is acknowledged that the best broadcast reception occurs when the tubes are just under their oscillating point, let a straight line represent the oscillating point of a tube from 200 to 600 meters. (See Fig. 1.) Draw a parallel line underneath this line so that they are separated by about a thirty-second of an inch. The lower line will represent the point of highest efficiency of the tube.

The Frequency Relationship

The frequency at 200 meters is 1,500 kilocycles; 300 meters, 1,000 kilocycles; 600 meters, 500 kilocycles.

The frequency at 300 meters is only one-third of what it is at 200 meters. The effective transfer of energy between the primary and secondary (I am stating it this way because it is the clearest way to make my point), varies with the frequency.

It is conceivable that with a given secondary inductance tuned by the proper variable capacity that a primary coil that will fit comfortably inside the secondary coil would require, in order to tune to just under the oscillation point at 200 meters, a certain definite number of turns.

I do not know the exact number, but for the sake of illustration let us say 3⅛ turns. The next longer wavelength—having a frequency of ten kilocycles less than 200 meters—would require a certain definite increased amount of wire on the primary, let us say 3½ turns—an increase of ⅜ of a turn. Then, for the next longer wavelength, 20 kilocycles less than 200 meters, you might require four turns, or an increase of ½ of a turn.

Effect of Coupling

These figures are in no wise actual. I put them down merely to illustrate the point that you require a continuously greater amount of inductance for each increase of 10 kilocycles of wavelength.

It is conceivable that requiring 3⅛ turns at 200 meters you would require in the neighborhood of 14 turns at 600 meters or 500 kilocycles.

This variation in the number of turns is of course based on a given degree of coupling.

Considering that 14 turns would be the proper number to tune to just under the oscillation point at 600 meters, then if the coupling between the primary and secondary were decreased you would in effect have a lesser number of turns on the primary. You could pull the primary away from the secondary so that you would have the exactly proper coupling for 300 meters—pull it still farther away and you could arrive at the exact spot where the coupling would be proper for 200 meters or the equivalent of 3⅛ turns, if 3⅛ turns were the right number.

If some mechanical means could be provided whereby the rate of separation between the primary and secondary coil could be kept in exact step at an every-varying rate, and that this variation could be accomplished automatically by the turning of the condenser knob so that the variation of the coupling between primary and secondary could always be exactly in proper step with the increase or decrease of the capacity of the condenser, you would have a system that would enable you at all times automatically to keep your tubes operating at a point just under the oscillation point without disturbing the rheostat or without resorting to any tuning devices whatsoever other than the condenser knobs.

Solves the Problem

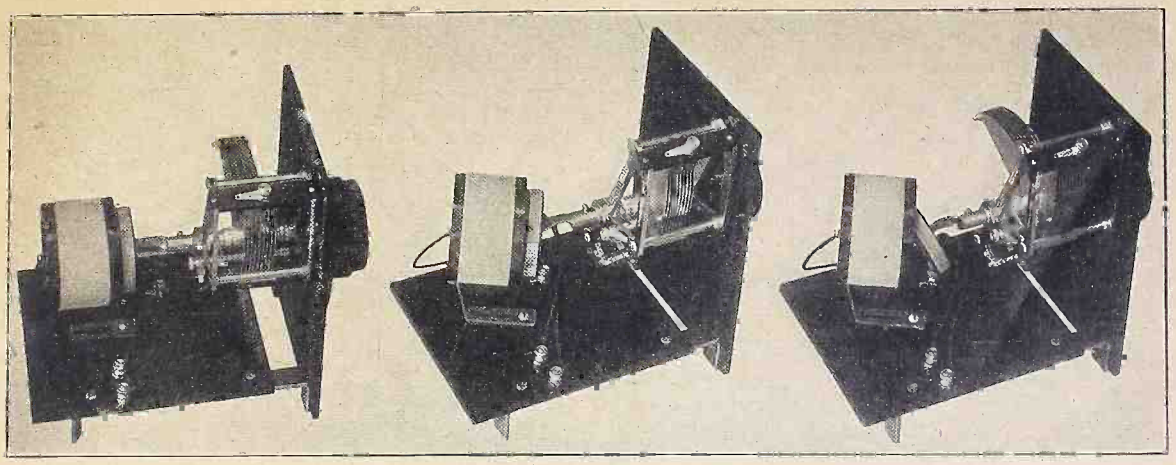
The Equamatic System does this very thing. Herewith are published six photographs. All of them are photographs of a unit built for the purpose of illustrating the means and the method by which the Equamatic System accomplishes an equal transfer of energy at all wavelength settings. Refer to photograph A. Notice that the secondary coil is equipped with a foot having a slot which fits around a screw to which is attached a spring clip which keeps the secondary firmly in place at any angle at which it is put.

In photograph A the primary and secondary coils are parallel to each other and also parallel with the faces of the condenser plates. With the coils in this position the arrangement is not materially different from any other primary and secondary. The turning of the condenser knob with the coils in this position would throw the condenser plates from maximum to minimum and from minimum to maximum without in the slightest changing the value of the energy transferred from the primary to the secondary coil.

Any Coupling at Command

The coils in this position would be efficient at 600 meters—with the condenser plates all in. But the minute you would turn the condenser plates out in the slightest degree, the coupling between the primary and secondary would be too great for the increased frequency (shorter wavelength) to which you would be tuning,

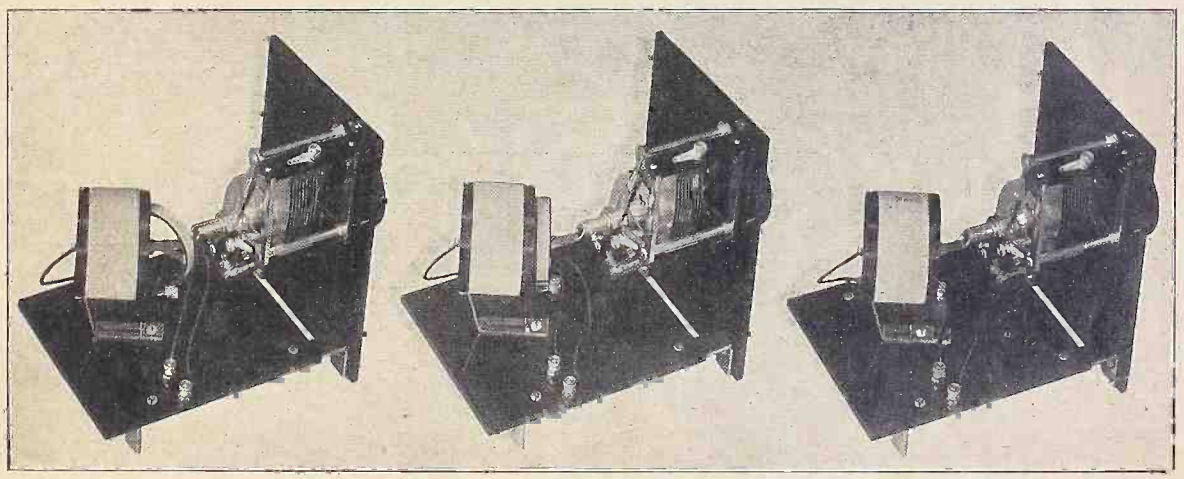
How the New Coils Work



A B C

FIG. 3

Note the foot of the secondary coil has a slot which fits around a screw. Thus the secondary is kept in place. The center axis upon which the secondary is turned for proper angular position must be exactly perpendicular underneath the center of axis upon which the primary turns.



D E F

FIG. 4

Photographs D, E and F are progressive studies of the coupling angle of increase as the condenser plates enmesh.

and the tube would break into oscillation.

By changing the angle of the secondary coil and leaving the primary coil just where it is you could obtain practically any constant degree of coupling desired that would be the equivalent of from 14 turns to no turns at all, as desired. You could even turn the secondary around so that it would be at an angle of 45 degrees, which would give you what is commonly referred to as zero coupling. You would have zero coupling at every dial setting.

By placing the secondary at various angles and then throwing the condenser plates all in and then adjusting the primary on the shaft of the condenser so that it is at maximum coupling with the secondary you can obtain any rate of variation of coupling you desire. You can get a very slight variation by moving the secondary slightly or a maximum variation by placing the secondary and primary at angles of 45 degrees.

To tune from 200 to 600 meters with a straight frequency line condenser there is an exact angle at which the secondary must be placed to insure the continuously varying correct rate of coupling necessary to keep the tubes just under their oscillation points—and without any further adjustments of any kind. It is about 58 degrees.

Refer to photograph B. The secondary has been set at the proper angle—about 58 degrees. The plates of the condenser have been turned all in. The primary coil has been adjusted on the condenser shaft so that it is at maximum coupling with respect to secondary—proper coupling to tune to 600 meters.

Determining Exact Degree

The exact degree of coupling is arrived at by pushing the secondary toward and over the primary until the coupling is great enough to force the tubes to break into oscillation, with all three dial settings alike. Then the secondaries are pushed back just a trifle until the tubes do not oscillate. The rheostat controlling the radio frequency tubes should be adjusted so that the tubes are pulling about five volts of A battery. The exact amount of voltage will depend a great deal upon the efficiency or inefficiency of the tubes.

When the proper degree of coupling has been provided the turning of the condenser dial changes the coupling between the primary and secondary at exactly the rate of speed necessary to provide the practical transfer of energy at every wavelength setting. The tubes will remain just under the oscillation point no matter what the dial setting.

This condition would not obtain if the secondary were placed at a lesser degree than 58 degrees. It also would not obtain if the secondary were placed at a greater degree than 58 degrees.

Should you place the secondary at an

(*Continued on page 26*)

Compass Called Aerial Aid

Ordinary Type of Outdoor Antenna Shows Best Results, Says Engineer, When Placed in Straight Line With the Magnetic Poles—Cites 93 Stations Tuned in on Each of Four Sets, as Against 89 and 88 in Other Instances

Knowledge Gleaned from 2-Year Tests Leads Mench to Devise a Self-Directional Antenna That He Claims Is Most Efficient — Decides on Final Model After 126 Efforts—Device Has 59 Insulators

[In the August 28 issue of RADIO WORLD *an article by K. B. Humphrey was published in which he openly doubted the directional effect of receiving antennas. It was conceded that transmitting aerials are directional. Herewith an expert on antennas discusses this problem.]*

By A. K. Mench

WHILE it is correct to say that the directional tendencies of radio antennas are not as great as those of transmitting aerials, a wide series of tests covering a period of two years has proven that there is a decided directional tendency on the part of radio antennas, and I will endeavor to prove my assertion by revealing the results of more than 500 experiments with 207 different types of antennas, including transmitting aerials used as receiving antennas.

Although there are radio engineers who specialize in certain parts of circuits, and the functions of those circuits, very few have paid more than cursory attention to one of the most important items which helps to bring to radio set owners the best reception. Outside of the few generally accepted facts known to practically all radio fans, little if anything is known of the real importance which an antenna plays in the making of fine reception, as far as the antenna is concerned. The receiver employed is not under discussion. Among the factors which have to be given serious consideration are location, height of the antenna, surface area of the wire used, and the care which must be given in erecting an antenna which will deliver 100% efficiency in conjunction with the receiver.

Usese a 13-to-87 Basis

We know that practically all of the receivers on the market today are made to operate best on an antenna of approximately 100 feet in length, including the leadin wire. Of course there are bound to be physical characteristics of the premises which make it imperative to use sometimes more than 100 feet. But in cases of this kind by the application of simple mathematics we find that the surface area of the antenna can still be kept within the 100 feet surface area rule, using 100 feet of number 14 gauge solid copper wire. This is really of paramount importance, because if the radio owner wants to get the most out of his receiver, then the surface area rule must be closely adhered to. Through experiments I found that the antenna itself is accountable for 87% of the 100% credited to the antenna and its leadin. This credits the leadin with about 13%. This ratio will be found applicable to almost any type of antenna.

In the cases where it is next to impossible to erect a perfect antenna, there is one solution which will be found to take its place. That is the antenna which is a self-directional, the DX Marvel Antenna. The self-directional type of antenna has proven to be far superior to all other types, and is as nearly perfect as is humanly possible to be made, with respect to reception from all compass points, ease in erecting, and results achieved by its use.

In proving that there is such a thing as a directional antenna, I will mention a few of the most important of the experiments which I conducted over a period of two years.

Points It Like Needle

Having an idea that all antennas are affected more or less by the magnetic poles, I decided to test this theory, because if it were true, then I had every reason to believe that here was the cause of what are termined directional antennas. I built an antenna of one wire fastened to two insulators and suspended from two poles. This is the most popular type of directional antenna. I ran it in a straight line with the magnetic needle of a compass. For nearly three weeks I tested this antenna between the hours of 5 P. M. and 2 A. M., keeping a log of all the stations received. In all of my tests I used four receivers, embodying four different circuits—regeneration, neutralization, tuned radio frequency and Super-Heterodyne. At the end of what I considered a thorough and severe test I pooled all of the stations received and found after striking a general average that each receiver had brought in 93 stations. In each of my tests with each antenna I made three changes, namely, placing the leadin wire at one end of the antenna, then in the middle, and then at the opposite end. There was little difference noted, except that when the leadin was placed at that end of the antenna which was nearly perpendicular over the receiver results were a slight increase in volume and distance.

My next experiment was with the antenna running East and West. Logging all stations in the same manner as the previous experiment, and striking a general average I found that each receiver only averaged 88 stations. The wide comparison between the two averages led me to believe that this type of antenna would give the best results if placed in only one certain direction. To prove my theory I again moved the antenna so that it ran in a Northeasterly-Southwesterly direction. The general average here was a trifle better. It was 89 stations per receiver. To me this conclusively proved that this type of antenna was directional, and decidedly so.

A Self-Directional Aerial

My theory proved, I got to wondering if it were not possible to make an antenna which would be self-directional, in other words, able to receive as well from one direction as another. So I set to work to make a self-directional antenna. One of the problems which confronted me at this time was the kind of wire to use. Bare wire was out of the question because of its quick corrosive capabilities. Solid bare wire gave the best results, but only as long as the wire had no coat of corrossion on it. So I tested with other kinds of wire (covered). Enamel wire was good, but it had a tendency to crack when subjected to much bending. After much experimenting I finally got what I wanted—No. 14 gauge triple tinned, double insulated wire (solid copper).

After making up and testing model after model, which I discarded as soon as I found them to be under the standard which I had set, I finally worked out what has proven to be the ultimate hope of every antenna builder. I gave this model the most rigid test to which I had as yet subjected any of the models, and was able to pronounce it as nearly perfect as it was possible for me to make it, but only after thirty-one alterations. In all of my tests for relative heights at which it would impart the best of results to any receiver, I found that it should not be less than thirty feet above ground, and when erected on top of a house where it really belongs, not less than seven feet above the top of the house. It was not only easier to erect, but I found through computations that it reduced the risk at least 90%, which item alone is worthy of serious consideration. It was a bit more intricate to build than the ordinary type, but I was more than compensated with the results which I obtained. At all times reception was far and away superior to reception on an ordinary directional antenna.

He Made 126 Models

It might interest some to know the 126 models were made, tested, and discarded before I had made what is now as close to 100% antenna as I can make. I was able to pronounce this perfect only after thirty-one alterations. Fifty-nine insulators are used, and, of course, depending on the physical characteristics of the premises on which it is to be erected, more may have to be used.

Aside from the exceptional results obtained from the antenna, its other chief characteristics are lessening of risk, always an important factor, the small actual space which it takes up, and the ease in erecting it.

Many people have expressed a dislike for anything of this nature which has to be placed on top of the house, which by the way is the proper place, giving as a feeble excuse that it detracts from the appearance of the house. If people want the best of reception and have a receiver which is very efficient, but do not want an antenna of this type on their house, then it would be far better for them to get a receiver which operates from a loop. This type of receiver is often too expensive and will not deliver the results that are obtained by using an outside antenna. No antenna for outside erection was ever built for appearance sake, because I have found in my extensive experiments that it is not practical to combine beauty of appearance with antenna efficiency. Possibly some day an antenna will be made which will combine the two, but it will not come about with our present day receiver.

How to Improve Selectivity

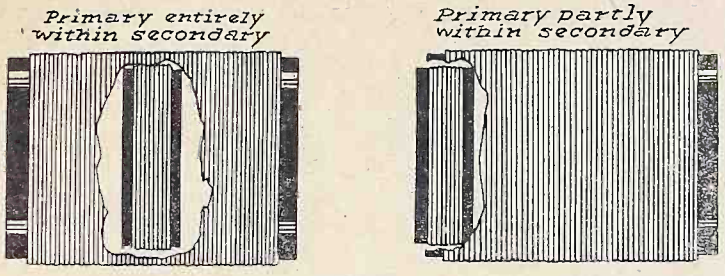


FIG. 1

Phantom views of a radio frequency transformer with adjustable primary. At left is closer coupling, at right is looser coupling, if the grid lead is connected at right-hand terminal of the secondary.

Variable Aerial Coupling Eliminates Interference—Directions for Making Suitable Tests in Your Home —Primary May Be Fixed, Once Set

By John F. Rider

Member, Institute of Radio Engineers

THERE is in use a large number of radio receivers which does not utilize any stages of tuner radio frequency amplification, the detector being coupled through some variable or fixed medium to the aerial. Furthermore many of these receivers do not afford the desired selectivity, although they possess the desired sensitivity, due to regeneration. Now the results obtainable with this type of receiver can be made more satisfactory through the correct use of variable coupling between the aerial and secondary. Furthermore, the data can be very conveniently applied to other receivers of different types which lack the degree of selectivity necessary for satisfactory reception.

Let us now arrange the equipment necessary for the test. This consists of the detecting unit and the 2-stage audio amplifying combination. The regeneration is advanced slightly and remains fixed. The radio frequency amplifier, if any, is not used during these tests. The coupling unit used to connect the detector tube to the aerial is the variable coupler coil. The primary coil, however, is replaced by a similar coil, consisting of 20 turns of No. 24 DSC wire wound on a tubing of the same diameter. The secondary coil can be fastened temporarily to the baseboard, but the primary coil should be variable in location with respect to the secondary inductance.

Needs Powerful Locals

Now it will be found that distance will defeat this experiment if it is conducted at an appreciable distance from a number of broadcasting stations. In other words the broad tuning effect necessary for the proper carrying out of this experiment will not exist, due to the distance from the broadcasters. If such is the case the date given herewith can be studied, and the information gleaned therefrom.

Set the pirmary coil entirely within the secondary, that is, adjust the combination for maximum coupling, and tune in one of the powerful locals. In New York City this was WJZ in the tests described. Now manipulate the tuning dial (secondary circuit) until the receiver is in resonance with another local operating on a wavelength in close proximity to that of the first station. This second station was WEAF. During this tuning process the coupling between the primary and secondary coils remains constant, that is, fixed in the original position.

Use Interferers

It is understood, of course, that other stations can be tuned in with the receiver for this testing. It is suggested that, irrespective of the location of the test receiver, interfering stations be used. In that way the action of the correct coupling is more forcibly illustrated. Now, with WEAF tuned to maximum volume and WEAF's microphone momentarily off the air, WJZ's signal was clearly though weakly heard. In other words WJZ was interfering with WEAF's program. Not that the station was at fault, but rather that the selecting powers of the receiver were not up to standard.

Shift the position of the primary with respect to the secondary inductance. The illustrations in Fig. 1 are in phantom effect, to illustrate the positions of the two winding forms. In my tests I listened in on WEAF's program and gradually reduced the coupling between the primary and secondary coils, until the interfering signal from WJZ was lost, and the volume

Drop in Volume Is Slight, If Any, and the Prime Goal Is Achieved for Enjoyable Reception.

on WEAF's signal had not suffered greatly. It is understod of course that as the coupling between the two coils was decreased, the secondary circuit was being continually tuned to compensate for the loss of the reactionary effect of the primary inductance.

Completing the Tests

We now tune in each of the two stations individually, obtain satisfactory volume on both, and in addition eliminate the interference. By correct coupling we have increased the selecting powers of the receiver.

We will now illustrate this action graphically. To do this we will draw hypothetical resonance curves for each of these two stations as received on our test receiver. We first relocate the primary in its original position. To facilitate our curves we will make aural observations of the dial range covered by these two stations. That is, we observe that WJZ is heard between divisions 40 and 68. WEAF on the other hand is heard between divisions 50 and 75. Both are received with practically the same intensity, so we will consider the pea of the two signal waves as equal in height.

Now, if we transpose these data onto graph paper we have something similar in Fig. 2. The dial settings and their interpolation into wavelengths is shown on the horizontal axis and comparative values of signal intensity, these being purely theoretical, are given on the vertical axis. Curve 1 is that of WJZ; 2 that of WEAF. These, too, are theoretical, being drawn according to the point of maximum signal intensity and the points of minimum signal intensity on the tuning dial.

A study of the curves shows that the maximum signal intensity from WJZ is obtained at 50 and that the signal intensity from WEAF on this point is practically zero. On the other hand the maximum signal intensity from WEAF is obtained on 61, but there is also received at this point a certain amount of signal from

(*Concluded on page 8*)

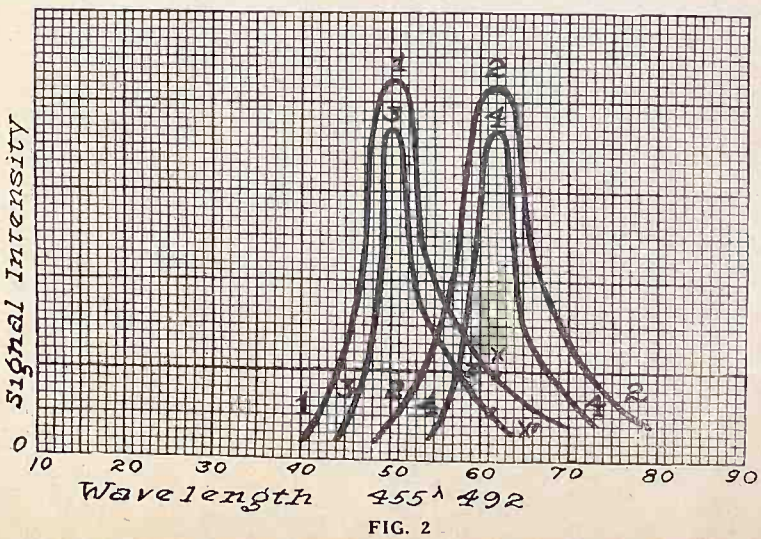


FIG. 2

Family of resonance curves, showing effect of proper coupling on selectivity.

Dial Readings Used For Selectivity Tests

Where Two Stations Interfere the Conflict May Not Be Equal, Hence Get Rid of the Stronger Overlapping

(*Concluded from page 7*)

WJZ as well. This then is the interfering signal. Interference from WEAF on WJZ's signal can not occur since the signal on WJZ's wave is practically zero.

Killing Interference

To eliminate the interfering signal we must reduce the received signal intensity from WJZ on WEAF's wave until it is negligible. We accomplish this by the reduction of coupling until position B in Fig. 1 is attained. We now observe that the two stations do not spread over as great a portion on the tuning dial. Whereas previously WJZ occupied a space from 40 to 68, it now occupies a space from 45 to 60 and whereas WEAF previously occupied a space from 50 to 75, it now occupies a space from 57 to 70. The new resonance curves are shown as 3 for WJZ and 4 for WEAF. A close study brings to light that the base of WJZ's curve barely reaches WEAF'S wave, hence the signal is negligible and no interference will result. As WEAF did not interfere with WJZ with the original settings, possibility of interference with this setting is still farther removed. The relative amplitudes of the interfering signals from WJZ on WEAF's wave can be seen as designated by X and X^1. The reduction in the signal intensity of the respective signals from the two stations is slight in comparison with the result—better selectivity. So we see that coupling manifests its effect upon selectivity as well as volume.

