APRIL 23

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Radio Magic

See page 4

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The Measure of Cutoff
Of Amplification in Resistance Audio

By J. E. Anderson

Contributing Editor; Consulting Engineer; Associate, Institute of Radio Engineers

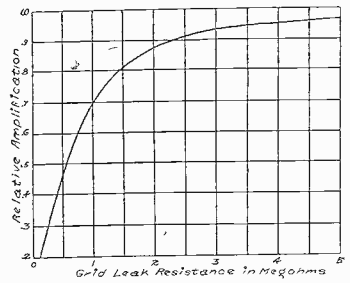


FIG. 1

Curve showing the relative amplification in resistance coupling as affected by the grid leak in series with the stopping condenser.

THE effect of the stopping condenser and the grid leak on the amplification is not generally recognized or there would not be so many faulty combinations included in the design of resistance amplifiers. The effects can easily be shown by means of curves.

Suppose that the internal plate resistance of the tube preceding the coupler is 150,000 ohms and that the lead or coupling resistance is 250,000 ohms. This we will hold constant for all the curves.

First let us consider the effect of varying the grid leak resistance while we hold the capacity of the stopping condenser constant at .006 mfd. and the frequency of the signal to be amplified at 25 cycles. Under these conditions we can calculate the amplification for various values of the grid leak resistance and compare this amplification to the greatest possible value of the amplification, that is, when the grid leak resistance is infinite in value. The ratio of the amplification at a given value of grid leak to the maximum is called the relative amplification. Its greatest value is unity.

Leak Should Exceed 1 Meg.

The curve in Fig. 1 shows the relative amplification at 25 cycles per second for various values of grid leak when the stopping condenser is .006 mfd., the coupling resistor is 250,000 ohms and when the plate resistance of the tube preceding is 150,000 ohms. The range of grid leak variation is from 250,000 ohms to 5 megohms. Note the very rapid decrease in the amplification for values of grid leak below one megohm. When the grid leak is as low as 100,000 ohms the relative amplification is only .2 of the maximum, that which would be obtained with a large condenser, a high value of leak resistance, or at a very high frequency. Is it any wonder that motorboating can be stopped by reducing the grid leak to 100,000 ohms or less? It not only stops the low frequency amplification but it kills the set for frequencies up to 25 cycles and much farther in frequency. For values of the grid leak in excess of 2 megohms the increase in the amplification is not rapid, and this value might be regarded as the lower limit. At 4 megohms the relative suppression is only 5%, which is not serious at 25 cycles.

The curve in Fig. 2 show the relative amplification as it varies with the stopping condenser. The grid leak resistance is held at one megohm and the frequency at 25 cycles. The internal tube resistance and the coupling resistance are the same as in the preceding curve.

This curve shows clearly what happens to the amplification when the stopping condenser is decreased. At about .001 mfd. the relative amplification is only 0.2. When the value of the condenser is .006 mfd. the relative amplification is a little over .7, which is still too low. It should be remembered here that the grid leak resistance is one megohm. If it had been 2 megohms the relative amplification at .006 mfd. would be somewhat higher. Not until the stopping condenser has a value of .012 mfd. does the relative amplification rise above 90%. Under the conditions, assume the stopping condenser should be at least .02 mfd., at which the relative amplification is within 4% of the maximum.

The Frequency Curve

The most elucidating way of showing the relative amplification is to show how it varies with the frequency for given constant conditions. In Fig. 3 the following conditions have been held constant. The plate resistance of the tube is 150,000 ohms, the coupling resistance is 250,000 ohms, the grid leak resistance is 2 megohms. In the lower curve the stopping condenser is .006 mfd. and in the upper curve it is .1 mfd. The lower curve shows little variation in the amplification above 25 cycles per second. Therefore if it is not desired to go any lower down on the scale a .006 mfd. condenser is about large enough when the other conditions are as stated. The higher curve shows practically no variation in the amplification above 5 cycles per second but a very rapid decrease below that value.

