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RADIO WORLD

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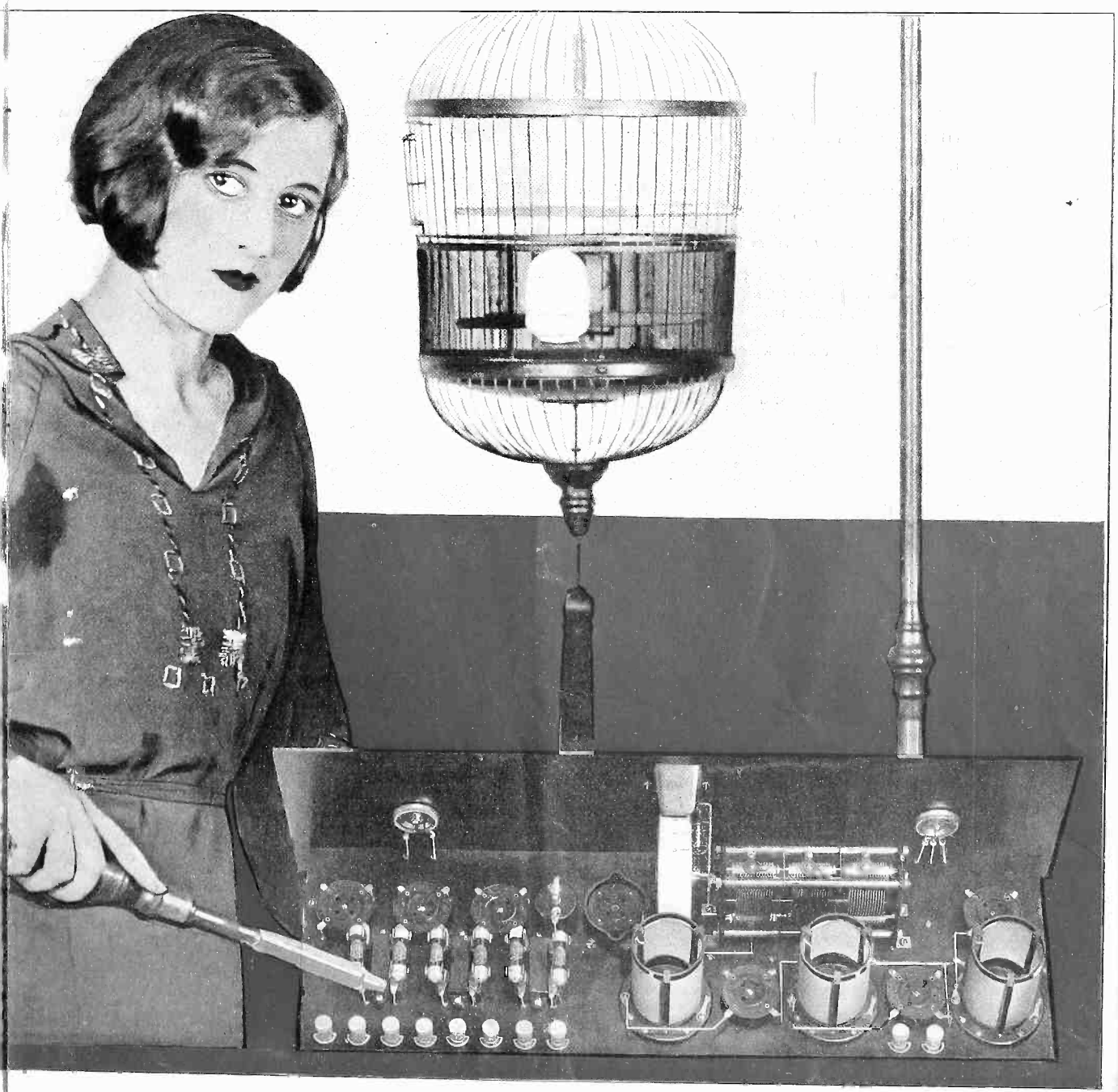
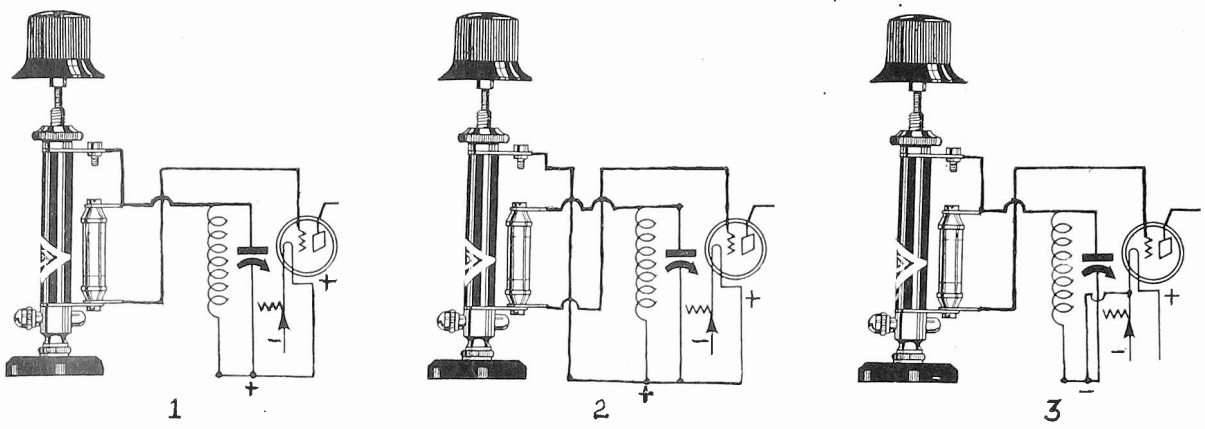
WORLD

America's First and Only National Radio Weekly



THE AERO-SEVEN. SEE PAGE 3.

"YOU WILL When You Know Why"



THERE are a great many things a person will NOT do, because he does not know of a good reason for doing them. And that is a good reason for NOT doing them.

If you do not know why you should have a variable grid leak in your receiver, then you are satisfied to be without one. But if you know why you should have a variable grid leak, then you will be dissatisfied without a Bretwood!

ONE The main reason for using a variable grid leak is to obtain maximum efficiency from your detector tube. By turning to the correct leak setting you establish greatest sensitivity, fullest volume. Exactly what that resistance value should be can not be told in advance. You simply turn the knob of the Bretwood Variable Grid Leak until your ear tells you that best results are being achieved. Then you may leave the leak setting in that position forever afterward.

"My Good Luck"

I read about the Bretwood Variable Grid Leak and decided to buy one. I tore off and filled out the coupon. I enclosed my check with the coupon and you promptly sent me the leak. While I did not immediately become a millionaire after tearing off that coupon, nor had my salary raised $5,000 a year, I nevertheless consider it was my good luck and not yours that the leak was sold to me. Why? Because I can bring in stations with that Bretwood Leak in the set that I can not bring in with any fixed leak of any resistance. My advice to others is: Fill out that coupon!—B. A. Reiners, 127-A Clarkson Ave., Brooklyn, N. Y.

North American Bretwood Co.,
145 West 45th Street, New York City.

Gentlemen: Enclosed find $1.75. Send me at once one De Luxe Model Bretwood Variable Grid Leak on 5-day money-back guarantee. (Or $2.25 for leak with grid condenser attached.)

NAME .....

ADDRESS .....

CITY ..... STATE.....

Dealers: If your jobber can't supply you, write us.

TWO A variable grid leak atones for any discrepancy in the capacity of a fixed grid condenser you may be using, and dispenses with the necessity of a variable grid condenser. Leak and condenser together must equal a certain product. Use a fixed condenser and a variable leak to obtain the result.

THREE When you get a new detector tube you adjust the leak to the new tube's needs, instead of buying a new leak to match the tube.

How To Connect the Leak

In the diagrams the bullet condenser is shown attached to the leak.

No. 1 shows the commonest way of connecting a grid leak, that is, in parallel with the grid condenser, the grid return being made through the secondary coil to positive A. No. 2 shows the method of connection where the grid is to be returned to positive A, although the coil may be connected either to plus or minus. In the diagram it is shown going to plus, but it could be moved over to minus without short circuit. This hook-up is used for gang tuning condensers.

No. 3 is the same as No. 1, except that the return is to negative filament instead of to negative A. The No. 3 method is for the special detector tube, e. g., 200A, 300A, etc.

North American Bretwood Co.

145 West 45th Street,
New York, N. Y.

SIXTH YEAR

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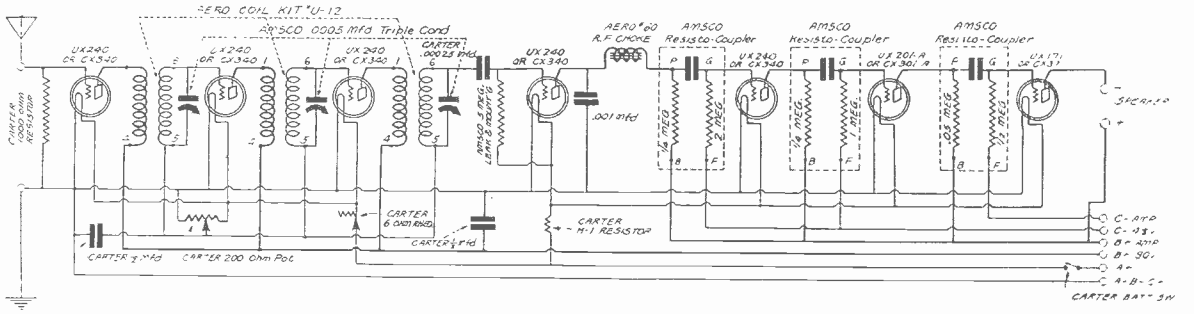
The Aero Seven

A Single Dial Set That Maintains Full Sensitivity Over the Entire Broadcast Band

By Zeh Bouck



The Aero-Seven shown in schematic diagram.

OF all technical nomenclature, the term efficiency is probably the most often misapplied. Efficiency is the ratio of work put into a machine over work accomplished by the machine—input over output. Perhaps we shall be guilty of another sacrilege against the concise terminology of science when we become a little more liberal and assume efficiency, in the long run, to mean nothing more than satisfaction per dollar. As a matter of fact, this is the only interpretation of efficiency applicable to a radio set as a whole. For while the efficiency, if individual operations, can be calculated, and directly effect reception, the over-all efficiency of the set is a meaningless expression. Such subtle things as quality, ease of control, and general simplicity are factors that contribute to the broader efficiency we have the temerity to suggest.

The Aero-Seven is a highly efficient receiver. It fills practically all the requirements of the ideal receiver which may be outlined as follows:

Only One Tuning Dial

The number of tuning dials should be limited to unity. A single dial receiver is certainly most easily tuned, a simplicity that reflects the fact that radio has been graduated from the laboratory stage and has now become an instrument of pleasure, to be operated by the casual pass of the hand from an easy chair. Selectivity should be perfect. That is, the receiver should tune neither too sharply nor too broadly. Either variation from the optimum is most undesirable. If a station tunes too broadly, interference will be experienced. One local station will often interfere with another, not to mention the impossibility of tuning through locals for distance when the lure of many miles impells.

If a receiver tunes too sharply, side bands, frequencies affected by audio notes, will be cut off, with resulting distortion. The receiver is then said to have a high cut off. The effect is similar to the output of certain poor audio amplifying transformers. The tone is drummy, muffled.

It should be possible to control the selectivity of the receiver. from a comparatively insensitive state to the point where it readily detects relatively small impulses. In other words the volume control should be confined to the radio frequency circuit.

If a receiver operates at all times at maximum sensitivity, the noise level will always be at its highest point, regardless of whether distant or local stations are being received.

Good All the Way Through

The extreme sensitivity required for the reception of DX necessarily sensitizes the receiver to extraneous and stray waves. Such sensitivity is quite unnecessary on local stations, where, aside from introducing disturbing noises, it generally results in overloading various tubes with resulting loss in quality.

The volume or sensitivity control also should effect the desired control without broadening tuning to more than a negligible degree.

Assuming these various approaches to perfection in the radio frequency sections of the receiver, an audio amplifier of comparable worth is essential to justify the electrical efficiency achieved.

The Aero Seven

To call the Aero-Seven "just another circuit" would do this receiver a gross injustice. As a matter of fact it is not another circuit. It is a combination of well-known circuits so modified that its action confirms very closely to the requirements for the ideal receiver outlined above.

Alignment Achieved

Single dial control of several R. F. circuits is achieved by well-designed tandem tuning. The problem of simultaneous tuning has always been the alignment of the various circuits. For successful tandem tuning the inductive values and the capacitative values in each circuit must be accurately matched at all frequencies. It has been very difficult to do this for two reasons.

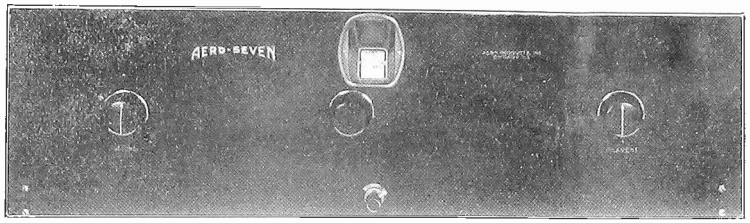
It is a painstaking and highly scientific task to match all coils and condenser sections. Even with these elements carefully checked, the capacitative and inductive effects of the proximity of parts and wiring introduce perplexing discrepancies. Also, the antenna coupling to the first R. F. tube often renders the tuning line of the first circuit inconsistent with that of succeeding circuits—an inconsistency which varies with the electrical characteristics of antennas.

The Aero coils are matched with a satisfactory degree of precision, immediately eliminating a possible factor for failures. The same may be said of the Amsco Triplet condenser. Each section of this condenser is equipped with a small equalizing or compensating capacity which can be varied to compensate stray circuit capacities. Stray inductive effects are matched by careful layout and design of wiring. (It is therefore inportant that drilled panels be obtained for this receiver, and the layout followed in every detail.)

Antenna Capacity Effect

The effect of the antenna circuit on the first tuned circuit is eliminated in the Aero-Seven, by coupling the antenna to the first tube by means of a resistance connected between antenna and ground as shown in the schematic diagram. The first R. F. tube therefore acts as an untuned radio frequency amplifier.

The optimum value of selectivity has been attained in this receiver. The circuits cover, over a wide range of wavelengths, a frequency band closely ap-



The front panel of the Aero-Seven.

proximating ten kilocycles—five kilocycles on each side of the fundamental frequency. This condition is achieved through careful coil design in combination with an efficient gain or sensitivity control.

Extreme sensitivity can be obtained with this receiver. The coils are characterized by low radio frequency resistance (genuinely scientific low loss construction) which results in a high amplification factor. Also, the design of the coils is such that there exists little inter-stage coupling. Amplification therefore approaches a true cascade effect, with high amplification and a thoroughly satisfactory degree of selectivity.

High-class R. F. and A. F.

The potentiometer volume control is not included in the tuned oscillatory circuits. It therefore has no effect on the damping of these circuits with resulting broadening of tuning. Whatever broadening exists is due to reduced regeneration, but never exceeds a highly satisfactory tuning characteristic.

Thus it is seen that the radio frequency section of the Aero-Seven is so designed to provide a high degree of radio frequency efficiency compatible with perfect quality. The entire reproduction of the detector tube is preserved throughout the audio amplifier. Amplification is effected by means of resistance coupling, acknowledged by the majority of engineers to give the closest approach to distortionless amplification.

The exact list of the parts used in the construction of this receiver is published herewith. Considering the equalizing problems involved in tandem tuning arrangements, it is recommended that the amateur confine himself strictly to the recommended apparatus, even in such seemly inconsequential parts as bypass condensers, rheostats and resistors.

* * *

Part II of this article will appear in Radio World next week. Detailed instructions on the wiring of the Aero-Seven receiver will be given. In the issue of October 22, Mr. Bouck will describe an all-electric model, with a special eliminator, designed for the Arcturus A C tubes.

LIST OF PARTS

	List Price
One Aero-Seven Foundation Unit ..	$12.00
One Aero Choke Coil-60	1.50
One Aero Kit of Coils U-12	12.00
One Silver-Marshall Drum Dial ...	3.00
One Carter "Imp" Battery Switch .	.65
One Carter "Imp" 200-Ohm Potentiometer	1.25
One Carter "Imp" 6-Ohm Rheostat	1.00
One Carter H-1000 Resistor	.30
One Carter H-1 Resistor	.25
One Carter .00025 Mfd. Condenser .	.40
Two One-half Mfd. by-pass condenser -205, 90c each	1.80
One Carter .001 Mfd. Condenser ...	.50
Ten XL Binding Posts, lettered-serial, ground, "A" battery plus, "A" battery minus, a "B" batteries minus, "B" 90 volts, speaker minus, amplifier B-X	1.50
One Amsco Floating Socket	1.00
Six Plain Sockets, 50c each	3.00
One Amsco .0005 Mfd. Triplet Condenser -1526	11.25
One Amsco Grid-Gate Mounting ..	.30
One Amsco 5 Meg. Grid-Gate	.50
One Amsco Resistance coupled audio kit	7.00
TOTAL	$59.20

The Strange Example of a Ga'n(ul Loss

By J. E. Anderson

The voltage step-up obtainable with a tube and transformer depends on the frequency, the mutual inductance between the two windings of the transformer and on the primary and secondary resistances.

The primary resistance is mainly the resistance of the plate circuit of the tube while the secondary resistance is the effective radio frequency resistance of the tuned secondary circuit.

For greatest step-up in the voltage the mutual impedance should be equal to the square root of the product of the two resistances.

The mutual impedance is the product of the mutual inductance between the coils and 6.28 times the frequency. For example, if the mutual inductance is 20 microhenrys and the frequency is 1,000,000 cycles, the mutual impedance is 126 ohms. If the primary resistance is 20,000 ohms, the secondary resistance would have to be only .8 of an ohm for greatest voltage step-up.

Even when the primary is not tuned, as is usually the case, the same rule holds approximately because the resistance in the primary is very much greater than the effective reactance.

Frequency Effect May Be Used

At a given frequency, coupling and primary resistance the secondary resistance can be varied to obtain greatest voltage gain. Suppose the mutual inductance is 80 microhenrys, the primary resistance is 20,000 ohms, and the frequency 1,000,000 cycles, what should the secondary resistance be for greatest voltage step-up? The mutual impedance is 503 ohms, the square of which is 252,500. This should be equal to the product of the two resistances. Since the primary resistance is 20,000 ohms, the secondary must be about 12.6 ohms.

Suppose the resistance in the primary circuit is only 10,000 ohms with the other conditions remaining the same. What should the resistance in the secondary be then? It should be twice what it was with the 20,000 ohm primary, or 25.2 ohms. Thus when the primary resistance is decreased the secondary has to be increased.

What effect has varying the mutual inductance on the required secondary resistance? We saw previously that when the mutual inductance was 20 microhenrys the mutual impedance was 126 ohms, and that the required secondary resistance was .8 ohm when the primary was 20,000 ohms. With a resistance of 10,000 ohms in the primary the required secondary resistance would have to be 1.6 ohms. Thus reducing the mutual inductance, or the coupling, between the coils decreases the required secondary resistance.

A variation in the frequency has the same effect as a variation in the mutual inductance, when the other conditions remain the same.

The closer the coupling is between the two coils the lower will be the selectivity. When the object is to get a very great selectivity the coupling should be made loose and the secondary resistance should be decreased, if it is desired to retain the maximum voltage step-up with the increased selectivity.

When high selectivity is not required the coupling can be made close and the secondary resistance made higher to stay on the peak of voltage step-up.

One place where this procedure is possible is in the intermediate frequency transformers in a super-heterodyne. A very high selectivity is not desired here, because it would suppress the higher notes in the sidebands, but a high voltage step-up per stage is desired. Hence intermediate coils can be wound with fine wire and closely coupled to each other.

Magnaformer an Example

Suppose the matching of the transformer is not satisfactory after it has been wound, because its secondary resistance is too low. This is easily remedied by putting a suitable eddy current "losser" in the field. By this means almost any desired resistance can be introduced into the secondary circuit. This losser may actually increase the voltage step-up and the sensitivity of the circuit, rather than reduce them, as in the Magnaformer.

There is no contradiction of terms involved here, though at first thought it seems so. The energy lost is drawn from the B battery and not from the signal energy.

U. S. Largest Exporter; Germany Close Second

The United States was the largest exporter of radio apparatus during 1926, 29.4 per cent of the total of international radio trade being credited to them, according to H. E. Way of the Department of Commerce's electrical equipment department. About $30,000,000 of business was executed between all the countries.

Germany was the closest competitor, with 25.6 per cent. Great Britain followed with 20.5 per cent, while France shared 13.7 per cent of the business. Although the exports from the United States decreased 12 per cent in 1926 as compared with 1925, the first half of this year shows an increase of $450,000, $3,705,861 being taken in. There was a great increase in receiver exports, e. g., 27 per cent, for a total of $1,128,625. Tubes also showed an increase of 25 per cent or a total of $501,206.

The Tube Is Dead Long Live the Tube!

By Seymour Fallon

A VACUUM tube is rated at a certain number of hours of use. For example, an average tube of a type is rated at 2,000 hours of continuous service when operated under certain conditions.

But the life of a tube is just as uncertain as the life of a man.

It may be long and it may be short, depending mainly on the abuse to which it is subjected in service. There is only a certain amount of life-giving element in the filament of a vacuum tube—and that is fairly constant for all the tubes of a type—but the length of life depends on the rate at which this life giving element is used up.

The one thing that determines the rate at which the tube is used up is the plate current that is flowing. The higher the plate current is, the shorter will be the life of the tube, and conversely, the lower the plate current is the longer will be the life.

Accidents are not supposed to happen.