The greatest volume is obtained when a condition of coupling other than either minimum or maximum exists. At first approximation this would mean that the resonance curves of the two stations we used in our tests should have been greater after the coupling was reduced. This is entirely correct, but our quest at this time was not volume but rather selectivity. Hence when we altered the coupling, the reason for the lower peak can well be explained by the fact that the coupling had been reduced to a point somewhere between very loose and critical. No doubt if we made curves or ascertained the relative value of signal intensity at critical coupling, the peaks would be much higher than when maximum coupling is in existence.

In Regenerative Sets

To apply these data to regular receiver operation is not difficult. It is evident that if the coupling between the aerial and the secondary circuit is correctly adjusted, selectivity can be increased. This condition should prevail in every regenerative receiver which does not utilize tuned radio frequency amplification preceding the detector. This applies specifically to ever so many 3-tube regenerative receivers (including audio). In addition it will be found worthwhile in receivers which utilize only one stage of tuned radio frequency amplification and no regeneration, to provide for variable coupling between the aerial and the secondary circuit (the input to the first R.F. tube). Where such arrangements are provided, it should not be overlooked that the only gain is not increased selectivity, but also increased signal intensity for critical coupling adjustments are possible on all stations.

Incidentally, all variable coupling of the input also provides a source of volume control which is absolutely free of distortion production, since it governs the signal input into the detector or the amplifiers. It must be admitted that a variable coupling augments the number of controls upon a panel, but it will be found that it constitutes that final element which permits of the nth degree of selectivity and the reception of that elusive station.

Not for Tuned RF

Furthermore, it need not be a continuously variable control. It will be experienced that one setting will provide satisfaction for a number of local and DX stations.

With respect to certain types of tuned radio frequency receivers which utilize two or more stages there is no need of applying the variable aerial-secondary coupling. Not that it would not prove beneficial, insofar as greater output and selectivity are concerned, but rather that the design of the receiver does not permit of loose coupling between the aerial and the secondary. Furthermore, the several stages of tuned radio frequency amplification will afford the desired degree of selectivity.

LONELY MOUNTED POLICE ENJOY PROGRAMS OF WGY

The Royal Canadian Mounted Police, romantic figures of novel and film, are after all, pretty lonely folk, especially those on duty in the far north where the nights are six months long. In letter to WGY, Inspector C. E. Wilcox, in command at Ellesmere, North Baffinland, relates the pleasure which he and the men of his detachment have taken in everything that WGY put on the air during the past winter. The letter was written May 21, reached WGY on September 4, and the writer explained that it was being written to send south on the mail ship which leaves but once a year.

AND CNRV ALSO GIVES THE BOYS MUCH JOY

VANCOUVER, B. C.

Mounted policemen in far-off Baffinland find their conditions of life considerably alleviated by the science of radio, according to a letter received by G. A. Wright, broadcasting manager at CNRV, the Canadian National Railway broadcasting station at Vancouver from Inspector C. E. Wilcox, of the Royal Canadian Mounted Police, who commands the Ellesmere subdistrict.

High Hopes For Ann Mack

Special interest attached to the first professional "appearance" of Ann Mack, guest artist with Allen McQuhae in the Atwater Kent hour, September 12, because she was backed by the same agencies that supported Mary Lewis. They predicted for Miss Mack that within the next few years she will be nationally known as a singer. Not only is Miss Mack said to have an exceptional voice but she has youth, beaut personality.

NAIL AS BIT

(*Hayden*)

IN building cabinets it sometimes happens that the builder does not have the proper size drill. An ordinary nail with the head chopped off will do in a pinch, although it is not useful for drilling Bakelite.

La Mertha Heads Radio Writers; Coles Honored

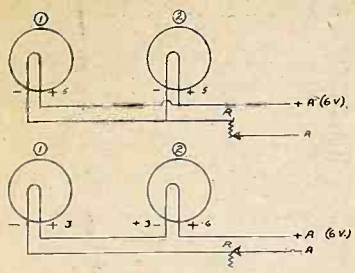
St. Louis Man, Elected President, Forecasts End of Wildcat Publicity—The Captain is Vice President

"Wildcat publicity and news matter detrimental to the best interest of the general public and the radio industry will soon be a thing of the past," declared Harry LaMertha, of the "Globe-Democrat," St. Louis, who was re-elected president of the National Association of Radio Writers at the annual meeting held in Madison Square Garden in conjunction with the RADIO WORLD's Fair. The association went on record as opposing misleading news and feature stories relating to radio subjects.

Captain Stephen L. Coles, of the "New York Herald Tribune," and formerly managing editor of Radio World, was elected vice-president; Stewart Mahoney, of "Country Gentleman," Philadelphia, treasurer; Arthur Sinsheimer, "Dry Goods Economist" Group, executive secretary; Walter A. Schilling, general secretary.

The Board of Directors includes: Robert E. Heinl, Washington, D. C., Orrin Dunlap, Jr., "New York Times"; William E. Hedges, "Chicago Daily News"; Arthur T. Halloran, "Radio," San Francisco; Lambdin Kay, "Atlanta Journal"; Lloyd Jacquet, "Brooklyn Daily Eagle," New York; Everett M. Boyd, "Cincinnati Enquirer"; Frank Rosen, "Philadelphia Enquirer"; Kenneth Warner, "QST," New Haven; Carl Butman, Washington; Frank Hinman, "Chicago Tribune"; Willis K. Wing, "Radio Broadcast," New York; E. L. Bragdon, "New York Sun"; Ralph Worden, "Cleveland News"; Jacques Cartier, "La Presse," Montreal; H. F. Wooley, "New York American"; Dave Casem, "New York Telegram"; Captain Robert S. Wood, "New York World"; H. F. Sohn, "Newark News."

A Change-over Tube Switch



FIGS. 1 AND 2

At top is shown parallel connection and at bottom series connection. Note the rheostat settings. It is assumed a 6-volt storage battery is used. However, a 4½-volt dry cell source will do for the parallel connection for —99 tubes.

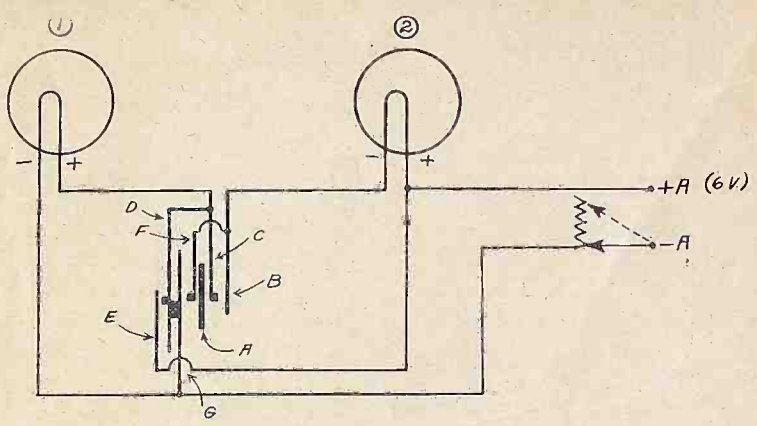


FIG. 3.

The use of a jack switch for change-over. The operation is described in the text.

Device Makes Any Set Adaptable to 99 or -01A Bulbs, From 4½ - Volt Source for the Small Tubes and From 6-Volt Source for Either Type

By Herman Bernard

Associate, Institute of Radio Engineers

SERIES-PARALLEL switching may be used in conjunction with the filament circuits of receivers so that when the switch is thrown one way the voltage is suitable for 5-volt tubes, while when it is thrown the other way, the 3-volt tubes may be inserted. This does not lend tube universality to a set, but it does enable the use of either 99 or 01A tubes, and meets a real demand. For instance, some persons do not like to have storage batteries in the house, hence for economy reasons they would prefer the 3-volt tubes, and such could be employed by using a 4½-volt dry cell source for the A current, the switch being thrown to parallel position. If a storage battery is used, the same parallel connection would serve for the 5-volt tubes (since storage A batteries are almost always 6 volts). If with the same storage battery the smaller tubes were to be used, the switch would be thrown to series position.

Use of 6-Volt Battery

With much attention focused on eliminators, and especially B eliminators that will pass enough current to operate the filaments of series-connected 3-volt tubes in a receiver, switching arrangements become doubly interesting. In the present way two tubes in series would draw .06 ampere total, at the filament, and a 5-tube set would drain the eliminator only .12 ampere, if the final audio tube, of the power variety, were heated by raw AC, by tapping the power transformer of the eliminator, as has become quite fashionable. However, 120 milliamperes (.12 amp.), is too much drain for nearly all eliminators designed for use conjunctively as A eliminators, so all the tubes would have to be in series to keep the drain of the 99s down to .06 ampere (60 milliamperes), a condition not covered by the switching arrangement now under discussion, but easily done by joining switches.

We will assume that a 6-volt storage battery is being used. It is well to have a switch of the sort pictured so that, for instance, if you have a pair of 3-volt tubes you may use them, while the other sockets in the set may contain 5-volt tubes. An accident may deprive you of the use of a pair of tubes at any time, so why not have the asset of interchangeability at one's command? Besides, you may want to replace one style of tubes throughout the entire set, and this can be done under the switching arrangement.

Parallel and Series

Fig. 1 shows two tubes connected with their filaments in parallel. The A battery is connected with minus post to the minus post of each of the two tubes and with A battery plus to the plus post of each of the two tubes. For the moment we will not consider the rheostat R, except to mention that the battery voltage of 6 is dropped to 5 on account of the resistance of the rheostat.

In Fig. 2 the same two tubes are connected in series. A minus goes to one of the filament posts of tube 1, the other filament post of that tube goes to one filament post of tube 2, and the remaining unconnected filament terminal of tube 2 is joined to A plus. Disregarding the rheostat, the series voltages are 0, +3, +3 and +6 at the respective terminals, as designated on the diagram. As "plus" is merely relative, the voltage at the positive post of each tube is 3. In one case it is the difference between 0 and 3+ and in the other the difference between 3+ and 6+. Hence in the last named instance, the 3 volts positive (purely arbitrary) is really zero and 6+ is really 3+. In other words, the voltage drops across the filament itself is 3, and that is all we are striving for.

Load on Rheostat

The rheostat R must be of sufficient current carrying capacity to serve the intended purpose. For the 2-tube arrangement the general run of rheostats will do amply, since the average current carrying capacity of these instruments is 1½ amperes, and a pair of tubes (even 5-volt power tubes) would not draw more than 1 ampere. However, if ever a string of tubes is hooked up to a single rheostat, where parallel connection prevails, remember that the rheostat must be able to carry the sum of the amperage drawn by each of the tubes.

A switching device which enables one to have either series or parallel connection for the filaments of a pair of tubes is shown in Fig. 3, where A is the movable arm. As the device is most likely to be a cam switch of the jack type, the movable arm will have a neutral point, when the tubes will not be connected at all, hence the switch is also an A battery switch.

One Switch for Each Pair of Tubes May Be Used, or the Change-Over May Be Accomplished for All Bulbs By Gang Operation of Jack or Arm Type Switches

Pilot Light Helps

Care must be taken, however, that the neutral point actually is established when one desires to turn the set off, so a telltale light in conjunction with such a switch is not a bad idea. If illuminated dials are used, such as National or Marco, then the pilot lights on the dials may be used for the telltale objective.

Now, to analyze the operation of this series-parallel switch. (Fig. 3) It has six points, B, C. D. E. F and G. No regard need be paid to A as a "point," since it is simply the lever and of itself is insulated and makes no electrical contact.

The arrow under the arm A shows that this arm is movable. When it is in neutral point no contacts are made and no tube lights, as previously explained. When the arm is thrown to the right, point C contacts with point B, thus joining one filament terminal (positive of tube 1) to one filament (negative) of tube 2. As will be observed, the negative leg of tube 1 is always connected to the same point, and the positive leg of tube 2 is likewise constant, although to the oppositely polarized battery lead.

Therefore the series connection does nothing except tie together otherwise open points in a simple manner, by uniting the respective filaments.

The Parallel Method

When the series connection is to be changed to parallel, however, the operation becomes a little more complicated. The arm A is thrown through neutral (just as one must go through neutral to shift from first to second speeds in most automobiles), and is thrown to the left. This causes arm F, connected to the negative filament, to go to A minus of tube

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Arm Switch Used For Tube Versatility

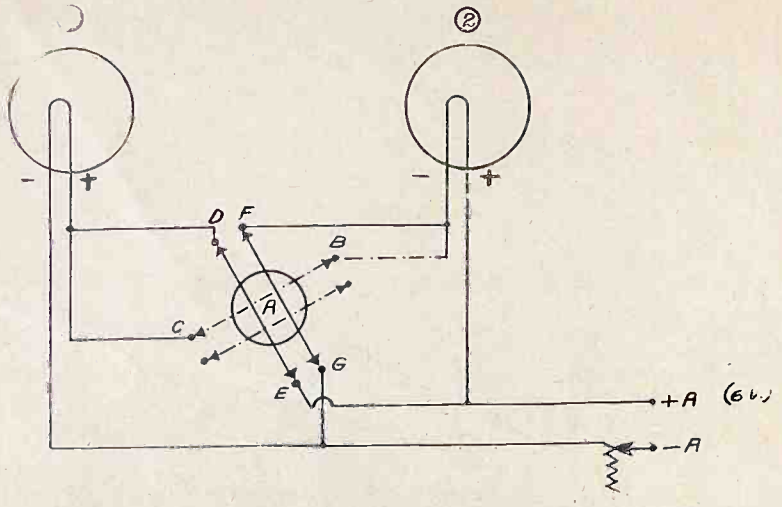


FIG. 4.
The arm type switch, equivalent to Fig 3 in its effect.

Adaptable to Gang Operation, So That Pairs of Bulbs May Be Put in Series or in Parallel, as to Filaments

(*Concluded from page 9*)

2, the battery contact being supplied through point G. Now the positive leg of tube 1 is open, unless provided for, and this need is met by point D contacting with E, which is always connected to A plus.

The same system is exemplified in Fig. 4, where a conventional series-parallel arm switch is used. Such a switch has eight points, four for one position and four for the other, and has a neutral point, besides, the equivalent of this being A in the jack switch. The six points utilized are B, C, D, E, F and G. The unused pair of points is shown in dotted line at lower right.

Gang Operation

Of course the same switching device may be repeated for each pair of tubes, and may be adopted for use in conjunction with a single odd-numbered tube in a set, and it is conceivable that a switch be built in three tiers, so that six tubes or less may be changed over as described, all in one motion, due to the common arm actuating the three. This has reference to the jack type of switching particularly. The arm type may be run that way or three of the small specimens may be mounted on the subpanel and the switching done as desired for pairs of tubes. This individual switching arrangement of course has the advantage of enabling change-over in pairs, while the common switch means all tubes must have the same filament voltage, be that three or five.

On the subject of the rheostat, R, it is put at short-circuit position for the series connection (all resistance wire cut out of the circuit), so that the full 6 volts are obtained, as that is necessary But when the parallel method is used, either from a 6-volt or 4½-volt source, some of the rheostat resistance is used to drop the surplus volt. Any rheostat from 20 to 30 ohms will do.

Rowles Quits KYW For College Post As Music Head

With the close of the first season of the Apollo Male Quartet at KYW, Chicago, come plans for another year, which if possible, will be even more successful than the last The next appearance of this quartet will witness the loss of its most prominent members, Lloyd Rowles, baritone and accompanist, who has been called to head the department of music at Hamline University, St. Paul, Minn.

Mr. Rowles will be succeeded by Earl Anderson, baritone, who was a member of the quartet for several years. Mr. Anderson's return will permit the quartet to continue without any break in its programs as he is familiar with all of the music, and personally is up to the high standard of performance which has marked the concerts of the four.

Ascension Islanders Get Station KDKA

PITTSBURGH.

In the Atlantic ocean there is an isolated volcanic island, "The Ascension," about 4,800 miles from here. It has an area of about 35 square miles, about one-half of which is under cultivation, and it rises to an elevation of 2,870 feet on Green Mountain, on which a sanitarium for sailors has been erected. The island, which belongs to Great Britain is under the direct control of the admiralty, and is used as a naval coaling station. About 400 seamen and officers live here.

BUREAU PUTS SAFETY RULES IN A BOOKLET

Directions for Installations Include Discussion of Antennas, Guy Wires and Poles—Ground Metal Masts More Than 10 Feet High

WASHINGTON.

In erecting antennas and guy wires for your radio sets see that you do not attach them to telegraph or electric light poles, do not carry them over streets or tracks, and avoid crossing electrical conductors of all kinds, warns the Bureau of Standards in its new handbook, "Safety Rules for Radio Installations."

Antenna supports must be sufficiently rigid and of such size to withstand any load which may come on them. Attachment to chimneys should be avoided. Metal poles or masts extended more than 10 feet above the supporting building must be permanently and effectively grounded.

In the case of receiving stations, leadin conductors shall not be less than No. 14 wire (that is, no higher number), if of copper, and not less than No. 17 if made of bronze or copper covered metal.

Clearance Rules

Clearances are given between leadin wires and other conductors on the building and it is recommended that leadin conductors be "securely fastened in a workmanlike manner." The code also requires that the leadin wire shall enter the building "through a rigid noncombustible, nonabsorptive, insulating tube or bushing, or through a drilled window pane."

For receiving stations grounds must not be made to gas pipes, but should be made to cold water pipes, if these are connected to a street main. An outlet pipe from a water tank fed by a street main or a well may be used, provided such outlet pipe is adequately bonded to the inlet pipe connected to the street main or well. Where the wire is attached suitable clamps must be used, and the entire surface of the pipe covered by the clamp must be scraped clean.

Leadin Conductors

Rules for the application of protective devices, such as lightning arresters and antenna grounding switch are also given. Each leadin conductor for a receiving station must be provided with a lightning arrester whether or not an antenna grounding switch is used. The arrester may be either outside the building or inside, if away from combustible materials.

If your set is connected to a power supply line, the device used and methods of wiring must be in accordance with the rules covering permanent or portable fixtures, devices and appliances, as given in Section 37 of the National Electrical Safety Code. The wiring of storage batteries must be in accordance with these rules, and such batteries must be placed where there is adequate ventilation.

Copies of the Handbook may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents.

15 LICENSES TO SEND GO TO ONE FIRM

Fifteen radio licenses have been issued to the General Electric Company by the Department of Commerce, to assist engineers of that company in their comprehensive inquiry into the mysteries of radio transmission.

To the average listener fifteen radio licenses sound like a lot of interference and there might be some atmospheric difficulties in the vicinity of Schenectady if all the transmitters represented by the fifteen licenses were on the air at the same time with voice and code. This is not the case however, as rarely more than six transmitters are working at once and these are so widely spaced that there is no chance of one transmitter enroaching on the air lane of another. Furthermore all of the Schenectady transmitters, no matter in what stage of development they may be, are controlled by crystal quartz which holds them closely to the desired frequency.

Busy World Over

On every continent engineers and investigators are striving to reveal some of the secerts of the art but nowhere are more men engaged in radio research than in Schenectady. The fifteen licenses are used to cover a wide range of wavelengths and widely different types of transmitters. From time to time propogation tests are made, sometimes with the cooperation of listeners in general and more often with the assistance of field representatives who travel in different directions from the transmitter and make measurements on quality and volume at varying distances, on land and on sea.

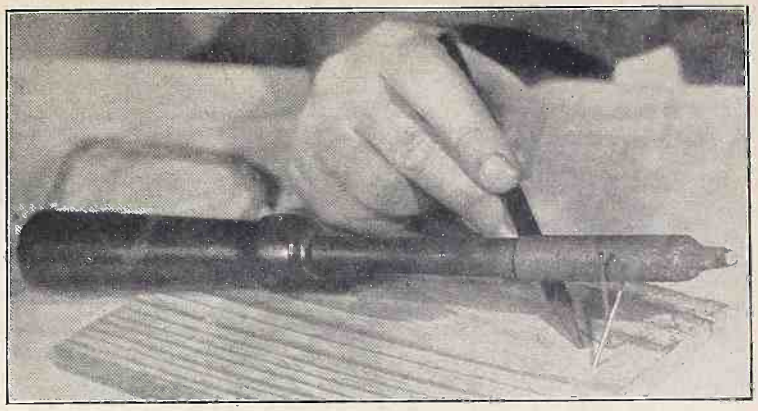
The licenses issued to the General Electric Company and the wavelengths for which they are issued are: 2XAW, 3 to 20 meters; 2XO, 2XAF and 2XAD, 10 to 50 meters; 2XH, 2XK and 2XAC, 50 to 150 meters; 2XAK and 2XAZ, 100 to 200 meters; 2XAG (50 kilowatts), 380 meters; 2XAH, 1000 to 4000 meters; 2XI, general experimental license; 2XAM, 110 meters; 2XAE, 110 meters. The fifteenth license is for broadcasting purposes and is best known to the average radio fan—it is WGY, licensed for 379.5 meters.

Cover Great Distances

Station 2XAF is now being used on 32.79 meters and it was this transmitter which carried the signals of WGY across the Atlantic and the Pacific, early this spring. The same program, in one evening was retransmitted in Johannesburgh, South Africa and heard directly in Perth, Australia. The British Broadcasting Company on one or two occasions successfuily rebroadcast WGY, through the medium of 2XAF, through all the stations of the B. B. C. chain.

2XAD is now being used for transmission on 20 and 26 meters, and 2XK, heard previcusly on 109, 100 and 65 meters is now operated periodically on 140 meters. 2XAH, at one time operated on 1560 meters, later on 1480, is now transmitting signals on 1400 meters for rebroadcasting by WCAD of St. Lawrence University, at Canton, N. Y. 2XAM and 2XAE are used by the General Engineering laboratory of the General Electric Company for communication between the main laboratory and the standardizing laboratory in the town of Glenville, about eleven miles away.

IRON RESTS ON NAILS



(Haydcn)

TWO NAILS driven into a piece of wood will provide a handy support for the hot soldering iron.

Owning a Receiver Is Sound Investment

Conservatives Who Hesitated to Put Any Money Into One, Due to Uncertainty of Results, Find Different Condition Now

By Powel Crosley, Jr.

The radio industry today is in the best position it has attained during its short sensational history of six years. Events of the past nine months have placed it on a firm business foundation. About the only cloud that can be detected is the lack of proper regulatory legislation due to the failure of Congress to attack the problem in a business-like manner. But is is safe to assume that the industry itself will not take advantage of this lack of legal restraint.

The fundamentals of business prosperity are basically a good product efficiently manufactured; a capable and trained selling organization, and a general prosperity enabling the public to buy things they desire.

Hectic Era Over

The history of the radio business during the past year has done much to improve the industry from the manufacturing end. The radio manufacturers of today have successfully passed through the hectic and costly troubles incident to sudden expansion and over production that all new and rapidly growing business unfortunately fall heir to. As a result of these experiences the industry is far sounder than ever before.

Much of the same experience has been had by the selling outlets. Dealers, wholesale or retail, that were not properly fitted to the exacting demand of selling and servicing radios have taken up other work. And those dealers who remain have profited by past experience with the result that they are better trained and fitted to properly care for the wants of the radio public.