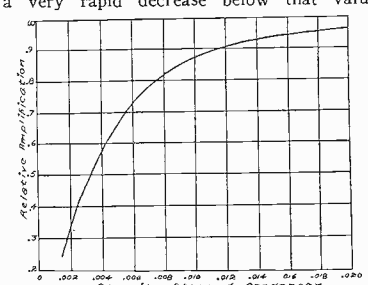


FIG. 2

Curve showing the relative amplification in resistance coupling as affected by the capacity of the stopping condenser.

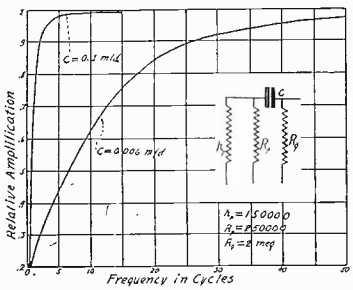


FIG. 3

Relative amplification as it varies with frequency. The plate resistor is 250,000 ohms, the stopping condensers .006 mfd. or .1 mfd. and the leak 2 meg.

Therefore with a .1 mfd. condenser in the grid circuit and the other constants as stated, the amplification will be practically constant from 5 cycles upward.

It must be remembered that the curves show the relative amplification for one stage only. In the usual resistance-coupled amplifier there are three identical couplers, each having the same effect. The total relative amplification is obtained by multiplying the separate amplifications. When these are all equal the total is the cube of one of them. For example, if the relative amplification is .95, the total is .95 x .95 x .95, which equals .857. It is clear then that the curve for one stage cannot be used directly for obtaining the true amplification. Curve 3 gives a relative amplification of .89 at 25 cycles. Three such curves combined would show a total relative amplification of .705. That is, the relative suppression is nearly 30 per cent for the entire audio amplifier. This is quite serious, even at 25 cycles. With the .1 mfd. stopping condenser the relative amplification at 10 cycles is for one stage about .99, and therefore the total relative amplification is .97. The suppression is therefore only 3 per cent.

The question of motorboating enters into the choice of stopping condenser and grid leak. Motorboating can be stopped in any circuit by decreasing the amplification sufficiently, even if the conditions otherwise are very favorable for motorboating. Since motorboating occurs in most cases at a low frequency, it can be stopped by decreasing the amplification at the low frequencies. If the amplification can be retained at the higher frequencies all is well. The shape of the three curves in this article suggests that one cure for motorboating is to reduce the grid leak or the stopping condenser, or both. But these methods introduce distortion. The ideal solution would be one which completely suppressed all frequencies below about 25 cycles and which introduced no suppression above that frequency. The upper curve in Fig. 3 very nearly satisfies this condition at 5 cycles, but this frequency is too low to suppress most motorboating.

Soldering That Stays Put

8 Rules for Use of Rosin Core Stated by Expert

By P. C. Ripley

Chicago Solder Company

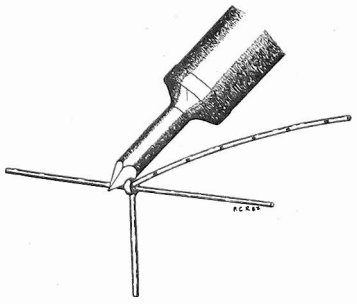


FIG. 1
The correct way to use rosin core solder.

THE user's lack of knowledge concerning the basic fundamentals controlling the successful use of rosin core solder in radio construction has often lead to unwarranted condemnation of this product. Others, having studied its capacities and virtues, are its staunchest defenders as the only suitable material for radio receiver construction. Long and exhaustive research on the part of radio engineers and manufacturers covering the entire field of fluxing agents resulted in their unqualified indorsement of this deoxidizer for radio use. For the home constructors who have attempted the use of rosin core solder with disappointing results this article is written, endeavoring to bring to their attention the probable cause of failure.

First, the user should refrain from abutted connections or joints. By that we mean merely placing one conductor on another and soldering. Always make a connection mechanically secure, then solder. There are several reasons for this instruction; several of a rather technical nature that would carry but little appeal to the average constructor, so we shall refrain from going into detail. But remember to make connections mechanically secure, then solder.