Current Should Be Moderate

To gain long life with a given tube and at the same time get the best results out of the tube it is necessary to keep the current down to moderate values and boost the voltages. But the voltages should not be increased if that in turn increases the plate current. The tube can always be operated with a high voltage and a moderate current.

One of the chief factors in determining the flow of current in the plate circuit is the temperature of the filament. This in turn is determined by the heating current. It is desirable to have the filament hot enough to insure an ample supply of electrons to prevent overloading. It is not necessary to reduce the filament current below normal to protect the tube against premature death, but it is highly desirable to keep the temperature at normal value for that reason. With normal filament current flowing it is a simple matter to protect the tube against excessive plate currents.

Two Limitation Methods

With a given value of applied plate voltage there are two ways of limiting the plate current. The first is the use of a high resistance in the plate circuit and the other is the use of a high negative bias.

The use of a high plate resistance is only a factor of consequence in resistance coupled circuits. In these the plate coupling resistance can be made so high, practically, that the available supply of electrons in the filament will last indefinitely. The resistance can well be half a megohm when the effective plate voltage is 90 volts. The effective voltage in the plate circuit is the difference between the applied plate voltage and mu times the grid bias. For example, if the mu of the tube is 30 and the grid bias is 3 volts and the applied plate voltage is 180 volts, the effective voltage in the plate circuit is 180 less 3 times 30, or it is 90 volts. With the total resistance in the plate circuit 1-2 megohm, the plate current will be 90 microamperes. That is not much to worry about.

Small DC Resistance

In the case of impedance or transformer coupled circuits the resistance of the plate circuit is small, though the impedance is high. Hence the protection offered by the coils is small. It is advisable to use a moderate applied plate voltage where the signal level permits and be sure to use the proper grid bias. If the grid and plate voltages are so adjusted that the plate current is 3 milliamperes the tube will last three times as long as when the current is 9 milliamperes. There will be no difference in the voltage step-up or the quality, or if there is a difference it is in favor of the 3 milliampere adjustment. This is particularly so if the plate current has been brought down with a suitable grid bias.

The plate current can be limited by inserting a high resistance in the plate voltage supply, or by using a filter and rectifier of high resistance. But this method is not available because of the effect of this high resistance on the quality of the amplifier. If the circuit does not actually oscillate at some audible or super-audible frequency as a result of it, there will be an amplification peak at some frequency which will in most cases ruin quality.

Some Last Years

As is well known, some tubes have been in service for many years and they continue to give excellent results. It is also known that newer tubes give out after a much shorter period of service. This is not due to any inferiority of the newer tubes but to the greater abuse to which they are subjected in in modern sets.

Plate voltages are raised to values previously considered dangerous and the grid bias voltages are neglected because it does not cost much to operate the sets with B battery eliminators even when the plate currents are high. The tubes now are subjected to high voltage surges which never occurred with battery operated sets.

Even with all the abuse to which the tubes are subjected it is only the power tubes which die prematurely, that is, before their rated life is up. There are many reasons for this. The voltage applied to tubes is always much higher than that applied to the other tubes. The plate impedance of the power tubes is always much less than the plate impedance of other tubes. The filament is usually not more than twice as large as that of other tubes, yet the rate of electron emission from these filaments is much more than twice that of the emission from the ordinary amplifier tubes.

Power Tube Filament

The power tube filament is usually operated at a temperature which is slightly in excess of the rated value. All these conditions help to shorten the life of the tube. One tube in particular which is subject to rapid deterioration is the —71.

It has a filament which is only twice that of the filament of a —01a tube yet its plate impedance is only one-sixth that of the —01a. The normal plate current in the —71 tube is 20 milliamperes while that of the —01a when operating as a voltage amplifier is only about 3 milliamperes. It is natural to expect that the life of the —71 should be shortened in the ratio of 10 to 3 as compared with the —01a tube.

It is true that the electric power drawn from the line to supply a receiver by way of a B battery eliminator costs very little. If this cost were all it would be useless to even discuss means of limiting the plate current. But as we have seen the life of the tube depends on the plate current and the cost of replacement of tubes must be added to the cost of the power.

Rectifier Tubes Affected

Not only is the life of the amplifier tubes dependent on the plate current but also the life of the rectifier tube. It makes little difference just what type of rectifier is used. If the same results can be obtained with half the plate current, the length of life of both the rectifier and the amplifier tubes has been doubled. The saving of electric power effected by cutting the plate current in two may amount to a dime while the cost of a new set of tubes might amount to $10 to $20. The quality of reproduction of the set with the low current consumption is likely to be much better than that of the higher current. It will be in every case if the reduction in current has been properly effected.

When a writer tells about the need of a certain grid bias he does not do so just to have something to say. He writes in the interest of best results with the least expense. His recommendations should be followed. Of course, it may be that he does not give the right advice as to grid bias, but then the manufacturers of the tubes do.

Radio Intrusion Gets Story-Tellers' Goat

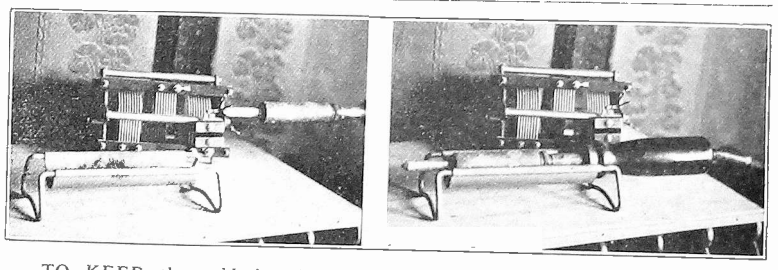
Angora.

Radio is causing great agitation among the Oriental story-tellers of this region. Until recently, their vocation was quite a lucrative one, but now due to the recent erection of a broadcasting station at Angora, their audiences have become quite lean. The people have become so interested in listening in, that in many portions of the country, these story-tellers have already become extinct.

To counteract this condition, the story-tellers have organized a union which will make an appeal to make the broadcasting tax heavier especially on the cafes, Turkish harems and baths, where one may listen in free of charge.

NEW PRICES IN FRANCE

A French radio company with two stores in Paris has just announced its new prices for radio parts, which are typical of the prices for radio apparatus in France. Based on the present rate of exchange the prices are as follows: One tube amplifiers, $2.00; two tube amplifiers of more expensive design, $4.60; crystal sets from $1.00 to $6.00; complete tube sets from $5.20 to $17. Variable condensers range in price from $1.30 to $5.00.



TO KEEP the soldering iron from dangling about and causing trouble, use a holder as shown above.

The Winner

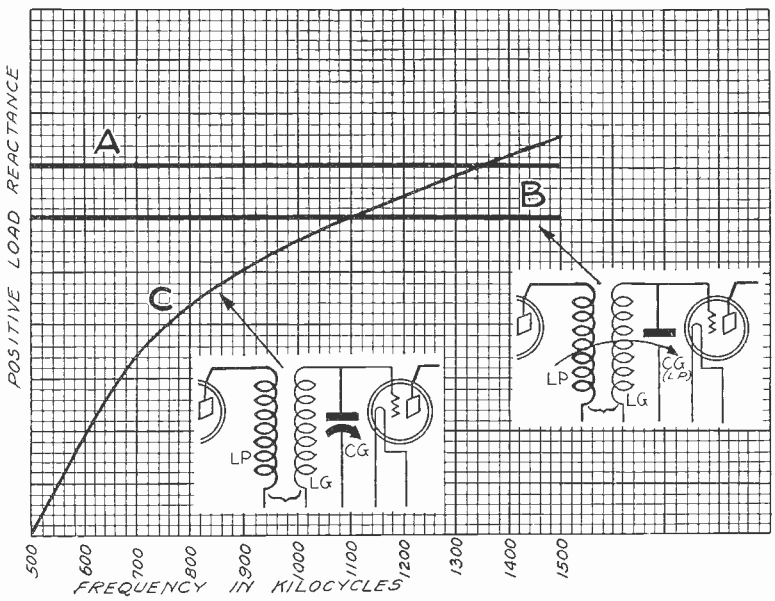


FIG. 3

The advantages of the wave-equalization system over the fixed primary method are lucidly shown in the above graph. LP is the plate or primary coil; LG is the secondary or grid coil, while CG is the secondary or grid variable condenser. CG and (LP) show that these are both varied at the same time.

By Lewis Winner

Technical Editor; Associate, Institute of Radio Engineers

(Part I of this article appeared in last week's issue, Oct. 1.)

PART II

ANY doubt that may exist as to the operation of the wave-equalization system may be cleared up by studying Fig. 3. The straight line A shows point where the tube oscillates. When the plate and grid coils are fixed to favor the middle and some of the higher frequencies, the signal intensity at the high waves is pretty low. And when it does go up, over spills the tube into oscillation. C ilustrates this point.

It can be clearly seen that as the higher frequencies or lower waves are reached, with a consequent step up in volume, the oscillatory point A comes closer, while at the lower end, near the higher waves, although the point of oscillation is quite distant, the volume is quite poor. However with variable coupling, the signal intensity is the same on all waves, yet the oscillatory point is not met. This is shown at B.

The tightening up of the coupling of the primary coil has the same effect as adding some more turns to the primary. The action between the primary and secondary may be described as the positive load reactance, since the secondary coil reacts on the primary coil and the closer the two are coupled, the more of a choke the primary becomes, thus causing the energy to be fed back from the plate of the tube through the internal capacity of the tube to the grid. Oscillation is the result.

Audio Curves

Also of interest, are the curves of the audio transformers used in this receiver which contribute largely to the excellent tonal reproduction. These are shown in Fig. 4. The familiar deep bend on the low frequencies is absent, as well as the sudden jump to the high frequencies, the amplification for all, being quite uniform.

The construction of the set is not difficult, but if not done with care, will prove to be quite intricate.

Panel Drilling Data

The drilling of the panel should first be tackled. First the hole for the filament switch should be drilled. This is 12 inches from both the left and right hand sides and 1¾ inches from the bottom. This will serve as a guide for the other holes, since they all lie in the same line. The hole for the rheostat R1 is 2 inches from the left, while the hole for the rheostat R2 is 2 inches from the right. These are both ¼ inch in diameter. Next drill the holes for the controls. One is 5¼ inches from the right and the other is 5¼ inches from the left. After these operations have been completed, procure the template which comes with the controls. With this, you will be able to obtain the exact dimensions of the large holes through which the readings or the numbers on the huge circular celluloid sheet can be seen. A fine triangular file is used to file down the rough edges after the piece of panelling has been hit out with the aid of a small hammer. When doing this, lay the panel down between two raised surfaces, placing two blocks of wood directly underneath the hole. This is done to prevent snapping of the panel. The small hole for the switch controlling the pilot light is then drilled.

Mount the controls on the panel. You will note that there is a distance of 1¾ inches from the rear of the control frame to the panel. Take the flat pieces of the shields and lay them directly opposite each control, so that they are only 1¾ inches from the front of the panel. Now procure a shield which has a raised surface. This is labelled 2A. Place it so that it is only 1¾ inches from the panel, or directly in back of the control. Place screws in all holes in controls. They need not fit. That is, they can be quite loose. Screw down the shield. Do the same with the other 2A shield. Place the panel so that it lies flat. Now, tap lightly over the shields with a small hammer. Wherever it is necessary to drill a hole, a small protrusion will be seen. On both, there will be one for the shaft, this 3½ inches from the sides and 3⅝ inches from the top; another one to the left, 3½ inches from the top and 2¾ inches from the left; another in the same line with the shaft hole, but 2⅜ inches from the top; and two, both in line with the shaft and the other line hole, which are 5/16 inches and 1 3/16 inches from the top.

Upon the completion of these operations, remove the shields, and drill the correct size holes, this to be obtained from the template. **[Part III next week]**

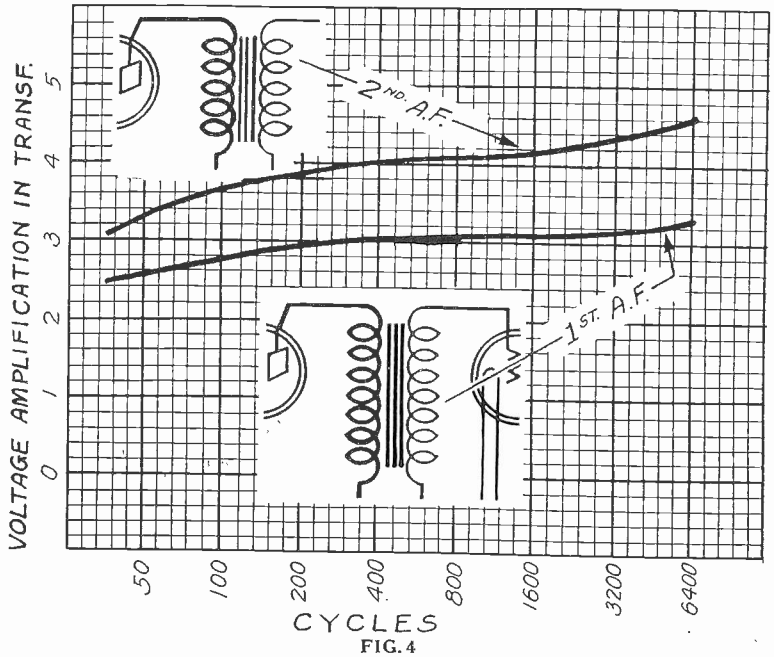


FIG. 4

These curves illustrate the amplification characteristics of the audio transformers used in the Winner.

Pictorial Diagram of Knickerbocker 4

By Herbert E. Hayden

The capabilities of the Knickerbocker Four intrigued a host of the set building fraternity. The pictorial diagram of the wiring is published herewith.

The wiring and the placement of the various parts are so clearly shown in this diagram that no one could make a mistake, no matter how little experience he may have. There are a few points, though, that should be emphasized. It will be observed that the filament leads on the two audio tubes are apparently reversed from the customary connections. It makes no difference which of the two filament binding posts on the Benjamin sockets is made plus or minus, just so the circuit is connected properly with respect to those which are chosen. Hence, whenever it is more convenient to make the binding post to the left positive instead negative as marked, it is all right to do so. But the Amperite must be in the negative lead.

Condenser Binding Posts

Another feature pertains to the binding posts on the Karas condensers. In each of the condensers there is a binding post shown on the front end plate near the dial. This leads to the grid in each case. The post has been placed there in the drawing for the sake of simplicity. Astually the high potential post on each condenser is not on the end plate but on the insulating strip running between the two end plates. And there are two of them, one near the baseboard and the other at the top. The lead to the grid is connected to the lower of these two posts, which is not visible in the drawing. The lead is very short.

The primary of the second Karas coil is shown in a plane at right angles to the coil and appears as a large circle. In this position the coupling between the first and the second tubes is practically zero. In practice the primary coil should make an angle of about 45 degrees with the secondary. The first primary is mounted on an extended shaft of the first Karas condenser. The tickler coil is similarly mounted on the shaft of the second condenser. The leads running to the tickler are clearly shown as to the termination, but it is not possible to tell from the drawing which one of the two possible connections will give the best results. The simplest way to find the correct connection is to try both and see which gives the louder volume and better selectivity. That one should be used. The difference between the correct and the reverse connections is so great that there can be no mistake about it.

Switch In Positive Lead

The Yaxley filament switch is connected in the positive lead from the battery, and it is mounted between and below the two Karas micrometric dials. The two Yaxley rheostats, which are used as volume controls in the radio frequency level, are at the right end of the set.

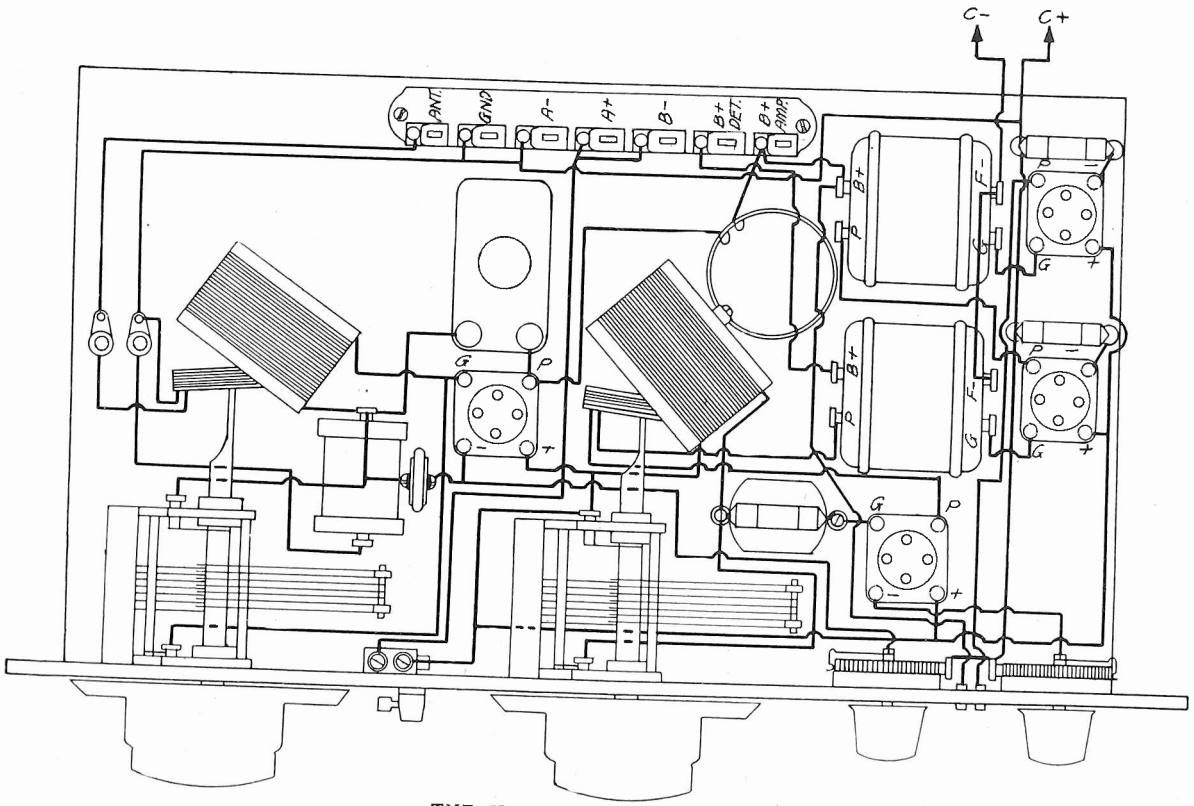
Between the two rheostats are the two Amsco pin jacks for the loudspeaker. The Samson neutralizing condenser is directly behind the first tube, while the Samson radio frequency choke coil is in the triangle formed by the first tube, the first condenser and the antenna coupler. At the right of the choke coil is the .0001 mfd. Sangamo condenser. The .00025 mfd. Sangamo grid condenser and the 2 megohm Amsco grid gate are at the left of the detector socket.

The Karas Harmonik audio frequency transformers are at the right conveniently placed with respect to the tubes with which they are connected.

Binding posts have been provided on the Mucher strip for the antenna and ground, the A battery and the B battery. Flexible leads are brought out for the C battery. **[Audio data next week.]**

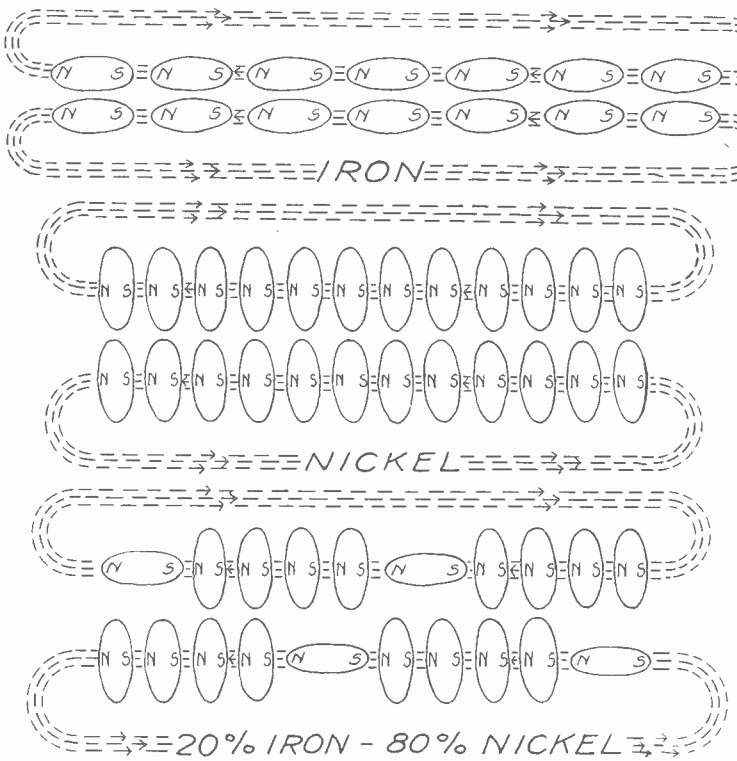
LIST OF PARTS

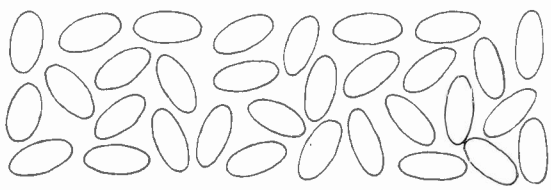
Two Karas Orthometric .00037 mfd. condensers.
One Karas antenna coupler.
One Karas three circuit coil.
Two Karas Harmonik audio transformers.
One Yaxley filament switch.
Two Amsco pin jacks.
One Samson 85 millihenry R. F. choke coil.
One Samson neutralizing condenser (.00003 to .0003 mfd.).
One Sangamo .00025 mfd. by-pass condenser with clips.
One Sangamo .0001 mfd. by-pass condenser.
One Amsco 2 megohn grid leak.
Two Yaxley 20-ohm rheostats.
Two 1A Amperites.
Two Karas Micrometric dials.
One 7x18x3-16 inch Micarta panel.
One wooden baseboard, 9¾x17¼x¼ inch.
One Mucher binding post strip containing 7 Fahnestock clips.
Four Benjamin sockets.