Prosperity Great Help

General prosperity is universal in our country. Both employment and wages continue at high levels and there is no indication apparent at this time of any change. Insofar as radio is concerned, every one of the 25,000,000 homes here are in financial position to buy radio equipment.

Another factor that should have a material influence on increasing sales is the fact that the public realizes that the experimental days of radio are over. The more conservative of our population have delayed installing a radio in their homes until they were assured there would be no revolutionary changes. That time now has been reached—not that the radio is perfect, but all its fundamentals have been standardized and from now on it is likely that the only changes will be in the line of refinements.

1,000,000 More Sets

So far this year there has been a notable increase in the number of radio equipped homes. Estimates place the number at well above 5,000,000—or an increase of more than 1,000,000 over 1925. According to the U. S. Department of Agriculture there are 1,000,000 radios on farms as compared to 553,000 in 1925.

When it is considered, however, that there are approximately 20,000,00 automobiles in operation in this country, it can be readily seen that the field for additional radio sales is almost unlimited. With this large field, the stabilization of our industry and the attitude of the public so favorable to radio entertainment, surely 1927 should be the greatest year in radio's history.

ON ITS WAY—
BERNARD
A 6-TUBE RECEIVER

GRID RETURN OPTION CITED FOR DIAMOND

Many queries are asked regarding the installation of the new 200A and 300A detector tubes or the CeCo type H special detector tube, and a choke coil and condenser in the plate circuit of the last tube to prevent DC from entering the speaker windings of a cone speaker in the New and Improved Diamond of the Air.

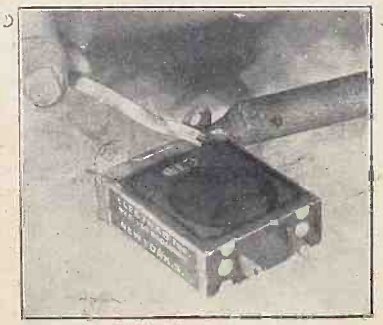
To use the —00A type tubes it is only necessary to change the grid return. That is, disconnect the rotary plate connection of C3, which now goes to the F plus post, and run it to the A minus post. This is the lead that is connected with one terminal of all the Amperites, before the voltage goes to the filament. In this case, it would be R1. Do not connect it to the F minus post on the socket. The CeCo tube requires no change in the detector wiring.

To connect the choke coil and condenser join one terminal of a large condenser (2 mfd. or more) and one terminal of the choke to the plate terminal of the last tube. Connect the other terminal of the choke to B+ amp. The open condenser side goes to the spring terminal of the single circuit jack, J3, which was removed from plate. Connect the other terminal of the jack to A minus.

On the subject of B eliminators for the Diamond, the electrolytic types do not seem to work so well, due perhaps to the two stages of resistance coupled audio. There is often a problem with a B eliminator of any sort when resistance AF is used, due to "motor boating," a throbbing effect due perhaps to audio oscillations. It makes signals sound jerky. Hence for the Diamond, the tube rectifier types of B eliminators are to be preferred.

If "motor boating" is encountered, remove a tube until you find the one that, when out, gets rid of the nuisance. This is the offender, then. Try changing its grid return to F minus on any socket or put a variable high resistance in series with the grid return (e. g., a Bretwood leak.)

SAFE AND SURE



(*Hayden*)

IN some circuits, especially B eliminators, the instructions call for soldering of the metal cases of condensers for grounding. But instead ground the cases by inserting a wire under the head of the mounting screws which are used to hold the condenser to the baseboard. Connect the wire to ground.

Naturalness Aided By Studio Draperies

Walls Are Completely Exposed or Partly or Fully Covered, Depending on Acoustical Requirements —Echo Effect in Homes Relied On

Broadcasters are finding the happy medium in studio draping, according to Frank Reichman, president of the Reichman Company of Chicago. In the early days of broadcasting, studios were located in barns and semi-open buildings with the result that the noise of dice games between members of the operating staff sometimes wafted through the studio door to go out on the air with peculiar results, he said.

Studio managers rapidly found out how sensitive a microphone was and a new era in studio construction was begun. Not only was the studio so constructed as to shut out all outside noises but ventilation also was sacrificed in the urge for absolute shutting out of street and control room noises.

Natural Reproduction.

Studio walls were swathed in folds of heavy cloth, while floors were floated in cork and otherwise constructed to eliminate all echo. By the comparative elimination of echo broadcasting station studios became as chambers of the dead and in them voices sounded strained, in fact so different from the same voice in a concert hall that a number of famous singers staggered out of broadcasting studios with the absolute conviction that their voices had lost all character and were as dead as the walls of the studio made them sound.

"With the studio echoes cut down to an absolute minimum the voice as reproduced in the home comes from the loudspeakers with exactly the same trueness that it went into the microphone," said Mr. Reichman.

Home Walls Echo

"Theoretically the walls of the home furnish the echo and build up the voice exactly as the walls of the hall build up the voice when a great artist is performing on the concert stage."

Theory and practice are two different things and radio reproduction suffered in comparison with concert appearances. Soprano voices were especially condemned and for many months program managers approached the booking of a soprano with fear and trembling. The microphone, transmitter and radio receiver were more accurate than the human voice, with the result that the listener was not satisfied with the broadcast reproduction, maintaining that it was entirely different from the same artists making a personal appearance.

Broadcastors were quick to realize this condition, however, and as radio developed and the art of broadcasting became more firmly established variations in the draping of studio walls were tested.

It was soon discovered that the complete elimination of the walls at the transmitter and of echo in the studios was as wise as the partial deadening of walls, and new draperies in modern broadcasting stations are hanging loosely from the wall so that they may be adjusted at intervals.

Wall Effect Varied

In some broadcasts part of the draperies are pulled away exposing the bare walls, while in other appearances the drapes completely drawn, even covering the door leading from the studio to the reception room.

Modern broadcasters have developed the art of draping the studio to the point where a perfect blend of ordinary room noises at the receiver is achieved through the wall echos from the studio and more and more radio listeners are enjoying the program of lyric sopranos and other delicate voices that radio was formerly accused of mutilating.

The development of the broadcasting art and the development of radio reproducing have not traveled together. Loud speaker manufacturers and acoustical engineers interested in the improvement and development of loud speakers have been forced to wait for the broadcaster to catch up with them at practically every stage of the development of radio of the present day, Mr. Reichman maintains, "The art of sound reproduction is much older than the radio, since for many years we have had reproduction of sound by means of the vibrating diaphram with the present day loud speakers, both horn and cone, presenting little in the way of radical developments over the models of several years ago," continued Mr. Reichman.

Startling Improvements

"Radio set manufacturers have made startling improvements, and the invention of the vacuum tube has done a great deal for reproduction, both in radio and in the phonograph industry, but the greatest improvements in reproducing have come not in the reproducer but in the transmitter or recorder and in the knowledge of handling voices and instruments gained by those handling the broadcasting station studio or the recording laboratory of the phonograph company."

No radical improvements in the art of reproduction are expected by Mr. Reichman, who has made a life study of reproduction, but improvements in transmission and recording will be continual for many years to come.

"There has been no change in the construction of a violin for many years," he points out to emphasize his argument, "while violinists seem to learn more and more the possibilities of their instruments.

"A radio loud speaker is merely the instrument on which the broadcasting station performs, and as the performers learn more and more the possibilities of their instruments so will we have greater and greater enjoyment from music in the home as presented by the speaker contained in the phonograph or radio receiver."

STATION FOR TURKEY

WASHINGTON.

A radio broadcasting station is nearing completion at Angoria, Turkey, according to a report to the Department of Commerce. The station is the work of the French, and it is said the Government is considering the installation of subsidiary radio stations in five or more districts.

U.S. HAS HALF OF RECEIVERS IN THE WORLD

Total Is Put at Between 12 and 15 Million in Survey by Department of Commerce, With 5,500,000 Sets Used in the Union

WASHINGTON.

There are probably between 12,000,000 and 15,000,000 radio sets in operation throughout the world, according to a survey recently made by the Electrical equipment Division of the Department of Commerce. Of these, the United States is believed to have nearly half, or about 5,500,000 sets.

About 900 broadcasting stations are now operating, more than 500 being in the United States. The actual number of stations which may be operating at once is of course considerably less, owing to the number of divided-time agreements in force. This, however, is not common in foreign countries, as the stations are fewer and the distances between them greater. The wave bands used abroad are also much wider.

A CLEAN BATTERY CONTACT

(Hayden)

COATING the surface of the connectors on the storage batteries with a thin film of vaseline will keep them from becoming corroded.

Radio Is Striving For 'Plane Safety

Marker Beacons, Field Localizers and Direction Finders Among Devices Relied on by Dr. Dellinger, Now Working on Problems

By Thomas Stevenson

WASHINGTON.

Comparative safety in air navigation will be attained by the use of a number of radio aids. This is the prediction of Dr. J. H. Dellinger, chief of the Radio Laboratory of the Bureau of Standards.

The statement has been made repeatedly that the first place of radio was to serve the navigator at sea, to bring assistance in case of distress. With the development of the aircraft, radio will be just as necessary to the air pilot as to the sea navigator.

"It would be impossible to prophesy the limit of possibilities of radio in connection with air navigation," says Mr. Dellinger. "It is generally agreed that the primary and most urgently needed application of radio in air navigation is simply that of communication. The great problem of the airplane at the present time is that of landing. The maintenance of communication so that the pilot, regardless of weather conditions, may be kept advised of suitable landing places, is the first requisite.

Telephony for 'Planes

"Comparing airplane communication with that applicable to marine vessels, it may be stated that aircraft require telephony instead of telegraphy, and that the communication be at higher frequencies, and, generally speaking, over shorter distances than for marine vessels.

"Most airplanes now have no crew other than the pilot, and this condition will doubtless be true for a long time to come. It is not to be expected that the pilot will also be a telegraph operator, and it therefore follows that radio telephony rather than telegraphy will be the system used on aircraft.

"Higher frequencies will be used than in marine communication because of the relatively small size of airplanes. It is inconvenient and undesirable to use long antennas on airplanes. Short antennas work more efficiently with high frequencies. It is therefore to be expected that relatively high frequencies will become standard for aircraft radio telephony.

To the 'Planes The Thing

"It is generally agreed that communication to the aircraft is much more important than communication in the other direction. It will add immeasurably to the peace of mind of the pilots and the safety of flying when all airplanes carry radio receiving sets and there is an adequate system of ground stations telephoning information as to weather, landing conditions, etc. As the airways develop and passenger carrying becomes common, there will be increasing use of radio telephony from the aircraft as well."

Among the possibilities of radio in the development of air transportation is the directive beacon.

"It seems clear," says Dr. Dellinger, "that the radio beacon will be used to mark the routes between landing fields. It is usable regardless of weather conditions. It assists in solving the problem of flying during poor visibility as the flier can go above the poor visibility level in his flight. The beacon signals serve as well at high latitudes as low."

Marker beacons, field localizers and direction finders are other developments which Dr. Dellinger expects to help air navigation. He also believes a landing alimeter will be worked out which would show the pilot his distance from the ground.

Conducting Experiments

Experimental work is in progress at the Bureau of Standards wiith the aim of improving the form of the radio aids. In this connection, a model transmitting station is being constructed, which Dr. Dellinger believes will be scattered throughout the country to communicate with aircraft.

"It would be impossible to prophesy the limit of possibilities of radio in connection with air navigation," says the Bureau of Standards radio chief. "In addition to radio telephony, the directive beacon, and the marker beacon, there remain the further possibilities of field localizers, direction finders and landing altimeters. Research is in progress on these additional aids. They all offer difficulties, but will doubtless be eventually worked out and adapted in various forms to aircraft use. In any event, there is every reason to believe that radio will have a steadily increasing part in expediting, and increasing the safety of air navigation."

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CONSTRUCTION OF RADIO PHONE AND TELEGRAPH RECEIVERS by M. B. Sleeper sent on receipt of 75c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

Radio University

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COULD YOU favor me with the electrical diagram of a 3-tube receiver, wherein one tube is used as a RF-AF tube, a second tube is used as a non-regenerative detector and the last tube is used as the audio amplifier (coupled with a transformer)? Please give the constants.—William Barnes, Newark, N. J.

Such a circuit is shown in Fig. 438. The reflexing system is used in the first tube. The primaries, L1 and L3, consist of 10 turns each. The secondaries, L2 and L4, consists of 44 turns, wound on a 3" diameter tubing. The primaries are wound on the same tubings as their respective secondaries. No. 22 double cotton covered wire is used. A ¼" space is left between the primary and secondary windings. The filaments of the three tubes are each controlled by ballast resistors of the ¼ ampere type. A 20 ohm rheostat may be substituted for the ballast in the detector circuit, for better control. C1 and C2 are .0005 mfd. variable condensers. C4, C5 and C6 are .00025 mfd. fixed condensers, used for bypassing. AFT1 is a low ratio audio frequency transformer 3½ to 1 or less, while AFT2 may be of the same ratio, or higher. J is a single circuit jack. A single plate voltage is used for the RF-AF and AF tubes, while the detector tube receives a separate B voltage. The detector voltage is 45, while the amplifier voltages are 90. C3 is a .00025 mfd. grid condenser, while R4 is a variable grid leak. (Bretwood). L and S are the filament light switch. Both dials should tune in step. The coils may be wound in basket weave style. The same number of turns as for the solenoid form is used. For the manner of winding, see Fig. 434 in the September 25 issue of RADIO WORLD, Radio University columns. The coils are placed in such a manner, so that no feed back is possible. This is done, either by placing them at right angles to each other, with the exact center of one coil at right angles to the circumference of the other coil, or by placing them on angle irons and tipping them. CH is a radio frequency choke coil, consisting of about 100 turns of No. 30 enameled wire, wound on a 1 inch form. A 1½-volt C battery is connected in the RF-AF grid return circuit.

* * *

WHAT TYPE of tube is the UX 213?—Larry Cand, Clifton, N. J.

It is a full wave rectifier, having an output of 65 milliamperes, with a maximum impressed voltage of 220. At about 50 mils, 135 volts can be obtained at the output.

* * *

WHEN A B eliminator is placed near a receiver, is it possible that noisy interference will result? If so, about how far should the eliminator be placed?—Caroll Wanster, Atlantic City, N. J.

Yes. This is due to power line disturbances or to physical vibration of the transformer. The eliminator should be placed about 15 feet from the set. This includes the power lines attached to the eliminator. Be sure that there are no other electrical appliances with cords running parallel to the antenna or ground or to the set itself.

* * *

WHEN DID Marconi first apply for a British patent on wireless telegraphy? (2) When did Hertz discover the theories upon which radio is based? (3) When did Dunwoody discover the rectifying properties of carborundum crystals? (4) When was the Kolster decremeter invented? Who was Dr. Kolster connected with, at this time? (5) When did the R. C. A. take over the business of the American Marconi Co? (6) When did Armstrong receive his patent on regeneration?—Karl Schmidter, Dover, Del.

(1) 1896. (2) 1887. (3) 1906. Dr. Greenleaf Pickard also discovered that silicon crystals had rectifying properties. (4) 1912. At this time Dr. Kolster was connected with the Bureau of Standards. It is still used by the Department of Commerce in the radio service. (5) 1919. (6) 1914.

* * *

PLEASE GIVE the physical dimensions of the USL Niagara, large size vertical, 45 volt B battery. (2) Please give the physical dimensions of the vertical, square upright type, 22.5 volt Burgess B battery. (3) Please give the physical dimensions of the Burgess A, 1½ volt battery.—Charles Bunds, Los Angeles, Cal.

(1) This battery is 8 3/16" long, 3 1/8" wide and 7 11/16" high. (2 and 3) There are two models of this type. One is 2½" long, 2½" wide and 6" high. This battery has exactly the same dimensions as the 1½ volt A battery, it being practically square. The other model B battery is 4 1/8" long, 3 1/8" wide and 7" high. This type is about twice the size of the others.

* * *

HOW ARE the connections of the Raytheon tube made to the UX or navy base socket?—Nathan Brar, Long Island City, N. Y.

The anodes of the tube are connected to the filament terminals. The cathode is connected to the plate terminal of the socket. The grid terminal is not used. The anode terminals (to filament posts) in the diagram are always indicated by arrows, while the cathode (to plate post) is indicated by a short heavy line in between the anode terminals.

* * *

IN BUILDING a Raytheon B eliminator should the metal cases of the transformer, choke coils and condensers be connected to B minus?—Max Blumen, Seattle, Wash.

Connect the metal to that A battery lead which is grounded in your receiver. This is not necessarily B minus.

* * *

I HAVE a 3-circuit tuner and two tuned RFT. The primaries of the RFT and tuner consist of 10 turns. The secondaries consist of 78 turns. Each primary and secondary is wound on a tubing 2½" in diameter. No. 24 double cotton covered wire is used. Can these be used in the combination 1-tube and 5-tube receiver shown in electrical diagramatical form in the Sept. 25 issue of RADIO WORLD, page 13? (2 If so, what are the capacities of the variable condensers shunting the secondaries? (3) What is the resistance of the variable resistor in the plate circuit of the detector circuit? (4) What is the resistance of the fixed resistors in the grid circuits of the AF tubes? (5) What are the capaci-

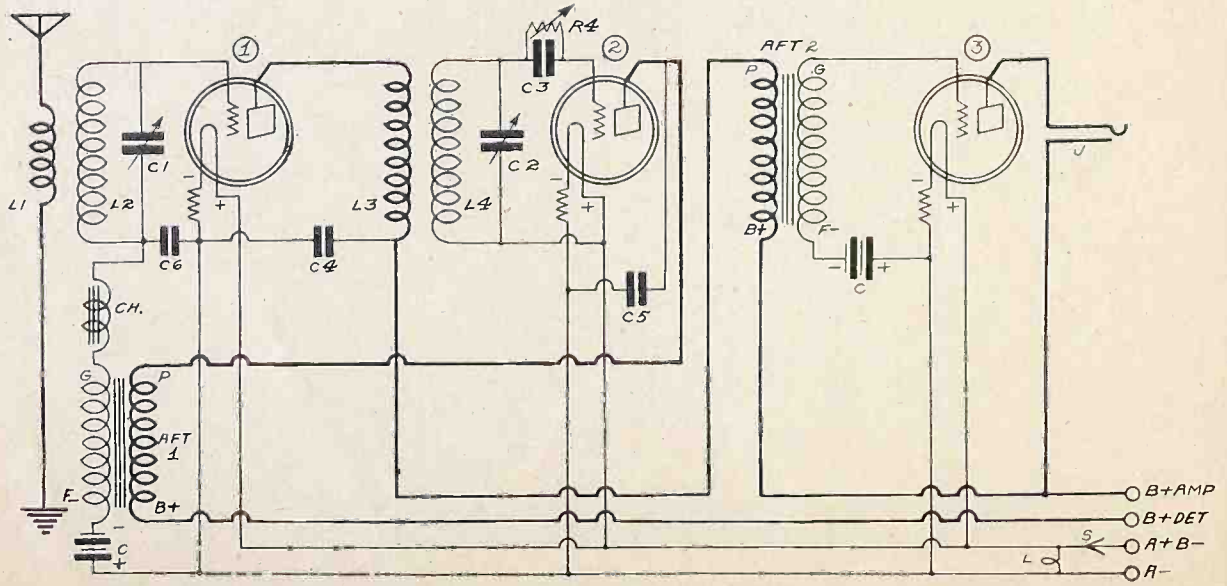

FIG. 438

The electrical diagram of the 3-tube reflex, using a non-regenerative detector.

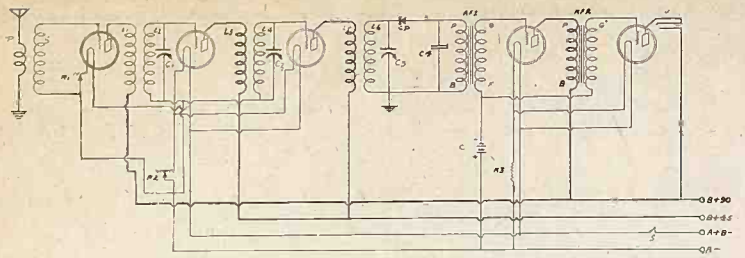

FIG. 439

The electrical diagram of a 5-tube receiver, using three stages of radio frequency amplification, a crystal detector and two stages of transformer coupled audio frequency amplification.

ties of the fixed condensers in the AF coupling circuits? —Jutry Hunt, Bedminster, Pa.

(1) Yes. (2) They should all be of the .00037 mfd. variable type. (3) Maximum resistance of about 100,000 ohms. (4) 500,000 ohms. R4 should be variable and of the potentiometer type. (5) 1 mfd.

* * *

I HAVE a tuned radio frequency transformer, having a 10-turn primary and a 59-turn secondary wound on a 3-inch tubing, with No. 24 dcc wire, and a variometer, having a 56-turn rotor (2¾" in diameter) and a 72-turn stator (3" in diameter). Please give the circuit diagram of a 3-tube regenerative set using the variometer in the plate circuit of the detector tube and two stages of transformer coupled audio frequency amplification. State the electrical data.—Conrad Johns, Hollywood, Cal.

In Fig. 440 you have the circuit diagram of this set. L1 and L2 indicate the primary windings of the tuned radio frequency transformer, while L3 indicates the variometer. C1 is a .00035 mfd. variable condenser, used too tune the secondary windings of the RFT C2 is a .00025 mfd. fixed condenser, while R1 is the 2 megohm grid leak, R2 is a 20 ohm rheostat used to control the filament temperature of the -01A type tube in the detector circuit. R3 is a ½ ampere ballast resistor, used to control the filament temperature of two -01A type tubes in the AF circuit. The AFT used are of the low ratio variety, e. g., 3 to 1. SCJ is a single circuit jack. S is the filament switch. This is necessary since the filament of the AF tubes would always be connected to the A battery, there being no means of control, other than completely cutting off the supply. The voltage to be supplied to the detector plate is indicated at B plus 1 and is about 45. The amplifier voltage, indicated at B plus 2, is about 90. The 200A or other detector type tubes may be used. When using these tubes, be sure that the grid return is made to minus and not to plus, as for the —01A tube, shown in the diatage to be supplied to the detector plate gram. A power tube may also be used in the last AF stage. This will require a separate ballast resistor and a separate B voltage. Also a C battery would have to be connected up. This is placed in series with the F minus post of the last AFT. That is, the F minus post is brought to the C minus post and the plus post of the C battery is connected to the A minus post. The ballast resistor is connected in the F minus lead.

* * *

I HAVE a fixed RFT and a fixed crystal detector. I would like to use these in a 5-tube receiver, wherein there are three stages of radio frequency amplification, the crystal detector and two stages of transformer coupled audio frequency amplification.—Clarence Zantrobe, Waco, Tex.