Test of Capacity

Second, never use any additional flux. To do this may cause trouble later that will be unjustly laid to the use of rosin. If you can not secure solder adhesion with rosin as a fluxing agent, locate the cause, for it can be easily remedied. Rosin is used as a fluxing agent in radio construction for a reason; to use any other fluxing agent with it will defeat its virtues. Use rosin core solder only.

Third, be sure that your iron has sufficient capacity for the work. Many failures in the use of rosin core solder are directly traceable to a lack of capacity in the iron. To test the capacity of your iron, secure a piece of copper as heavy as the materials on which you will work. Clean this with sandpaper, apply the heated iron and hold the strand of rosin core on the copper one-eighth of an inch from the iron. If in a few moments this melts and flows freely toward the iron you can feel sure that your iron has a heat-generating capacity ample to cope with the work. It is no indication of capacity to melt solder on the iron.

Fourth, nickel plating on soldering contacts will cause trouble. File this away and the base metal, usually brass or copper, will respond to the fluxing power of rosin. The material in rosin that acts as an oxide solvent displays little activity on the oxides of nickel. File all nickel plating from soldering surfaces.

Don't Carry Molten Solder

Fifth, surface dirt, lacquers, shellac, sulphates and the hundred and one substances encountered on soldering surfaces should be removed mechanically. Filing, sandpapering or scraping is satisfactory. A flux is compounded to dissolve metallic oxides only and cannot be expected to remove any and all substances with which your soldering surfaces may be covered. Mechanical cleaning is always helpful.

Sixth, never attempt to carry solder and flux from the spool to the work on the point of the heated iron. "Rosin joints" or insecurely soldered connections are sure to result. Apply the iron to the connection. When the joint has absorbed sufficient heat to melt the solder touch the rosin core directly to the joint and not to the iron. This liberates the rosin where required and at a time when it can serve to its greatest ability. The active part of the rosin is driven into the atmosphere in the form of a blue-white smoke at a very rapid rate when subjected to the high heat of the soldering iron. See Fig. 1. Heat the connection and melt the rosin core solder on the heated joint.

Seventh, to melt rosin core solder indiscriminately on any portion of the iron body or faces will result in disaster. Always touch the solder to the heated surfaces where solder adhesion is desired or at the junction of the iron's working face and work's surface. Careless applications frequently cause those dreaded "rosin joints." Rosin loses its activity as a flux by highly heating.

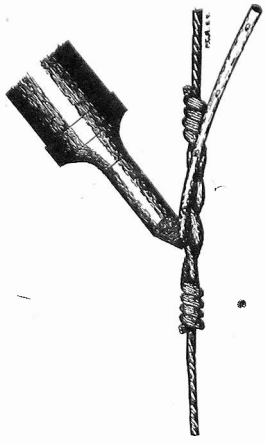


FIG. 2
Applying rosin core solder at the junction of iron and work.

Eighth, long and slender points on soldering irons may cause trouble. Conduction and radiation in the parts to be soldered may be so rapid that a solder melting temperature cannot be attained through such small conducting bodies. All contact faces of the iron should be maintained in a well-tinned (solder coated) condition at all times to assist in heat conduction from the iron to the work. It will be found that a scrap cut from a tin can on which you can melt a small amount of rosin core solder will be of material assistance in maintaining a well-tinned iron. Simply agitate the working faces of the iron in this pool of molten solder and rosin. A well-shaped and properly tinned iron is indispensable.

By following these simple instructions on the use of rosin core solder you will eliminate all possibility of "rosin joints," and the ease with which solder-protected connections are formed will be a distinct surprise.

Professor Uses 'Phones And Regains Hearing

At First Limited to Headpiece Reception Only, He Next Listens to Speaker and Now Has Normal Audibility

Los Angeles.

That there may be untouched fields for the development of radio as a cure for various ailments is hinted by an incident told by officials of KFI, Los Angeles. For years Prof. A. E. Brooks had been on the faculty of the University of Tennessee but on account of total deafness had to retire and moved to Southern California. Although unable to hear any ordinary sound, no matter how loud, with the use of earphone he could listen to radio, on account of the strong mechanical vibrations.