THE KNICKERBOCKER FOUR

The Most Sensitive Micrometer Described





UNMAGNETIZED IRON OR NICKEL

By Lewis Rand

[*Part I of this discussion was published last week, October 1. Part II follows.*]

Since iron and nickel behave oppositely toward magnetizing forces, iron lengthening and nickel shortening, we can assume that the iron molecule is in effect a prolate, or egg-shaped spheroid, and that the nickel molecule is an oblate spheroid, like the earth. The iron molecule is elongated along the magnetic axis while the nickel molecule is flattened along the magnetic axis, just like the earth.

In the unmagnetized condition the molecules point in every direction and the magnetic effect outside of the aggregate is zero. As a magnetizing force is applied to the sample of metal the molecules align themselves so that their magnetic axes are parallel with the magnetizing force. The stronger the magnetizing force the more completely the molecules so align themselves until at saturation all are pointing in the same direction. All the billions of little magnets then act in the same direction and there is a strong magnetic field outside the sample of metal.

How will these assumptions as to the effective shape of the molecules with regard to the axis of magnetization explain the changes in dimensions which the metals undergo when they are magnetized?

The iron molecule was assumed to be prolate or egg-shaped. Suppose a large number of eggs be laid out on a table in a strip a foot wide and three feet long, in a haphazard fashion. The space allotted will be full. Now arrange all the eggs with their long axes in the same direction, that is, along the three foot length. It is apparent that they will now require more than three feet. It is also apparent that the eggs will now occupy a strip less than a foot wide. In other words, the arranging of the eggs in an orderly way has lengthened and narrowed the strip of eggs. A similar process goes on in an iron wire which is magnetized along its length.

The nickel molecule, on the other hand, was assumed to be oblate or earth-shaped, with its magnetic axis along the shortest diameter. Therefore when a piece of nickel wire is magnetized along its length, it shortens and thickens. This also could be demonstrated with the eggs by assuming that the magnetization takes place transversely to the long axis.

Now what will happen when the two types of molecules are mixed in the wire, that is, when the wire is made of an alloy of iron and nickel? For one particular proportion nothing would happen to the dimensions. All the iron molecules would arrange themselves with the long axes along the wire and all the nickel molecules with the short axes parallel to the wire. One metal would try to lengthen the wire and the other would try to shorten it by the same amount. No appreciable force would be required to effect the change because the molecular forces would also neutralize each other.

The mechanism of these effects may be entirely different in fact from the assumed, but the effects are, as if the mechanism is as assumed. There is no doubt about the striking magnetic properties of iron-nickel alloy in which the proportion is about 20%-80%.

Since magnetostriction has assumed such vast, practical importance it has become necessary to devise instruments for measuring the minute changes in length, which are hundreds of times more sensitive than any instrument ever used before. Previously available instruments for measuring small distances were only sensitive enough to give an indication of the magnitude of the larger magnetostriction effects, but were wholly inadequate for accurately measuring the ultra-microscopic changes that occur in the special alloys. Instruments of extreme sensitivity are usually unstable and therefore unreliable. But this criticism does not apply to an instrument developed by P. P. Cioffi of Bell Laboratories, for it is stable and yet so sensitive that it can detect a change in length of a wire of a billionth part of an inch.

The principle of this sensitive instrument can readily be understood with the aid of the accompanying diagram. The vertical line ab is a wire about four inches long of the material under magnetostriction test. One end of this wire is secured to the support while the other end is attached to a lever operating a mirror m, which is so arranged that any change in the length of the wire will tilt it. L is a source of strong illumination, such as an arc light, C1 is a collimating lens which is so placed with respect to the arc L that the light which emerges is parallel. The light falls on the silvered mirror and is reflected through a second collimating lens C2, which concentrates the light on a sensitive photo-electric cell PE. The normal course of a ray of light is LPO.

Intensity Changes

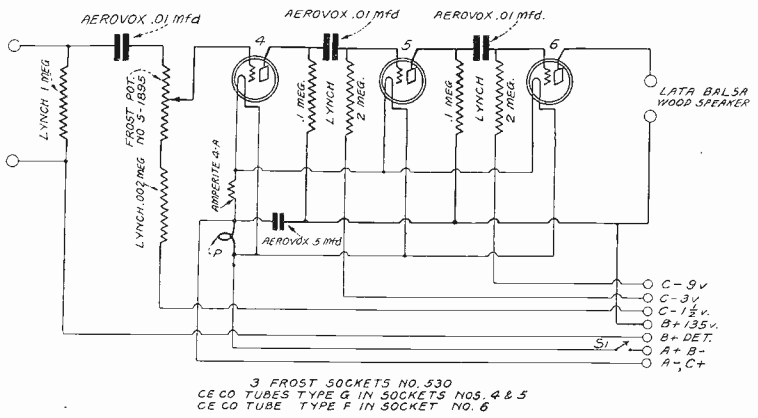
The amount of light that reaches the photo-electric cell determines the intensity of the photo-electric current delivered by the cell, and this current is measured with a sensitive galvanometer G. If some means can be found whereby a slight tilting of the mirror changes the amount of light that enters the photo-electric cell it is possible to determine the change in the length of the wire ab from the change in the current through the galvanometer.

The control of the mirror of the amount of light transmitted into the photo-electric cell is simple and yet ingenious. Between the source of light and the mirror a screen SS has been interposed. This screen consists of alternate transparent and opaque bands 1-32 inch wide. The light is then transmitted in luminous parallel sheets 1-32 inch thick and the same distance apart. The apparatus is so adjusted that the planes of the sheets of light are parallel to the axis of rotation of the mirror.

Interposed between the mirror and the photo-electric cell is another striated screen S'S', exactly like the first. This also is adjusted so that its bands are parallel with the axis of the mirror.

(*Concluded next week*)

The Unified Diamond's Excellent Audio Basin



The schematic diagram of the audio frequency basin of the Unified Diamond. Note the small resistor connected in series with the volume control potentiometer. Its purpose is to provide a finite minimum setting volume.

By the Laboratory Staff

The Audio Basin of the Unified Diamond contains all the tubes and coupling devices necessary in the audio amplifier beyond the detector tube. This part of the receiver is resistance coupled and consequently the Audio Basin contains three plate resistors, three grid leaks and three grid condensers. A portion of the first grid leak is a 500,000 ohm Frost potentiometer which is used as a volume control. The Basin is very compact in its arrangement and requires very little room in the radio receiver. It fits into the right-hand front corner of the cabinet after the Radio Frequency Fountain has been installed. Although compact, it affords ample room for two high mu tubes and a power tube, even if the power tube is a 310, which is a much larger sized tube than the average.

The wiring of the Audio Basin is extremely simple. The Basin has been so laid out that all leads are short and direct. The wiring may be either on top of the sub-panel or under it, as the constructor desires. The sub-panel method of wiring allows a little more directness in running the wires, and it will also make a neater job. The Acme Celatsite wire which is used in the wiring is well insulated so that it can be run from point to point without danger of short-circuit.

Wire Filament First

When wiring the Audio Frequency Basin it is well to wire filament circuit first, inserting the 4A Amperite in the negative leg of all the filaments.

When the filament circuit has been finished the plate and grid connections should be made.

The wire from the plate of the detector tube in the Radio Frequency Fountain is connected to the plate resistor and grid condenser in the upper left corner of the pictorial layout of the Audio Frequency Basin. The grid resistor mounting just above tube (4) does not hold the entire grid leak in this stage but only the .002 megohm Lynch resistor connected in series with the Frost volume control potentiometer. One end of this potentiometer is connected to the condenser and the other to the upper end of the .002 megohm resistor. The grid of tube (4) is connected to the sliding arm of the potentiometer.

How Connections Are Made

The plate P of tube (4) is not connected to the nearest point of the second coupler but is connected to the lower, which is next to the plus A terminal of socket (4). This is done so that the upper junction of grid condenser and leak can be connected to the grid G of tube (5). The third coupler in the upper right corner of the pictorial layout is so placed that both the connection to P of (5) and to G of (6) are as short as possible.

The plate P of (6) is connected directly to one of the Eby loud speaker binding posts.

The 4a Amperite is placed below tube (4) in the drawing and the .5 mfd. Aerovox by-pass condenser is put below the middle coupler.

The coupling condensers are soldered directly on the lugs of the resistance couplers. The lugs on the condensers must be bent to a right angle to make this convenient.

The resulting vertical mounting of the coupling condensers also saves a great deal of space in the assembly and is consistent with the compactness of the design.

The object of the .002 megohm resistor in series with the potentiometer is to provide a minimum setting volume. For example, if the volume is turned down with the potentiometer, there will be some left when the slider of the potentiometer is at its lowest point. Since the total resistance is .502 megohm and the minimum is .002 megohm, the residual volume is .4% of the total. This amount serves to indicate that the set is turned on even when the potentiometer is set at minimum.

The Frost potentiometer contains the filament switch which controls the filament current in all the tubes of both the Radio Frequency Fountain and the Audio Frequency Basin. There is an additional filament switch in the Unified Diamond which controls only the filament current in the radio frequency portion of the circuit. This switch is S2 in the diagram of the receiver.

The object of having two switches in the circuit is to adapt it to use with a phonograph pick-up. When the complete circuit is used for radio reception S2 is closed. When the audio amplifier alone is used with a phonograph pick-up this switch is opened. Then when S1 is turned on only the audio amplifier is operative.

LIST OF PARTS
for the Audio Frequency Basin

Organic Kit, with List Prices

Three Lynch .1 meg. metallized resistors	$2.25
Three Lynch 2 meg. metallized resistors	1.50
One Lynch .002 meg. (2,000 ohms) metallized resistor	1.00
Three Lynch double mountings	1.50
Three Frost sockets, No. 530	1.20
Three Aerovox .01 mfd. moulded condensers, No. 1450	2.70
One Aerovox .5 mfd. bypass condenser, No. 250	.90
One 4A Amperite with mounting	1.10
Two, Eby binding posts (speaker X, speaker —).	.30

Inorganic Kit

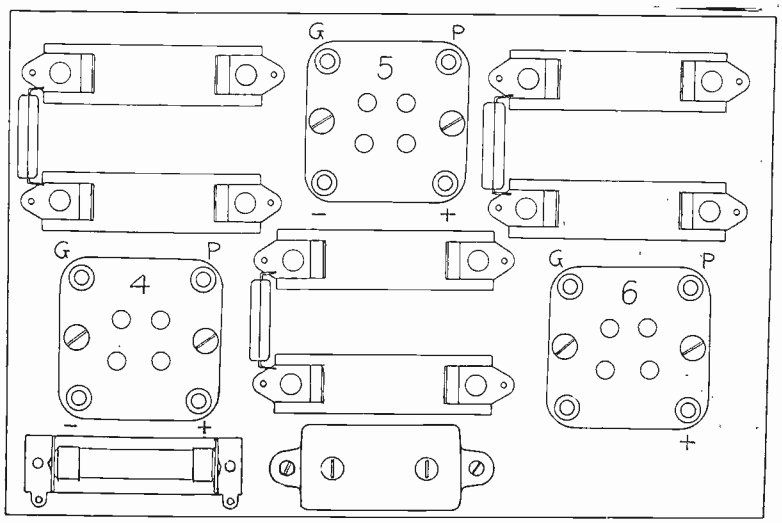
One 8½x5½x3/16 inch Bakelite base.
Five feet for base.
Six lengths of Acme Celatsite.

Accessories

Two CeCo type G tubes for sockets 4 and 5; one CeCo type F for socket 6.
One Lata Balsa Wood Reproducer.
One Pacent Phonovox.

NEW FRENCH STATION

The first station to be erected in France since December, 1926, has just been put into operation at Lille, in the northern portion of France, near the old Paris Gate. The director of the cabinet of the Minister of Commerce, M. Laskine opened up the station, which operates on a wavelength of 285 meters.



The pictorial layout of the audio frequency basin of the Unified Diamond.

Life Gamble in Se Hop Converted to Fai Risk

(From Radio Corporation of America.)

Whatever radio means to the navigator and his fares at sea, it must soon come to mean as much or more to the airman and his passengers, when flying over the trackless ocean or across the black or foggy countryside—not as a spectacular feat but rather as a matter of routine.

To the aerial navigator radio offers a ready means of communication with those below. It affords a wonderful organization for gathering and collating meteorological facts, that the airman may know the weather that lies ahead of him over a given route, and plan accordingly. By means of the direction finder, radio provides the true guide posts of the skies defining the aerial highways. Indeed, commercial aviation, in passing from the stunt stage to the commercial stage, can progress only so fast as radio beacons shall dot the great air routes of tomorrow.

Aviation radio is something quite apart from marine, transoceanic or broadcasting radio. In fact, it introduces still another phase of radio communication.

The mechanical requirements of aviation radio are peculiar unto itself for in no other application must weight and space be so assiduously conserved. Equipment intended for use aboard ship or on land, no matter how portable it may be, is generally unsuited for use in an airplane. Hence special equipment has had to be designed and constructed.

Remarkable Range.

Yet there is a most attractive side to aviation radio despite the rigid handicaps of minimum weight and bulk. Aircraft radio transmitters are capable of remarkable range with little power, due to the unobstructed propagation of the waves from the loftily trailing antenna, so that what power might be lost in meeting weight and bulk requirements, is perhaps more than made up in other ways.

The engineers of the Radio Corporation of America and its associated companies, the Westinghouse Electric & Manufacturing Company, and the General Electric Company, are giving considerable attention to the development of aircraft transmitters and receivers. As a consequence, special equipment has been developed, embodying numerous refinements giving maximum efficiency with the minimum power, weight and bulk.

Typical of the special equipment developed for airplanes may be mentioned the installation aboard the "American Legion" of Commander Davis, which crashed prior to its proposed transatlantic flight.

Weighing less than 65 pounds, without the accessories, and occupying an absolute minimum of space, this equipment included two transmitters and a receiver, with an effective working range of over a thousand miles!

Weighed Only 14 Pounds.

One transmitter was intended for short wave operation on 45 meters, and included a crystal quartz oscillator so as to hold the signals rock steady for ready interception at the distant points. The other transmitter was intended for communication with ships and marine land stations, with a wavelength range of from 550 to 850 meters. Both transmitters employed a 50-watt oscillator tube. The antenna reel consisted of 350 feet of wire, with fish-shaped weights at the free end of the wire. In sending on the shortwave band, it was necessary to reel out about 60 feet of wire, and correspondingly more for the marine band transmission.

The receiver in this installation employed three tubes, an oscillating detector of the UX-201-A type, and two stages of audio-frequency amplification with the same type of tubes. It weighed only 14 pounds. Both transmitter and receiver were mounted on strips of sponge rubber to minimize undesirable effects from the tremendous vibration present in an airplane.

In the case of a forced landing on the surface of the water, the "American Legion" was provided with a number of bamboo masts in sections, which could be rigged to over 45 feet for the purpose of transmitting signals.

So far as the technique of aircraft radio is concerned, the means for entirely satisfactory service are at hand. The recent transatlantic flight of Commander Byrd in particular, as typified by the constant bulletins from the "America" to the world at large during the passage, proves the value of radio communication to the airman.

Eliminates Complete Gambling.

It is no stretch of the imagination or of enthusiasm to say that the carrying of radio by the transatlantic flyer spells the difference between some measure of safety and a complete gamble. At the cost of a few pounds, and perhaps two cubic feet of their valuable space and competent operation, the intrepid airman who have been lost in the ocean wastes of the Atlantic and the Pacific, during the past few months, might still be counted among the living.

The recent transoceanic flights have also disclosed the value of radio and radio organization in undertaking reasonably safe flights. The Radio Corporation of America has taken a hand in virtually all these flights to the extent of gathering weather reports from ships scattered over the oceans from hour to hour, so that the meteorological experts on shore might prognosticate the probable flying conditions over the proposed route. And when the course is over some three thousand of miles of water, with an opportunity for a dozen or more meteorological conditions obtaining at any given time along the entire route, the value of radio to aviation becomes still more apparent.

Aviation Beacons Due.

Just as radio beacons are beginning to dot the various coasts as an infallible guide for seafarers, so must aviation radio beacons soon dot the great air routes. By means of the radio direction finder, the airman can aim his ship for a given point with the accuracy and certainty of a marksman pointing his rifle. Fog and blackness of the night cease to hold terror for the airman working with radio beacons. An important point to remember is that the airman, unlike the ocean navigator, navigates in a three-dimensional medium—the horizontal directions are complicated by the addition of the vertical direction. One of the most serious factors in flying is this navigation in the vertical plane and many fatal accidents are due to lack of judgment as to the exact distance between airship and ground below, in a fog. With radio beacons, however, it is possible to guide the airman safely back to the ground, despite fog or blackness or other elements contriving to rob the airman of his sense of sight and direction.

Nineteen Stations Dropped by Board

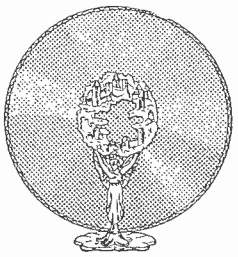
Washington.

Nineteen stations have been dropped from the list of stations, the Federal Radio Commission announced. Sam Pickard, secretary of the commission, stated that these stations were deleted either on their own request or on their failure to file their application for renewal of 60-day licenses. The stations are:

	W	Kc
KFIQ—I. M. Miller, M. D., Yakima, Wash.	100	1,440
KFVN—Carl E. Bagley, Fairmont, Minn.	100	1,310
KFWH—F. Wellington Morse, Eureka. Calif.	100	1,180
KFXH—W. S. Bledsoe, El Paso, Tex.	100	1,240
KGES—Central Broadcasting Co., Central City, Nebr.	10	1,470
KOLO—Gerald K. Hunter, Durango, Colo.	5	1,500
WABR—Scott High School, Toledo, Ohio	50	1,070
WCBH—University of Mississippi, Oxford, Miss.	100	1,240
WCOM—City of Manchester, Manchester, N. H.	100	1,260
WEBK—W D B K Broadcasting Station, Cleveland, Ohio.	250	1,320
WEAI—Cornell University, Ithaca, N. Y.	250	620
WHBD—Chamber of Commerce, Bellefontaine, Ohio	100	1,350
WKBM—John Wilbur Jones, Newburgh, N. Y.	100	1,440
WKBU—Portable, Harry K. Armstrong, New Castle, Pa.	50	1,470
WTAZ—Thos. J. McGuire, Lambertville, N. J.	15	1,360
WREO—Reo Motor Car Co., Lansing, Mich.	500	1,300
WTHO—W. J. Thomas Broadcasting Co., Detroit, Mich.	250	1,370
WMBY—Rob. T. Isaacs, Bloomington, Ill.	15	1,500
WMBU—Paul J. Miller, Pittsburgh, Pa.	50	1,380

Vitalitone's Newest Cone, "Dream Castle"

In addition to their release of the latest ship model, the "Santa Maria," the Vitalitone Radio Corporation, 88 University Place, New York City, now have ready their latest de luxe model, the "Dream Castle." This speaker is of the double-cone type, 22 inches in diameter. It is built to meet any output requirements used in any of the up-to-date circuits or factory built sets. The design motif represents the "Dream Castle" in the clouds, supported by the radio fairy queen standing in a graceful pose upon an inverted lotus-flower. The whole ensemble is highly artistic, poetic in conception and the coloring is exquisitely carried out. The stand is executed in statuary bas-relief and finished in polychrome. The finest materials are used throughout and the cone is actuated by the famous Vitalitone unit. This unit is conceded by experts to be most powerful even with extreme power input.



In addition to the red magnet Vitalitone unit, this makes three models of speakers turned out by this concern for the new season, namely, the "Conqueror," the "Santa Maria," and the "Dream Castle." Full information on all Vitalitone products will be sent to those interested upon application to the above concern.—J. H. C.

Radio University

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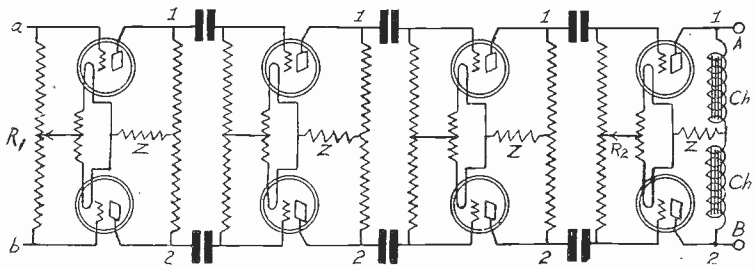


FIG. 570

The circuit diagram of the push-pull resistance coupled amplifier requested by Charles Hubbard

SOMETIME AGO you published a description by J. E. Anderson of a push-pull resistance coupled amplifier. I wish to experiment with this circuit and would like to know in what issue it appeared.

(2)—Will you please publish a diagram of the circuit, giving the values of the constants?

(3)—Can the circuit be made to work on a B eliminator without motorboating?

Charles Hubbard, Rockford, Jll.

(1)—June 11 issue.

(2)—See Fig. 570. For an experimental circuit the stopping condensers may have any value from .006 to .5 mfd. The grid resistors may have any value from .5 to 2 megohms. The plate resistors may lie between .1 and .5 megohms. Corresponding parts in the two sides must be identical—tubes, stopping condensers and resistors. There should be means for balancing the circuit as at R1 and R2. The chokes should be about 100 henrys. The Zs represent the impedance of the plate voltage source.