The circuit diagram is shown in Fig. 439. The fixed RFT is used in the antenna circuit, while tuned radio frequency transformers are used in the two RFT and detector coupling circuits. P indicates the primary and S the secondary of the fixed RFT. L1, L3 and L5 are the primaries of the tuned RFT. These consist of 10 turn. The secondaries L2, L4 and L6 consist of 66 turns. Each primary and secondary is wound on a tubing 3¾" in diameter. No. 24 double cotton covered wire is used. The secondaries of these coils are shunted by .00037 mfd. variable condensers, C1, C2 and C3. A single reostat is used to control the filament of the RF tube, this having a resistance of 20 ohms. The filaments of the other two RF tubes are controlled by a 10 ohm rheostat, R2. CD is the crystal detector. C4 is a .001 mfd. fixed condenser. AF1 and AF2 are both low ratio audio frequency transformers, e. g., about 3 to 1. The —01A tubes should be used. The filament of both AF tubes are controlled by a ballast resistor of the ½ ampere type. With this scheme, two —01A tubes must be used in these stages. If a power tube is used, then a separated ballast is required. S is the filament switch. A single circuit jack or phone tips may be connected at the output of the crystal detector circuit. J at the audio output, is also a single circuit jack.

* * *

ABOUT TWO years ago I built a 5-tube Neutrodyne. I always turned the detector rheostat about one-quarter the way up, when the battery was fully charged, and the results were great. Now I have to turn the rheostat all the way up, when the battery is fully charged and even then the volume is not great. Is it possible that the tube is worn. It has been in the set for two years. The -01A tubes are used throughout.—Eugene Ulhert, Jefferson, S. C.

The filaments of the tube is worn. The emission qualities have been killed, due to age and use. Try changing tubes around.

* * *

I HAVE built a 3-tube regenerative receiver, using a tickler. The stations come in with fair volume. I cannot get the detector tube to oscillate. I have tried reversing the tickler, but to no avail. Will adding about 10 turns(present tickler has 25 turns of No. 26 scc wire wound on a 1¾" form), to the tickler smooth out the trouble? Will placing a .001 mfd. fixed condenser across the primary of the first AFT also help? I am using transformer coupled audio frequency amplification. The -01A type tubes are used throughout. The detector plate receives 45 volts. I have also tried higher voltages, but upon doing so, the set would become difficult to control. The tickler would have no effect when the voltage was increased.—Irving Kahn, Scarsdale, N. Y.

Adding the turns to the tickler or placing the fixed condenser across the AFT primary will help. Be sure that the filament voltage is properly adjusted.

* * *

WHAT IS the shelf life of the average large size 45-volt B battery?—Milton Harris, Olmstedville, N. Y.

Ten months or more.

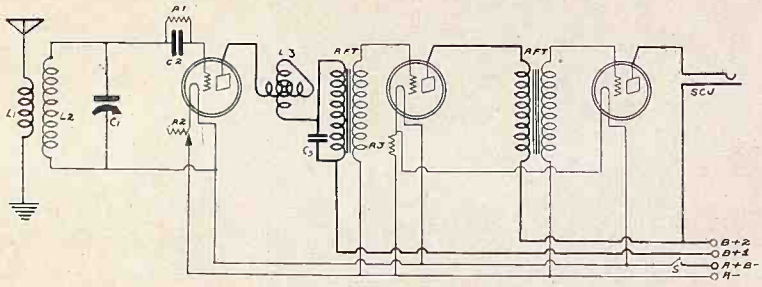

FIG. 440

The electrical diagram of the 3-tube regenerative set.

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Name .....

Street .....

City and State .....

Perfect Voice Honor Is Rosaline Greene's

She Is Acclaimed by Judges in Test Held by Radio World's Fair—Won Fame With the WGY Players for Vocal and Dramatic Talent

Rosaline Greene, of Bay Shore, Long Island, former WGY star, is the winner of the perfect radio voice test under the auspices of the Radio World's Fair.

Miss Greene was graduated in June from the New York State College for Teachers, but may return to radio instead of teaching English and elocution, as she had planned.

It was only after the greatest deliberation that the victor in the contest was determined. But when a mass of evidence was produced testifying to the special quality of her voice, the Radio World's Fair directors decided in her favor. Experts have written of Miss Greene in such manner as this:

"Her golden tones awaken the waves of the ether as we may fancy Triton's horn awakened the waves of the sea."

A number of radio fans spoke of Miss Greene's voice as being "impressive, appealing, and expressive," one man stating that it was "chockful of inflections, sweet and deliciously provocative at times."

At New Madison Square Garden she was introduced to Dr. Frank E. Miller, considered the foremost authority on the voice, who has just returned from Europe. Dr. Miller conducted experiments in analyzing the human voice for Columbia University and many scientific bodies.

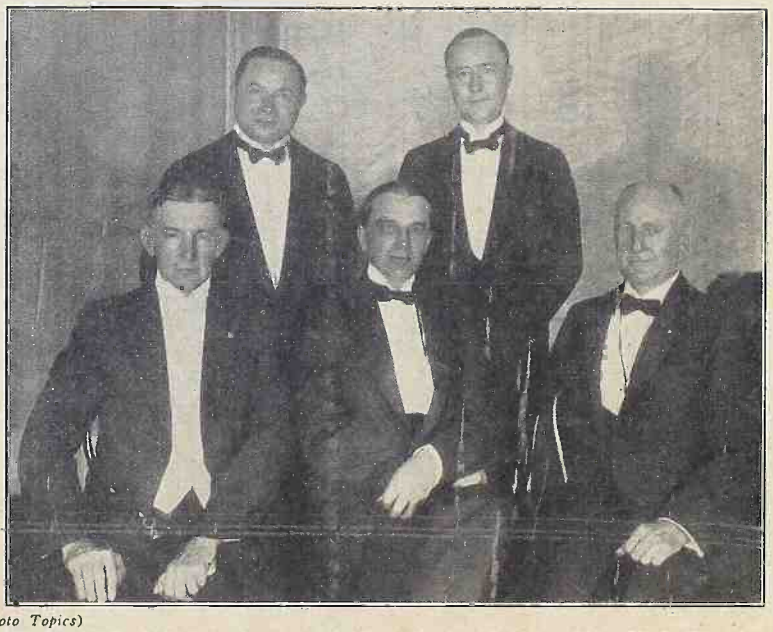
Miss Greene was the leading lady of the WGY players, and her voice has been heard by many millions of people, many in Europe, where the Schenectady station is heard frequently.

Set Trophy Awarded to 16-Year-Old Boy

The world's championship trophy for skill in building radio receivers, among amateur wireless enthusiasts, was awarded to John Harrison Hartley, a 16-year-old red-headed American boy, who is more than six feet tall, according to an announcement from the Radio World's Fair, New York.

Hartley's set was the most elaborate, from the engineering viewpoint, and it was also the most distinctive as to general form.

5 GREAT EXECUTIVES FOREGATHER



(Foto Topics)

AT the Radio Industries banquet, held at the Hotel Astor, New York City, in conjunction with the Radio World's Fair, four noted figures were photographed—Vice-President Dawes, Owen D. Young, General Harbord, David Sarnoff and M. H. Aylesworth. Mr. Young is chairman of the R. C. A. board, General Harbord is president of the R. C. A., Mr Sarnoff is vice-president and general manager of the R. C. A., and Mr. Aylesworth is president of the new National Broadcasting Corporation (WEAF).

JOY REIGNS AS

(Foto Topics)

G. CLAYTON IRWIN, co-director of Fair, New Madison Square Garden, New Ill., "Miss Radio, 1926-27"; Norma Sm Atlantic City beauty Contest, and A. C seacoa

Highest Bi Right to

Several Days of Dickering Narrative of the Dempsey Three Days

The contract for the privilege of broadcasting the world championship heavyweight fight between Jack Dempsey, champion, and Gene Tunney, challenger, was signed by Tex Rickard, promoter of the fight, and representatives of the Royal Typewriter Co. Arrangements then were made by the typewriter company with WEAF and WJZ, and their station chains, as well as others, to broadcast the ringside description of the fight.

Rickard at first wanted all newspapers barred from broadcasting dispatches of the fight's progress.

Rickard declared before he had leased the broadcasting privilege, that any contract he signed would bar newspapers from broadcasting by radio reports of the bout which the papers received over their wires from the ringside.

E. L. Austin, director general of the Sesquicentennial Exposition, Philadelphia, scene of the bout, said he saw no possible way in which Rickard could prevent such broadcasting service, and added that if the promoter did attempt it the Sesqui would not permit it.

"As to Rickard's stopping the newspapers from broadcasting what news they get over their press wires. I see no way he could prevent it. It is their news when they get it, and they are entitled to do what they will with it.

WINNERS MEET

recent Third Annual Radio World's
ork; Mrs. Lota Harrauff, of Princeton,
ood, of Tulsa, Okla., winner of the
ugent, director of the pageant at the
esort.

dder Got end Fight

ith Rickard Over Ringside unney Battle Ended Only efore Event

"If the promoter should make any attempt to prevent the newspapers from doing this, if they desire, I would not permit it.

"As to the broadcasting rights direct from the ringside, that is an entirely different proposition. Rickard does not control that, either, as this is an exposition feature and the rights are distributed by mutual arrangements with us."

The announcement of assurance of blow-by-blow broadcasting of the fight was made by George Ed Smith, President of the typewriter company.

"The Royal Typewriter Company has acquired the broadcasting rights to the fight," said Mr. Smith, "and a vast tie-up of broadcasting stations will carry a word picture to the largest audience of fight fans ever assembled in the history of boxing."

Negotiations for the radio broadcasting privileges made swift progress between Col. John S. Hammond, Vice President of the Madison Square Garden Corporation, and representatives of the typewriter company, and were brought to a virtual close with the signing of a memorandum of agreement between the two parties in the office of Col. Hammond at Madison Square Garden.

Engineers immediately began the task of planning the layout.

Anna Case to Sing At Next Kent Hour

Fall and Winter Series to Open with Albert Spaulding, Violinist, as Associate Artist—Other Noted Musicians Later

Anna Case, famed soprano of Metropolitan Opera, and Albert Spalding, concert violinist, will lead the long procession of nationally famous grand opera and concert artists whom A. Atwater Kent has engaged for his series of weekly radio concerts this season.

These two artists will open the series this Sunday, broadcasting over a network of fifteen stations. They will be followed on succeeding Sunday evenings by such internationally known stars as Frances Alda, Lucrezia Bori, Ernestine Schumann-Heink, Frieda Hempel, Josef Hofmann, Edward Johnson, Maria Kurenko, Louise Homer, Reinald Werrenrath, Margaret Matzenauer, Mary Lewis, Rosa Ponselle, Charles Hackett, and others yet to be announced.

The enlistment of these topliners of the music world has been made possible through a special arrangement Mr. Kent has made with the Metropolitan Opera Company, enabling him to broadcast world famous opera stars not heretofore available to radio.

Announcement of the opening of the big Sunday evening series comes on the eve of the last of the summer radio programs conducted by Allen McQuhae, the popular Irish tenor. The success of this and other summer radio concerts has led to predictions of revolutionary changes in the concert world, which has heretofore enjoyed strictly seasonal popularity.

The futility of trying to assemble audiences in concert halls during the summer months has heretofore determined the time when the concert season opened and closed. Radio now follows the music lover no matter where or when he goes and brings him the finest concert music.

When, on September 26, Allen McQuhae in the Atwater Kent hour has sung "The Lord is My Light," "Autumn Leaves," "Caucasian Sketches," "Ballymore Ballad," "Nora O'Neal," and others, he will for a time bid goodbye to an appreciative audience of millions of listeners scattered thousands of miles apart over half of the United States.

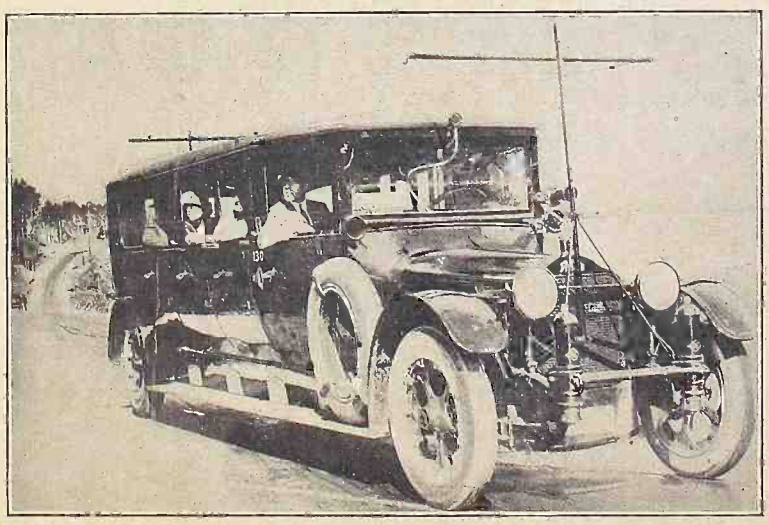
The stations that will broadcast the big series of Atwater Kent Sunday evening concerts, are as follows: WEAF, new York; WJAR, Providence; WEEI, Boston; WSAI, Cincinnati; WRC, Washington; WCCO, Minneapolis-St. Paul; WTAM, Cleveland; WGN, Chicago; WFI, Philadelphia; WCAE, Pitsburgh; WGR, Buffalo; WOC, Davenport; WTAG, Worcester; KSD, St. Louis, and WWJ, Detroit.

COON-SANDERS ON AIR AT WGN AND WLIB

The famous Coon-Sanders orchestra, the original Nighthawks of Station WDAF, Kansas City, known throughout the country as one of radio's most entertaining jazz bands, started broadcasting again over WGN and WLIB, Chicago.

These ten syncopators, headed by the humorous Carleton Coon and his piano-pounding partner, Joseph Sanders, have built up a most unusual reputation.

BUS RIDERS ENJOY CONCERTS



(*Keystone*)

W. E. TRAVIS, president of California Transit Company of Oakland, Calif., recently sent the first radio-equipped bus out on its regular run to Sacramento and passengers enjoyed a radio concert during the trip.

A THOUGHT FOR THE WEEK

RADIO shows may come and radio shows may go, but radio will run on for all time. You can't beat an eternally established principle.

RADIO WORLD
REG. U.S. PAT. OFF.
The First and Only National Radio Weekly

Radio World's Slogan: "A radio set for every home."

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TECHNICAL EDITOR, Lewis Winner
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ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
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OCTOBER 2, 1926

Light Opera Digests Featured at WBBM

CHICAGO.

"Bright Spots from the Comic Operas" is a recent feature added to the regular programs of the Stewart-Warner Air Theatre, station WBBM. They will be presented at 8:15 every Thursday night by the Stewart-Warner Light Opera company under the direction of a newly appointed Feature Director who has planned a series of Feature Radio productions for the winter season.

The most popular and tuneful numbers from the comic operas will be interwoven with a running sketch of the story which will be accompanied by a background of the airs not featured as solos.

"The Prince of Pilsen," that amusing opera which concerns a mistake in identity between the prince of the title and a Cincinnati beer king, was presented on September 16. The most popular of the De Koven operas, "Robin Hood," presenting a melange of rollicking music, was put on September 23.

Nothing Like Radio, Britannica Holds

New Edition of Encyclopedia Sets Forth That the Art Is Additional to Other Modes of Intercourse And Not a Substitute

By Wallace Fremont

THE thirteenth edition of the Encyclopedia Britannica, edited by J. L. Garvin, has just been published at 342 Madison Avenue, New York City. The first edition was published in 1771.

The subject of radio is treated in the encyclopedia by several experts, including Ralph Bown, vice-president, Institute of Radio Engineers. He is affiliated with the American Telephone & Telegraph Co.

There were 1,105 stations licensed up to August, 1924, with only 535 on the air. This led Mr. Bown to write:

"It is certainly arguable that the movement began by overshooting the mark. The present tendency to which the indications point is toward consolidation for better service, in point both of utility and entertainment, and toward an economically sounder radio industry."

Opportune Movement

Discussing other phases he says:

"The broadcasting movement, when it crossed the Atlantic, found Europe impoverished and war-weary. Yet, so prompt and general was its popularity that we must conclude that other forces, besides those which had stimplated broadcasting in America, were at work.

"After nearly five years in which strain and the sense of insecurity had found occasional relief in somewhat hectic pleasure-seeking, it was an opportune moment for the appearance of a form of pleasure which could be enjoyed at home, naturally and without effort, as well as cheaply.

"Thus, an innovation, comparable in cultural importance to the introduction of printing, was launched tentatively upon a responsive Europe, before either the financial organization of broadcasting services or their relations with the theatre, the musical profession, the press or the wireless industry had been properly settled, and while the conditions for good broadcasts were unexplored."

Speech on Air

In analyzing broadcasting he wrote:

"Broadcast speech includes (a) informative and practical utility matter such as news, market prices, weather reports, time signals, agricultural bulletins and notices of various sorts (e. g., appeals for charity, police notices, club or association bulletins and notifications of dangerous illness to relatives whose address is unknown); (b) "talks," i. e., short lectures or series of lectures on all sorts of subjects, critics of literature, drama, music and films, courses of education addressed to schools in school hours or to adults, and debates; (c) important public speeches, ceremonies and events taken by a microphone on the spot; (d) religious services, either specially arranged for broadcasting or taken by a microphone from church or chapel; (e) radio drama, a form of dramatic presentation in which all effects other than vocal have to be conveyed to the ear or suggested to the imagination, and which calls, therefore, for a special technique in playwriting and acting; (f) humorous entertainment; (g) advertisement; and (h) political or other propaganda.

Miscellaneous Types

"In addition there are miscellaneous special broadcasts, such as words of command for physical exercises performed by listeners at home or messages from an explorer in the heart of a distant country. How many of these categories are admitted depends upon the constitution and policy of the broadcasting authority or concern; for example, advertisement and propaganda on controversial subjects are barred in Great Britain and certain other countries, while many stations (especially in America) are maintained solely for one or two of the named purposes."

"This list of activities," adds Mr. Bown, "is enough to indicate the immense social importance of broadcasting and also to demonstrate that it is a means and not an end. Its functions," he continues, "is to render all these sorts of entertainment, all these departments of thought, all these services of information, accessible simultaneously to the maximum number of people in their own homes.

Must Discriminate

"But in the presence of so vast an array of material selection must necessarily be exercised. Practically, the power of program builders is no more—and also no less—than the power of selection. Even so, it is at present far from being an absolute power. Established interests, such as the press, the theatre and the musical industry, have many cases safeguarded their special fields in various ways, and the technical requirements of transmission also operate to a certain extent as a check, in spite of the great improvements which have been made in the first three years of systematic practice.

"Nevertheless, it is gradually coming to be recognized by other interests that broadcasting has obtained a permanent hold, and, moreover, that it is really an addition to rather than a substitute for the older modes of intercourse."

International Features

The international possibilities of broadcasting are discussed in Britannica as follows:

"We may now glance at broadcasting in its international aspect, and more especially European broadcasting, as a possible cementing influence between nations now becoming daily conscious of a unity that the foreground of their history seems to deny.

"In 1925, when all countries of western, northern and central Europe had to a great extent absorbed broadcasting as a normal element in their national life, it became manifest that apart from incidental divergences, all broadcasting concerns, acting quite independently of one another, were putting much the same classes of fare before their respective policies, and thereby disclosing a cultural unity in Europe hitherto scarcely suspected. The barriers of political and racial geography were overleaped."

OFFICIAL LIST OF STATIONS

(Corrected and Revised Up to September 22)

[Herewith is published a complete and corrected list of the broadcasting stations in the United States, with wavelengths given in meters, even unto decimals, and equivalent frequency given in kilocycles.]