One morning recently he called KFI on the telephone and excitely told how on the previous night, while wearing the earphones, he suddenly regained his normal hearing. He had immediately removed the phones and turned on the loud speaker, and to his joy, heard the program as clearly as if he had never been deaf. The best part of it all, Prof. Brooks said, was that he was still able to hear perfectly not only radio, but all other sounds.

TEST OF "RADIO MAGIC"

The human body may be used as a conductor in an interesting experiment in "radio magic." Remove one speaker cord from the set. Leave the other speaker cord intact. Hold the free speaker cord in one hand and touch somebody else's nose with your other hand. Let the other person have his or her hand on the speaker post of the set from which the free cord was removed. The speaker will play, just as always, except that the volume will be a little less.

A Combination AF Channel
2 Double Impedances and 1 Transformer Used

IN the course of development work on general problem of uniform and ample amplification, the General Radio Company of Cambridge, Mass., has developed a unit which combines an excellent frequency characteristic with a high degree of amplification. This unit, known as the Type 373 Double Impedance Coupler, incorporates two chokes and a coupling condenser, making a complete coupling unit for insertion between the plate and the grid circuits of successive tubes. This feature, together with the compact dimensions of the black metal case, makes it a simple matter to substitute the GR 373 unit for a transformer or other coupler in any existing set.

Double impedance coupling differs radically from the usual impedance-coupled amplifier, as well as from the well-known resistance coupling. In the usual type of impedance-coupled amplifier "blocking" frequently occurs, particularly in the last stage tube. This is probably because, in spite of precautions taken to adjust the grid bias properly, an occasional signal causes the grid to charge. Unless this charge has leaked off before the next impulse reaches the grid, "blocking" occurs.

The high resistance leak used in the usual impedance-coupled amplifier does not permit the charge to leak off rapidly enough. If the resistance is reduced to the point where blocking no longer occurs, signal strength suffers. The reactance type of leak of the double impedance coupler, on the other hand, combines a high impedance to alternating current with a low direct current resistance, and the tendency to block is overcome.

The high value of the coupling resistance required in resistance-coupled amplifiers for good quality sometimes results in tubes being operated at too low a plate voltage for best results. Plate voltage is the actual voltage on the tube, and in a resistance-coupled amplifier it is much less than the battery or B eliminator voltage.

While the drop through the resistance can be compensated for by raising the plate voltage, not all users find it possible to attain the necessary high voltage for proper operation. In consequence, while distortion due to unequal amplification of different frequencies is avoided, harmonics are frequently introduced as a result of rectification due to overloaded tubes, with confusing distortion in what is claimed to be a distortionless amplifier. On the other hand, the low direct current resistance of the coupling coil in the GR 373 unit avoids the large loss of voltage experienced with coupling resistances, while its high impedance to audio frequency insures a high quality of reproduction.

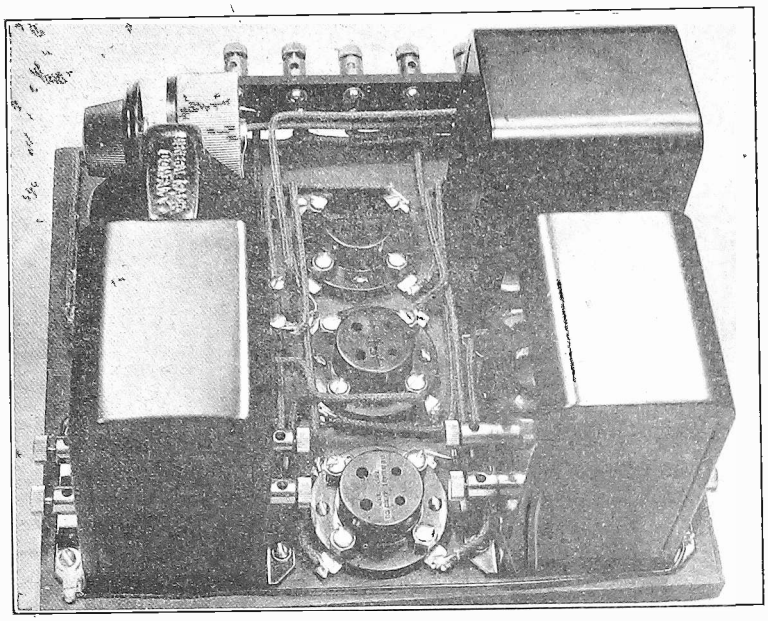


FIG. 1
The combination audio amplifier, using two double impedance stages and one transformer stage, with an output transformer.