(3)—Yes, if it is properly balanced.

* * *

CAN THE NEW 27 type AC tubes be used as amplifiers?

(2)—Can these tubes be used with the grid bias method of detection?

(3)—Is it possible to operate these tubes on direct current and get good results?

(4)—What is the rated voltage and current of the filament of this tube?

Robert A. Franklin, Salt Lake City, Utah.

(1)—Yes, these tubes can be used as amplifiers, as well as detectors.

(2)—They can be used with either type of detection.

(3)—They can be operated on direct current, but they are not so suitable for that as the old type tubes.

(4)—The rated voltage is 2½ volts and the rated current is 1¾ amperes.

* * *

WHAT SHOULD BE the inductance of the radio frequency coil in the plate circuit of the detector tube to prevent the transmission of radio frequency currents into the audio frequency amplifier?

(2)—Is it better to wind the coil with enamel wire or with silk covered?

(3)—What is the advantage of the figure eight choke coil?

(4)—Which is better, air core or iron core?

Jesse Brown, Wilmington, Del.

(1)—It depends what the type of audio frequency coupling follows it and on what size capacity is used. If there is a condenser of .0005 mfd. across the line on each side of the choke, one millihenry is enough in a resistance coupled circuit. In other types of coupling the second condenser can be omitted and the coil changed to about 5 millihenrys.

(2)—It makes no difference.

(3)—The figure eight coil has a weak outside field.

(4)—About equally good.

* * *

SOME RECOMMEND the use of a grid bias of 36 volts with a 71 type tube and 180 volts on the plate while the manufacturers recommend 40½ volts bias. Which is right?

(2)—What is the voltage amplification of a 71 tube?

Elmer Wenstron, Minneapolis, Minn,

(1)—Both are right. The 40½ volt bias gives the greatest output with a minimum distortion. The 36 gives slightly higher amplification.

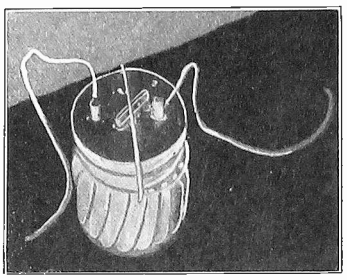
(2)—It varies between 2.9 and 3, depending on the grid bias and the plate voltage.

* * *

I CONSTRUCTED an electrolytic condenser as described by J. E. Anderson. After the jar had been standing a few days there was a white deposit on the top of the jar around the edges. What is this?

(2)—I have had very good results with this condenser and it is beyond me why such condensers are not used more than they are. Why is it?

(1)—The electrolyte will creep up and evaporate so that ultimately the salt will be deposited around the top of the jar. To prevent the creeping of the electrolyte a layer of mineral oil about a quarter of an inch deep should be put over the solution. Nujol is suitable. It is also well to seal the container with wax or paraffine, except for one minute hole so located that the liquid cannot be splashed out.



THE electrolytic condenser on which a coating of white appeared.

(2)—One of the reasons for the absence of electrolytic condensers in commercial eliminators is the difficulty of shipping them. There is always danger of splashing and of breaking the container. The spilled electrolyte might damage other parts of the eliminator. The reason electrolytic condensers are not used by home constructors more than they are is that very few know about the condensers and their desirable qualities. The messy work of making the condenser may also deter a few amateurs.

* * *

WILL YOU please tell how to make a one millihenry coil to be used as a radio frequency choke coil. Francis Emerson,

Wind 215 turns of No. 26 enameled wire on an insulating form of inside diameter ¾ inch, outside diameter 1½ inches, and length of winding space 3-8 inch.

* * *

I HAVE a small electric lamp for a 110 volt circuit, which I want to use as a pilot light on my electrified set. Can this be done safely?

(2)—If so, will you please publish a diagram showing where to connect it.—Joseph Butler, Des Moines, Iowa.

(1)—It is perfectly safe.

(2)—It should be connected in parallel with the primary of the power input transformer as shown in Fig. 571.

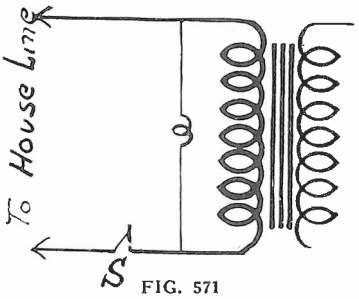
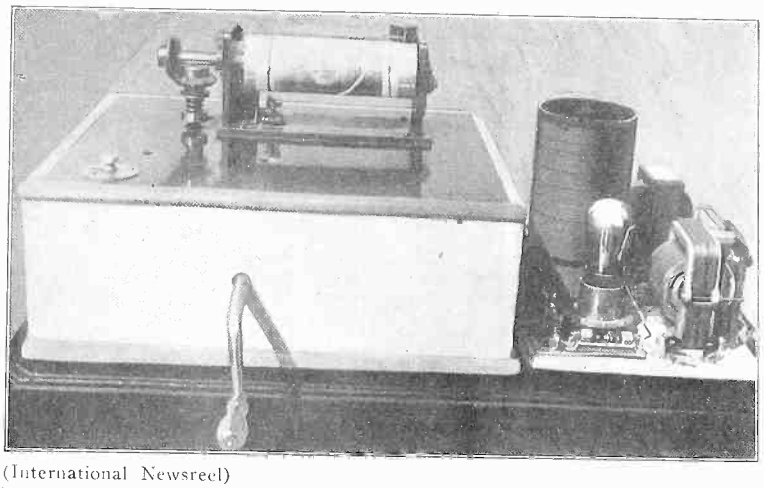


FIG. 571

A HOME-MADE STILL PICTURE DEVICE



(International Newsreel)

THE COOLEY rayfoto picture combination transmitter and receiver which can be built for $100. Stills can be received and transmitted with this device.

All Troubles Cured By Systematic Search

By Chisholm Force

Not every newly assembled receiver works right at the first throw of the switch. It makes little difference whether the set has been assembled by a professional set builder or by an amateur. Very often there is a flaw in the wiring or in the parts. The professional set-builder knows how to proceed systematically to find the trouble. The amateur often tests and frets in vain.

The professional has a definite mode of procedure in testing. It is that of successive elimination. He begins at the beginning and ends at the end, and when he gets through he has found the trouble. The end of the test is usually reached long before he gets to the loudspeaker binding posts.

One systematic method of testing follows.

Connect a milliammeter or a low range voltmeter in the plate return lead of the B battery or substitute—at a point where the plate currents of all the tubes flow. If a milliammeter is used it should have a range of about 0-25 millamperes. Remove all the tubes from the circuit but the first. Turn on the power. If there is a deflection of the meter the plate circuit of that tube is complete. The filament is lighted or there would be no deflection. The plate voltage is effective or there would be no reading on the meter. There is no break in the circuit or no current could flow.

Test of Grid Circuit

The grid circuit of the same tube can be tested with the same meter in the same position. Vary the grid bias on the tube and note the response on the meter. When the negative bias is increased the reading should decrease and vice versa. If the meter responds as expected the grid circuit is probably intact. If no provision has been made for a grid bias in the tube, cut the grid circuit temporarily and insert a small battery.

Test every tube in the circuit the same way, using the same or a more appropriate tube for the test. If any misbehavior is noted in one of the plate or the grid circuits, short circuit suspected points temporarily to see where the open is.

The test outlined does not show whether one of the transformer or impedance windings in the plate or grid circuits is shorted. If an open has not been discovered by the procedure outlined, the circuit should be systematically tested for short-circuited windings. This is done with the voltmeter. Its range must be suitable to the voltage applied to the plate circuits. Remove the tubes from the sockets as a safety measure. Connect the voltmeter between the plate of a tube and the negative end of the filament (or of the positive) and note the reading on the voltmeter.

Does the meter show full battery voltage? If it does, the winding is shorted. If the voltage is greatly reduced the winding is probably all right. This method can also be used on the intermediate transformers but very careful observation is necessary to tell whether there is any reduction in the voltage or not. The test on the radio frequency coils is to see whether they tune right. If they do, they are right.

One of the most frequent causes of failure of a Super-Heterodyne to work is that the oscillator will not function. If everything else in the circuit tests out all right then look to the oscillator. First put in a tube known to be a good amplifier or oscillator. Check over the tuned circuit and make sure that windings are continuous, not shorted and that the leads are correctly connected. If all is found well except that the circuit will not oscillate, increase the filament current and the plate voltage. A simple test for oscillation can be carried out with the meter in the plate circuit as in the previous tests. Short-circuit either the grid coil or the plate coil, but not both at the same time, and note the change in the reading on the meter. If the circuit did oscillate before short-circuiting, the reading should go down considerably when the short-circuit is applied, that is, when the oscillations stop.

50,000,000 IN UNIT

(International Newsreel)

GENE TUNNEY, just after the recent fi persons heard. He had just been declar friends in Tuscon and Bridge

By Dinny Burke

The whole world listened in to the description of the recent fight between Gene Tunney and Jack Dempsey. Seventy broadcast stations in the United States and two in Canada were tied together in the gigantic hook-up. These seventy-two stations were heard in every state in the Union, in every province in Canada, in the greater part of Mexico and in many of the fringe territories of the northern part of the continent. It was heard in Alaska, in the Klondyke, in the Hudson Bay country.

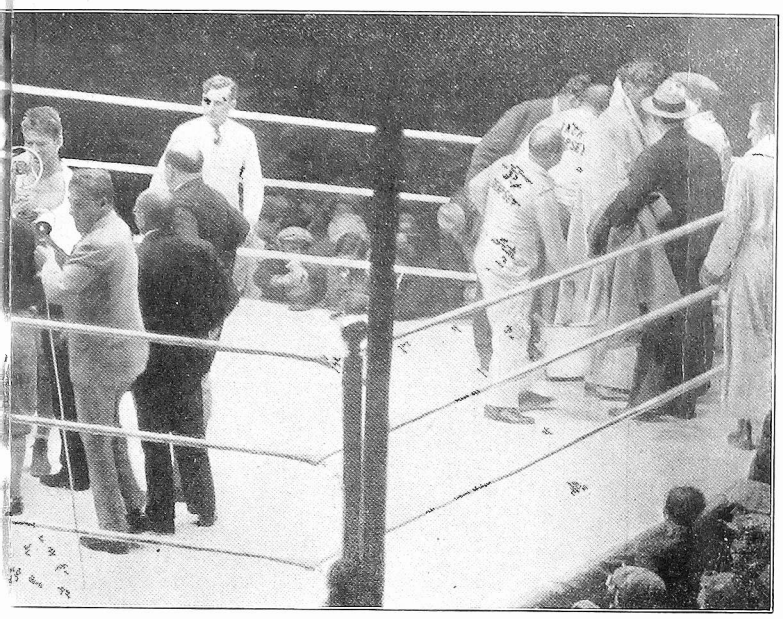
The short wave stations operating in the United States sent the blow-by-blow description of the fight to England, France, Germany, Australia, New Zealand, South Africa and to most of the South American countries. In these various countries the description by Graham McNamee was rebroadcast, so that nearly every one in these countries who had access to a radio receiver and who could understand English as spoken by a highly excited American could follow the fight as well as if he had been seated in one of the more remote seats in Soldier Field, Chicago.

The man on the African veldt, the Australian bush, the Argentine pampas, the Russian steppes could hear the description, as well as the man in the club rooms in New York, London, Paris could hear it. The difference in time did not prove to be a serious obstacle to those who wanted to listen in. The man in California listened during his dinner hour, the man in London got up early in the morning to listen, the man in Australia listened in during his lunch hour the day after the fight.

All of these millions throughout the world saw the fight through McNamee's eyes. They heard the attendant noise with their own ears. They heard the click of the reporters' typewriters, the click of the telegraph instruments, the shouts of the gallery, the thud of the more effective blows struck.

They did not see the condition of the

D STATES HEAR DEMPSEY-TUNNEY FIGHT



with Jack Dempsey, spoke a few words into the microphone, that more than 50,000,000 he winner, though the radio audience had not exactly been told that Tunney selected in sending best wishes. Dempsey (extreme right) heard none of this.

wo contestants before, during or after he fight. For this they had to rely on he announcer's words, which at times were ot as complete as the listeners would have iked.

Rounds Seemed Short

There were several outstanding facts about he fight which any one could hear and see. One was the abreviated rounds. Any one with a watch in his hands could tell that each round was short by about ten seconds. Any one with a watch in his hands could also tell that the champion and ultimate winner of the bout was down for from 12 to 14 seconds and yet only the count of nine was tolled over the recumbent champion. The announcer counted in his excitement but he neglected to say that the count started once, but was stopped when the referee noticed that Dempsey was right beside the fallen Tunney. The delay was enough to save the situation for Tunney.

Another point on which the radio listeners did not get the concensus was the condition of the challenger at the conclusion of the fight. McNamee said that Dempsey was groggy as the result of a whirlwind of blows from Tunney and that he was practically out on his feet. In this the reporters did not quite concur in their published descriptions of the fight.

Still another point on which the radio listeners were left to draw their own conclusions was the official decision. The announcer made the prediction that the judges and the referee would undoubtedly decide in favor of Tunney, but he never announced what they did.

Tunney Made Little Speech

This so-called oversight was complained of in Berlin, as well as in other foreign and domestic places. Many missed the significance of the little speech made by Tunney, for they did not know that Tunney did speak. He sent best wishes to the folks "out there," especially "in Tucson, Ariz., and in Bridgeport, Conn."

One incident of the broadcasting of the fight is worthy of notice, though it is only of sectional interest. Shortly before the fight the key station, WEAF, "blew up" as far as its quality and volume are concerned.

GRID CURRENT WINS SUPPORT

Ever since the advent of the first transformer coupled tube audio amplifier we have always guarded against the presence of grid current in the grid-filament circuit of the vacuum tubes. We have been informed that grid current causes amplitude distortion, a change in the signal waveform, a reduction in the tube amplification, in general, everything detrimental to good audio amplification. In fact, all fans have been warned against permitting grid current in any amplifiers.

Now we hear of a new system of audio amplification in which grid current is permissible; in which the amount of grid current usually encountered with very detrimental results in a transformer coupled audio system has no effect upon the wave form or amplification. This new theory if amplification is propounded by E. E. Hiler and pertains to tuned double impedance amplification, U. S. Patent 1589692.

The presence of grid current is usually considered as an indication of tube overloading, and is made audible in the loudspeaker by a rasping or blasting sound on certain frequencies. With this new system, it seems as if this form of annoyance is removed.

The reason for permitting a certain amount of grid current is founded upon the fact that the momentary change in the grid filament circuit when grid current is present is not reflected back upon the primary circuit of the coupling unit in this system of amplification.—J. F. Rider.

Forty-five Licensed By the R.C.A. Group

With a view toward stabilizing the radio industry, the Radio Corporation of America in conjunction with its associate companies early in 1927 began to license manufacturers who desired to benefit by their numerous patents. Twenty-three set manufacturers and twenty-two power supply and amplifier unit manufacturers have become licensees as the following list shows:

SET MANUFACTURERS

(1)—Zenith Radio Corporation, 3620 Iron Street, Chicago, Ill.
(2)—All American Radio Corporation, 4201 Belmont Avenue, Chicago, Ill.
(3)—Splitdorf-Bethlehem Electrical Company, Newark, N. J.
(4)—Stromberg-Carlson Telephone Manufacturing Company, 1060 University Ave., Rochester, N. Y.
(5)—The Crosley Radio Corporation, Cincinnati, O.
(6)—Freed-Eisemann Radio Corporation, Junius & Liberty Aves., Brooklyn, N. Y.
(7)—F. A. D. Andrea, Inc., 1581 Jerome Ave., New York, N. Y.
(8)—Federal Telephone Manufacturing Company, Buffalo, N. Y.
(9)—American Bosch Magneto Corporation, Springfield, Mass.
(10)—Charles Freshman, Incorporated, 240 West 40th St., N. Y. City, N. Y.
(11)—Howard Radio Company, 451 North Ohio St., Chicago, Ill.
(12)—Gilfillan Bros., Incorporated, 1815 Venice Boulevard, Los Angeles, Calif.
(13)—Wm. J. Murdock Company, 347 Washington Ave., Chelsea, Mass.
(14)—Bremer-Tully Manufacturing Company, 520 South Canal St., Chicago, Ill.
(15)—Steinite Radio Company, Atchison, Kan.
(16)—Day-Fan Electric Company, Dayton, O.
(17)—Mohawk Corporation of Illinois, Diversey at Logan Boulevard, Chicago, Ill.
(18)—King Manufacturing Company, Buffalo.
(19)—Atwater-Kent Manufacturing Company, 4700 Wissahickon Ave., Philadelphia, Pa.
(20)—United States Electric Corporation, Chicago, Ill.
(21)—Phanstiehl Radio Company, Waukegan, Ill.
(22)—Federal-Brandes Co., Inc., Newark, N. J.
(23)—A. H. Grebe and Company, Incorporated, Richmond Hill, N. Y.

POWER SUPPLY

(1)—Radio Receptor Company, Inc., 106 Seventh Ave., New York City, N. Y.
(2)—General Radio Company, 30 State St., Cambridge, Mass.
(3)—Martin-Copeland Co., Providence, R. I.
(4)—J. S. Timmons, Incorporated, 339 East Tulpehocken St., Philadelphia, Pa.
(5)—National Company, Inc., 61 Sherman St., Malden, Mass.
(6)—Farrand Manufacturing Company, Incorporated, Long Island City, N. Y.
(7)—Harold J. Power, Inc., Medford Hillside, Mass.
(8)—American Transformer Company, 174 Emmet St., Newark N. J.
(9)—Zenith Radio Corporation, 3620 Iron St., Chicago, Ill.
(10)—William J. Murdock Company, 347 Washington Ave., Chelsea, Mass.
(11)—Mohawk Corporation of Illinois, Diversey at Logan Boulevard, Chicago, Ill.
(12)—Gilfillan Bros., Incorporated, 1815 Venice Boulevard, Los Angeles, Calif.
(13)—Howard Radio Company, 451 East Ohio St., Chicago, Ill.
(14)—Stromberg-Carlson Telephone Manufacturing Company, 1060 University Ave., Rochester, N. Y.
(15)—Steinite Radio Company, Atchison, Kansas.
(16)—Federal Telephone Company of Buffalo, Buffalo, N. Y.
(17)—Bremer-Tully Manufacturing Company, 520 South Canal St., Chicago, Ill.
(18)—King Manufacturing Company, Buffalo, N. Y.
(19)—Phanstiehl Radio Corporation, Waukegan, Ill.
(20)—United States Electric Corporation, Chicago, Ill.
(21)—Crosley Radio Corporation, Cincinnati, O.
(22)—A. H. Grebe and Company, Incorporated, Richmond Hill, N. Y.

ST OF STATIONS

With wavelengths, frequencies, location and year, corrected to Sept. 28. Time sharers in parentheses.