Station	Location and Owner	kc	m
KDKA	East Pittsburgh, Pa., Westinghouse E. & M. Co.	970	309.1
KDLR	Devils Lake, N. D., Radio Elec. Co.	1300	231
KDYL	Salt Lake City, Utah, Newhouse Hotel	1220	246
KFAB	Lincoln, Neb., Neb. Buick Auto Co.	880	340.7
KFAD	Phoenix, Ariz., Elec. Equip. Co.	1100	273
KFAF	San Jose, Cal., A. E. Fowler	1380	217.3
KFAU	Boise, Idaho, Indep. Sch. Dist. of Boise	1070	280.2
KFBB	Havre, Mont., F. A. Buttrey & Co.	1090	275
KFBC	San Diego, Cal., Union League Club	790	380
KFBL	Everett, Wash., Leese Bros.	1340	224
KFBS	Trinidad, Cal., School District No. 1	1260	238
KFBU	Laramie, Wyo., St. Matthews Cathedral	800	374.8
KFCB	Phoenix, Ariz., Nielson Radio Supply Co.	1260	238
KFDD	Boise, Idaho, St. Michael Cathedral	1090	275.1
KFDM	Beaumont, Tex., Magnolia Petroleum Co.	950	315.6
KFDX	Shreveport, La., First Baptist Church	1270	236.1
KFDY	Brookings, S. D., S. D. State College	980	305.9
KFDZ	Minneapolis, Minn., Harry O. Iverson	1300	231
KFEC	Portland, Ore., Meier & Frank	1210	248
KFEL	Denver, Colo., Eugene P. O'Fallon, Inc.	1180	254.1
KFEQ	Oak, Neb., Scroggin & Co.	1120	268
KFEY	Kellog, Idaho, Bunker Hill & Sullivan	1290	233
KFEP	Moberly, Mo., First Baptist Church	1240	242
KFGQ	Boone, Ia., Crary Hardware Co.	1330	226
KFH	Witchita, Kans., Hotel Lassen	1120	267.7
KFHA	Cunnison, Colo., Western State College of Colo.	1190	252
KFHL	Oskaloosa, Ia., Penn College	1250	240
KFI	Los Angeles, Cal., Earl C. Anthony, Inc.	640	468.5
KFIF	Portland, Ore., Benson Polytechnic Inst.	1210	248
KFIO	Spokane, Wash., North Central High School	1130	266
KFIQ	Yakima, Wash., First Methodist Church	1170	256
KFIU	Juneau, Alaska, Alaska Elec. Light & Power Co.	1330	226
KFIZ	Fon du Lac, Wis., Daily Commonwealth	1100	273
KFJB	Marshalltown, Ia., Marshall Electric Company	1210	248
KFJC	Junction City, Kans., R. B. Fegan	1370	218.8
KFJF	Oklahoma City, Okla., Nat'l Radio Mfg. Company	1150	261
KFJI	Astoria, Ore., E. E. Marsh	1220	245.8
KFJM	Grand Forks, N. D., Univ. of N. D.	1080	278
KFJR	Portland, Ore., Ashley C. Dixon & Son	1140	263
KFJY	Fort Dodge, Ia., Tunwall Radio Co.	1220	246
KFJZ	Fort Worth, Tex., W. E. Branch	1180	254.1
KFKA	Greeley, Colo., Colo. State Teachers Col.	1100	273
KFKU	Lawrence, Kans., University of Kans.	1090	275
KFKX	Hastings, Neb., Westinghouse, E. & M. Co.	1040	288.3
KFKZ	Kirksville, Mo., Cham. of Com.	1330	225.4
KFLR	Albuquerque, N. M., Univ. of N. M.	1180	254
KFLU	San Benito, Tex., San Benito Radio Club	1270	236
KFLV	Rockford, Ill., Swedish Evangelist Church	1310	229
KFLX	Galveston, Tex., Geo. Roy Clough	1250	240
KFMR	Sioux City, Ia., Morningside College	1150	261
KFMX	Northfield, Minn., Carlton College	890	336.9
KFNF	Shenandoah, Ia., Henry Field Seed Co.	650	461.3
KFOA	Seattle, Wash., Rhodes Department Store	660	454.3
KFOB	Burlingame, Cal., K. F. O. B., Inc.	1330	225.4
KFON	Long Beach, Cal., Echophone Radio Shop	1290	233
KFOO	Salt Lake City, Utah, Latter Day Saints Union	1270	236
KFOR	David City, Neb., Tire & Electric Co.	1330	226
KFOT	Wichita, Kans., College Hill Radio Club	1300	231
KFOX	Omaha, Neb., Technical High School	1210	248
KFOY	St. Paul, Minn., Beacon Radio Service	1190	252
KFPL	Dublin, Tex., C. C. Baxter	1190	252
KFPM	Greenville, Tex., New Furniture Co.	1240	242
KFPR	Los Angeles, Cal., L. A. County Forestry Dept.	1300	231
KFPW	Carterville, Mo., St. John's Methodist Episcopal Church	1160	258
KFPY	Spokane, Wash., Symons Investment Co.	1098	273
KFQA	St. Louis, Mo., The Principa	1150	261
KFQB	Fort Worth, Tex., Searchlight Publishing Co.	1140	263
KFQD	Anchorage, Alaska, Chovin Supply Co.	1320	227.1
KFQP	Iowa City, Ia., G. S. Carson, Jr.	1340	224
KFQU	Holy City, Cal., W. E. Riker	1300	230.6
KFQW	North Bend, Wash., C. F. Knierim	1390	215.7
KFQZ	Hollywood, Cal., Taft Products Co.	1330	226
KFRB	Beeville, Tex., Hall Brothers	1210	248
KFRC	San Francisco, Cal., City of Paris	1120	268
KFRU	Columbia, Mo., Stephens College	600	499.7
KFRW	Olympia, Wash., Western Broadcasting Co.	1370	218.8
KFSD	San Diego, Cal., Airfan Radio Corporation	1220	245.8
KFSG	Los Angeles, Cal., Echo Park Evangelist Ass'n	1090	275
KFUL	Galveston, Tex., T. Goggan & Brothers	1160	258
KFUM	Colorado Springs, Colo., W. D. Corley	1250	239.9
KFUO	St. Louis, Mo., Concordia Seminary	550	545.1
KFUP	Denver, Col., Fitzsimmons General Hospital	1280	234
KFUR	Ogden, Utah, Peery Building Company, Inc.	1340	224
KFUS	Oakland, Cal., L. L. Sherman	1170	256
KFUT	Salt Lake City, Utah, University of Utah	1150	261
KFUU	Oakland, Cal., H. C. Colburn & E. L. Mathewson	1360	220.4
KFVD	Venice, Cal., C. I. McWhinnie	1460	205.4
KFVE	St. Louis, Mo., Venson Broadcasting Corp.	1250	239.9
KFVG	Independence, Kans., First M. E. Church	1270	236.1
KFVI	Houston, Tex., Headquarters Troop, 56th Calvary	1250	240
KFVN	Fairmont, Minn., Carl E. Bagley	1320	227
KFVR	Denver, Col., Moonlight Ranch	1230	244
KFVS	Cape Girardeau, Mo., Cape Girardeau Battery Station	1340	224
KFVY	Albuquerque, N. M., Radio Supply Co.	1200	250
KFWB	Hollywood, Cal., Warner Brothers Pictures	1190	252
KFWC	San Bernardino, Cal., L. E. Wall	1420	211.1
KFWF	St. Louis, Mo., St. Louis Truth Center	1400	214.2
KFWH	Eureka, Cal., F. Wellington Morse, Jr.	1180	254.1
KFWI	S. San Francisco, Cal., Radio Entertainments, Inc.	1300	226
KFWM	Oakland, Cal., Oakland Educational Society	1450	206.8
KFWO	Avalon, Cal., Lawrence Mott	1420	211.1
KFWU	Pineville, La., Louisiana College	1260	238
KFWV	Portland, Ore., Wilbur Jernan	1410	212.6
KFXB	Big Bear Lake, Cal., Bertram C. Heller	1480	202.6
KFXD	Logan, Utah, Service Radio Company	1460	205.4
KFXF	Colorado Springs, Colo., Pikes Peak Broadcasting Co.	1200	249.9
KFXH	El Paso, Tex., Bledsoe Radio Co.	1240	242
KFXJ	Near Edgewater, Col., R. G. Howell	1390	215.7
KFXR	Oklahoma City, Okla., Classen Film Finishing Co.	1400	214.2
KFXY	Flagstaff, Ariz., Harry M. Costigan	1460	205.4
KFYF	Oxnard, Cal., Carl's Radio Den	1400	214.2
KFYJ	Portable, Tex., Houston Chronicle Publishing Co.	1260	238
KFYO	Texarkana, Tex., Buchanan-Vaughan Co.	1430	209.7
KFYR	Bismark, N. D., Hoskins-Meyer, Inc.	1210	248
KGAR	Tucson, Ariz., Tucson Citizen	1230	243.8
KGBS	Seattle, Wash., A. C. Dailey	1321	227
KGBU	Ketchikan, Alaska, Roy R. Thornton	1310	228.9
KGBW	Joplin, Mo., Martin Brotherson	1050	282.8
KGBX	St. Joseph, Mo., Julius B. Abercrombie	862	347.8
KGBY	Shelby, Neb., Albert C. Dunning	1480	202.6
KGBZ	York, Neb., Federal Live Stock Remedy Co.	900	333.1
KCCA	Decorah, Ia., Charles Walter Greenley	1070	280.2
KGCB	Oklahoma, Okla., Wallace Radio Institute	905.8	331
KGCG	Newark, Ark., Moore Motor Co.	1280	234.2
KGCH	Wayne, Neb., Wayne Hospital	663.3	450
KGCI	San Antonio, Tex., International Radio Co.	1250	239.9
KGCL	Seattle, Wash., Louis Wasmer	1300	230.6
KGCM	San Antonio, Tex., Robert B. Bridge	1140	263
KGCN	Concordia, Kans., Alva E. Smith	1428	210
KGO	Oakland, Cal., General Electric Co.	830	361.2
KGTT	San Francisco, Cal., Glad Tidings Tabernacle, Inc.	1450	206.8
KGU	Honolulu, T. H., Marion A. Mulrony	1110	270
KGW	Portland, Ore., Morning Oregonian	610	491.5
KGY	Lacey, Wash., St. Martins College	1080	277.6
KHJ	Los Angeles, Cal., Times Mirror Co.	740	405.2
KHQ	Spokane, Wash., Louis Wasmer	760	394.5
KFLZ	Anita, Ia., Atlantic Automobile Co.	1100	272.6
KJBS	San Francisco, Cal., J. Brunton & Sons Co.	1360	220
KJR	Seattle, Wash., Northwest Radio Service Co.	780	384.4
KLDS	Independence, Mo., Reorganized Church of Jesus Christ	680	440.9
KLS	Oakland, Cal., Warner Brothers	11200	250
KLX	Oakland, Cal., Tribune Publishing Co.	590	508.2
KLZ	Denver, Colo., Reynolds Radio Co.	1130	265.3
KMA	Shenandoah, Ia., May Seed & Nursery	650	461.3
KMJ	Fresno, Cal., The Fresno Bee	1280	234.2
KMMJ	Clay Center, Neb., M. M. Johnson Co.	1310	228.9
KMO	Tacoma, Wash., KMO, Inc.	1200	250
KMOX	St. Louis, Mo., Voice of St. Louis	1070	280.2
KMTR	Los Angeles, Cal., Echophone Co.	1260	238
KNRC	Hollywood, Cal., Clarence B. Juneau	1440	208.2
KNX	Los Angeles, Cal., Los Angeles Express	890	336.9
KOA	Denver, Colo., General Electric Co.	930	322.4
KOAC	Corvallis, Orc., Oregon Agriculture College	1070	280.2
KOB	State College, N. M., New Mexico College of Agri.	860	348.6
KOCH	Omaha, Neb., Omaha Central High School	1160	258
KOCW	Chickashia, Okla., Oklahoma College for Women	1190	252
KOIL	Council Bluffs, Ia., Mona Motor Co.	980	305.9
KOIN	Portland, Ore., KOIN, Inc.	940	319
KOMO	Seattle, Wash., Birt F. Fisher	980	305.9
KOWW	Walla Walla, Wash., Frank A. Moore	1052	285
KPO	San Francisco, Cal., Hale Brothers, Inc.	700	428.3
KPJM	Prescott, Ariz., Wilburn Radio Service	1395	215
KPPC	Pasadena, Cal., Pasadena Presbyterian Church	1310	229
KPRC	Houston, Tex., Houston Printing Co.	1010	296.9
KPSN	Pasadena, Cal., Star-News Publishing Co.	950	315.6
KQW	San Jose, Cal., First Baptist Church	900	333.1
KQV	Pittsburgh, Pa., Doubleday Hill Electric Co.	1090	275
KRE	Berkeley, Cal., Berkeley Daily Gazette	1170	256
KSAC	Manhattan, Kans., Kansas State Agricultural College	880	340.7
KSBA	Shreveport, La., W. G. Paterson	960	312.6
KSD	St. Louis, Mo., Pulitzer Publishing Co.	550	545.1
KSL	Salt Lake City, Utah, Radio Service Corporation	1000	299.8
KSMR	Santa Maria, Cal., Santa Maria Valley RR.	1430	209.7
KSO	Clarinda, Ia., A. A. Berry Seed Co.	1240	242
KTAB	Oakland, Cal., Associated Broadcasters	990	302.8
KTBI	Los Angeles, Cal., Bible Institute	1020	293.9
KTBR	Portland, Ore., M. E. Brown	1140	263
KTHS	Hot Springs, Ark., New Arlington Hotel	800	374.8
KTNT	Muscatine, Ia., Norman Baker	900	333.1
KTUE	Houston, Tex., Uhalt Electric	1140	263
KTW	Seattle, Wash., First Presbyterian Church	660	454.3
KUOA	Fayetteville, Ark., University of Ark.	1000	299.8
KUOM	Missoula, Mont., University of Mont.	1230	243.8
KUSD	Vermillion, S. D., University of S. D.	1080	278
KUT	Austin, Tex., University of Tex.	1300	231
KVOO	Bristow, Okla., Voice of Okla	800	374.8
KWCR	Cedar Rapids, Ia., H. F. Parr	1080	278
KWG	Stockton, Cal., Portable Wireless Telegraph Co.	1210	248
KWKC	Kansas City, Mo., Wilson Duncan Studios	1270	236
KWKH	Shreveport, La., The W. K. Henderson Iron Works and Supply Co.	960	312.3
KWSC	Pullman, Wash., State College of Wash.	850	348.6
KWUC	Lemars, Ia., Western Union College	1190	252
KWWG	Brownsville, Tex., City of Brownsville	1080	278
KYW	Chicago, Ill., Westinghouse E. & M. Co.	560	535.4
KZM	Oakland, Cal., Freston D. Allen	1250	240
WAAD	Cincinnati, O., Ohio Mechanical Institute	1160	258
WAAF	Chicago, Ill., Daily Drovers Journal	1080	277.6
WAAM	Newark, N. J., Isaiah R. Nelson	1140	263
WAAW	Omaha, Neb., Omaha Grain Exchange	1080	278
WABB	Harrisburg, Pa., Harrisburg Radio Co.	1470	204
WABC	Asheville, N. C., Asheville Battery Co.	1180	254
WABI	Bangor, Me., First Universalist Church	1250	240
WABO	Rochester, N. Y., Hickson Electric Co., Inc.	1080	278
WABQ	Haverford, Pa., Haverford College Radio Club	1150	261

(Continued on page 20)

(Continued from page 19)

WABR—Toledo, O., Scott High School.. 1140 263
WABW—Wooster, O., The College of Wooster 1450 206.8
WABX—Mount Clemens, Mich., Henry B. Joy 1220 246
WABY—Philadelphia, Pa., John Magaldi Jr. 1240 242
WABZ—New Orleans, La., Colis Place Baptist Church 1090 275.1
WADC—Akron, O., Allen T. Simmons.. 1160 258
WAFD—Port Huron, Mich., Albert B. Parfet 1090 275
WAGM—Royal Oak, Mich., Robert L. Miller 1330 275
WAHG—Richmond Hill, N. Y., A. H. Grebe 950 315.6
WAIT—Taunton, Mass., A. H. Waite & Co. 1310 229
WAIU—Columbus, O., American Insurance Union 1020 293.9
WAMD—Minneapolis, Minn., Raddison Radio Corporation 1230 243.8
WAPI—Auburn, Ala., Alabama Polytechnic Institute 650 461.3
WARC—Medford, Mass., American Radio & Research 1150 261
WATT—Portable-First District, Edison Electric, Ill. 1230 243.8
WBAA—W. Lafayette, Ind., Purdue University 1100 273
WBAK—Harrisburg, Pa., Pennsylvania State Police 1090 275
WBAL—Baltimore, Md., Consolidated Gas & Power Co. 1220 245.8
WBAC—Decatur, Ill., James Miliken University 1110 270.1
WBAP—Forth Worth, Tex., Wortham Carter Publishing Co. 630 475.9
WBAW—Nashville, Tenn., Braid Elec. Co. & Waldrum Drug Co. 1270 236.1
WBAX—Wilkes Barre, Pa., J. H. Stenger Jr. 1170 256
WBBC—Brooklyn, N. Y., Peter J. Testan 1200 249.9
WBBL—Richmond, Va., Grace Covenant Presbyterian Church 1310 228.9
WBBM—Chicago, Ill., Atlass Investment 1330 226
WBBP—Petoskey, Mich., Petoskey High School 1260 238
WBBR—Rossville, N. Y., Peoples Pulpit Ass'n 720 416.4
WBBS—New Orleans, La., First Baptist Church 1190 252
WBBW—Norfolk, Va., Ruffner Junior High School 1350 222
WBBY—Charlestwo, S. C., Washington Light Infantry 1120 268
WBBZ—Portable, Ill., C. L. Carrell.... 1390 215
WBCN—Chicago, Ill., Foster & McDonnell 1130 266
WBDC—Grand Rapids, Mich., Baxter Laundry Co. 1170 256.3
WBES—Takoma Park, Md., Bliss Electrical School 1350 222
WBNY—New York, N. Y., Baruschrome Corporation 930 322.4
WBOQ—Richmond Hill, N. Y., A. H. Grebe & Co., Inc. 1270 236
WBRC—Birmingham, Ala., Birmingham Broadcasting Co. 1210 248
WBRE—Wilkes Barre, Pa., Baltimore Radio Exchange 1300 231
WBRS—Brooklyn, N. Y., Universal Radio Mfg. Co. 761 394
WBT—Charlotte, N. C., Charlotte Cham. of Com. 1090 275
WBZ—Springfield, Mass., Westinghouse E. & M. Co. 900 333.1
WBZA—Boston, Mass., Westinghouse E. & M. Co. 900 333.1
WCAC—Mansfield, Conn., Conn., Agricul. College 1090 275
WCAD—Canton, N. Y., St. Lawrence University 1140 263
WCAE—Pitsburgh, Pa., Kaufman & Baer Co. 650 461.3
WCAJ—University Place, Neb., Neb. Wesleyan University 1180 254
WCAL—Northfield, Minn., St. Olaf College 890 336.9
WCAM—Camden, N. J., City of Camden 1270 236.1
WCAO—Baltimore, Md., Brager of Baltimore 1090 275
WCAP—Washington, D. C., Chesapeake and Pot. Telephone Co. 640 468.5
WCAR—San. Antonio, Tex., Southern Radio Corporation 1140 263
WCAT—Rapid City, S. D., School of Mines 1250 240
WCAU—Philadelphia, Pa., Universal Broadcasting Co. 1080 278
WCAX—Burlington, Vt., University of Vermont 1200 250
WCAZ—Carthage, Ill., Carthage Coll 1220 245.8
WCBA—Allentown, Pa., Charles W. Heimbach 1180 254
WCBD—Zion, Ill., Wilber Glenn Voliva 870 344.6
WCBE—New Orleans, La., Uhalt Radio Co. 1140 263
WCBH—Oxford, Miss., University of Miss. 1240 242
WCBM—Baltimore, Mr., Hotel Chateau 1310 229
WCBR—Portable, R. I., C. H. Mosster 1430 209.7
WCES—Portable-First District, H. L. Dewing & H. Messter 1239 242
WCCO—Anoka, Minn., Washburn Crosby Co. 720 416.4
WCFL—Chicago, Ill., Chicago Fed. of Labor 610 491.5
WCFT—Tullahoma, Tenn., Knights of Pythias Home 1190 250.2
WCLO—Camp Lake, Wis., C. E. Whitmore 1300 231
WCLS—Joliet, Ill., H. M. Couch 1400 214
WCMA—Culver, Ind., Culver Military Academy 1160 258.5
WCOA—Pensacola, Fla., City of Pensacola 1350 222.1
WCRW—Chicago, Ill., C. R. White 720 416.4
WCSH—Portland, Me., H. R. Rines.... 1170 256
WCSO—Springfield, O., Wittomberg College 1210 248
WCWK—Fort Wayne, Ind., Chester W. Keen 1280 234.2
WCWS—Portable, Mass., C. W. Selen.... 1430 209.7
WCX—Pontiac, Mich., Detroit Free Press 580 516.9
WJR—Pontiac, Mich., Jewett Radio & Phonograph Co. 580 516.9
WDAD—Nashville, Tenn., Dads Automobile Accessories, Inc. 1330 226
WDAE—Tampa, Fla., Tampa Daily Times 1100 273
WDAF—Kansas City, Mo., Kansas City Star 820 365.6
WDAG—Amarillo, Tex., J. Laurence Martin 1140 263
WDAH—El Paso, Tex., Trinity Methodist Church 1120 267.7
WDAY—Fargo, N. D., Radio Equipment Corp. 1150 260.7
WDBE—Atlanta, Ga., Gilham Schoen Electrical Co. 1120 270
WDBJ—Roanoke, Va., Richardson Wayland land Elec. Corp. 1310 228.9
WDBK—Cleveland, O., M. F. Broz.... 1320 227
WDBO—Winter Park, Fla., Rollins College 1250 240
WDBZ—Kingston, N. Y., Kingston Radio Club 1290 232.4
WDEL—Wilmington, Del., Wilmington Electric Spec. Co. 1130 265.3
WDGY—Minneapolis, Minn., Dr. George W. Young 1140 263
WDOD—Chattanooga, Tenn., Chattanooga Radio Co., Inc. 1170 256
WDRC—New Haven, Conn., Doolittle Radio Corporation 1120 268
WDWF—Cranston, R. I., Dutee Wilcox Flint Inc. 680 440.9
WDZ—Tuscola, Ill., James L. Bush.... 1080 278
WEAF—N. Y. City, Broadcasting Company of America, Inc. 610 491.5
WEAI—Ithaca, N. Y., Cornell University 1180 254
WEAM—North Plainfield, N. J., Borough of N. Plainfield 1150 261
WEAN—Providence, R. I., The Shepard Co. 817 367
WEAO—Columbus, O., Ohio State University 1020 293.9
WEAR—Cleveland, O., Willard Storage Battery Co. 770 389.4
WEAU—Sioux City, Ia., Davidson Bros. Co. 1090 275
WEBC—Superior, Wisc., W. C. Bridges 1240 242
WEBH—Chicago, Ill., Edgewater Beach Hotel 810 370.2
WEBJ—New York, N. Y., Third Avenue R. R. Co. 1100 273
WEBL—Portable, R. C. A. Show..... 1330 226
WEBQ—Harrisburgh, Ill., Tate Radio Co. 1330 226
WEBR—Buffalo, N. Y., H. H. Howell.. 1230 244
WEBW—Beloit, Wisc., Beloit College... 1120 258
WEBZ—Savannah, Ga., Savannah Radio Radio Corporation 1140 263
WEEI—Boston, Mass., Edison Electric Illuminating Co. 860 348.6
WEHS—Chicago, Ill., O. G. Fordham.. 1480 202.6
WEMC—Berrien Springs, Mich., Emanuel Miss. College 1050 285.5
WENR—Chicago, Ill., All-American Radio Corp. 1130 266
WEW—St. Louis., Mo., St. Louis University 832.8 360
WFAA—Dallas, Tex., Dallas News & Dallas Journal 630 475.9
WFAM—St. Cloud, Minn., Times Publishing Co. 1100 273
WFAV—Lincoln, Neb., University of Neb. 1090 275
WFBC—Knoxville, Tenn., First Baptist Church 1200 250
WFBE—Seymour, Ind., J. V. De Welle 1330 226
WFBG—Altoona, Pa., W. F. Gable Co.... 1080 278
WFBH—N.Y.C., Concourse Radio Corp. 1100 273
WFBJ—Collegeville, Minn., St. John's University 1270 236
WFBL—Syracuse, N. Y., Onondaga Hotel 1190 252
WFBM—Indianapolis, Ind., Merchant H. L. Co. 1120 268
WFBR—Baltimore, Md., Fifth Infantry, National Guard 1180 254
WFBZ—Galesburg, Ill., Knox College.. 1180 254
WFCI—Pawtucket, R. I., Frank Crook, Inc. 1309 229
WFDF—Flint, Mich., Frank D. Fallain 1280 234
WFL—Philadelphia, Pa., Strawbridge & Clothier 760 394.5
WFKB—Chicago, Ill., Vesta Battery Co. 1380 217.3
WFRL—Brooklyn, N. Y., Robert Morrisson Lacey 1460 205.4
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction Co... 1210 248
WGBB—Freeport, N. Y., H. H. Carman 1230 243.8
WCBC—Memphis, Tenn., First Baptist Church 1080 278
WGBS—Evansville, Ind., Finke Furniture Co. 1270 236.1
WGBL—Scranton, Pa., Scranton Broadcasters, Inc. 1250 239.9
WGBR—Marshfield, Wisc., G. S. Ives. 1310 229
WGBS—Astoria, L. I., N. Y., Gimbel Brothers 950 315.6
WGBU—Fulford-by-the-Sea, Fla., Florida Cities Finance Co. 1080 278
WCBX—Oreno, Me., University of Me... 1280 234.2
WGCP—Newark, N. J., May Radio Broadcasting Corp. 1190 252
WGES—Chicago, Ill., Oak Leaves Broadcasting Corp. 1200 249.9
WGHB—Clearwater, Fla., Fort Harrison Hotel 1130 265.3
WGHP—Detroit, Mich., George Harrison Phelps, Inc. 1110 270
WGM—Jeanette, Pa., Verne & Elton Spencer 806 372
WGMU—Portable, N. Y., A. H. Grebe & Co. 1270 236
WGN—Chicago, Ill., Chicago Tribune.. 990 302.8
WGR—Buffalo, N. Y., Federal Tel. & Tel. Co. 940 319
WGST—Atlanta, Ga., Georgia School of Technology 1110 270
WGY—Schenectady, N. Y., G. E. Co..... 790 379.5
WHA—Madison, Wisc., University of Wis. 560 535.4
WHAD—Milwaukee, Wisc., Marquette University 1090 275
WHAM—Rochester, N. Y., Eastman School of Music 1080 278
WHAP—New York, N. Y., Wm. H. Taylor Finance Corp. 695.6 431
WHAR—Atlantic City, N. J., F. D. Cooks Sons 1090 275
WHAS—Louisville, Ky., Courier Journal & Louisville Times 750 399.8
WHAZ—Troy, N. Y., Rensselaer Polytechnic Inst. 790 379.5
WHB—Kansas City, Mo., Sweeney School Co. 820 365.6
WHBA—Oil City, Pa., C. C. Shaffer.... 1200 250
WHBC—Canton, O., Rev. E. P. Graham 1180 254
WHBD—Bellefontaine, O., Chamber of Commerce 1350 222.1
WHBF—Rock Island, Ill., Beardsley Spc. Co. 1350 222
WHBG—Harrisburg, Pa. John S. Skane 1300 231
WHBL—Portable, Ninth District, C. L. Carrell 1390 215
WHBM—Portable, Ninth District, C. L. Carrell 1390 215.7
WHBN—St. Petersburg, Fla., First Avenue M. E. Church 1260 238
WHBP—Johnstown, Pa., Johnstown Automobile Co. 1170 256
WHBQ—Memphis, Tenn., St. Johns M. E. Church 1290 233
WHBU—Anderson, Ind., Riviera Theatre & Bings Clothing 1370 218.8
WHBW—Philadelphia, Pa., D. R. Kienzle 1390 215.7
WHBY—West De Pere, Wisc., St. Norberts College 1200 249.9
WHDI—Minneapolis, Minn., W. H. Dunwoody Institute 1080 278
WHEC—Rochester, N. Y., Hickson Electric Co., Inc. 1160 258
WHFC—Chicago, Ill., Hotel Flanders.. 1160 258.5
WHK—Cleveland, O., Radio Air Service Corporation 1100 272.6
WHN—New York, N. Y., Geo. Schubel 830 361.2
WHO—Des Moines, Ia., Bankers Life Co. 570 526
WHT—Deerfield, Ill., Radiophone Broadcasting Corp. 1260 238
WIAD—Philadelphia, Pa., Howard R. Miller 1200 250
WIAS—Burlington, Ia., Home Electric 1180 254
WIBA—Madison, Wisc., Capital Times-Strand Theatre 1270 236.1
WIBG—Elkins Park, Pa., St. Paul's Protestant Episcopal Church 1350 222
WIBH—New Bedford, Mass., Elite Radio Stores 1430 209.7
WIBI—Flushing, L. I., N. Y., F. B. Zittell, Jr. 1370 218.8
WIBJ—Portable, Ill., C. L. Carrell.... 1390 215.7
WIBM—Portable, Ill., B. Maine..... 1390 215.7
WIBO—Chicago, Ill., Nelson Brothers.. 1330 226
WIBR—Weirton, W. Va., Thurman A. Owings 1220 246
WIBS—Elizabeth, N. J., Thos. F. Hunter 1480 202.6
WIBU—Poynette, Wisc., The Electric Farm 1350 222
WIBW—Logansport, Ind., Dr. L. L. Dill 1360 220
WIBX—Utica, N. Y., WIBX, Inc..... 1280 234.2
WIEZ—Montgomery, Ala., A. D. Trum 1300 230.6
WIL—St. Louis, Mo., Benson Radio Co. 1160 258
WIOD—Miami, Fla., Carl G. Fisher Co. 1210 247.8
WIP—Philadelphia, Pa., Gimbel Bros. 590 508.2
WJAD—Waco, Tex., Jackson's Radio Engineering Laboratories 850 352.7
WJAF—Ferndale, Mich., J. A. Fernberg Radio Co. 749.6 400
WJAG—Norfolk, Neb., Norfolk Daily News 1110 270
WJAK—Kokomo, Ind., Kokomo Tribune 1180 254.1
WJAM—Cedar Rapids, Ia., D. M. Perham 1120 268
WJAR—Providence, R. I., The Outlet Co. 980 305.9
WJAS—Pittsburgh, Pa., Pittsburgh Radio Supply House 1090 275
WJAX—Jacksonville, Fla., City of Jacksonville 890 336.9
WJAZ—Mount Prospect, Ill., Zenith Radio Corp. 930 322.4
WJBA—Joliet, Ill., D. H. Lentz, Jr. 1450 206.8
WJBB—St. Petersburg, Fla., Financial Journal 1180 254.1
WJBC—La Salle, Ill., Hummer Furniture Co. 1280 234
WJBI—Red Bank, N. J., Robert S. Johnson 1370 218.8
WJBK—Ypsilanti, Mich., E. F. Goodwin 1290 233
WJBL—Decatur, Ill., Wm. Gushard Dry Goods Co. 1110 270
WJBO—New Orleans, La., V. Jenson 1120 267.7
WJBR—Omro, Wisc., Omro Drug Stores 1320 227.1
WJBT—Chicago, Ill., John S. Boyd..... 1260 238
WJBU—Lewisburg, Pa., Bucknell University 1420 211.1
WJBV—Woodhaven, N. Y., Union Course Lab. 638 469.9
WJBW—New Orleans, La., C. Carlson, Jr. 880 340.7
WJBX—Osterville, Mass., Renderson & Ross 1071 280
WJBY—Casden, Ala., Elec. Construction Co. 1110 270.1