For those seeking the utmost realism in radio rendition, together with reliable operation on reasonable plate voltages, the amplifier shown in the accompanying diagram is suggested, although it need not be followed in precise detail. Three stages of double impedance coupling may be employed, but increased volume, without perceptible loss of quality, results from the use of one transformer-coupled stage, as indicated. If a great volume of output is desired, a 112 should be used in the second stage, as well as a 371 or 171 in the last stage, with the usual 301-A or 201-A type of tube in the first stage.

In using impedance-coupled amplifiers with plate supplies having an alternating current source, trouble is sometimes encountered. Several methods of overcoming this trouble are generally successful. The use of different plate voltages on the different tubes of the amplifier is frequently effective. It will sometimes be found helpful to place the transformer in the middle stage of the amplifier. In this case the primary should be reversed if necessary. Condensers placed across the plate supply binding posts of the receiver help materially in stabilizing the amplifier. Also, to provide the utmost clarity on low, sustained notes, a large condenser, with a capacity of from 10 to 20 mfd., may be shunted across the full B eliminator output if found necessary.

The tubes employed in this amplifier must be properly operated, with their full rated filament battery voltages, ample plate voltage, and proper grid-biasing or C battery.

Because of the excellent frequency characteristic of the GR 373 Double Impedance Coupler, as presented in the accompanying curve, nothing but a good make of cone-speaker, with distortion reduced to a minimum, should be employed. The high voltage output of the power tube calls for a speaker filter or output transformer. In the circuit shown, a GR 387-A speaker filter is recommended. Practically the same results may be obtained by substituting an output transformer, such as the GR 367.

The results obtained are excellent.

SCHEMATIC DIAGRAM
FOR COMBINATION 2 STAGE DOUBLE IMPEDANCE COUPLED
AND 1 STAGE TRANSFORMER COUPLED AMPLIFIER WITH SPEAKER FILTER

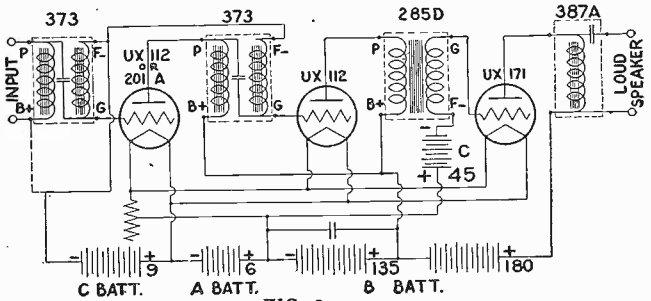


FIG. 2
Circuit diagram of the combination audio amplifier.

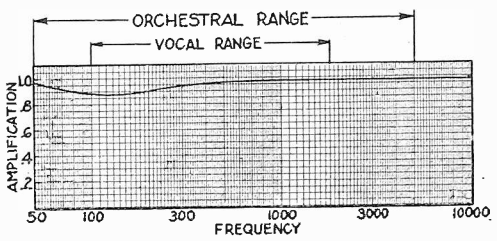


FIG. 3
The uniform amplification obtained is shown in the above graph.