Station	Kc	M	Watts
AAD—Cincinnati, O.	1120	267.7	25
WAAF—Chicago, Ill. (WBBM, WJBT, WORD)	770	389.4	500
WAAM—Newark, N. J. (WGBS)	860	348.6	500
WAAT—Jersey City, N. J. WGBB and WEVD)	1220	245.8	300
WAAW—Omaha, Neb. (6 to 7 only)	860	348.6	500
WABC—Richmond Hill, N. Y. (WBOQ)	920	325.9	2,500
WABF—Pringleboro, Pa.	1460	205.4	250
WABI—Bangor, Me.	770	389.4	100
WABQ—Philadelphia, Pa.	1410	212.6	500
WABW—Wooster, O.	1210	247.8	50
WABY—Philadelphia, Pa.	1210	247.8	50
WABZ—New Orleans, La.	1210	247.8	50
WADC—Akron, O.	1250	239.9	1,000
WAFD—Detroit, Mich.	1370	218.8	250
WAGM—Royal Oak, Mich.	1330	225.4	50
WAGS—Somerville, Mass.	1390	215.7	5
WAIT—Taunton, Mass.	1400	214.2	10
WAIU—Columbus, O. (WEAO)	1060	282.8	5,000
WALK—Bethayres, Pa. (Portable)	1490	201.6	50
WAMD—Minneapolis, Minn.	1330	225.4	500
WAPI—Auburn, Ala. (daytime only)	940	319	1,000
WARS—Brooklyn, N. Y. (WSDA, WBBC)	1320	227.1	500
WASH—Grand Rapids, Mich.	1170	256.3	250
WASN—Boston, Mass.	990	302.8	100
WATT—Boston, Mass.	1490	201.6	100
WBAA—West Lafayette, Ind. (WRM)	1100	272.6	500
WBAK—Harrisburg, Pa. (WPSC)	1000	299.8	500
WBAL—Baltimore, Md.	1050	285.5	3,000
WBAO—Decatur, Ill.	1120	267.7	100
WBAP—Fort Worth, Tex. (WFAA)	600	499.7	1,500
WBAW—Nashville, Tenn.	1210	247.8	100
WBAX—Wilkes-Barre, Pa. (WBRE)	1200	249.9	100
WBBC—Brooklyn, N. Y. (WARS, WSDA)	1320	227.7	500
WBBL—Richmond, Va.	1210	247.8	100
WBBM—Chicago, Ill. (WJBT, WAAF, WORD)	770	389.4	500
WBBP—Petoskey, Mich.	1250	239.9	100
WBBR—Rossville, N. Y. (WJBI, WLTH, WEBJ)	1170	256.3	1,000
WBBW—Norfork, Va.	1270	236.1	50
WBBY—Charleston, S. C.	600	499.7	75
WBBZ—Chicago, Ill. (Portable)	1470	204.0	100
WBCN—Chicago, Ill. (WENR, WTAS)	1040	283.3	250
WBES—Takoma Park, Md.	1010	296.9	100
WBET—Boston, Mass.	1240	241.8	500
WBKN—Brooklyn, N. Y. (WWRL, WIBI, WBMS)	1120	267.7	100
WBMH—Detroit, Mich.	1420	211.1	100
WBMS—Union City, N. J. (WBKN, WWRL, WIBI)	1120	267.7	100
WBNY—New York City, N. Y. (WKBQ, WKBO)	1370	218.8	500
WBOQ—Richmond Hill, N. Y. (WABC)	920	325.9	500
WBRC—Birmingham, Ala.	1230	243.8	250
WBRE—Wilkes-Barre, Pa. (WBAX)	1200	249.9	100
WBRL—Tilton, N. H.	650	461.1	500
WBRS—Brooklyn, N. Y. (WCDA, WCGU, WRST)	1420	211.1	100
WBSO—Wellesley Hills, Mass. (WDWF)	780	384.4	100
WBT—Charlotte, N. C.	1160	258.5	500
WBZ—Springfield, Mass.	900	333.1	15,000
WBZA—Boston, Mass.	900	333.1	500
WCAC—Mansfield, Conn. (WDRC)	560	535.4	500
WCAD—Canton, N. Y.	820	365.6	500
WCAE—Pittsburgh, Pa.	580	516.9	500
WCAH—Columbus, Ohio	560	535.4	250
WCAJ—Lincoln, Neb. (KMMJ)	790	379.5	500
WCAL—Northfield, Minn. (KFMX)	1270	236.1	500
WCAM—Camden, N. J.	1340	223.7	500
WCAO—Baltimore, Md. (WCBM	780	384.4	250
WCAT—Rapid City, S. D.	1210	247.8	100
WCAU—Philadelphia, Pa.	890	336.9	500
WCAX—Burlington, Vermont	1180	254.1	100
WCAZ—Carthage, Ill.	880	340.7	50
WCBA—Allentown, Pa. (WSAN)	1350	222.1	100
WCBD—Zion, Illinois (WLS)	870	344.6	5,000
WCBE—New Orleans, La.	1320	227.1	5
WCBM—Baltimore, Md. (WCAO)	780	384.4	100
WCBR—Providence, R. I. (Portable)	1490	201.6	100
WCBS—Springfield, Ill.	1430	209.7	250
WCCO—Minneapolis, Minn.	740	405.2	5,000
WCDA—Brooklyn, N. Y. (WRST, WBRS, WCGU)	1420	211.1	500
WCFL—Chicago, Ill. (WLTS)	620	493.6	1,500
WCGU—Coney Island, N. Y. (WCDA, WBRS, WRST)	1420	211.1	500
WCLO—Camp Lake, Wisc.	1320	227.1	100
WCLS—Joliet, Ill. (WKBB)	1390	215.7	150
WCMA—Culver, Ind.	1160	258.5	250
WCOA—Pensacola, Fla.	1200	249.9	500
WCOC—Columbus, Miss.	1300	230.6	250
WCOT—Olneyville, R. I.	1330	225.4	50
WCRD—Chicago, Ill. (WFKB & WPCC)	1340	223.7	500
WCSH—Portland, Me.	700	428.3	500
WCSO—Springfield, Ohio	1170	256.3	500
WCWK—Fort Wayne, Ind.	1400	214.2	250
WCWS—Bridgeport, Conn. (Portable)	1490	201.6	100
WDAD-WLAC—Nashville, Tenn.	1330	225.4	1,000
WDAE—Tampa, Fla.	1120	267.7	500
WDAF—Kansas City Mo.	810	370.2	1,000
WDAG—Amarillo, Texas	1140	263.0	250
WDAH—El Paso, Texas	1280	234.2	100
WDAY—Fargo, N. Dak.	830	361.2	250
WDBJ—Roanoke, Va.	1300	230.6	250
WDBO—Winter Park, Fla.	1250	239.9	500
WDBZ—Kingston, N. Y. (WOKO)	1390	215.7	50
WDEL—Wilmington, Del.	1130	265.3	100
WDGY—Minneapolis, Minn. (WRHM)	1150	260.7	500
WDOD—Chattanooga, Tenn.	1180	254.1	500
WDRC—New Haven, Conn.	1090	275.1	250
WDWF—Cranston, R. I. (WBSO)	780	384.4	500
WDWM—Newark, N. J. (WHAP, WMSG)	1270	236.1	500
WDZ—Tuscoa, Ill. (Daytime only)	1080	277.6	100
WEAF—N. Y. City	610	491.5	50,000
WEAM—North Plainfield, N. J.	1250	239.9	250
WEAN—Providence, R. I.	1130	265.3	500
WEAO—Columbus, O. (WAIU)	1060	282.8	750
WEAR—Cleveland, O. (WTAM)	750	399.8	1,000
WEBC—Superior, Wisc.	1240	241.8	250
WEBE—Cambridge, Ohio	1210	247.8	10
WEBH—Chicago, Ill. (WJJD)	820	365.6	2,000
WEBJ—New York, N. Y. (WJBI, WLTH, WBBR)	1170	256.3	500
WEBQ—Harrisburg, Ill.	1340	233.7	15
WEBR—Buffalo, N. Y.	1240	241.8	200
WEBW—Beloit, Wisc.	1160	258.5	500
WEDC—Chicago, Ill. (WGES)	1240	241.8	500
WEEI—Boston, Mass.	670	447.5	500
WEHS—Evanston, Ill.	1390	215.7	100
WEMC—Berrien Springs, Mich.	1260	238.0	1,000
WENR—Chicago, Ill. (WBCN, WTAS)	1040	283.3	500
WEPS—Gloucester, Mass.	1010	296.9	100
WEVD—Woodhaven, N. Y. (WAAT and WGBB)	1220	245.8	500
WEW—St. Louis, Mo.	850	352.7	1,000
WFAA—Dallas, Texas (WBAP)	600	475.9	500
WFAM—St. Cloud, Minn.	1190	252	10
WFBC—Knoxville, Tenn.	1280	234.2	50
WFBE—Cincinnati, Ohio.	1220	245.8	250
WFBG—Altoona, Pa.	1070	280.2	100
WFBJ—Collegeville, Minn.	1100	272.6	100
WFBL—Syracuse, N. Y.	1160	282.8	750
WFBM—Indianapolis, Ind. (WKBF)	1090	275.1	250
WFBR—Baltimore, Md.	1230	243.8	100
WFBZ—Galesburg, Ill. (WRAM)	1210	247.8	50
WFCI—Pawtucket, R. I.	1240	241.8	50
WFDF—Flint, Mich.	860	348.6	100
WFHH—Clearwater, Fla.	820	365.6	500
WFI—Philadelphia, Pa. (WLIT)	740	405.2	500
WFIW—Hopkinsville, Ky.	1220	245.8	500
WFKB—Chicago, Ill. (WCRW)	1340	223.7	500
WFKD—Philadelphia, Pa.	1460	205.4	10
WFLA—Boca Raton, Fla.	1410	212.6	1,000
WGAL—Lancaster, Pa. (WKJC)	1190	252.0	15
WGBB—Freeport, N. Y. (WEVD and WAAT)	1220	245.8	400
WGBC—Memphis, Tenn.	1080	277.6	15
WGBF—Evansville, Ind.	1270	236.1	250
WGBI—Scranton, Pa. (WQAN)	1300	230.6	100
WGBS—Astoria, L. I., N. Y. (WAAM)	860	348.6	500
WGCP—Newark, N. J. (WNJ)	1070	280.2	500
WGES—Chicago, Ill. (WEDC)	1240	241.8	500
WGHP—Mt. Clemens, Mich.	1230	243.8	1,500
WGL—New York, N. Y. (WODA)	1020	293.9	500
WGM—Jeanette, Pa.	1440	208.2	50
WGMU—New York, N. Y., Portable (WRMU)	1490	201.6	100
WGN—Chicago, Ill. (WLIB)	980	305.9	15,000
WGR—Buffalo, N. Y.	990	302.8	750
WGST—Atlanta, Ga. (WMAZ)	1110	270.1	500
WGWB—Milwaukee, Wisc.	1370	218.8	500
WGY—Schenectady, N. Y. (WHAZ)	790	378.5	50,000
WHA—Madison, Wisc. (WLBL)	940	319.0	750
WHAD—Milwaukee, Wis.	1110	270.1	500
WHAM—Rochester, N. Y.	1080	277.6	5,000
WHAP—New York, N. Y. (WDWM, WMSG)	1270	236.1	1,000
WHAR—Atlantic City, N. J. (WPG)	1100	272.6	750
WHAS—Louisville, Ky.	650	461.3	500
WHAZ—Troy, N. Y. (WGY)	790	379.5	500
WHB—Kansas City, Mo. (WOQ)	890	336.9	500
WHBA—Oil City, Pa.	1150	260.7	10
WHBC—Canton, Ohio	1270	236.1	10
WHBF—Rock Island, Ill.	1350	222.1	100
WHBL—Chicago, Ill. (Portable-Carrell)	1470	204.0	100
WHBM—Chicago, Ill. (Portable-Carrell)	1490	201.6	100
WHBN—St. Petersburg, Fla.	1010	296.9	10
WHBP—Johnstown, Pa.	1310	228.9	250
WHBQ—Memphis, Tenn.	1290	232.4	100
WHBU—Anderson, Ind.	1360	220.4	15
WHBW—Philadelphia, Pa. (WTAD)	1360	220.4	100
WHBY—West De Pere, Wisc.	1200	249.9	50
WHDI—Minneapolis, Minn. (WLB)	1220	245.8	500
WHEC-WABO—Rochester, N. Y.	1180	254.1	100
WHFC—Chicago, Ill.	1390	215.7	200
WHK—Cleveland, Ohio (WJAY)	1130	265.4	500
WHN—N. Y. City (WQAO, WPAP)	760	394.5	500
WHO—Des Moines, Iowa	560	535.4	5,000
WHPP—New York, N. Y. (WMRJ)	1450	206.8	10
WHT—Chicago, Ill. (WIBO)	720	416.4	5,000
WIAD—Philadelphia, Pa. (WHBW)	1360	220.4	50
WIAS—Burlington, Ia. (KICK)	630	475.9	100
WIBA—Madison, Wisc.	1250	239.9	100
WIBG—Elkins Park, Pa. (Sunday, day time only)	680	440.9	50
WIBI—Flushing, N. Y. (WBKN, WWRL, WBMS)	1120	267.7	100
WIBJ—Chicago, Ill. (Portable-Carrell)	1490	201.6	100
WIBM—Chicago, Ill-Portable-Carrell)	1490	201.6	100
WIBO—Chicago, Ill. (WHT)	720	416.4	500
WIBR—Steubenville, Ohio	1200	249.9	50
WIBS—Elizabeth, N. J. (WTRC, WLBX, WMBQ)	1470	204	150
WIBU—Polynette, Wisc.	1380	217.3	20
WIBW—Chicago, Ill. (Portable-Carrell)	1470	204.0	100
WIBX—Utica, N. Y.	1260	238.0	150
WIBZ—Montgomery, Ala.	1300	230.6	15
WICC—Bridgeport, Conn.	1400	214.2	250
WIL—St. Louis, Mo.	1160	258.5	250
WIOD—Miami Beach, Fla.	1210	247.8	1,000
WIP—Philadelphia, Pa. (WOO)	590	508.2	500
WJAD—Waco, Texas	670	447.5	500
WJAG—Norfolk, Nebr.	1350	222.1	250
WJAK—Kokomo, Ind.	1280	234.2	50
WJAM—Cedar Rapids, Ia. (KWCR)	780	384.4	100
WJAR—Providence, R. I.	620	483.6	500
WJAS—Pittsburgh, Pa. (KQV)	1110	270.1	500
WJAX—Jacksonville, Fla.	890	336.9	1,000
WJAY—Cleveland, Ohio (WHK)	1130	265.3	500
WJAZ—Mt. Prospect, Ill. (WMBI)	1140	263.0	5,000
WJBA—Joliet, Ill.	930	322.4	50
WJBB—St. Petersburg, Fla.	870	344.6	250
WJBC—LaSalle, Ill.	1320	227.1	100
WJBI—Red Bank, N. J. (WEBJ, WLTH, WBBR)	1170	256.3	250
WJBK—Ypsilanti, Mich.	1360	220.4	15
WJBL—Decatur, Ill.	1410	212.6	250
WJBO—New Orleans, La.	1140	283.3	100
WJBR—Omro, Wisc.	1320	227.1	100
WJBT—Chicago, Ill. (WBBM, WAAF, WORD)	770	389.4	100
WJBU—Lewisburg, Pa.	1400	214.2	100
WJBW—New Orleans, La.	1260	238.0	30
WJBY—Gadsden, Ala.	1280	234.2	50
WJBZ—Chicago Heights, Ill.	1440	214.2	100
WJJD—Mooseheart, Ill. (WEBH)	820	365.6	1,000
WJPW—Ashtabula, Ohio	1440	208.2	100
WJR-WCX—Pontiac, Mich.	680	440.9	5,000
WJZ—Bound Brook, N. J.	660	454.3	30,000
WKAF—Changed to WTMJ Milwaukee, Wis.	880	340.7	500
WKAQ—San Juan, P. R.	1300	230.6	1,000
WKAR—East Lansing, Mich.	1340	223.7	50
WKAV—Laconia, N. H.	1390	215.7	150
WKBB—Joliet, Ill. (WCLA)	1370	218.8	10
WKBC—Birmingham, Ala.	1310	228.9	100
WKBE—Webster, Mass.	1090	275.1	250
WKBF—Indianapolis, Ind. (WFBM)	1490	201.6	100
WKBG—Chicago, Ill. (Portable)	1360	220.4	500
WKBH—La Crosse, Wis.	930	322.4	50
WKBI—Chicago, Ill.	1460	205.4	15
WKBL—Monroe, Mich.	1400	214.2	50
WKBN—Youngstown, O. (WMBW)	1370	218.8	500
WKBO—Jersey City, N. J. (WKBQ and WBNY)	1410	212.6	50
WKBP—Battle Creek, Mich.	1370	218.8	500
WKBQ—New York, N. Y. (WKBO, WBNY)	1380	217.3	100
WKBS—Galesburg, Ill. (WLBO)	1190	252.0	50
WKBT—New Orleans, La.	1380	217.3	100
WKBV—Brookville, Ind.	1380	217.3	500
WKBW—Buffalo, N. Y.	1500	199.9	15
WKBZ—Ludington, Mich.	930	322.4	15
WKDR—Kenoshia, Wis.	1190	252.0	50
WKJC—Lancaster, Pa. (WGAL)	900	333.1	500
WKRC—Cincinnati, Ohio	1040	283.3	150
WKY—Oklahoma City, Okla.	1120	267.7	30
WLAP—Louisville, Ky.	1220	245.8	500
WLB—Minneapolis, Minn. (WHDI)	1430	209.7	50
WLBC—Muncie, Indiana	1430	209.7	50
WLBF—Kansas City, Mo.	1400	214.2	100
WLBG—Petersburg, Va.	1490	201.6	30
WLBH—Farmingdale, N. Y. (Portable)	1260	238.0	250
WLBI—East Wenona, Ill.	940	319.0	1,000
WLBL—Stevens Point, Wis. (WHA)	1120	267.7	50
WLBM—Boston, Mass.	1470	204.0	50
WLBN—Chicago, Ill. (Portable)	1380	217.3	100
WLBO—Galesburg, Ill. (WKBS)	930	322.4	50
WLBT—Crown Point, Ind.	930	322.4	15
WLBR—Belvidere, Ill.	1450	206.8	50
WLBV—Mansfield, Ohio.	1020	267.7	500
WLBW—Oil City, Pa.	1470	204.0	250
WLBX—Long Island City, N. Y. (WIBS, WMBQ, WTRC)	1430	209.7	50
WLBY—Iron Mountain, Mich.	1440	208.2	250
WLBZ—Dover-Foxcroft, Me.	1210	247.8	50
WLCI—Ithaca, N. Y.	980	305.9	500
WLIB—Chicago, Ill. (WGN)	740	405.2	500
WLIT—Philadelphia, Pa. (WFI)	870	384.4	5,000
WLS—Chicago, Ill. (WCBD)	620	483.6	100
WLTS—Chicago, Ill. (WCFL)	1170	256.3	500
WLTH—Brooklyn, N. Y. (WBBR, WEBJ, WJBI)	810	370.2	1,000
WLWL—Kearny, N. J. (WMCA)	1330	225.4	500
WMAC—Cazenovia, N. Y. (WSYR)	700	428.3	500
WMAF—South Dartmouth, Mass.	550	545.1	750
WMAK—Lockport, N. Y.	1310	228.9	100
WMAL—Washington, D. C.	1280	234.2	50
WMAN—Columbus, Ohio	670	447.5	1,000
WMAQ—Chicago, Ill. (WQJ)	1210	247.8	100
WMAY—St. Louis, Mo.	1110	270.1	500
WMAZ—Macon, Ga. (WGST)	1470	204.0	100
WMBA—Newport, R. I. (Portable)	1490	201.6	100
WMBB—Chicago, Ill. (WOK)	1190	252.0	500
WMBC—Detroit	1420	211.1	100
WMBD—Peoria Heights, Ill.	1460	205.4	250
WMBE—St. Paul, Minn.	1440	208.2	10
WMBF—Miami Beach, Fla.	780	384.4	500
WMBG—Richmond, Va.	1450	206.8	15
WMBH—Chicago, Ill. (Portable-E. D. Aber.)	1470	204.0	100
WMBI—Addison, Ill. (WJAZ)	1140	263	5,000
WMBJ—Monnesson, Pa.	1290	232.4	50
WMBL—Lakeland, Fla.	1310	228.9	50
WMBM—Memphis, Tenn.	1430	209.7	10
WMBO—Auburn, N. Y.	1360	220.4	100
WMBQ—Brooklyn, N. Y. (WTRC, WIBS, WLBX)	1470	204.0	100
WMBR—Tampa, Fla.	1190	252.0	100
WMBS—Harrisburg, Pa.	1280	234.2	250
WMBW—Youngstown, O. (WKBN)	1400	214.2	50
WMC—Memphis, Tenn.	580	516.9	500
WMCA—New York, N. Y. (WLWL)	810	370.2	500
WMPC—Lapeer, Mich.	1280	234.2	30
WMRJ—Jamaica, N. Y. (WIPP)	1450	206.8	10
WMSG—New York, N. Y. (WHAP, WDWM)	1270	236.1	500
WNAB—Boston, Mass. (Changed to WASN)	850	352.7	500
WNAC—Boston, Mass.	1250	239.9	500
WNAD—Norman, Okla.	1160	258.5	250
WNAL—Omaha, Nebr. (KOCH and KFOX)	1040	263.0	100
WNAT—Philadelphia, Pa. (WRAX)	990	302.8	250 / 500
WNAX—Yankton, S. D.	1440	208.2	200
WNBA—Forrest Park, Ill.	1450	205.8	50
WNBF—Endicott, N. Y.	1150	260.7	250
WNBH—New Bedford, Mass.	1450	206.8	50
WNBJ—Knoxville, Tenn.	1500	199.9	50
WNBL—Bloomington, Ill.	1420	211.1	15
WNBO—Washington, Pa.	1480	202.6	15
WNBQ—Rochester, N. Y.	1310	228.9	20
WNBR—Memphis, Tenn.	1070	256.3	500
WNJ—Newark, N. J. (WGCP)			