WJJD—Moosehart, Ill., Loyal Order of Moose	810	370.2
WJR—Pontiac, Mich., Jewett Radio & Phonograph Co. and The Detroit Free Press	580	516.9
WJY—New York, N. Y., R. C. A.	740	405.2
WJZ—Bound Brook, N. J., R. C. C. A.	660	454.3
WKAF—Milwaukee, Wisc., WKAF Broadcasting Corp.	1150	261
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico	880	340.7
WKAR—East Lansing, Mich., Michigan State College	1050	285.8
WKAV—Laconia, N. H., Laconia Radio Club	1340	223.7
WKBA—Chicago, Ill., Arrow Battery Co.	1430	209.7
WKBB—Joilet, Ill., Sanders Brothers.	1060	282.8
WKBC—Birmingham, Ala., H. L. Ansley	1330	225
WKBD—Jersey City., N. J., Frank V. Breiner	1276	235
WKBE—Webster, Mass., K. & B. Electric Co.	1110	270.1
WKBF—Indianapolis, Ind., Noble D. Watson	1229	244
WKBG—Portable, Ill., C. L. Carrell	1390	215.7
WKBK—La Crosse, Wisc., Callaway Music	1200	249.9
WKBI—Chicago, Ill., Fred L. Schoenwolf	1360	220.4
WKBJ—St. Petersburg, Fla., Gospel Tabernacle, Inc.	1071	280
WKBL—Monroe, Mich., Monrona Radio Mfg. Co.	1190	252
WKBM—Newburgh, N. Y., J. W. Jones	970	309.1
WKBO—Jersey City, N. J., Camith Corp.	970	309.1
WKDR—Kenosha, Wisc., Edward A. Dato	700	428.3
WKJC—Lancaster, Pa., Kirk Johnson & Co.	1160	258.5
WKRC—Cincinnati, O., The Kodel Radio Corp.	710	422.3
WKY—Oklahoma City, Okla., R. C. Hull & N. S. Richards	1090	275
WLAL—Tulsa, Okla., First Christian Church	1200	250
WLAP—Louisville, Ky., W. V. Jordan	1090	275
WLB—Minneapolis, Minn., University of Minnesota	1080	278
WLBL—Stevens Point, Wisc., Wisc. Department of Markets	1080	278
WLIB—Elgin, Ill., Liberty Weekly, Inc.	990	302.8
WLIT—Philadelphia, Pa., Lit Brothers.	760	394.5
WLS—Crete, Ill., Sears Roebuck Co.	870	344.5
WLSL—Cranston, R. I., The Lincoln Studies, Inc.	680	440.9
WLTS—Chicago, Ill., Lane Technical High School	1160	258
WLW—Harrison, O., The Crosley Radio Corp.	710	422.3
WLWL—N. Y. C., Paulist Fathers	1040	288.3
WMAC—Cazenovia, N. Y., C. B. Meredith	1090	275
WMAF—Dartmouth, Mass., Round Hills Radio Corp.	680	440.9
WMAK—Lockport, N. Y., Norton Laboratories	1130	266
WMAL—Washington, D. C., M. A. Leese Optical Co.	1410	212.6
WMAN—Columbus, O., Haskett Radio Station	1080	278
WMAQ—Chicago, Ill., Chicago Daily News	670	447.5
WMAY—St. Louis, Mo., Kings Highway Presb. Ch.	1210	243
WMAZ—Macon, Ga., Mercer University	1150	261
WMBB—Chicago, Ill., American Bond & Mortgage Co.	1200	250
WMBC—Detroit, Mich., Michigan Broadcasting Co., Inc.	1170	256.3
WMBF—Miami Beach, Fla., Fleetwood Hotel Corp.	780	384.4
WMBI—Chicago, Ill., Moody Bible Institute	1040	288.3
WMC—Memphis, Tenn., Commercial Publishing Co.	600	499.7
WMCA—Hoboken, N. J., Greely Square Hotel Co.	880	340.7
WMRJ—Jamaica, N. Y., Peter J. Prinz	1320	227.1
WMSG—N. Y. C., Madison Square Garden Broadcasting Corp.	990	302.8
WNAB—Boston, Mass., The Shepard Stores	1070	280.2
WNAC—Boston, Mass., The Shepard Stores	697	430.1
WNAD—Norman, Okla., University of Okla.	1180	254
WNAL—Omaha, Neb., Omaha Central High School	1160	258
WNAT—Philadelphia, Pa., Lennig Brothers Co.	1200	250
WNAX—Yankton, S. D., Dakota Radio Apparatus Co.	1230	244
WNBH—New Bedford, Mass., New Bedford Hotel	1210	247.8
WNJ—Newark, N. J., Radio Shop of Newark	1190	252
WNOX—Knoxville, Tenn., Peoples Tel. & Tel. Co.	1120	267.7
WNRC—Greensboro, N. C., Wayne M. Nelson	1340	223.7
WNYC—New York, N. Y., Department of Plants & Structures	570	526
WOAI—San Antonio, Tex., Southern Equipment Co.	760	394.5
WOAN—Lawrenceburg, Tenn., J. D. Vaughn	1060	282.8
WOAW—Omaha, Neb., Woodmen of the World	570	526
WOAX—Trenton, N. J., Franklyn J. Wood	1250	240
WOC—Davenport, Ia., Palmer School of Chiropractic	620	483.6
WOCL—Jamestown, N. Y., A. B. Newton	1090	275.1
WODA—Patterson, N. J., O'Dea Temple of Music	767	390.9
WOI—Ames, Ia., Iowa State College	1110	270
WOK—Homewood, Ill., Neutrowound Radio Mfg. Co.	1380	217.3
WOKO—Peekskill, N. Y., Harold E. Smith	1290	232.4
WOO—Philadelphia, Pa., John Wanamaker	590	508.2
WOOD—Grand Rapids, Mich., Grand Radio Co.	1240	241.8
WOQ—Kansas City, Mo., Unity School.	1080	278
WOR—Newark, N. J., L. Bamberger & Co.	740	405.2
WORD—Batavia, Ill., Peoples Pulpit Association	1090	275
WOS—Jefferson City, Mo., State Marketing Bureau	680	440.9
WOWO—Fort Wayne, Ind., Main Automobile Supply Co.	1320	227
WPAK—Agricultural College, N. D., N. D. Agricultural College	1090	275
WPAP—Cliffside, N. J., (See WQAO)	830	361.2
WPCC—Chicago, Ill., North Shore Congregational Ch.	1160	258
WPDQ—Buffalo, N. Y., Hiram L. Turner	1460	205.4
WPG—Atlantic City., N. J., Municipality of Atlantic City	1000	299.8
WPRC—Harrisburg, Pa., Wilson Printing & Radio Co.	1390	215.7
WPSC—State College, Pa., Pennsylvania State College	1050	261
WQAA—Parkersburg, Pa., H. A. Beale Jr.	1360	220
WQAC—Amarillo, Tex., Gish Radio Service	1280	234
WQAE—Springfield, Vt., Moore Radio News Station	1220	246
WQAM—Miami, Fla., Electrical Equipment Co.	1050	285.5
WQAN—Scranton, Pa., Scranton Times	1200	250
WQAO—Cliffside, N. J., Calvary Baptist Church (WPAP used when Palisade Amusement Park Program is on)	830	361
WQJ—Chicago, Il., Calumet Co.	670	447.5
WRAF—Laporte, Ind., Radio Club, Inc.	1340	224
WRAH—Providence, R. I., Stanley N. N. Real	1276	235
WRAK—Escanoba, Mich., Economy Light Co.	1170	256
WRAM—Galesburg, Ill., Lombard College	1230	244
WRAV—Yellow Springs, O., Antioch College	1140	263
WRAW—Reading, Pa., Avenue Radio & Electric Shop	1260	238
WRAX—Philadelphia, Pa., Beracah Ch. Inc.	1120	267.7
WRBC—Valparaiso, Ind., Immanuel Lutheran Church	1080	278
WRC—Washington, D. C., R. C. A.	640	468.5
WRCO—Raleigh, N. C., Wayne Radio Co.	1190	252
WREC—Coldwater, Miss., Wooten's Radio Shop	1180	254
WREO—Lansing, Mich., Reo Motor Car Co.	1050	225.5
WRHF—Washington, D. C., Washington Radio Hospital Fund	1170	256
WRHM—Minneapolis, Minn., Rosedale Hospital	1190	252
WRK—Hamilton, O., Doron Brothers Electric Co.	1110	270
WRM—Urbana, Ill., University of Ill.	1100	273
WRMU—Motor Yacht "MU-1," A. H. Grebe & Co.	1270	236
WRNY—N. Y. C., Experimenter Publishing Co.	800	374.8
WRR—Dallas, Tex., City of Dallas	1220	246
WRST—Bay Shore, N. Y., Radiotel Manufacturing Co., Inc.	1390	215.7
WRVA—Richmond, Va., Larus & Brother Co., Inc.	1170	256
WSAI—Cincinnati, O., United States Playing Card Co.	920	325.9
WSAJ—Grove City, Pa., Grove City College	1310	229
WSAN—Allentown, Pa., Allentown Call Publishing Co., Inc.	1310	229
WSAR—Fall River, Mass., Doughty & Welch Electric Co.	1180	254.1
WSAV—Houston, Tex., Clifford W. Vick	1210	247.8
WSAX—Chicago, Ill., Zenith Radio Corporation	1120	268
WSAZ—Pomeroy, O., Chas. Electric Shop	1230	244
WSB—Atlanta, Ga., Atlanta Journal Co.	700	428.3
WSBC—Chicago, Ill., World Battery Co.	1040	288.3
WSBF—St. Louis, Mo., Stix Baer & Fuller	1100	273
WSBT—South Bend, Ind., South Bend Tribune	950	315
WSDA—N. Y. C., Seventh Day Adventist Church	1140	263
WSKC—Bay City, Mich., World's Star Knitting Co.	1150	261
WSM—Nashville, Tenn., National Life & Accident Insurance Co.	1060	282.8
WSMZ—New Orleans, La., Sasnger Amusement Co. & Maison Blanche Co.	940	319
WSMH—Owosso, Mich., Shattuck Music House	1250	240
WSMK—Dayton, O., S. M. K. Radio Corp.	1090	275
WSOE—Milwaukee, Wisc., School of Engineering of Milwaukee	1220	246
WSRO—Hamilton, O., Harry W. Fahlander	1190	252
WSSH—Boston, Mass., Tremont Temple Baptist Church	1150	260.7
WSUI—Iowa City, Iowa, State University of Ia.	620	483.6
WSVS—Buffalo, N. Y., Seneca Vocational School	1370	218.8
WSWS—Woodale, Ill., Illinois Broadcasting Corporation	1090	275.1
WTAB—Fall River, Mass., Fall River Daily	1130	266
WTAD—Carthage, Ill., Robert E. Compton	1270	236
WTAG—Worcester, Mass., Worcester Telegram	550	545.1
WTAL—Toledo, O., Toledo Radio & Electric Co.	1190	252
WTAM—Cleveland, O., Willard Storage Battery Co.	770	389.4
WYAQ—Eau Claire, Wisc., C. S. Van Gordan	1180	254.1
WTAR—Norfolk, Va., Reliance Electric Co.	1150	261
WTAW—College Station, Tex., Agricultural & Mechanical College of Texas	110	270
WTAX—Streator, Ill., Williams Hardware Co.	1300	231
WTAZ—Lambertville, N. J., Thomas J. McGuire	1150	261
WTIC—Hartford, Conn., Travelers Insurance Co.	630	475.9
WWAE—Plainfield, Ill., Electric Park.	780	384.4
WWJ—Detroit, Mich., Evening News Association (Detroit News)	850	352.7
WWL—New Orleans, La., Loyola University	1090	275
WWRL—Woodside, N. Y., Woodside Radio Laboratories	1160	258.5

5 New Stations, All In Different States

WASHINGTON.

Five new stations have been licensed by the Department of Commerce, ten stations have changed their wavelengths, one station has changed its call, and seven stations have changed ownership.

NEW STATIONS

WKBM, J. W. Jones, Newburgh, N. Y. 215.7 m., 1390 kc.

WKBL, Monrona Radio Mfg. Co., Monroe, Mich. 252 m., 1190 kc.

WKBO, Camith Corporation, Jersey City, N. J. 309.1 m., 970 kc.

WCAZ, Carthage College, Carthage, Ill. 245.8 m., 1220 kc.

KPJM, Wilburn Radio Service, Prescott, Ariz. 215 m., 1395 kc.

CHANGES

KSBA, Shreveport, La., is now owned by W. G. Patterson. This station was formerly owned by W. L. Henderson I. W. & S. Co., and operated under the call of KWKH.

KOIL, Council Bluffs, Iowa, is now owned by the Mona Motor Company. The station was formerly owned by the Monarch Mfg. Co.

WBRC, Birmingham, Ala., has been transferred from the Bell Radio Corporation to the Birmingham Broadcasting Company.

WEHS has been changed from Robert E. Hughes, Evanston, Illinois, to Oliver G. Fordham, Chicago, Ill.

KMO, Tacoma, Washington, has been transferred from the Love Elec. Co. to KMO, Inc.

KFVD has been changed from McWhinnie Elec. Co., San Pedro, Calif., to C. I. McWhinnie, Venice, Calif.

KFBC, San Diego, Calif., has been transferred to the Union League Club by W. K. Azbill.

WDRC, New Haven, Conn. has changed its wavelength from 267.7 to 268 meters.

WBZA, Boston, has changed its wavelength from 241.8 to 333.1 meters.

KFYF, Oxnard, Calif., has changed its wavelength from 205.4 to 214.2 meters.

WSBT, South Bend, Ind., has changed its wavelength from 275.1 to 315 meters.

KSBA, Shreveport, La., has changed its wavelength from 312.3 to 312.6 meters.

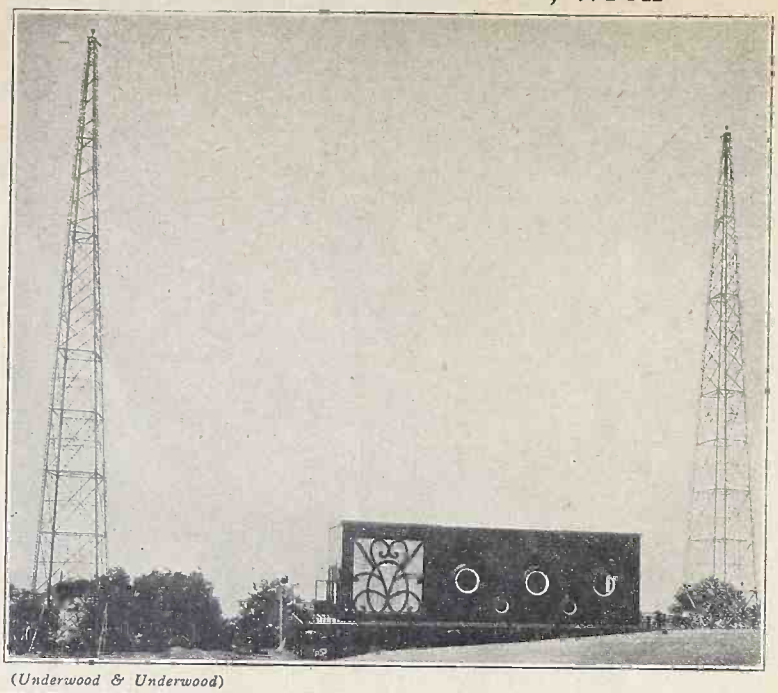
KOIL, Council Bluffs, Iowa, has changed its wavelength from 277.6 to 305.9 meters.

WAPI, Auburn, Ala., has changed its wavelength from 247.8 to 461.3 meters.

KFBC, San Diego, has changed its wavelength from 215.7 to 380 meters.

WIL, St. Louis, has changed its wavelength from 272.6 to 258 meters.

HOME OF NEW STATION, WPAP



(*Underwood & Underwood*)

WPAP, at Palisades Amusement Park, New Jersey, is in a large building designed to represent the Freshman Masterpiece receiving set.

THE RADIO TRADE

Canada the Leader On Our Export List

Purchased $3,682,928 Equipment, More Than 27 Per Cent of Total—Asia Second, Europe Third, Latin-America Fourth

WASHINGTON.

Canada was our leading market for radio apparatus during 1925, Asia ranked second, Europe third and Latin America fourth, according to statistics of the Electrical Equipment Division of the Department of Commerce.

Canada purchased equipment valued at $3,682,928, or more than 27 per cent of our total radio exports in 1925. South America bought $999,123 worth, or more than 10 per cent of total exports. The periods of maximum sales of radio equipment in Canada and South America are directly opposite. Sales during September to February in Canada are large, while the South American market is dull, and conversely, South America is an active purchaser from May through August, when the seasonal decline is in effect in Canada. Because of this variation sales promotion activities may be regulated by the American exporter so as to divide his efforts between the two markets according to the seasonal change.

Radio development in South American countries has progressed, but less rapidly than it has in Canada. Mexico, Central America and the West Indies are in general handicapped in radio development by the low purchasing power of the population and the almost constant static which makes reception nearly impossible in some regions.

INSTALL THE BRETWOOD GRID LEAK and thus avoid scratchy signals. Send $1.50 for this famous grid leak. North American Bretwood Co., 145 W. 45th St., N. Y. C.

Youngstown Set For Three-Day Show

YOUNGSTOWN, O.

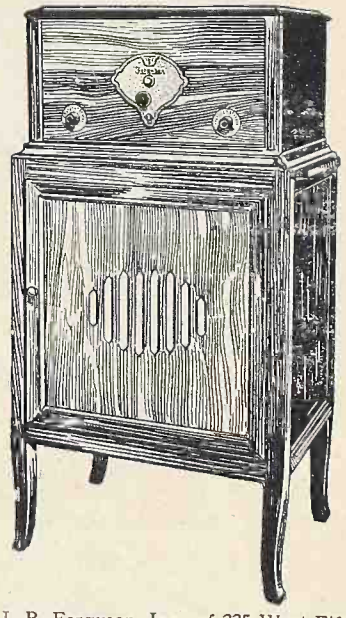
The first annual radio show ever held in this city will be put on in the Fitch garage at Wick and Commerce Streets, September 30 and October 1 and 2.

Thirty of the leading radio dealers of the city have signed up for space and the show has the indorsement of the Mahoning Valley Amateur Radio Association (a member of the American Radio Relay League) and the Youngstown Radio Dealers' Association.

FRESHMAN JOINS R. M. A.

Chas. Freshman Co., Inc., of New York and Chicago, manufacturers of Freshman Masterpiece radio receivers and other apparatus, have recently joined the Radio Manufacturers Association, embodying in its membership the foremost concerns in the radio industry.

Ferguson Model Ten Features Full Tone



J. B. Ferguson, Inc., of 225 West Fifty-seventh Street, have a new receiver, the Model Ten Ferguson, shown above, with single control, calibrated in meters. The receiver is sold with or without table. Six tubes are used—two radio, detector and two audio. Fullness and expression of tone are stressed in the set.