Station	Kc	M	Watts
WNOX—Knoxville, Tenn.	1130	265.3	1,000
WNRC—Greensboro, N. C.	1340	223.7	500
WNYC—New York City, N. Y.	570	526	500
WOAI—San Antonio, Texas	990	302.8	2,000
WOAN—Lawrenceburg, Tenn.	1050	260.7	250
WOAX—Trenton, N. J. (WEAM)	1250	239.9	500
WOBU—Charleston, W. Va.	1120	267.7	50
WOBT—Union City, Tenn.	1460	205.4	15
WOC—Davenport, Ia.	800	374.8	5,000
WOCL—Jamestown, N. Y.	1340	223.7	25
WODA—Paterson, N. J. (WGL)	1020	293.9	1,000
WOI—Ames, Iowa; 5000, daytime, 6 to 6 (WSUI)	1130	265.3	2,500
WOK—Chicago, Ill. (WMBB)	1190	252.0	5,000
WOKO—Peekskill, N. Y.	1390	215.7	250
WOKT—Rochester, N. Y.	1430	209.7	500
WOMT—Manitowoc, Wis.	1350	221.1	50
WOO—Philadelphia, Pa. (WIP)	590	508.	500
WOOD—Furnwood, Mich.	1150	260.7	500
WOQ—Kansas City, Mo. (WHB)	890	336.9	250
WOR—Newark, N. J.	710	422.3	500
WORD—Batavia, Ill. (WBBM), WJBT, WAAF)	770	389.4	5,000
WOS—Jefferson City, Mo.	760	394.5	500
WOW—Omaha, Nebr.	590	508.2	1,000
WOWO—Ft. Wayne, Ind.	1310	228.9	1,000 2,500
WPAB—Norfolk, Va.	1430	209.7	100
WPCC—Chicago, Ill., (WFKB. WCRW)	1340	223.7	500
WPCH—New York, N. Y. (WRNY)	970	309.1	500
WPDQ—Buffalo, N. Y. (WSVS)	1460	205.4	50
WPEP—Waukegan, Ill.	1390	215.7	250
WPG—Atlantic City, N. J. (WHAR)	1100	272.6	2,500
WPRC—Harrisburg, Po.	1430	209.7	100
WPSC—State College. Pa. (WBAK)	1000	299.8	500
WPSW—Philadelphia, Pa.	1480	202.6	50
WPTF—Raleigh, N. C.	720	416.4	500
WQAA—Parkersburg, Pa.	1390	215.7	500
WQAE—Springfield, Vt.	1200	249.9	50
WQAM—Miami, Fla.	930	322.4	750
WQAN—Scranton, Pa. (WGBI)	1300	230.6	100
WQAO-WPAP—Cliffside, N. J. (WHN)	760	394.5	500
WQJ—Chicago, Ill. (WMAQ)	670	447.5	500
WRAF—La Porte, Ind.	1440	208.2	100
WRAH—Providence, R. I.	1500	199.9	250
WRAK—Escanaba, Mich.	1060	282.8	50
WRAM—Galesburg, Ill. (WFBZ)	1210	247.8	50
WRAV—Yellow Springs, Ohio	880	340.7	100
WRAW—Reading, Pa.	1260	238.0	50
WRAX—Philadelphia, Pa. (WNAT)	1040	283.3	250
WRBC—Valparaiso, Ind.	1260	238.0	250
WRC—Washington, D. C.	640	468.5	500
WREC—Memphis, Tenn.	1180	254.1	50
WREN—Lawrence, Kans. (KFKU)	1180	254.1	750
WRES—Quincy, Mass.	1380	217.3	50
WRHF—Washington, D. C. (6 a.m. to 6 p.m.)	930	322.4	150
WRHM—Minneapolis, Minn. (WDGY)	1150	260.7	1,000
WRM—Urbana, Ill.; 1000 watts before 6 p.m. (WBAA)	1100	272.6	500
WRMU—New York, N. Y. Portable) (WGMU)	1490	201.6	100
WRNY—New York, N. Y. (WPCH)	970	309.1	500
WRPI—Terre Haute, Ind.	1440	208.2	100
WRR—Dallas, Texas	850	352.7	500
WRRS—Racine, Wis.	930	322.4	50
WRSC—Chelsea, Mass.	1460	205.4	15
WRST—Bay Shore, N. Y. (WCDA, WRBS, WCGU)	1420	211.1	250
WRVA—Richmond, Va.	1180	254.1	1,000
WSAI—Cincinnati, O.	830	361.2	5,000
WSAJ—Grove City, Pa.	1340	223.7	250
WSAN—Allentown, Pa. (WCBA)	1350	222.1	100
WSAR—Fall River, Mass.	1190	252.0	100
WSAX—Chicago, Ill.	1470	204.0	100
WSAZ—Huntington, W. Va.	1240	241.8	100
WSB—Atlanta, Ga.	630	475.9	1,000
WSBC—Chicago, Ill. (WWAE)	1290	232.4	500
WSBT—South Bend, Ind. (WEMC)	1350	222.1	250
WSDA—New York, N. Y. (WARS, WBBC)	1320	227.1	250
WSEA—Virginia Beach, Va. (WTAR)	1140	263.0	250
WSIX—Springfield, Tenn.	1410	212.6	150
WSKC—Bay City, Mich.	610	491.5	250
WSM—Nashville, Tenn.	880	340.7	5,000
WSMB—New Orleans, La. WAAT)	930	322.4	500
WSMK—Dayton, O.	1220	245.8	500
WSOE—Milwaukee, Wis.	1010	296.9	200
WSRO—Hamilton, Ohio.	1100	270.1	500
WSSH—Boston, Mass.	870	384.4	100
WSUI—Iowa City, Iowa (WOI)	1300	230.6	100
WSVS—Buffalo, N. Y. (WPDQ)	1130	265.3	500
WSYR—Syracuse, N. Y. (WMAC)	1460	205.4	50
WTAD—Quincy, Ill.	1330	225.4	500
WTAG—Worcester, Mass.	1270	236.1	250
WTAL—Toledo, Ohio (WABR)	1040	283.3	500
WTAM—Cleveland, Ohio (WEAR)	1070	280.2	100
WTAQ—Eau Claire, Wisc.	750	399.8	3,500
WTAR—Norfolk, Va. (WSEA)	1180	254.1	500
WTAS—Batavia, Ill. (WBCN, WENR)	1140	263.0	500
WTAS—Batavia, Ill. (WORD)	1040	283.3	1,500
WTAW—College Station, Texas	1090	275.1	3,500
WTAX—Streator, Ill.	970	309.1	500
WTFF—Washington, D. C.	930	322.4	50
WTIC—Hartford, Conn.	1470	204	50
WTMJ—Milwaukee, Wisc. (WHAD)	560	535.4	500
WTRC—Brooklyn, N. Y. (WIBS, WMBQ, WLBX)	1020	293.9	1,000
WTRL—Midland Park, N. J. (WJBI, WIBI, WBMS)	1470	204	50
WWAT—Chicago, Ill. (WSBC)	1120	267.7	100
WWJ—Detroit, Mich.	1290	232.4	500
WWL—New Oreans, La.	850	352.7	1,000
WWNC—Ashville, N. C.	1090	275.1	100
WWRL—Woodside, N. Y. (WBKN, WJBI, WIBI, WBMS)	1010	296.9	1,000
WWVA—Wheeling, W. Va.	1120	267.7	100
KDKA—East Pittsburgh, Pa.	770	389.4	100
KDLR—Devils Lake, N. D.	950	315.6	50,000
KDYL—Salt Lake City, Utah	1300	23.6	50,000
KELW—Burbank, Calif. (KPPC)	1160	258.5	100
KEX—Portland, Ore.	1310	228.9	250
KFAB—Lincoln, Nebr. (5000 before 7 p. m.)	1250	239.9	2,500
KFAD—Phoenix, Ariz.	970	309.1	2,000
KFAU—Boise, Idaho (4,000 watts daytime)	1100	272.6	500
KFBB—Havre, Mont.	1050	285.5	2,000
KFBC—San Diego, Calif.	1090	275.5	2,500
KFBK—Sacramento, Calif.	1210	247.8	100
KFBL—Everett, Wash.	560	535.4	100
KFBS—Trinidad, Colo.	1340	223.7	50
KFBU—Laramie, Wyo.	1260	238.0	15
KFCB—Phoenix, Ariz.	700	428.3	500
KFCR—Santa Barbara, Calif.	1230	243.8	125
KFDM—Beaumont, Texas	1420	211.1	50
KFDX—Shreveport, La.	800	374.8	500
KFDY—Brooklings, S. D. (KMA, KWKH)	1270	236.1	250
KFDZ—Minneapolis, Minn.	760	394.5	500
KFEC—Portland, Ore. (KFIF)	1300	215.7	10
KFEL—Denver, Colo.	1400	214.2	50
KFEQ—St. Joseph, Mo.	1210	247.8	250
KFEY—Kellogg, Idaho	1300	230.6	1,000
KFEQ—St. Joseph, Mo.	1290	232.4	10
KFH—Wichita, Kansas	1300	230.6	1,000
KFHA—Gunnison, Colo.	1220	245.8	500
KFHL—Oskaloosa, Iowa.	1180	254.1	50
KFI—Los Angeles, Calif.	1410	212.6	10
KFIF—Portland, Ore. (KFEC)	640	468.5	5,000
KFIO—Spokane, Wash. (KFPY)	1400	214.2	50
KFIU—Juneau, Alaska	1220	245.8	100
KFIZ—Fond du Lac, Wisc.	1330	225.4	10
KFJB—Marshalltown, Iowa	1120	267.7	100
KFJF—Oklahoma, Okla.	1210	247.8	15
KFJI—Astoria, Ore.	1100	272.6	750
KFJM—Grand Forks, N. Dak.	1200	249.9	15
KFJR—Portland, Ore. (KTBR)	900	333.1	100
KFJY—Fort Dodge, Ia. (KFMR)	1060	282.8	100
KFJZ—Fort Worth, Texas	680	440.9	100
KFKA—Greeley, Colo.	1200	249.9	50
KFKB—Milford, Kansas	750	399.8	200
KFKU—Lawrence, Kansas (WREN)	1240	241.8	1,000
KFKX—Chicago, Ill. (KYW)	1180	254.1	500
KFKZ—Kirksville, Mo.	570	526.0	2,500
KFLR—Albuqerque, N. M.	1330	225.4	15
KFLV—Rockford, Ill.	720	225.4	15
KFLX—Galveston, Texas	1120	267.7	100
KFNF—Shenandoah, Iowa (KMA)	1110	270.1	1,000
KFON—Long Beach, Calif.	1240	241.8	500
KFOR—Lincoln, Nebr.	1380	217.2	100
KFOX—Omaha, Nebraska (KOCH, WNAL)	1160	258.5	100
KFOY—St. Paul, Minn.	1050	285.5	100
KFPL—Dublin, Texas	1090	275.1	15
KFPM—Greenville, Texas	1300	230.6	15
KFPR—Los Angeles, Calif. (KFQZ)	1290	232.4	250
KFPW—Carterville, Mo.	1140	253.0	50
KFPY—Spokane, Wash. (KFIO)	1220	245.8	250
KFOA—St. Louis, Mo.	930	322.4	50
KFBQ—Ft. Worth, Tex.	920	325.9	1,000
KFQD—Anchorage, Alaska	870	344.6	100
KFQU—Holy City, Calif.	1200	249.0	100
KFQW—Seattle, Wash.	1380	218.3	100
KFQZ—Hollywood, Calif. (KFPR)	1290	232.4	100
KFRC—San Francisco, Calif.	660	454.3	1,000
KFRU—Columbia, Mo.	1200	249.9	500
KFSD—San Diego, Calif.	680	440.9	500
KFSG—Los Angeles, Calif.	1090	275.1	500
KFUL—Galveston, Texas	1160	258.5	500
KFUM—Colorado Springs, Colo.	1270	236.1	100
KFUO—St. Louis, Mo. (KSD)	550	545.1	500
KFUP—Denver, Colo.	1320	227.1	100
KFUR—Ogden, Utah	1330	225.4	50
KFUS—Oakland. Calif. (KRE)	1170	256.3	50
KFUT—Salt Lake City, Utah	600	499.7	50
KFVD—Venice, Calif. (KGFJ)	1440	208.2	250
KEVE—St. Louis, Mo.	1280	234.2	1,000
KFVG—Independence, Kans.	1330	225.4	50
KFVI—Houston, Texas	1260	238.0	50
KFVR—Denver, Colo.	630	475.9	250
KFVS—Cape Girardeau, Mo.	1340	223.7	50
KFWB—Los Angeles, Calif.	830	361.2	500
KFWC—San Bernadino, Calif.	1350	222.1	100
KFWF—St. Louis, Mo.	1400	214.2	250
KFWI—San Francisco, Calif.	1120	267.7	500
KFWM—Oakland, Calif. (1000 watts day time)	1270	236.1	500
KFWO—Avalon, Calif.	1370	218.8	250
KFWV—Portland, Ore.	1310	228.9	50
KFXB—Los Angeles, Calif.	190	252.0	500
KFXF—Denver, Colo.	1060	282.2	500
KFXJ—Near Edgewater, Colo.	1390	215.7	15
KFXR—Oklahoma City, Okla.	1400	214.2	15
KFXY—Flagstaff, Ariz.	1460	205.4	25
KFYO—Breckinridge, Texas	1420	211.1	15
KGA—Spokane, Wash.	1150	260.7	2,000
KGAR—Tuscon, Ariz.	1280	234.2	100
KGBS—Seattle, Wash.	1480	202.6	100
KGBU—Getchikan, Alaska	1310	228.9	500
KGBX—St. Joseph, Mo.	1040	283.3	500
KGBY—Columbus, Nebr.	1480	202.6	50
KGBZ—York, Nebr.	1410	212.6	100
KGCA—Decorah, Iowa	1480	202.6	10
KGCB—Oklahoma City, Okla. (KGFG)	1390	215.7	50
KGCH—Wayne, Nebr.	1020	293.9	250
KGCI—San Antonio, Texas (KGDR)	1480	202.6	15
KGCL—Seattle, Wash. (KPCB)	1300	230.6	50
KGCN—Concordia, Kansas	1440	208.2	50
KGCR—Brooklings, N. Dak.	1440	208.2	15
KGCU—Mandan, N. Dak.	1440	208.2	100
KGCX—Vida, Mont.	1230	243.8	10
KGDA—Dell Rapids, S. Dak. (Day time only)	1280	234.2	15
KGDE—Barrett, Minn.	1460	205.4	15
KGDJ—Cresco, Iowa	1480	202.6	10
KGDM—Stockton, Calif.	1380	217.3	10
KGDP—Pueblo, Colo.	1340	223.7	10
KGDR—San Antonio, Texas (KGCI)	1480	202.6	15
KGDW—Humboldt, Nebr.	1450	206.8	100
KGDX—Shreveport, La.	1410	212.6	250
KGDY—Oldham, S. Dak.	1450	206.8	15
KGEF—Los Angeles, Calif.	1140	263.0	500
KGEH—Eugene, Ore.	1490	201.6	50
KGEK—Yuma, Colo.	1470	204.0	10
KGEN—El Centro, Calif.	1330	225.4	15
KGEO—Grand Island, Nebr.	1460	205.4	100
KGEQ—Mineapolis, Minn.	1480	202.6	50
KGER—Long Beach, Calif. (KRLO)	1390	215.7	100
KGEU—Lower Lake, Calif.	1320	227.1	50
KGEW—Fort Morgan, Colo.	1370	218.8	10
KGEY—Denver, Colo.	1490	201.6	15
KGEZ—Kalispell, Mont.	1460	205.4	100
KGFB—Iowa City, Iowa	1340	223.7	10
KGFF—Ava, Okla.	1460	205.4	25
KGFG—Oklahoma City, Okla. (KGCB)	1390	215.7	50
KGFH—La Crescenta, Cal. (KMIC)	1340	223.7	100
KGFI—San Angelo, Tex.	1360	220.4	15
KGFJ—Los Angeles, Calif. (KFVD)	1440	208.2	100
KGFK—Hallock, Minn.	2340	223.7	50
KGFL—Trinidad, Colo.	1350	222.1	50
KGFM—Yuba City, Calif.	1420	211.1	15
KGFN—Aneta, N. Dak.	1500	199.9	15
KGFO—Terra Haute, Ind.	1470	204.0	100
KGFP—Mitchell. So. Dak.	1410	212.6	10
KGO—Oakland, Calif.	780	384.6	5,000
KGRC—San Antonio, Texas	1360	220.4	50
KGRS—Amarillo, Texas	1230	243.8	150
KGTT—San Francisco, Calif.	1450	206.8	50
KGU—Honolulu, T. H.	1110	270.1	600
KGW—Portland, Ore.	610	491.5	1,000
KGY—Lacey, Wash.	1230	243.8	50
KHJ—Los Angeles, Calif.	740	405.2	500
KHMC—Harlingen, Texas	1270	236.1	100
KHQ—Spokane, Wash.	810	370.2	1,000
KICK—Anita, Ia. (WIAS)	630	475.9	100
KJBS—San Francisco, Calif.	1360	220.4	50
KJR—Seatle, Wash.	860	348.6	2,500
KKP—Seattle, Wash.	1130	265.3	15
KLDS—Independence, Mo.	1110	270.1	1,500
KLIT—Portland, Oregon	1450	206.8	10
KLS—Oakland, Calif. (KZM)	1220	245.8	250
KLX—Oakland, Calif.	590	508.2	500
KLZ—Denver, Colo.	1120	267.7	250
KMA—Shenandoah, Iowa (KWKH and KFDY)	760	394.5	1,000
KMED—Medford, Oregon	1120	267.7	50
KMIC—Inglewood, Calif. (KGFH)	1340	223.7	250
KMJ—Fresno, Calif.	820	365.6	50
KMMJ—Clay City, Neb. (WCAJ)	790	379.5	500
KMO—Tacoma, Wash.	1180	254.1	250
KMOX—St. Louis, Mo.	1100	299.8	5,000
KMTR—Los Angeles, Calif.	570	526.0	500
KNRC—Santa Monica, Calif.	800	374.8	500
KNX—Los angeles, Calif.	890	336.9	500
KOA—Denver, Colo. (10,000 until 7 p. m.)	920	325.9	5,000
KOAC—Corvalis, Ore.	1110	270.1	500
KOB—State College, N. M. (KWSC, KTW)	760	394.5	5,000
KOCH—Omaha, Nebr. (WNAL, KFOX)	1160	258.5	250
KOCW—Chickasha, Okla.	1190	252.0	250
KOIL—Council Bluffs, Iowa	1080	277.6	1,500
KOIN—Portland, Ore.	940	319.0	1,000
KOMO—Seattle, Wash.	980	305.9	1,000
KOWW—Walla Walla, Wash.	1000	299.8	500
KPCB—Seatte, Wash. (KGCL)	1300	230.6	50
KPJM—Prescott, Ariz.	1400	214.2	15
KPNP—Muscatine, Iowa	1420	211.1	100
KPO—San Francisco, Calif.	710	422.3	1,000
KPPC—Pasadena, Calif. (KELW)	1310	228.9	50
KPRC—Houston, Texas	1020	293.9	500
KPSN—Pasadena, Calif.	950	315.6	1,000
KQV—Pittsburgh, Pa. (WJAS)	1110	270.1	500
KQW—San Jose, Calif.	1010	296.9	500
KRAC—Shreveport, La.	1360	220.4	50
KRE—Berkeley, Calif. (KFUS)	1170	256.3	100
KRLD—Dallas, Texas	1350	222.1	500
KRLO—Los Angeles, Calif. (KGER)	1390	215.7	250
KROX—Seattle, Wash. (KRSC)	1420	211.3	50
KRSC—Seattle, Wash. (KROX)	1420	211.1	50
KSAC—Manhattan, Kans.	900	333.1	500
KSBA—Shreveport, La.	1120	267.7	1,000
KSCJ—Sioux City, Ia. (KWUC)	1230	243.8	500
KSD—St. Louis, Mo. (KFUO)	550	545.1	500
KSEI—Pocatello, Idaho	900	333.1	250
KSL—Salt Lake City, Utah	990	302.8	1,000
KSMR—Santa Maria, Calif.	1100	272.6	100
KSO—Clarinda, Iowa	1320	227.1	500
KSOO—Sioux Falls, S. D.	1430	209.7	250
KTAB—Oakland, Calif.	1070	280.2	500
KTAP—San Antonio, Texas	1310	228.9	10
KTBI—Los Angeles, Calif.	1040	282.3	500
KTBR—Portland, Ore. (KFJR)	1060	282.8	50
KTCL—Seattle, Wash.	1080	277.6	500
KTHS—Hot Springs, Ark.	880	340.7	750
KTNT—Muscatine, Iowa	1170	256.3	3,500
KTSA—San Antonio, Tex. (formerly WCAR)	1130	265.3	2,000
KTUE—Houston, Tex.	1410	212.6	5
KTW—Seattle, Wash. (KWSC, KOB)	760	394.5	1,000
KUJ—Seattle, Wash.	1500	199.9	10
KUOA—Fayetteville, Ark.	1010	96.9	500
KUOM—Missoula, Mont.	800	374.8	500
KUSD—Vermillion, S. D.	620	483.6	250
KUT—Austin, Texas	1280	232.4	500
KVI—Tacoma, Wash.	1280	232.4	50
KVOO—Bristow, Okla.	860	348.6	1,000
KVOS—Seattle, Wash.	1430	209.7	50
KWBS—Portland, Ore.	1500	199.9	15
KWCR—Cedar Rapids, Ia. (WJAM)	780	384.4	250
KWG—Stockton, Calif.	870	344.6	50
KWJJ—Portland, Ore.	1310	228.9	50
KWKC—Kansas City, Mo.	1350	222.1	100
KWKH—Shreveport, La. (KMA, KFOY)	760	394.5	1,000
KWLC—Decorah, Iowa	1210	247.8	50
KWSC—Pullman, Wash. (KOB, KTW)	760	394.5	500
KWTC—Santa Ana, Caif.	880	340.7	5
KWUC—LaMars, Iowa (KSCJ)	1230	243.8	1500
KWWG—Brownsville, Texas	1080	277.6	500
KXL—Portland, Ore.	1360	220.4	50
KYA—San Francisco, Calif.	970	309.1	500
KYW—Chicago, Ill. (KFKX)	570	526	2,500 5,000
KZM—Oakland, Calif. (KLS)	1220	245.8	100

A THOUGHT FOR THE WEEK

YOU may not approve of prizefights from an ethical viewpoint and possibly you don't care which of the "pugs" knocks out the front teeth of the other, but if you're in the radio business you must admit that these affairs certainly do add to the popularity and profits of the business.

SIXTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

Member, Radio Publishers Association

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

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ROLAND BURKE HENNESSY, President
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European Representatives: The International News Co. Breams Bldgs., Chancery Lane, London, Eng.
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EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard
TECHNICAL EDITOR, Lewis Winner
CONTRIBUTING EDITORS:
J. E. Anderson, Capt. Peter V. O'Rourke, and James H. Carroll

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ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	231 lines	150.00
½ Page, 8¾" D. C.	231 lines	150.00
¼ Page, 4⅛" D. C.	115 lines	75.00
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Numbers Suggested for Station Waves

A special committee of the National Electrical Manufacturers' Association is studying the possibility of designating broadcasting channels by numbers as well as by call letters, so as to simplify the identification of the stations on the dials.

"A striking suggestion," said L. B. Raycroft, vice-president of the Radio Division of the association, "has been made, which may eliminate the confusion which arises over the designation of broadcast channels and wavelengths. The suggestion was made by R. H. Langley. The channels, as now determined by the Federal Radio Commission, instead of being designated as at present, might be designated by arbitrary numbers, say from one to ninety-six. This would simplify program announcements.

THEY SAY

DAVID SARNOFF, vice-president and general manager, Radio Corporation of America: "The remarkable strides made in 1927 in developing and producing radio receivers utilizing lighting current as the source of power, in the life-like rendition of music and speech, and in simplifying the operation of sets for the home, are the developments which will carry radio forward in 1928. Many problems stood in the way of harnessing ordinary house lighting current to the delicate task of detecting and amplifying radio signals. For one thing, suitable tubes had to be developed to rectify the alternating current into the direct current of the required voltages and to operate directly off the raw current for the lighting of the filaments."

* * *

RALPH H. LANGLEY, Consulting Engineer of the Crosley Radio Corporation: "To test accuracy of reproduction of a receiving set it is necessary to study each tone or audio frequency. It is necessary also to analyze the way in which the receiver reproduces the tone color of each frequency. Not only must the fundamental of the note be reproduced accurately, but the loudspeaker must pick up the harmonics of the note which give to it tone color. For instance, the fundamental vibration of the same note played on the violin, the flute or the piano may be identical, but the harmonics of the note are different in each instrument, and the loudspeaker must distinguish that difference."

* * *

MAJ. J. ANDREW WHITE, director, Columbia Broadcasting System: "In a short time the announcer, as we know him today, will be no more. It must be one of two things—an announcer patterned after a master of ceremonies, with a natural sense for making fitting introductions and for saying the right things and at the right time, without recourse to announcements prepared for him in advance, or the 'presentation director.' In its presentation director the station will have a man versed in music, continuity and showmanship who can handle a program feature from birth to finale before the microphone."

* * *

CARL D. BOYD, vice-president, United States Electric Corporation: "We believe that the radio industry, which closely follows the lines of the automobile industry, cannot continue in its present prosperity without stabilization and standardization. This has been proved in the automobile industry by the General Motors Corporation. Standardization and stabilization of the automobile market were produced only through the incorporation of several automobile concerns under General Motors. Prices were lowered through specialized production and quality was raised. This is what we aim to do in the radio field."

* * *

NOEL S. DUNBAR, designer, Splitdorf Radio Corporation: "How can I buy an art furniture model radio set when the model may not conform exactly to the period of the room in which I wish to place the receiver? That is a frequent question. You may safely group furniture of a common origin. In a way, your eye will tell you the proper combination. Curved lines do not as a rule go with straight lines. This is a good rule. Periods that stood for heavier construction cannot be harmoniously blended with periods that leaned toward delicate lines."

Super Power Adds No Interference

Washington.

In a recent statement Commissioner A. H. Bellows indicated that the Federal Radio Commission was in favor of high power broadcasting. He stated that licenses will not be issued for high power broadcasting without discrimination, since much engineering skill is required for the proper use of such power. The results of recent experiments by some stations using high power demonstrated the intrinsic value to the public.

The commission does not intend to hold out an offer to any broadcasting stations, for use of higher power. The judgment of the commission will be exercised as to the "public service, convenience or necessity" of the programs to be sent out.

"The advantage is not longer range and there is no intention of creating so-called national stations," Mr. Bellows continued. "Modulation of programs and sharper tuning seem to be the promise of the high powered stations.

"Our experience has definitely proved to us that up to 5,000 watts the range of interference is proportional to power in general. Above 5,000 watts there is no increase in the amount of interference caused by a station, and experiments such as WGY has been conducting on 100 kilowatts, using newly developed modulation tubes, seem to have proved that reception quality is better and that more constant reception is possible under high power.

"The increased wattage permits the stations to penetrate ordinary causes of disturbance, such as static, so that listeners within a certain range are enabled always to tune in on that station with more or less success.

"The increase in the number of high power stations will come about gradually. There are comparatively few today that exceed 10,000 watts."

Higher Power, More Selectivity, Urged

Washington

Engineers of the National Electric Light Association claim that only a minute portion of the so-called "man-made static" is due to the lines. They suggest high power broadcasting and sharper tuning.

They declare that much of the noise is due to nature. Noises caused by electrical machines cannot be wholly eliminated, but the high power suggestion, which will drown out the noise, will certainly aid in completely eliminating it, they say.

State's Rights Plea Raised for WBAW Power

Washington.

Since Tennessee has no powerful station it is within the State's right to increase the power of one station, namely WBAW, at Nashville, from 100 to 10,000 watts, representatives of this station claimed in a recent hearing before the Federal Radio Commission.

SOS SETS OFF ALARM

So as to insure protection of life aboard British vessels, where only one radio operator is carried, automatic alarm devices have been installed. When an SOS is on the air the alarm goes off, a series of dashes being heard.

THE RADIO TRADE

Cressy Joins CeCo As Sales Engineer

H. H. Steinle, general sales manager of the C. E. Mfg. Co. Inc., Providence, R. I., makers of the well-known CeCo tubes, announced that Charles O. Cressy, radio engineer and sales executive, has been added to the CeCo organization with the title of sales engineer.

For a year, until 1909, Mr. Cressy served with the Massie Wireless Telegraph in every capacity from operator to junior engineer. Following his employment with this company he devoted two years to independent radio research.

In 1913, he assumed a Government position as radio expert and was placed in charge of communications with Santo Domingo. The first successful radio station in this territory was installed and conducted by Mr. Cressy. During the revolution, he, like many others, became involved in local politics, and while pursuing his duty on a gunboat, enjoyed bombardments, blockades and other interesting incidents of the revolution.

In 1914 and 1915 Mr. Cressy served as operator and engineer with the Marconi Company, with location at the trans-atlantic station at New Brunswick, N. J. During 1916, Mr. Cressy's services were engaged in his home state by the R. I. Naval Militia and from 1917 to 1919, he served in the United States Navy starting as Ensign and first serving as Radio Officer of the North Atlantic Patrol Squadron No. 1, with headquarters on the U. S. S. Chester. Here he served on the staff of Admiral (then Captain) Hillery P. Jones.

In August 1917, Mr. Cressy was transferred to European duty, becoming special convoy Radio officer. In March 1918, he undertook the exacting duties of Aviation Radio instructor. In this branch alone, his experiences would fill many a volume. Finally Mr. Cressy was assigned to St. Nazaire as Radio Officer of Base No. 8, in charge of all radio material and personnel. He continued in service here until the end of the war, finishing with the rank of Senior Lieutenant.

During 1920 and 1921 he was attached to the Headquarters of the U. S. Naval Reserve, serving as radio instructor on land and during sea cruises.

From 1922 to August 1924, he was Sales Manager of the Coto-Coil Co., and later organized the Eastern Electric & Mfg. Co., producing radio sets and coils.

Receiving set manufacturers, through Mr. Cressy, will receive the full benefit of CeCo engineering co-operation. Jobbers and retailers will get increasing service, both from the sales and engineering departments.

Mr. Steinle said:

C. E. Mfg. Co., Inc., is a further evidence of the desire on the part of this company to render a full and complete service to their public, their distributors and to set manufacturers who are studying to improve radio reception through the use of perfect tubes, engineered to exacting standards, vigilantly tested and inspected at every stage of manufacture."

VAN PRAGG WITH COLUMBIA

Henry Van Praag, who for many years was solo cellist with Victor Herbert's orchestra, and who has been featured in many New York Symphony and New York Philharmonic orchestra concerts, joined the Columbia Broadcasting System's group of artists

Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufacturers, jobbers, dealers and mail order houses are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

RADIO WORLD,
145 West 45th St., N. Y. City.

I desire to receive radio literature.

Name .....

Address .....

City or town.....

State .....

T. M. Murphy, 406 Locust St., Lawrenceburg, Tenn.
Joseph Van Orden, Bx. 212, Butler, N. J.
J. E. Wolfe, Hutchinson Courts, Kittanning, Pa.
C. T. Davis, 1532 North Weber St., Colorado Springs, Colo.
G. S. Thorpe, Englewood, Mo.
Dr. Gomer, Teddlie, Handley, Tex.
Adrian Martin, Fort Strone, Q. M. Corps, Mass.
C. A. Burton, Jr., P. O. Box 527, Decatur, Tex.
W. N. Bolvon, 717 North 10th St., Enid, Okla.
P. A. Newlin, 231 11th St., Toledo, O.
Albert W. Hubbard, 1106 Russell Road, Willow Grove, Pa.
City Radio Company, 219 14th St., Oakland, Calif.
J. J. Morgan, 817 Fleming St., Key West, Fla.
William Weidman, 103-24 124th St., Richmond Hill, L. I., N. Y.
S. C. Pugh, 1116 Blanding St., Columbia, S. C.
G. Danielson, Bx, 487, Litchfield, Minn.
Joseph Buley, 814 South Clay St., Louisville, Ky.
Everett F. Barnett, 1424 East Washington St., Los Angeles, Calif.
L. M. Ohls, Arkadelphia, Ark.
Frank M. Givens, 1700 17th Ave. S., Nashville, Tenn.
James C. Pope, U. S. S. Camden, New London, Conn.
Louis Portnoy, 85 Middleton St., Brooklyn, N.Y.
Jose Lotufo and Irmaos Minervini, Rua Santa Ephigenia, 61 Sao Paulo, Brazil.
J. M. Orton, 3210 West Calhoun Boulevard, Minneapolis, Minn.
Rev. Charles Hannigan, c/o St. Joseph's Church, 53 Bwin St., New Bern, Calif.
L. . Richardson, 27 Congress St., Emporia, Kans.
Angelo Locasto, 1648 83rd St., Brooklyn, N. Y.
C. Stepp, 105 S. Dean St., Englewood, N. J.
Raymond C. Douglas, 1105 East Philadelphia St., York, Pa.
Philip R. Dixon, 7 Fox St., F. H., Cincinnati, O.
Millard Foote, 2235 Victor St., Cincinnati, O.
William E. Bersch, 1818 Central Ave., Indianapolis, Ind.
F. A. Tate, 5223 Graham St., Seattle, Wash.
Fred J. Browning, 125-17 Jamaica Ave., Richmond Hill, N. Y.
J. W. Lyon, P. O. Box 1042 San Francisco, Calif.
W. E. Eberhart, Jr., 2170 Heander St., Baton Rouge, La.
Wallace W. Spring, 19729 Keating, Detroit, Mich.
Philip Abbruscato, 1538 58th St., Brooklyn, N. Y.
Michael J. Schramm, 979 Fresh Pond Road, Brooklyn, N. Y.
J. H. De Cantillon, 108 Bunker Ave., Meriden, Conn.
R. H. Kingery, Chadwick, Ill.
G. C. Cunningham, 1623 Columbus Ave., N. S. Pittsburgh, Pa.
Frank Sargeant, 849 Pinewood Ave., Toledo, O.
L. A. Dowd, 728 Chestnut St., Oakland, Calif.
C. E. Dickerman, East Corinth, Vt.
R. W. Weber, 16106 South 9th St., Terra Haute, Ind.
R. A. Jennings, 120 West Chestnut St., Washington, Pa.
O. L. Wooley, 1328 East St. Vrain St., Colorado Springs, Colo.
A. M. Barnet, 1325 Walton Ave., Bx., N. Y. City.
Robert Barstow, 804 Main St., Midland, Mich.
Fletcher Curry, White Deer, Tex.
Arthur Thomer, 74 West 89th St., N. Y. City.
Carl Johnson, 4624 Filmore St., Pittsburgh, Pa.
E. Dierbergerm, 5109 Wadsworth St., Los Angeles, Calif.
G. A. Riesdorph, R. D. 4, Waterloo, N. Y.
Farris & Powell, Agency, Mo.

NEW CORPORATIONS

Webster Stores, Bx., N. Y. City, radios; $10,000. (Atty., B. Herdes, 551 5th Ave., N. Y. City.)
Kenneth Harkness, N. Y. City, radios and autos; $5,000. (Atty., V. H. Gallagher, 541 Lincoln Place, Brooklyn, N. Y.)
Fifth Ave. Radio and Auto Accessories; $5,000. (Atty., E. Halpern, 116 Nassau St., N. Y. City.)
Davis Electric Co., radio and telephone systems; $20,000, (Atty. A. J. Steen, 101 West 31st St., N. Y. City.)

The Biograph

PAT KILEY

Pat Kiley is now the eastern sales manager for Herbert H. Frost, Inc., and Runzel-Lens Electric Manufacturing Company, both of Chicago, and represents the Gray & Danielson Manufacturing Company of San Francisco, manufacturers of the Remler condenser, Infradyne, dials, etc. His territory for these three concerns embraces the entire eastern seaboard of the United States from Maine to Florida, and he covers it with active efficiency.

PAT KILEY

He was one of the first men who sold radio exclusively. While other men introduced radio in certain sections of the country, it was usually in conjunction with electrical goods, radio being with them only a side line.

When E. F. MacDonald, Jr., organized the Zenith Company at the birth of commercial radio, Kiley was brought by him from New York City to Chicago and will be remembered by many of the present outstanding figures of the industry as the smiling young man who guarded the portals of McDonald's door.

After leaving the Zenith Company Kiley returned to New York City and realizing the importance of the part that the jobber plays in the radio merchandising scheme he accepted a position with J. H. Bunnell and Company, jobbers.

While with Bunnell, Kiley was in charge of radio sales in the metropolitan district. He severed connections with Bunnell to become assistant to Frank Burns, who was then in charge of the Eastern District for Frost and for Cunningham tubes. When Major Herbert H. Frost severed connections with the Company that bears his name, and the Cunningham tube interests were divorced from Frost Radio, Kiley became the District Sales Manager in the territory which was formerly in charge of Frank Burns. At the same time, he took on the representation of the Runzel-Lens Electric Manufacturing Company and maintains an office at 30 Church Street, New York City.

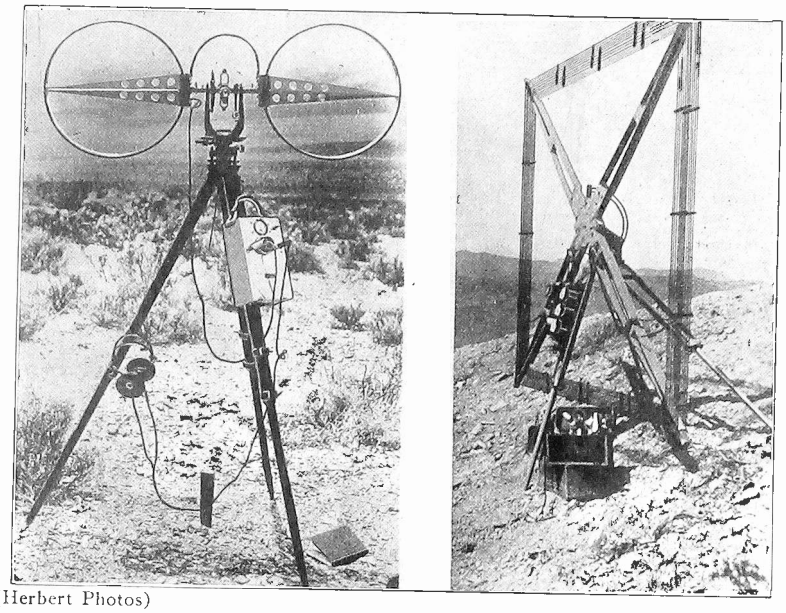
POWERS APPOINTS SERVICE STATION TO AID DEALERS

In line with his efforts to best serve the dealers he sells, Mike Powers of the M. J. Powers Co., 109 Lafayette Street, New York City, representative for the well-known Abox line, has appointed Radio Construction Laboratories, 142 Liberty street, official service station in this territory. Here, troubles encountered by the fan in wrong installation, use of improper chargers, etc., will be smoothed out, making things easier for the fan and dealer alike. In almost every instance of trouble with the Abox, it has been found to be due to these causes and not inherent in the Abox itself. This is a well-equipped laboratory, having both pure A. C. and D. C., the most modern of equipment and ideally adapted to give this service.—J. H. C.

M. & H. EXHIBIT STRODYNE

M. H. Sporting Goods Co. of Philadelphia exhibited a complete Strobodyne receiver and created quite a stir at the show in that city. Already set builders are reporting big things for this circuit.

HOW RADIO LOCATES METALS



(Herbert Photos)

RECEIVING apparatus with which it is possible to locate precious metals is shown at the left. The loops on top of the tripod comprise the direction-finding antennas. At the right is the broadcasting apparatus. Presence of metal will cause the broadcast signal to be distorted. The amount of distortion is measured by meters on the receiver.

Nature's Secret Riches Wrested from Her Bosom

By Humphrey Dell

Prospecting for mineral deposits has always been a fascinating though uncertain occupation. The lure of sudden and immense riches has induced men to devote their entire lives to a search for hidden minerals. Most of the old prospectors died in disappointment, a few of them attained their goal.

But as time went on the number of mineral deposits that could be seen from the surface became exhausted. No longer could the old prospector go out with a pick and shovel with any hope of stumbling on a heap of gold and silver gleaming in the sunlight. Almost every square inch of surface had been thoroughly examined by other prospectors before him.

Though most of the mineral deposits reaching the surface have already been found, there is untold wealth just below the surface. If man had eyes keen enough to penetrate hundreds of feet of rock and soil he would find wealth directly under his feet. He would not have to sink expensive shafts to explore the ground underneath in the hope of finding the deposits. He could see them if they were there.

Seeing Below the Surface

Not until the advent of radio did man have a means whereby he could see the nature of the strata below the surface. Now with the aid of radio waves he can see as clearly hundreds of feet under the ground as he can see on the surface. All he has to do is to interpret what he sees.

There is a very close similarity between seeing objects on the surface with the aid of ordinary light and seeing objects underground with the aid of radio waves. Radio waves and light waves differ only in the frequency or length. Because of the difference in frequency light waves and radio waves behave differently toward matter. The short waves of light will pass through certain things and be absorbed by others. Or certain things will reflect these light waves. Radio waves also will pass through certain objects and be absorbed by others. But some objects may be transparent to radio waves and opaque to light waves, and vice versa. Usually both light waves and short radio waves are reflected by the same things—conductive to metals.

Prospecting with the aid of short radio waves is worked on the principle that ordinary rock and soil are comparatively transparent to short radio waves. If there is a body of conducting ore within 500 feet of the surface the radio waves will strike it and be reflected back again. A person with a suitable receiver on the surface, by proper interpretation of the reflected waves as received, can tell what the nature of the sub-surface strata is.

Like Looking at Lake Bottom

This is closely analogous to looking at the bottom of a lake. The water is comparatively transparent to light waves. A certain amount of the light that falls on the surface of the water reaches the bottom. Part if this is reflected back again and a portion of the reflected light reaches the surface. If the water is not too deep or too muddy, the amount of light coming back will be enough to see by. A person looking at the bottom will actually see it. The nature of the bottom can be gauged by the manner in which the light is reflected or absorbed by the bottom. A polished mirror, which essentially is a surface of highly conductive metal and not glass, would appear bright and would send back all the light that fell on it. Mud would not be so clear because it would absorb most of the light.

In the method of prospecting with radio waves a short wave radio transmitter is used to take the place of the light source. It sends out the waves which are to be reflected by any possible body of metal in the ground. The ore body does not have to be polished like the mirror because the radio waves, though short, are long as compared with the irregularities in the ore body. The condition for reflection is that the ore body be highly conducting in comparison with the conductivity with the surrounding rock and soil.

Wave Front Distortion Utilized

The short wave transmitter sends out waves in all directions. When there are no obstructions the waves will travel out in a symmetrical fashion, but impediments will distort the wave front and change the apparent direction of the source. This distortion of the wave front is important in connection with prospecting.

A direction finding receiver is set up in the field of the transmitter and the direction from which the radio waves come is carefully determined at many suitably chosen points in the field. Normally all these directions should point to the same point where the transmitter is located. A body of conducting mineral will alter the course of the waves, whether the mineral is on or below the ground. Hence if the waves do not travel out from the transmitter equally in all direction there is a strong probability that a mineral body is responsible for the distortion.

Since the body of mineral acts as a secondary source of radio waves some of the measured directions will point to the mineral body rather than to the actual source of the waves. Other directions will be a combination of the effects of the true transmitter and its image in the mineral body. At some points the reflected waves will predominate; at others the direct waves will predominate.

Exclusion Process Used

By carefully plotting the apparent direction of the transmitter at many points in the field, the location of which is known, the location of the disturbing body of mineral can also be fixed. It is not only possible to tell below what point of the surface the body is but also to tell how far below it is. And again it is possible to tell the approximate extent of the deposit.

Both the transmitter and the receiver in this system are mounted on surveyors' transits to facilitate accurate measurement of direction and also to simplify the portability of the outfit. The total equipment weighs only 500 pounds and can be easily handled by a crew of four men.

Since the principle of the radio prospector depends on the conductivity of the mineral deposit, it is limited to sulphides of copper, lead and iron and to deposits of native metals of all kinds. But the sulphides are the most common form of mineral deposits and therefore the method is of wide application.

The method of prospecting by radio waves is extensively used in the mining districts of Arizona and other Western states abounding in mineral deposits. This method is being carefully studied and refined to extend its use, if possible, to other types of mineral deposits, that is, to non-conducting minerals.

12 STATIONS IN BRAZIL

A report received by the Department of Commerce from Joseph F. Hunt, Vice-Consul at Rio de Janeiro, shows that Brazil now has 12 broadcasting stations. Three are in Rio de Janeiro, one in Minas Geraes, six in Sao Paulo, one in Pernambuco and one in Bahia.

Fernald Laboratories Widen Their Scope

Among recent incorporations that are of interest to the radio trade is that of the H. and F. Radio Laboratories, 168 Washington Street, New York City. This laboratory is not a new institution in the radio field by any means, having been founded some five years ago, but due to its enormous increase in business and the great growth of its technical clientele, it became necessary to incorporate. The officers of the corporation are: Paul R. Fernald, President and Treasurer and Harry D. Gilbert, Secretary.

Mr. Fernald is well known for his work and research in the superheterodyne field and is one of the best-equipped general radio technicians in the country.