Welty's

RADIO PRODUCTS

A new Welty unit. Two step tuned R. F., all wired and ready to install in any set. The condenser o' NaAld made with localized tuning dials extending through the panel. All condensers may be operated simultaneously or separately. Equipped with either copper, shielded or unshielded R. F. coils of the plug in type. Absolutely dependable. Exceptiona selectivity. Excellent tonal quality.

Price, with Shielded Coil $32.50
With Unshielded Coils $28.50
Separate Coils, Shielded $12.50
Separate Coils, Unshielded $8.50

Welty's R. F. Amplifier Unit

WM. A. WELTY & CO., 36 South State St., Chicago

HEADQUARTERS FOR
1927 VICTOREEN
Complete stock of all parts for the Victoreen receiver, as specified by Arthur H. Lynch; also for the Lynch Amplifier and B Eliminator, and the A Eliminator.
CeCo Tubes, high mu Type G, or special detector type H, $2.50; type A, $2.
Also full line of Lynch Resistors, Tobe Condensers, National Illuminated Type C Dials, National Power Transformers, Chokes and Variable Condensers. Also all Bruno parts; switch, 75c; adjust. brackets, $1.25.
Complete Parts for Browning-Drake and Other Popular Receivers
Try-Mo Radio Company
9 West Broadway, near Barclay Street — New York City, Tel. Cortland 5079

BLUE PRINTS
for
1927 VICTOREEN
Circuit diagram and panel layout, price for both together $1.50
Blue Print for
LYNCH Lamp Socket Amplifier, $1.50
or $2.50 for all three
RADIO WORLD
145 West 45th St., New York City

Build Your Improved Browning-Drake
by the aid of
Popular Radio
SIMPLIFIED
Blue Prints
Easy, Quick and Accurate
The Improved Browning-Drake Broadcast Receiver, designed by Arthur H. Lynch, former Editor of Radio Broadcast and built and approved in the POPULAR RADIO LABORATORY.
Here is a receiver which combines all the advantages of a circuit that has long been recognized as standard with new ideas and improvements which have been made in receiver construction since the circuit was first designed.
High efficiency that emphasizes fine tone quality is the outstanding characteristic of this new model.
By using POPULAR RADIO Blue Prints in building your Improved Browning-Drake Broadcast Receiver, you can save time, eliminate the possibility of error, and make your set exactly like the laboratory model.
If your local dealer cannot supply you with Blue Prints of the Improved Browning-Drake they will be sent postpaid upon receipt of $1.00 per set.
A full description of this set, with detailed August, 1926, issue of POPULAR RADIO. directions for building, was published in the Send 35c for copy.
POPULAR RADIO
Service Bureau W
627 W. 43rd St., New York City

DESIGN DATA FOR RADIO TRANSMITTERS AND RECEIVERS, by M. B. Sleeper, sent on receipt of 75c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

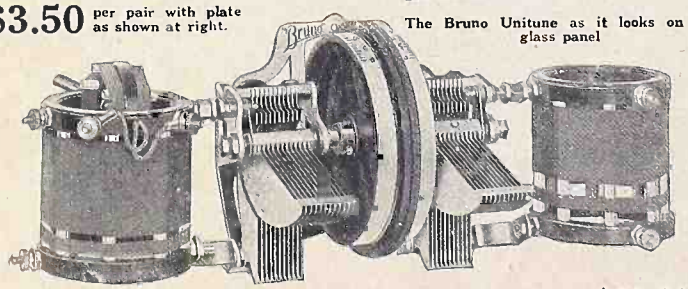
BIG RADIO BARGAIN!
The Biggest Value and Buy in a Life-Time. Genuine R-C-A Radiola III—(2-tube sets) complete with 2 R. C. A. WD-11 Tubes and one set of Brandes or Murdock Phones—(Your choice).
$12.95 COMPLETE SET
Packed in original cartons. Sold formerly at $35.00. FREE—One Lightning Arrester with each Radiola purchased. Extra Accessories for the above set: 2 Dry Cells, 1 "C" Battery, 1 large 45-volt "B" Battery. Complete set of Batteries at special price of $3.95. Shipped anywhere upon the receipt of Money Order for $5.00. Balance C.O.D. Postage extra
MAURICE SCHWARTZ & SON
710-712 Broadway, Schenectady, N. Y.

Silent "B" Power with World Radio Storage "B" Battery
12 Cells 24 Volts
Lasts Indefinitely—Pays for Itself
Dependable. Quiet "B" power, clear without "hum." Economy you have never before thought possible. Convenience. Outstanding performance. Recharged for almost nothing. Solid rubber case insures against leakage or acid. Extra heavy glass jars. Heavy rugged plates. Approved and listed as standard by Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc., and other Radio authorities.
Extra Offer: 4 Batteries in series (96 Volts) $10.50.
SEND NO MONEY! just state number of batteries wanted and we will ship same day order is received. Pay expressman after case insures batteries. 5 per cent discount for cash with order. Send your order today—NOW!
WORLD BATTERY COMPANY
1219 So. Wabash Ave. Dept. 82 Chicago, Ill
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. $10.50; 180 Amp. $12.50; 140 Amp. $13.25. All equipped with Solid Rubber Case.
World STORAGE BATTERIES
Set your Radio Dials for the new 1000-watt World Storage Battery Station, WSBC, Chicago. Always something interesting.
KDKA - WEAF - WGN - WJS - KHJ - KGO - KFAF - WJY - KOA

S. HAMMER RADIO CO.
303 Atkins Avenue, Brooklyn, N. Y.
Please send me FREE, Your NEW
RADIO CATALOG
Name .....
Address .....
City ..... State.....
FILL OUT AND MAIL

F R E E
NEW 1927 RADIO CATALOG
Write Today to
Chicago Salvage Stock Store
509 S. State St., Dept. R.W., CHICAGO, U.S.A.
MORE THAN a score of new kits—all the latest and best—with specified parts to build them—at prices that mean big savings for you. And all the latest parts and accessories as advertised in current radio magazines. The largest, most complete and up-to-date radio stock in the world. Yours to choose from in this new catalog. Write for your copy.


"Bruno" UNITUNE THE HEART OF THE CIRCUIT
Simplifies and Beautifies Any Set
The exquisite drum type of tuning is made available to home constructors of radio receivers by the brilliant ingenuity of William A. Bruno, who has designed the most beautiful drum tuning control on the market.
This is the Unitune, so-called because it enables the tuning controls to be adjusted, so tuning can be accomplished with one up or down motion. The drums themselves are independently available.
$3.50 per pair with plate as shown at right.

The Bruno Unitune as it looks on a glass panel


This model consists of basic Unit 2 C with one fixed R.F. Coupler and a Three Circuit Tuner mounted on condenser posts. Price complete **$20.00**
The UNITUNE R.F. consists of the basic condenser frame, model 2C, and two Bruno LOW LOSS R. F. transformers. This combination provides two radio frequency stages and covers a wavelength of 200 to 550 meters. Price, including panel plate and screws.....$17.00
The "CC" UNITUNE consists of one .0005 mfd. bakelite-shaft, straight line frequency condenser and a three circuit tuner on one frame, with regular Bruno drum control. Price $12.00.
The "CF" UNITUNE consists of "2C" unit with one fixed R. F. coupler & spoolnt three winding coil, with fixed primary and tickler, for use in capacity feed-back regenerative circuits. Price, $19.00.
The "B-D" UNITUNE consists of "2C" unit with two special Bruno Inductances for the BROWNING-DRAKE receiver. Price, $21.00.
SEND IN FOR FREE BOOKLET
For better reception use instruments manufactured by:
BRUNO RADIO CORPORATION 40 Payntar Avenue, Long Island City, N. Y.
NOTICE All regenerative UNITUNE Kits are licensed under the Armstrong patent No. 1,113,149 and are assembled by the Clapp-Eastham Company exclusively for us.

EBY Quality Sockets Are of Advanced Design

This ingenious socket appeals instantly to radio engineers and individual set builders. It maintains a three-point positive wiping contact at all times. Provides a shock-absorbing base which allows the tube to "float" when in service. And permits interchangeability and other desirable features of the marvelous new UX and CX tubes. **60c**

and EBY Binding Posts

provide a good electrical connection for any type of terminal. The tops don't come off..... **15c**

THE H. H. EBY MFG. CO.
4710 STENTON AVE.,
Philadelphia, Pa.

CARTER

Chosen for New Victoreen Circuit

No. 6 Jack Switch
Double Pole—Double Throw—complete with knob and pointer $1.60

"TIP" JACK
Fits any standard cork tip .....10c.

No. 2 Short Jack
Makes good contact with all plugs. Closed circuit, 30c ea.

Any dealer can supply.
In Canada—Carter Radio Co., Limited, Toronto

Carter Radio Co.
300 S. RACINE AVENUE
CHICAGO, ILL., U.S.A.

THE RECTAVOX AND THE VICTOREEN

$25.00 Complete

This charming Gothic mantel type reproducer is built especially to match resistance coupling. It will bring out all the true tones possible with the Victoreen Circuit.

The principle of the Rectavox is that of the violin—the resonant cabinet vibrates with the music throwing off the tones, full, clear and mellow. The Rectavox is beautifully made—genuine mahogany woodwork, two-tone bronze-finished grill, and a 20-foot cord for placing it where the best acoustical properties of the room may be realized. Hear the Rectavox and compare.

Best Manufacturing Company
1200 Grove St., Irvington, Newark, N. J.
Sales Dept.
The Hartzell Sales Company
50 Church St., N. Y. C.

THE TRADE-MARK

TOBE

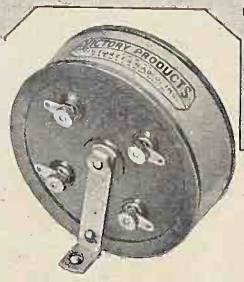
on the by-pass and filter condensers in your Victoreen Superheterodyne will insure your set against condenser trouble once and for all.

Used in the Lynch Power Amplifier for the filter and amplifier circuits.

Tobe Deutschmann Co.
Cambridge, Mass.

The CELATSITE
Wire specified for the 1927 VICTOREEN is made only by
THE ACME WIRE CO. New Haven, Conn.
ACME WIRE

DID YOU GET A COPY OF RADIO WORLD'S VACATION NUMBER DATED JUNE 12? This issue is full of information for summer vacationists. Some of the features are: The Light 5-tube Portable, by Herman Bernard, The Freshman Masterpiece, by Albert W. Franklin, The Importance of C Batteries, by John F. Rider, etc. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.



VICTOREEN SUPER COILS

Dependable Standardized Parts with a World Wide Reputation

The fact that Victoreen Super parts are used in many thousand sets all over the world is proof of their merit.

Victoreen Super sets are free from oscillation, howls or squeals. Their "B" Battery consumption is exceptionally low—less than some three tube sets.

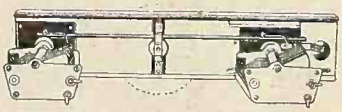
Victoreen R. F. Transformers are made with air core construction. They are not merely "matched" but are actually tuned to a guaranteed precision within 1/3 of 1%.

Victoreen Coupling Unit and Victoreen Antenna Coupler are made for use with R. F. Transformers.

Use These Parts

4 Victoreen 170 R.F. Transformers, each.....$7.00
1 Victoreen 150 Coupling Unit, each..... 5.50
1 Victoreen 160 Antenna Coupler, each..... 3.50

Victoreen Master Control Unit

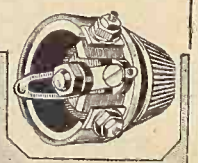


A completely assembled, convenient, single control unit for use on circuits employing two or more condensers of the same capacity. Easy to mount. Simplifies tuning.

Victoreen Master Control Unit, type V.S.....$19.50
Extra condenser 4.50

Victoreen Rheostats

Zero temperature coefficient. Double the number of turns of wiring used on ordinary rheostats. Three terminals simplify wiring. Five resistances, 2, 6, 10, 20, 30 ohms.....**$1.20 each**
Potentiometers 200 and 400 ohms .....**$1.50 each**



THE GEO. W. WALKER CO.
6528 Carnegie Ave., Dept. B., Cleveland, Ohio
Branches in Principal Cities

CONFESSIONS OF A SUPER BUG, by James H. Carroll, appeared in RADIO WORLD dated May 22. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

TABLE FOR CONVERSION OF FREQUENCIES AND METERS appeared in RADIO WORLD dated May 1, 1925. Sent on receipt of 15c, or start your sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

Increased Quality and Volume

with such systems as LYNCH Power Amplifier and B Supply and with VICTOREEN and BROWNING-DRAKE Circuits.

Two New, Ce-Co Tube Developments

TYPE "G"
HIGH MU

For Impedance or Resistance Coupled Receivers

Fil. V..... 5.0
Fil. Amp..... 0.25
Plate Volts..... 90-180

Gives Clearer Reproduction With Increased Volume.

Price $2.50

TYPE "H"
SPECIAL DETECTOR

Fil. V..... 5.0
Fil. Amp..... 0.25
Plate Volts..... 67-90

RATING

Improved Reception Especially on DX or Distant Stations.

Price $2.50

Write for data sheet covering complete line of CeCo Tubes

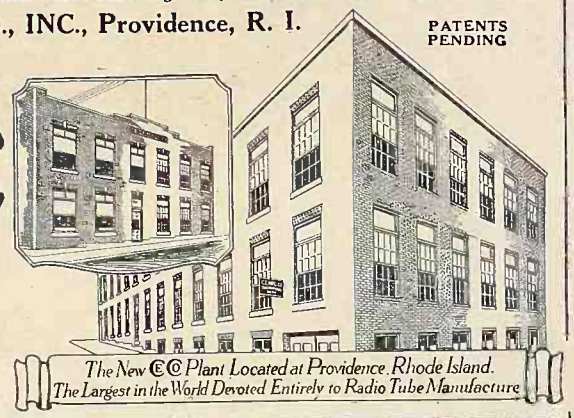
C. E. MFG. CO., INC., Providence, R. I.

PATENTS PENDING

MEMBER R.M.A.

CC TUBES FOR EVERY RADIO NEED

"Best by Test" in the laboratory.
"Best by Performance" in the home.



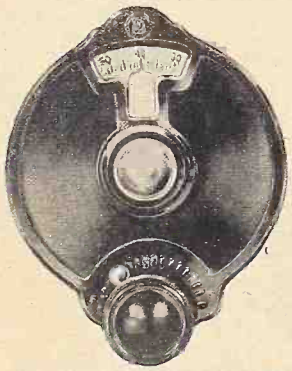
The New CC Plant Located at Providence, Rhode Island. The Largest in the World Devoted Entirely to Radio Tube Manufacture

NATIONAL

VELVET VERNIER ILLUMINATED DIALS, TYPE C
"EQUICYCLE" CONDENSERS

play their essential part in the perfection of the new Victoreen set, described in this issue of Radio World.

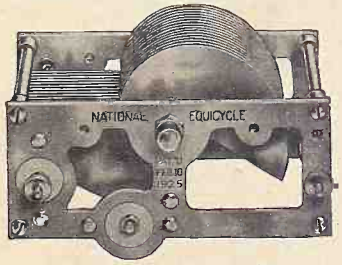
Ask your dealer to show you the NATIONALLY known NATIONAL Browning-Drake Coil and R. F. Transformers, now spacewound for sharper tuning—the NATIONAL Impedaformers for quality impedance coupled audio amplification. Send for Bulletin 116-R.W.



THE NATIONAL ILLUMINATED VELVET VERNIER DIAL, TYPE C

has its scale brightly lighted by a tiny concealed 6-volt lamp. Tuning is easy with this dial, for you can see the figures, and if the dial light is put on the filament switch it acts as a telltale for the tube. Easily and quickly installed by anyone with drill and screwdriver only. And this new dial retains every feature which has made the NATIONAL VELVET VERNIER Type A and B Dials so universally used.

Price, $3.00



THE NATIONAL "EQUICYCLE" CONDENSERS (SLF)

turn through 270 degrees instead of the usual 180, thus spreading out crowded stations still more. Their precision of action, freedom from wear, lightness, rigidity and exceedingly low minimum capacity recommend them to radio users who want only the finest components in their sets. Furnished with or without NATIONAL VELVET VERNIER DIALS.

Prices: With Type C Illuminated Dials:—

.0002S Mfd. $7.50
.0003S Mfd. $7.75
.0005 Mfd. $8.00

NATIONAL COMPANY, INC., makes the NATIONAL Tuning Units comprising NATIONAL VELVET-VERNIER DIALS, genuine NATIONAL Browning-Drake Spacewound coils and R. F. Transformers, and the NATIONAL Variable Condensers in a large number of different combinations suitable for the construction of practically any type of modern Radio receiving set. These are described in Bulletin 115-R.W., gladly sent you on request.

NATIONAL COMPANY, Inc.
W. A. READY, President **110 Brookline Street, CAMBRIDGE, MASS.**

Fingerprints Sent By Radio from Paris

PARIS.

By means of the Belinograph transmitters, which have been installed in the Prefecture of Police, Paris, photographs of fingerprints can now be flashed to other French cities, either over the telegraph wire or by radio, in a few seconds. In this way, it is now possible to transmit pictures of fingerprints of "wanted" persons, as well as their general description. This certainly is counted on to decrease the number of escapes. It is planned by other countries to install these instruments also, to aid capturing international thieves before they have a chance to cross frontiers. Heretofore rapid transportation has had to be depended upon.

With an increase in the power of these instuments, it is thought that these photographs may be flashed across the sea, much in the same style as the R. C. A. system does now.

Plenty of DX On 1926 Victoreen Super

RESULTS EDITOR:

I have built the 1926 Victoreen Super-Heterodyne and found it to be a wonderful receiver. I do not live in an ideal location for DX, yet Chicago stations can be tuned in as if they were locals. I have heard KTNT, WSB and WDAF with enough volume to fill a 7-room apartment.

EDWARD YOUNG,
213 8th St.,
Jersey City, N. J.

ELECTRAD
Certified Radio Parts

LYNCH METALLIZED
FIXED RESISTORS
ARE WARRANTED

Absolutely Noiseless
Permanently Accurate
MEMBER R.M.A. *Dependable!*

Write Us
ARTHUR H. LYNCH, Inc.
Manufacturers of Radio Devices
Fisk Bldg., Broadway & 57th Street
New York, N. Y.

BLUE PRINT and Book, DIAMOND OF THE AIR sent on receipt of 50c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

WIRELESS IN THE HOME, by Lee deForest, sent on receipt of 15c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

Heavy-Duty RADIOHM

for

Simple Control of B-Battery Eliminator

GET full efficiency from your "B" Battery Eliminator by installing a Centralab Heavy - Duty Radiohm. Full resistance variation with a single turn of knob, allowing panel marking for proper setting to provide various voltages. *Tested and approved by the Raytheon Laboratories.*

Resistance remains permanent as adjusted (no carbon particles or discs), and remains same for any knob setting regardless of how often adjusted. Bushing and shaft insulated to withstand 1500 volts. Its smooth and noiseless operation will greatly improve your set.

$2 at your dealer's or mailed direct on receipt of price

CENTRAL RADIO LABORATORIES

13 Keefe Ave., Milwaukee, Wis.

Makers of a full line of variable resistances for 69 manufacturers of leading standard sets.

Centralab

FREE BOOKLET FOR INVENTORS

IF YOUR INVENTION is new and useful it is patentable. Send me your sketch.

Z. H. POLACHEK, 70 Wall St., New York

Reg. Patent Attorney-Engineer

NEW 1927 FREE RADIO GUIDE

Newest Edition Ready

Shows the latest circuits, the newest developments in radio at startlingly low prices. Get the parts you want here and save money. The best in parts, kits, sets and supplies. Orders filled same day received. Write for free copy NOW; also please send names of one or more radio fans

CORWIK COMPANY, 102-140 So. Canal St., Chicago.

LATEST HOOK-UPS & RADIO CATALOG

TUN-A-LOOP

THE LOOP SENSATION OF THE NEW SEASON

AN ENGLISH-WHITMAN PRODUCT

If your dealer cannot supply you, write for information.

ENGLISH-WHITMAN PRODUCTS

120 Broadway New York City

Free

Mailing Lists

Will help you increase sales

Send for FREE catalog giving counts and prices on classified names of your best prospective customers—National, State, Local—Individuals, Professions, Business Firms.

99% Guaranteed by refund of 5¢ each

ROSS-Gould Co. 913 N. 10th St. St. Louis

LOOK UP DOWN

RADIO SERVICE

Radiola Super-Heterodyne Specialist

Designing - Building - Wiring - Repairs

FENWAY PARTS

FREE Handsome Leatherette Log and Data Book. Send Ten Cents to Cover Mailing Cost.

CHAS. W. DOWN, M. E.

2050 Broadway New York City

PHONE: TRAFALGAR 5979

"RAMBLER-SIX"

THE ONLY REAL PORTABLE

$90 without tubes or batteries

Satisfaction Guaranteed

WRITE FOR KIT PRICES

Approved by Radio World Laboratories

American Interstate Radio Service

183 Greenwich Street, New York City

Distributors, Jobbers, Dealers, write for special trade terms

CAN SELL YOU A STORE IN ANY LINE OF business; location anywhere. H. Landsman & Co., 1,440 Broadway.

EQUAMATIC SUITS EVERY AERIAL TYPE

(Continued from page 5)

would be far under the oscillation point at 200 meters.

In photograph B the dial is set at 100. The plates are all in. The coils are placed at the proper angles to tune a 600 meter wave.

In photograph C the dial has been turned to 50, throwing the condenser plates half way out—to tune to 300 meters—1,000 kilocycles. The primary has been automatically turned so that it is at one-half of the degree of coupling between maximum and minimum.

By minimum I mean the coupling for 200 meters—not zero.

Refer to photograph D. The dial has been set at zero. The condenser plates are all out—to tune to 200 meters. The coupling between primary and secondary is at a minimum—the equivalent of what would be 3½ turns on a primary coupled in parallel as in photograph B.

Another advantage of the Equamatic System is that it automatically compensates for any variation in the length of aerial.

Aerial Compensation

The ideal length of aerial is about 70 feet. But it does not make any difference how long the aerial is, the Equamatic System takes care of it. It is conceivable that with an exceptionally long aerial—and aerial having a high natural wavelength of its own—that it might be efficient to have a maximum coupling between primary and secondary at 200 meters and a minimum coupling between primary and secondary at 600 meters.

The Equamatic System accomplishes this in a very simple manner (Photograph E). This is the same as D with the ex-

(Concluded on page 27)

Silence!

Let your tubes *float* in the Na-Ald Silencer Socket

The slightest vibrations cause disturbing microphonic noises in the tube. The Silencer Socket floats the tube and absorbs all shocks—up, down, sideways and pivotal. The only socket on the market that does.

Positive contact over entire length of tube prongs. Contact is triple self-locking.

Soldered lugs under the socket provide connections for wiring above or below panel, or they can be removed and the binding posts used. Socket base is round, permitting mountings in any direction.

The Na-Ald Silencer Socket fits UV 201A and all UX tubes. Price 50c.

ALDEN MANUFACTURING CO.,
Dept. S-6 Springfield, Mass.

Alden Processed
NA-ALD
Sockets and Dials

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 145 *West 45th Street, New York City*
(Just East of Broadway)

Please send me RADIO WORLD for.....months, for which

please find enclosed .....