Radio World's CLASSIFIED ADS *for Quick Action*

10 Cents a Word—10 Words Minimum—Cash With Order

LATEST THREE-TUBE CIRCUIT and construction data, 25c. Excellent quality; performance. Radioman, 4528 Adams Street, Chicago.

DIRECT FACTORY SALE—Wholesale prices. Tremendous Savings. Selling direct to you. Here are some of our many items: 30 Henry Choke, 100 M.A., $2.19; 10 Henry Choke, 400 M.A., $5.48. Power Transformers for all kinds of Eliminators and for all types of A.C. Tubes, at Special Low Prices. EVERY ITEM FULLY GUARANTEED. Promptly shipped, upon receipt of order. Send for free illustrated catalog today. Todd Electric Co., Inc. (Manufacturers) 36 West 20th Street, Dept. D, New York City.

BETTER THAN ANY FIXED LEAK is the Bretwood Variable Grid Leak. It allows adjustment of grid voltage to maximum sensitivity for reception of far-distant signals, with distortion. The Improved 1928 Model De Luxe Bretwood Grid Leak, $1.75; or $2.25 for Grid Leak with Bretwood Bullet Condenser attached. The North American Bretwood Co., 145 West 45th Street, New York City.

RADIO SET ASSEMBLING, Wiring, Repairing. Guaranteed workmanship. Reasonable charges. Write Wm. H. Vordenfeld, Shumway, Illinois.

RADIO AGENTS—Make Big Money—Easy! Selling Marvelous New Sets and Accessories. Buy from factory at lowest prices. Get New Catalog with thousands of nationally advertised bargains. FREE Call Book. Write today. American Auto and Radio Co., Dept. 198, American Radio Bldg., Kansas City, Mo.

VALET AUTOSTROP RAZOR—The only razor that sharpens its own blades. Highly polished nickel-plated, self-stropping Valet AUTOSTROP Razor, with one blade, in velvet lined metal case. Leather strop especially prepared, and complete outfit in neat, lithographed carton. Mailed post paid on receipt of 50c. SPECIAL: Send $2 for one-third of a year subscription for Radio World (yearly price $6), mention this particular ad, and complete "Pal" set will be sent as a premium. If already a subscriber, your subscription will be extended three months. THE COLUMBIA PRINT, 145 West 45th Street, New York City.

AMPLIFYING CRYSTAL DETECTOR—Operates speaker—No tubes; no transformers. Money back Guarantee. Plans 50 cents. Frank Pritchard, Box 107, Oklahoma City, Okla.

TRANSFORMERS FOR A.C. TUBES, $3.50. 50H-85MA Chokes, $2.50. All parts for Raytheon Eliminator, $16.75. Write for detailed lists, Radio Parts Sales Co., Orange, N. J.

Do you want to complete your files for Radio World?—Any copy that you missed during the past Summer will be supplied @ 15c. the copy, or any 7 copies for $1.00, or you can start your subscription with any issue. Circulation Dept. Radio World, 145 W. 45 St., New York City.

HOW TO BUILD RADIO WORLD'S Four-Tube Universal Receiver fully described by Herman Bernard in the March 12, 19 and 26 issues of RADIO WORLD. Send 45c and get these three numbers. RADIO WORLD, 145 West 45th Street, New York City.

Radio Kit Co. Ready With Unified Diamond Kit

The extensive and growing business of Radio Kit Co., 72 Cortlandt Street, New York City, has forced them to increased facilities, and the opening of the new season finds them prepared to meet any demand on the part of fans for any kit or set of parts known to radio. Their laboratory experts, after exhaustive tests, have selected the Unified Diamond as a leader and are now ready to ship any or all of the respective kits for this fine circuit to any part of the world. They also carry in stock, tested and matched kits for the Winner, Everyman Four, Strobodyne, Victoreen, Camfield, Knickerbocker Four and all other circuits. Every kit is laboratory tested before shipment and absolute satisfaction is guaranteed. They also carry kits for all the best makes of speakers, including Ensco, Balsa and others, also all kits for power packs and B elimination, units and high-grade parts. Every help is given to set builders who purchase kits, the homebuilders' department being under the direction of E. B. Moore, a leading radio engineer. This concern is glad to answer questions and inquiries to the above address will receive prompt reply.—J. H. C.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Radio World, published weekly at New York, N. Y., for October 1, 1927.

State of New York,
County of New York, ss.:

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Roland Burke Hennessy, who, having been duly sworn according to law, deposes and says that he is the Editor of the Radio World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation etc.), of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are: Publisher, Hennessy Radio Publications Corp., 145 W. 45th St., N. Y. C.; editor, Roland Burke Hennessy, 145 W. 45th St., N. Y. C.; managing editor, Herman Bernard, 145 W. 45th St., N. Y. C.; business manager, Herman Bernard, 145 W. 45th St., N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of the stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given): Hennessy Radio Publications Corp., 145 W. 45th St., N. Y. C. Roland Burke Hennessy, 145 W. 45th St., N. Y. C. Mrs. Mary McArthur, Gulfport, Florida.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... weekly. (This information is required from daily publications only).

ROLAND B. HENNESSY,
Editor.

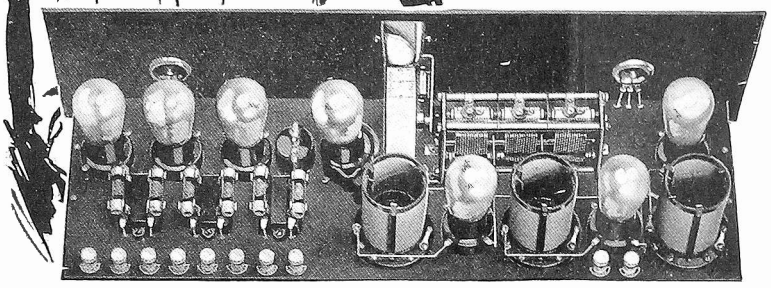
(Sworn to and subscribed before me this 22nd day of September, 1927)

ESTHER M. GURIN,
Notary Public, Bronx County. Bronx Co. Clerk's No. 109; Register No. 2839. New York County Clerk's No. 218; Register No. 8213. Term expires March 30, 1928.

Note.—This statement must be made in duplicate and both copies delivered by the publisher to the postmaster, who shall send one copy to the Third Assistant Postmaster General (Division of Classification), Washington, D. C., and retain the other in the files of the post office. The publisher must publish a copy of this statement in the second issue printed next after its filing.

AERO-SEVEN RECEIVER

10-Kilocycle Selectivity



Utilizing New 340 Tubes

Unique Features

The Aero-Seven Receiver, which is being featured in the prominent radio magazines and newspapers, is a new tried and tested tuned R. F. circuit, incorporating the most modern radio improvements at a popular price. It is a distinct innovation in a tuned R. F. receiver utilizing three stages of R. F. and three stages of resistance coupled audio. Circuit is built around the famous improved Aero Universal Coils, with improved Amsco S. L. tuning 3-gang condenser, S-M singlecontrol drum dial and the tried and tested parts of other famous manufacturers. Such names as Carter, X-L, Westinghouse, Aero, Amsco and Silver-Marshall assure you of a circuit that is the final word in perfection.

Distinct features are: the new Hi-Mu tube at input and in R. F. stages, potentiometer control, higher amplification, 10-kilocycle selectivity and **true** single control.

The Aero-Seven has a broadcast range from below 200 meters to over 500 meters (1500-500 kc) and requires no shielding as with the small Aero coils, direct pick-up is negligible and coupling between coils is the very minimum The coils are twice-matched at both high and low frequencies of the broadcast band, thus eliminating many difficulties in single dial control and overcoming one of the principle causes of disappointments.

The adjustable compensators on the Amsco condensers facilitate the equalization of circuits, solving the major problems of tandem tuning.

The extremely sharp selectivity of the Aero-Seven circuit is due to the low resistance of the coils. The high voltage gain per stage, due to the extremely low loss construction, assures extreme distant reception and greatest volume and sensitivity is assured through the high efficiency of the coil windings.

New and Unique Hookup
3 Stages of Radio Frequency
3 Stages of Audio Amplification

The Aero-Seven has a new and unique hook-up that incorporates three stages of R. F. and three stages of Audio. There are two stages of tuned radio frequency and a special coupling stage, the secondary function of which is to prevent antenna detuning, thereby giving single control which is both theoretically and practically perfect. This independent antenna circuit is of a new and efficient design and employs a resistance connected between the antenna and ground inputting to the first grid circuit. Five CX340 tubes are used—3 in the R. F. circuit, one detector and one in the audio.

In the three audio stages, one 171 power tube is used, one 201A tube and the one CX340 tube in the input.

The circuit, therefore, is different from the usual 7-tube R. F. circuits, which variations contribute to its optimum selectivity, perfect quality and thrilling volume.

The combination of all the various parts, the matching of the Aero Universal Coils, together with the Amsco compensating 3-gang condenser, with true single control and potentiometer control, greatly simplifies operation and tuning, while adding efficiency to the circuit.

First Use of New CX-340 Tubes—
1-6/10 Times Better

Utilizing the new CX340 Cunningham tubes in place of the usual 201A, gives the Aero-Seven the distinction of being the first circuit using this superior method. CX340 tubes are 1-6/10 times more effective than 201A tubes, having a 5-volt filament and .25 amperes; plate, 180 volts maximum. In this receiver 90 volts is used constantly on the plate for the R. F. circuit, something seldom attempted but efficiently worked out here. It is a High Mu tube having a high amplification factor (Mu-30) and is used both as a detector and as a radio and audio amplifier. The Aero-Seven is specially designed to operate with this new and better CX340 tube and the results secured will be a pleasing revelation to you. It is surprising what tone and volume is secured with a minimum use of current.

Resistance Coupled Audio Amplification

Resistance coupled audio amplification in the Aero-7 attains a quality of reproduction unapproachable in other systems. It preserves the extraordinary quality consistently achieved by Aero-7's 10-kilocycle selectivity.

10 Kilocycle Selectivity
Now a Real Fact

Ten kilocycle selectivity is OPTIMUM Selectivity. It means a receiver that tunes sharply enough to eliminate interference and yet does not tune so sharply as to cause distortion. It is the ideal tuning characteristic. "Optimum tuning," says the engineer, when he means a perfect set.

Why bother with anything but the best? Why put up with anything but 10-kilocycle selectivity, as represented in the Aero-Seven circuit?

Due to the low-loss construction of the coils and condensers in the Aero-Seven and the great selectivity introduced into the circuit itself, you get selectivity so sharp that you cannot get two stations at one time under present broadcast regulations, at the same time providing adequate frequency margin to prevent high "cut off"—distortion.

Imagine what this means in perfect radio reception. Selectivity, the ability to time in clearly, sharply, without fear of disturbance in getting the station you want whenever you want it—that's something every radio fan has long desired. It is an actuality in the Aero-Seven—a feature that is necessary in an up-to-date circuit—a feature that you get in the Aero-Seven when you build it.

New, Modern, Proved Features
in Aero-Seven

10 Kilocycle selectivity.
Resistance coupled amplification.
Uses new CX340 tubes instead of 201A.
3 stages of R. F.
3 stages of audio amplification.
Extreme D-X reception.
Potentiometer control.
Silver-Marshall single drum dial.
True single control.
Aero Coils are twice matched at both high and low frequencies.
Amsco adjustable condensers.
Carter resistances
Westinghouse Foundation Unit.
X-L Posts.
High quality parts throughout.
Range below 200 to above 550 meters (1,500-500 KC).
Low loss characteristics throughout
Perfectly compensated—variation in antenna circuit doesn't affect it.
Wiring underneath sub-panel.
Simple construction.
Easy to build in quick time.
The most popular-priced 7-tube circuit.

The Aero-Seven-tube Receiver assures you of the very latest in radio. It has everything—beautiful tone, 10 kilocycle selectivity—extreme long range and a volume at your command that can be raised to music-hall proportion or lowered to slumbering whispers. The particularly meritorious application of resistance coupling creates a most remarkable tone. It gives you a receiver that is in a class all its own—a real conqueror of space—a companion that you can depend upon absolutely in any emergency. It delivers quality that is quality, and yet its construction is so low in cost as to be almost unbelievable.

An Opportunity for Set Builders

The set builder will find the Aero-Seven a most profitable receiver to build. It is an extremely simple circuit—efficient, high grade and having a record of exceptional performance. It could hardly be duplicated in a factory-built set at double the cost.

You can make big money building this set for your friends and get a real "kick" out of it yourself.

Complete parts, drilled and engraved panels and foundation units are being distributed through the jobbing trade and are available at leading radio stores everywhere. If your dealer cannot supply you, order direct giving your dealer's name and we will see that you are supplied promptly.

A full-size working blueprint and booklet of assembly and operating instructions with complete data is furnished, which makes it both practical and easy to build this circuit quickly. Build yours early—get the jump on the other fellow.

Get the facts. Mail the coupon and 10c stamps for this valuable booklet. Send today—NOW!

See article in this issue

Aero Products, Inc.
Dept. 610, 1768 Wilson Ave., Chicago

Dear Sirs: Enclosed find 10c for which please send me construction data and all the facts in building the new Aero-Seven Receiver.

Name .....

Address .....

Get the Facts—MAIL NOW →

AERO PRODUCTS, INC.

1768 Wilson Ave., Dept. 610, Chicago, U. S. A.

ASSOCIATED MANUFACTURERS—AMSCO, AERO, CARTER, WESTINGHOUSE-MICA RTA, SILVER-MARSHALL, X-L

BLUEPRINTS OF INEXPENSIVE DX RECEIVERS

THE FIVE-TUBE DIAMOND OF THE AIR, a very selective circuit of thrilling tone quality, that brings in distant stations to the great delight of the fans, is easily built, in fact can be constructed in a couple of hours. The authorized blueprints that make this speed and efficiency possible are just off the press and will be shipped at once, together with a booklet of full textual exposition of construction, including winding of coils, how to connect coil terminals, what values of condensers and resistors to use, etc. If you want a tone quality set that will give you great enjoyment, be sure to build this five-tube Diamond of the Air. The receiver consists of a stage of tuned radio frequency amplification, a specially sensitized detector, first stage of transformer audio and next two stages of resistance audio. It is easily adapted to playing phonograph records on your speaker. Get acquainted with this NEW delight.

THE FOUR-TUBE DIAMOND

represents the most that is obtainable from four tubes. A stage of tuned radio frequency amplification, a specially sensitized detector, and two stages of transformer coupled audio. Follow the diagrams as shown in the blueprint and you can't go wrong. You will be amazed at the results. Build the set from parts that you have. Full instructions cover utilization of such apparatus. Thousands are eager to build an economical set and this one is the most economical in cost of construction and upkeep, where one considers the surpassing results. Works splendidly from batteries, with either type 99 or type 01A tubes, and can be used with A and B eliminators, power packs, etc., with great success.

Look Over Both of These

Blueprints and read the text in both cases before choosing the receiver you are to build.

SEND NO MONEY!

Just fill out the coupon below, and note what you get FREE!

Guaranty Radio Goods Co.
145 West 45th Street, New York City

Please send me one newly-printed official blueprint of the 5-tube Diamond of the Air, one newly printed official blueprint of the 4-tube Diamond, and the textual data giving full directions for constructing these sets. I agree to pay the postman 75 cents on delivery. Also, you are to send me, without extra cost, one Auto Strop Safety Razor, one blade and one automatic razor strop.

Name .....

Address .....

City .....State.....

Five New Tubes In CeCo.'s Line

After much research the C. E. Manufacturing Co., 702 Eddy St., Providence, R. I., manufacturers of the well-known CeCo tubes, have produced five new tubes, two of which are of the AC type, two are high power filament type rectifiers and one a full wave gas content rectifier.

The detector AC tube is of the heater type, having a five prong socket and is called N-27. The amplifier AC tube is known as M-26 and can be used in both the AF and RF portions of the set, with raw AC directly on the filaments. The filament voltage which can be applied to heater in the N-27 is 2.5. It draws 1.75 amperes at this voltage. The filament of the amplifier tube draws 1.05 amperes, when voltage of 1.5 is applied.

One of the rectifier tubes, known as R-81 is of the half-wave filament type, it being possible to apply 750 volts to the plate. It will pass 100 milliamperes. The filament of this tube draws 1.25 amperes at a voltage of 7.5. The other rectifier tube known as the R-80, is a full-wave filament type rectifier. This tube passes 125 milliamperes at 300 volts plate. The filament of this tube draws 2 amperes, at a voltage of 5.

The gas content tube passes 85 milliamperes at 300 volts. All the tubes are constructed in the CeCo style so that one may be assured of their durability and efficiency.

End Radio Bothers

DO YOU KNOW what's wrong when your radio set isn't working right? Ten to one, you don't. Twenty to one, you would if you had a copy of

Hoff's Radio Trouble Finder

Ever hear of M. M. Hoff, radiotrician, of Philadelphia? He was one of the very first "radio bugs" and has been building and studying sets ever since. And now, out of his broad experience, this man has written a book to tell radio owners how to keep their sets working right.

He tells in plain words and illustrations how a set is made, what the parts are called, what are the few usual troubles and how to fix them. Then he lists 103 troubles that sometimes happen and tells how to detect and fix each one.

The book is a regular cyclopedia of radio information—only it's in language anyone can understand. Read it five minutes and you'll know more about radio than you ever dreamed of.

You Need This Book

It will save you many a repair man. It will save you hours of guessing and fussing and fuming. It will help you keep the tone of your set always sweet and strong. It will keep you from losing many programs. And, best of all—

IT WILL MAKE YOU STOP SWEARING MUCH TO THE SURPRISE OF YOUR FAMILY

because radio repairs are expensive. Why hire them done when you can easily learn how to keep your set from needing them?

All It Costs Is $1

Send cash with your order and you get also a Dictionary of Radio Terms and the latest list of Radio Broadcasting Stations with call letters and the new Federal Radio Commission wave lengths.

Send your dollar today while the copies last.

WALT C. WHITE, Distributor
Quincy Bldg., Chicago

COMPLETE DETAILS on what ohmage resistances may be used with B eliminators to also obtain C bias, were given by Frank Logan in the March 12 issue of RADIO WORLD. Either send 15c for his issue or begin your subscription with this issue. RADIO WORLD, 145 West 45th St., New York City.

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For NEW RADIO WORLD Subscribers Ordering NOW

Radio World has made arrangements

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—for the price of one:
—Send $6.00 today for RADIO WORLD
—for one year (regular price
—for 52 numbers)
—and select any one of the other
—nine publications for twelve months.

—Add $1.00 a year extra for
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—Present RADIO WORLD subscribers
—can take advantage of this offer by
—extending subscriptions one year
—if they send renewals NOW!

Radio World's Special Two-for-Price-of-One Subscription Blank

RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find $6.00 for which send me RADIO WORLD for twelve months (52 numbers), beginning ..... and also without additional cost, Popular Radio, or Radio News, or Science and Invention, or Radio Dealer, or Radio (San Francisco), or Radio Age, or Boys' Life (or $10.00 for a two-year subscription to one address). No other premium with this offer.

Indicate if renewal.

Offer Good Until Nov. 20, 1927.

Name .....

Street Address .....

City and State .....

Restored Enchantment

This is the Eveready Layerbilt that gives you Battery Power for the longest time and the least money.

Radio is better with Battery Power

THERE is no doubt of it—radio is better with Battery Power. And never was radio so worthy of the perfection of reception that batteries, and batteries alone, make possible. Today more than ever you need what batteries give—pure DC, Direct Current, electricity that flows smoothly, quietly, noiselessly. When such is the current that operates your receiver, you are unconscious of its mechanism, for you do not hear it humming, buzzing, crackling. The enchantment of the program is complete.

Batteries themselves have improved, as has radio. Today they are so perfect, and so long-lasting, as to be equal to the demands of the modern receiver. Power your set with the Eveready Layerbilt "B" Battery No. 486. This is the battery whose unique, exclusive construction makes it last longer than any other Eveready. Could more be said? In most homes a set of Layerbilts lasts an entire season. This is the battery that brings you Battery Power with all its advantages, conferring benefits and enjoyments that are really tremendous when compared with the small cost and effort involved in replacements at long intervals. For the best in radio, use the Eveready Layerbilt.

EVEREADY
Radio Batteries
–they last longer

At a turn of the dial a radio program comes to you. It is clear. It is true. It is natural. You thank the powers of nature that have once more brought quiet to the distant reaches of the radio-swept air. You are grateful to the broadcasters whose programs were never so enjoyable, so enchanting. You call down blessings upon the authority that has allotted to each station its proper place. And, if you are radio-wise, you will be thankful that you bought a new set of "B" batteries to make the most out of radio's newest and most glorious season.

NATIONAL CARBON CO., INC. New York—San Francisco

Unit of Union Carbide and Carbon Corporation

Tuesday night is Eveready Hour Night—9 P. M., Eastern Standard Time

WEAF—*New York*
WJAR—*Providence*
WEEI—*Boston*
WDAF—*Kansas City*
WFI—*Philadelphia*
WGR—*Buffalo*
WCAE—*Pittsburgh*
WSAI—*Cincinnati*
WTAM—*Cleveland*
WWJ—*Detroit*
WGN—*Chicago*
WOC—*Davenport*
WCCO—*Minneapolis, St. Paul*
KSD—*St. Louis*
WMC—*Memphis*
WRC—*Washington*
WGY—*Schenectady*
WHAS—*Louisville*
WSB—*Atlanta*
WSM—*Nashville*

Pacific Coast Stations—9 P. M., Pacific Standard Time

KPO—KGO—*San Francisco*
KFOA—KOMO—*Seattle*
KFI—*Los Angeles*
KGW—*Portland*

Have you heard the new Victor record by the Eveready Hour Group—orchestra and singers—in Middleton's Down South Overture and Dvořák's Goin' Home?