SUBSCRIPTION RATES:

Single Copy.....$ .15
Three Months..... 1.50
Six Months..... 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year for Foreign Postage; 50c for Canadian Postage.

.....

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(*Concluded from page 26*)

ception of the position of the primary angle. All that has been done is to turn the primary coil from a minimum coupling to a maximum coupling by adjusting it on the condenser shaft. It takes but a second to do this.

No matter what your length of aerial is you can adjust the primary coupling to compensate for it. It is not always necessary to change the coupling from minimum to maximum. It can be changed to any intermediate degree in accordance with the necessity provided by the length of aerial.

Photograph F is like photograph E, and illustrates how the coupling between primary and secondary can be tightened to compensate for a weak battery or old tubes.

All that has been done is to push the secondary forward toward and over the primary.

Full Value From Tubes

The beauty of this system is that you are enabled to take full advantage of the amplification factor of your tubes. It is not necessary to put a positive bias on the grid of your detector tube, nor is it necessary to insert any resistaance whatver in the plate circuit.

The laboratory experiments with the Equamatic System indicated that the condenser shafts should be placed seven inches apart center to center as a minimum. With the condenser shafts seven inches apart and with the coils set at a 58 degree angle there is practically no intercoupling of electrostatic or electromagnetic fields.

The sleeve fixture attached to the primary and which fits over the extended shaft of the condenser is of sufficient length to preclude any undesirable overlapping of the electrostatic fields with the electromagnetic fields.

A Battery Voltage

You may judge of the high efficiency result of this system when I tell you that it is naturally so sensitive that it will not pull more than 3½ volts A battery with 201-A tubes. As a matter of fact, the system is too sharp and too critical for the tubes.

In order to adapt the system so that it can be successfully and easily operated by any radio fan, it was found advisable to introduce a retard coil in the grid circuit. The effect of this coil is to cause the tubes to operate higher on their characteristic curves, giving a greater latitude of play for the rheostat.

Without this retard coil the slightest touch of the rheostat at any dial setting will throw the tubes into oscillation. With the retard coil there is plenty of latitude to move the rheostat a comfortable distance to control oscillations. In a 5-tube set, using the Equamatic System, the detector rheostat is 10 ohms. The two RF tubes are connected to a 30-ohm rheostat common to both tubes.

When the coupling is properly adjusted you can tune from one end of the broadcast scale to the other without the tubes oscillating in the slightest—but a slight turn of the rheostat dial will cause the tubes to break into oscillation at any point.

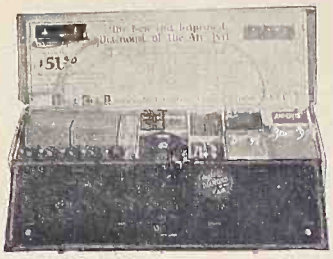
[*In next week's issue, the Fall Buyers' Number, dated October 9, will be published a complete exposition of how to build the Karas Equamatic 5-Tube Set, embodying the Equamatic system. The parts include, besides the Karas coils, condensers and AF transformers: One 7 x 28 in. Continental Fiber Co. panel, two Yaxley phone jacks, one Yaxley filament switch, one Sangamo .00025 mfd. fixed condenser with clips, one Amsco 2-meg. grid gate; two No. 1A Amperites, one Jones Multi-Plug, with mounting and 8 ft. cable and five Benjamin push type sockets.*]

THE "NEW IMPROVED"

DIAMOND OF THE AIR "KIT"

Complete Set of Parts for This Wonderful Set As Checked and Specified by HERMAN BERNARD

1 Bruno No. 99 R.F. Coil
1 Bruno No. 99 Tuning Coil
2 No. 101 .0005 S.F. Bruno Condensers
1 Bruno Pilot Light Switch
3 Bruno Bakelite Vernier Dials
3 ¼ Amp. Amperite (mounted)
1 ½ Amp. Amperite (mounted)
1 3½-1 Bruno Trutone Model D Transformer
2 .1 megohm resistors (General Resistor)
1 1 megohm leak (General Resistor)
1 .5 megohm leak (General Resistor)
1 Bretwood Variable Grid Leak
2 Double Circuit Jacks
1 Single Circuit Jacks
1 Century 7x24 drilled and engraved Panel
5 Pacent U.X. Spring Sockets
1 Century Drilled Socket Strip
1 Pr. Bruno Brackets
2 .25 mfd. Aerovox By-Pass Condensers
1 5 strand De Luxe multi-colored battery cable
1 Push Pull Battery Switch
1 .00025 Aerovox Cond.
4 Bruno Binding Posts
5 Battery Cable Markers
2 Flexible leads for C battery
4 Mounts
Bus Bar Screws, Spaghetti, etc.



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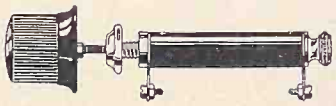
The Diamond of the Air Owes Some of Its Efficiency to This Leak

The BRETWOOD

Variable Grid Leak

Certified for The Diamond



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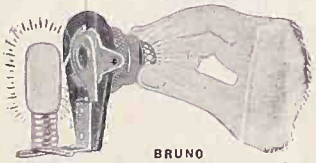

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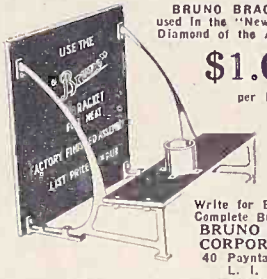

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General Resistor Products

Selected and Certified for the

NEW and IMPROVED

DIAMOND OF THE AIR

By HERMAN BERNARD

General Resistor Co., Inc.

190 Emmett Street, Newark, N. J.

Trickle Chargers for the Victoreen

Used With an A Battery, Even a Small One, They Solve the Tube Filament Heating Problem Very Nicely

[In the previous issue, September 25, Arthur H. Lynch described how to make the Lynch Lamp Socket Amplifier, which included a 3-stage audio amplifier system and A, B and C eliminators, to be used with the 1927 Victoreen, a 6-tube Super-Heterodyne, or other 8,000 receivers. The 1927 Victoreen was described September 18. In the present issue the use of sources other than eliminators, to be used in conjunction with the Victoreen, is discussed. Next week, October 9, the Fall Buyers' Number, Mr. Lynch will describe how to make the Lynch battery eliminator.]

As was stated last week, the abolition of the B battery, by the use of an eliminator operated from the light socket, has been done very satisfactorily. The eliminator and audio amplifier work the 1927 Victoreen or any other good set very well. A battery elmination, however, has found many obstacles and caused engineers to work day and night for the solution of the many tangles that present themselves. Some such eliminators have been perfected. A small sized storage battery, connected up with a slow charging apparatus, e. g., trickle charger, makes a fine A "near-eliminator." This system can be successfully used by those already owning storage A batteries, whether they be large or small. The service obtainable from trickle chargers is very satisfactory. Only the usual storage battery precautions are necessary. One must add distilled water to the cells of the battery, watch the condition of the plates, clean the posts from the corroding substances which accumulate, etc. When the complete A battery and trickler charger is purchased, usually a 40-hour ampere or even smaller sized battery is used. The battery need not be larger, since the charger charges the battery all the while the set it disconnected. The charge is at a very slow rate, approximately .6 amperes. If the battery were large and used for a great while, it would take a very long time to completely charge it.

Chemical cell or tube rectifiers are used in the trickle units. The General Elec-

"Outsell, Because They Excel"
Empire
A'l Types
Including NEW Detector (EX-200A) High MU and Power Amplifier
Ask for Folder "W" Write for Prices Dealers and Jobbers
EMPIRE ELECTRICAL PRODUCTS COMPANY
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A & B Battery Charger ONLY $2
SATISFACTION GUARANTEED

Charges any type of storage A or B battery, using a few cents worth of ordinary house current, either alternating or direct. Cannot injure battery. Complete directions enclosed. Anyone can operate. No expensive "extras" to buy. Why pay $10.00 to $15.00 for a charger when you can get this splendid GUARANTEED R. B. Charger by mailing us two dollars (bills, money order, check or stamps) plus ten cents in stamps or coin to pay mailing costs? Charger will be sent postpaid. If you are not satisfied, return within five days and we will refund your money. Order at once—TODAY.
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A Guaranteed Radio Tube Within Reach of All
Every tube guaranteed. A tube for a dollar of $2 value. A trial order will convince you as it has thousands of others. Send your orders at once. Orders sent C.O.D. parcel post.
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WFKB CHANGE

Announcement has been made by Ward S. Perry, (above), president of The Vesta Battery Corporation, Chicago, that Station WFKB, Chicago, has been bought by his corporation. WFKB has been operating for over a year on 217.3 meters as an experimental station, having been off the air temporarily. The station will use 1,000 watts.

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SALESMAN WANTED

MAKE $100 WEEKLY in spare time. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays $100 profit. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. OZARKA, INC., 431 N. La Salle Ave. R., Chicago, Ill.

PATENTS—Write for free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our Inspection and Instructions Free. Terms reasonable. Radio, Chemical, Mechanical, Electrical and Trademark experts. Victor J. Evans Co., 924 Ninth, Washington, D. C.

THE BROWNING-DRAKE CIRCUIT—Text and illustrations covering this famous circuit starting with our issue of Aug. 14. The 3 numbers sent on receipt of 45c. RADIO WORLD, 145 W. 45th St., N. Y. C.

GETTING MAXIMUM RESULTS with Super-Heterodynes by Herman Bernard appeared in RADIO WORLD dated May 15th. 15c per copy, or start your subscription with that issue. RADIO WORLD, 145 West 45th St. N. Y. City.

HOW TO USE AERIALS IN GROUND AND WATER, by Lewis Winner, appeared in RADIO WORLD, dated May 29. Sent on receipt of 15c, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

SELL AND INSTALL RADIO SETS. With a $25 capital we can put you in the radio business and show you how to earn a hundred or two a week. For full details write Guaranty Radio Goods Co., 145 West 45th Street, New York City.

VICTOREEN CIRCUIT

The series of Victoreen articles started in RADIO WORLD dated Sept. 11. Back issues sent on receipt of 15c a copy. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE VACATION NUMBER OF RADIO WORLD DATED JUNE 12 contained many great features. The light 5-tube Portable, by Herman Bernard. The Freshman Masterpiece, by Albert W. Franklin. The Importance of C Batteries, by John F. Rider, etc. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

GET THE COPIES OF RADIO WORLD YOU MISSED DURING THE SUMMER

We have put aside a supply of copies of RADIO WORLD published during the past summer. Let us know what dates you need to complete your files and these copies will be sent you for 15c each or any seven for $1. RADIO WORLD, 145 W. 45th St., N. Y. C.

Relays Make Bow to the Set Builder

Automatically Put Charger on When Set Is Off and Also Stop Replenishment at Full Charge

tric Co. has just introduced a trickler charger using a small Tungar rectifying tube. This charges at about .6 ampere.

To switch the battery from set to charger a switching arrangement is necessary. A double throw, double pole switch, or the electrically operated relay switches recently placed on the market may be used. One of the first of the relay switches for this use was put on the market by the L. S. Brach Co., of Newark, N. J. The Yaxley Co., of Chicago, is making an effective new electrical relay switch to serve this object. By means of these switches, it is only necessary to have a single filament switch on the panel. This controls the complete operation of the units.

When the filament switch is turned on, the circuit between the battery and the filament circuit of the set is completed.

Circuit Breaking

When the filament switch is turned off, a circuit breaker makes contact with magnets of the relay. Another circuit is then made. This connects the battery to the charger. When the battery is full, the circuit breaker opens. These units are operated direct from the 110 volt mains. There are some units operated from the mains that connect and disconnect the B battery eliminator and the A battery to the set, and connect the A battery to its trickler charger.

CIVIL SERVICE

The United States Civil Service Commission announces an open competitive examination for Junior Physicist. Applications must be on file at Washington, D. C., not later than October 9. The date for assembling of competitors will be stated on the admission cards sent applicants after the close of receipt of applications, and will be about ten days after that date.

The examination is to fill vacancies in the Bureau of Standards, Department of Commerce, Washington, D. C., and in positions requiring similar qualifications

The entrance salary for this position in the District of Columbia is $1,860 a year. After the probational period required by the civil service act and rules, advancement in pay without material change in duties may be made to higher rates within the pay range for the grade, up to a maximum of $2,400 a year.

WORLD'S FINEST LOUD-SPEAKER

A three-foot cone speaker—unit developed by the inventor of the Tropadyne. Easily assembled, saving 60% of the cost. Complete Kit with blue prints sold on rigid money-back guarantee — shipped prepaid or C.O.D. $10.

Engineers' Service Co.

THE BROWNING-DRAKE CIRCUIT

Full particulars of this circuit appeared in RADIO WORLD, dated Aug. 14, 21 and 28. Any copies sent for 15c each, or the entire three copies for 45c, or start your subscription with any of these numbers. RADIO WORLD, 145 W. 45th St., N. Y. C.

SICKLES DIAMOND WEAVE COILS

Sturdy, compact, sharp-tuning, Sickles coils means low distributed capacity, low dielectric losses, and wide range of frequency, with small variable capacity.

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140 Union Street, Springfield, Mass.

No.	Coil	Prices
30	Shielded Transformer	$2.00 each
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18A	Roberts Circuit	8.00 set
25	Aristocrat Circuit	8.00 set

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SERVICE FOR SET BUILDERS

KIT OF COMPLETE PARTS FOR THE DIAMOND-OF-THE-AIR
$37.50

HARD RUBBER
SHEET—ROD—TUBING
Special Hard Rubber Parts Made to Order
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NEW YORK HARD RUBBER TURNING CO.
212 Centre Street New York

"B" BATTERY ELIMINATOR

Only $7.95

MONEY-BACK GUARANTEE

No more worry with "B" Batteries! Throw the worn-out old cells in the ash can! Hook up a Roll-O "B" Battery Eliminator and forget battery troubles forever. This wonderful new invention means better reception, sharper tuning. Gives you more real pleasure from your set.

Completely Equipped—No "Extras" to Buy

Operates perfectly on direct or alternating current, giving up to 90 volts current, and using the full wave of the power supply. Simple directions enclosed—any one can plug it in to any kind of set up to six tubes. Constant voltage gives set more power without danger of burning out tubes. Costs no more than set of good "B" Batteries. Solidly built in beautifully finished metal case, with genuine bakelite top.

Send $1.00

Send Your Order Now

Don't blame your set because run down "B" Batteries won't let it work right. Order your Eliminator NOW. Former price $12.95. Now cut to $7.95. Write name and address on a piece of paper, pin a dollar bill to it, and mail it TODAY. Pay postman balance ($6.95 plus a few cents postage) when he delivers your Eliminator. Use it ten days. If not more than satisfied, return it and get your money back.

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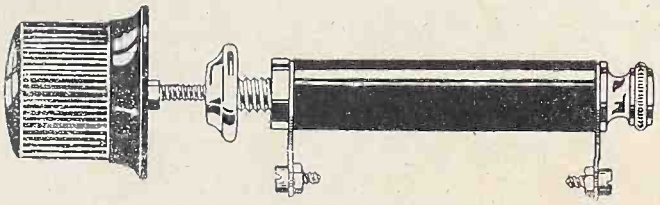
EXQUISITE CARE

Is Taken at the Studio and in the Control Room to Give Listeners the Best Possible Tone Quality.

WHAT ARE YOU DOING

At the Receiving End to Capitalize This Expert Solicitude? Are You Letting Your Detector Tube and Your Last Audio Tube Overload and Distort?



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Guaranteed Precision Range, 0 to 10 megohms.

Connect a BRETWOOD Variable Grid Leak in the detector circuit of your set and turn the knob until the signals clear up beautifully.

Use a BRETWOOD Variable Grid Leak across your last stage audio transformer, or put one in place of the fixed leak in the final grid of impedance or resistance coupled audio. Turn the knob and note the amazing improvement in quality.

In any circuit where a grid leak has to be used its value in ohms is important. Conditions differ in individual circuits and with different equipment. Experts cannot specify definite values that are applicable to all cases. The variable leak takes the guesswork out of the grid circuit, and the BRETWOOD is the best for the purpose. "It Does the Trick!"

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Enclosed find $1.50, for which send me one BRETWOOD Variable Grid Leak on five-day money-back guarantee.

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B—Beauty
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BST-5 RADIO RECEIVER
CERTIFICATION EXCELLENT
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VERIFIED BY
TESTS MADE BY
August 15 1926
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This RADIO RECEIVER has been subjected to the various rigid tests of our laboratories and has been found to possess all the high standards adopted for this
GUARANTY RADIO GOODS COMPANY
The article complies fully with all modern radio engineering principles of this class.
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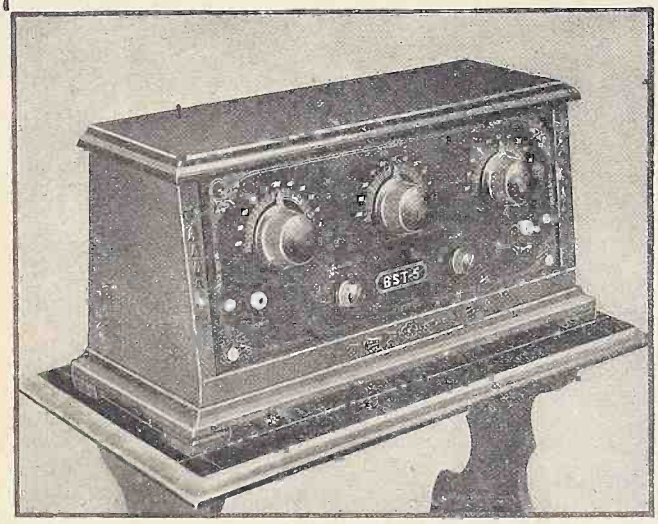
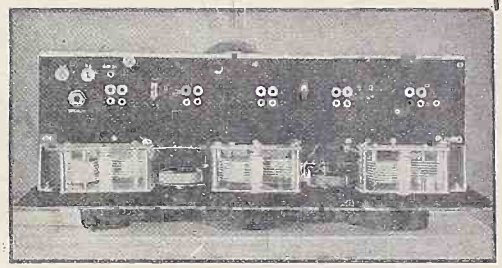
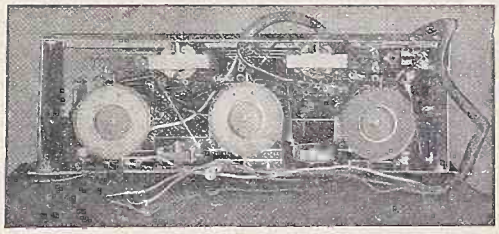
1927 Model Shielded Radio Receiver
Powerful, Selective, Highly Sensitive
A $75 Set Sold Direct From Factory at $40



New model cabinet, Du Pont Duco finish; base 21" long by 8" wide, height 9½", top 21" by 6" Five-ply walnut veneer piano finish.



Top inside view, BST-5, showing compact aluminum shielded indestructible chassis.



Bottom inside view, BST-5, showing improved foolproof curkoid coils and rigid construction, with complete harness for simple installation.

THIS highly sensitive, powerful and selective BST-5 radio receiver has all up-to-the-minute improvements. Heavy aluminum automobile type chassis, shielded against stray currents and distortion. Flexible grip, Universal type sockets, eliminating microphonic noises. Has provision for battery eliminator and any power tube. Fahnestock clips on sub-panel for adjusting C battery, has voltages for power tube. Efficient on either long or short aerial, including indoor aerial. This BST-5 sets a new standard for true tone values and selectivity. This BST-5 gives greater volume than many six-tube sets and consumes less current.

28 Stations in 3½ Hours

Mr. E. H. Thiery, Tax Collector, New Hartford, Conn., writes: "I am well pleased with my BST. In three hours and a half last night I got the following stations: WTIC, WJZ, WGY, WBZ, WPG, WNAC, WMSG, WEEI, KDKA, WAAM, WEAN, WSAR, WJBI, WMAC, WLWL, WJAR, WAHG, WBNY, WEAF, WNJ, WCSH, WSAN, WHK, WMCA, WRVA, WHN, WHAR, WWJ.

GUARANTEE

Satisfaction or Money Back

Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition.

Workmanship throughout guaranteed the best. Assembled by experts.

Immediate Delivery

$40.00

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GUARANTY RADIO GOODS CO., 145 West 45th St., New York, N. Y.

RADIO WORLD Guarantees the Responsibility of This Advertiser

Some People Will never Learn—
The Truth About Radio

MANY a new radio will perform perfectly. Whether it continues to do so or not will depend entirely on one thing—the very truth that is seldom discussed.

Do you drive a car?

Don't little troubles happen occasionally?

Do you depend on a handy man for service or do you prefer a mechanic who has been factory trained on *your* make of car?

Experience has, no doubt, proven to you that men who know *all* about *all* makes of cars generally don't make the best mechanics to work on *your* car.

You wouldn't think of buying any car, no matter how low its price, unless you knew you could receive service by men who know how.

Treat the purchase of a radio instrument in exactly the same manner if you wish lasting satisfaction.

Service is just as necessary, just as important on a radio instrument as it is on an automobile.

Occasionally little things will go wrong. They will be serious to you and almost as serious to the handy man who can fix all radios but—

Such troubles will mean just a few seconds' time to a factory trained service man who knows that make of radio as he should.

While radio is rather a new industry, even now there are 4364 factory trained Ozarka service men—let us give you the name and address of the one nearest you.

Allow him to set up an Ozarka in your home.

He will let you do all the tuning so that you can satisfy yourself as to exactly what it will do for distance, volume, tone and ease of tuning.

His factory training enables him to keep every Ozarka which he sells, working just as it did when new.

Any radio, no matter what its price may be, will only be as satisfactory as the trained service behind it.

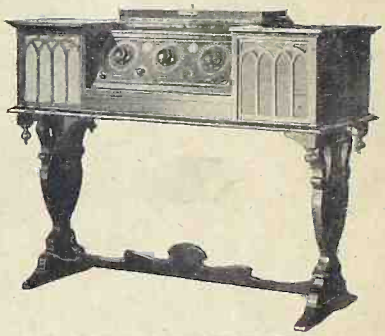
OZARKA
INCORPORATED

120 W. Austin Avenue E CHICAGO, ILL.

OZARKA
TRADE MARK REGISTERED

$132.50 Plus installation and transportation; Ozarka Senior 5 Tube Model complete with Loud Speaker and all accessories.

$100 Plus installation and transportation Ozarka Junior 5 Tube Model complete with built-in speaker and all accessories.



$215 Plus installation and transportation Ozarka Console 5 Tube Model, solid walnut cabinet, complete with all accessories.

We have a few Openings for the Right Men

WHILE there are today 4364 Ozarka representatives, some territory is still open. We want men who believe in the future of radio—men who are tired of working for some one else—men who would like to add to their present income by devoting their evenings to Ozarka.

At the start you can keep your present position. Later on, after you have proven what you can do, then you will give us all your time because it will pay far more than your present position.

The man we want may not have much money but he is not broke. He has lived in his community for some time—he has a reputation that his word is good. He may not have made any startling success but he has never "put over something" just to make money. He may know nothing about radio or salesmanship but he will be successful if he is willing to study what we are willing to teach him, without cost.

The field in radio is wide open for the trained man. The success of the 4364 Ozarka representatives proves what men can do. If you are interested, ask for a copy of the Ozarka Plan, a 108 page book which tells a true story of how big money and a permanent business can be built in radio. It is a story of life; of why some men fail while others succeed. This book has shown many men how to start making extra money immediately and within a very short time establish a business of their own.