The Melo-Heald
An Eleven-Tube Super-Heterodyne
By Herbert E. Hayden

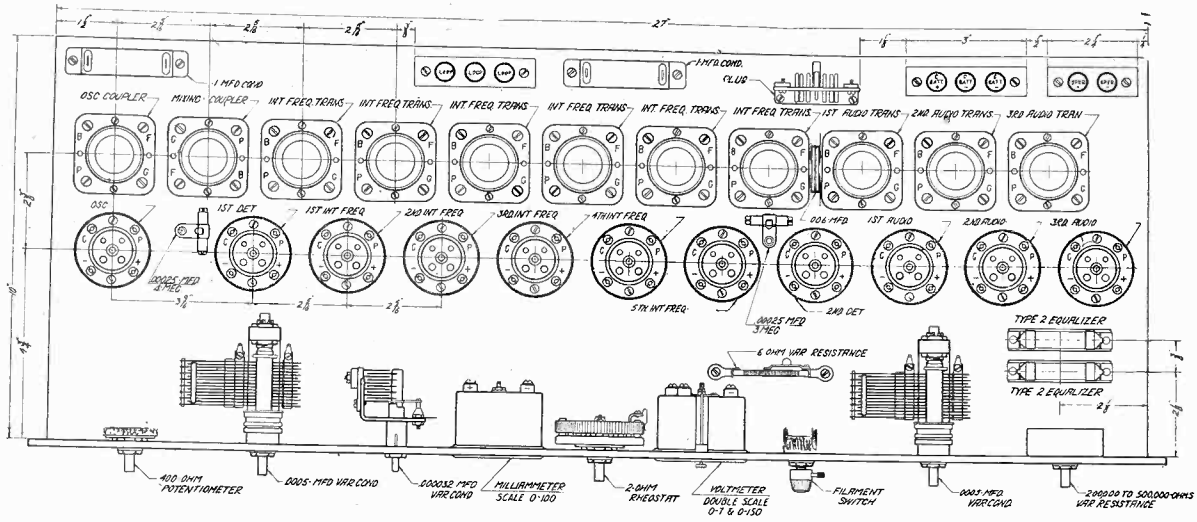


FIG. 2

Recommended layout of the parts on baseboard as well as on the panel.

PART II.

IN Part I of the description of the Melo-Heald eleven-tube Super-Heterodyne we closed with a discussion of the two-ohm master rheostat which controls the filament current in the intermediate amplifier.

Since there are 5 tubes, each drawing ¼ ampere, on this rheostat, the voltage may be cut down as low as 3½ volts, which is low enough to stop self-oscillation.

Grid Detection

In the detector the grid detection method is also used. The grid condenser is of .00025 mfd. and the grid leak 3 megohms. The grid return goes to the negative leg of the filament, which adapts the circuit to the new CX300-A or UX200-A tube. To facilitate detection and to keep the intermediate frequency current out of the audio amplifier, a .006 mfd. condenser is connected across the primary of the first audio transformer.

The oscillator, the modulator and the detector tubes are all on one 6-ohm rheostat placed in the negative lead. This further aids in controlling the volume of the receiver.

Three audio frequency stages are used. All the transformers are of low ratio and designed to give an even amplification over the entire audio band. A high resistance potentiometer is connected across the secondary of the second audio transformer for the purpose of still further controlling the volume. The resistance of this potentiometer should preferably be half megohm, though a somewhat lower value may be used if such is available.

AF Resistors

A common ballast resistor is used for the first two audio frequency tubes to drop the filament voltage from 6 to 5 volts. This should be of such resistance that it will carry ½ ampere with a one volt drop in the voltage. A separate ballast is used for the last tube in order that different output tubes may be used as desired. For good volume and quality either a 112 or a 371 or 171 should be used. These tubes require the same ballast resistor, which is the same as the common ballast for the other two audio tubes.

Choice of Switch

A filament switch is placed in the negative lead of the filament battery. The choice of a switch is important since this is often a source of a great deal of the noise which is heard in receivers. The contact should at all times be positive and there should be considerable pressure at the contacts. Furthermore, the contact should be confined to a small area in order to get the greatest possible pressure from the spring. To prevent corrosion and the formation of high resistance oxides, the contact tips should be silver.

It is customary in Super-Heterodynes de luxe to incorporate plate current and plate and filament voltage meters. While it is not necessary to incorporate them, they are very handy for testing the con-

(*Continued on page 7*)

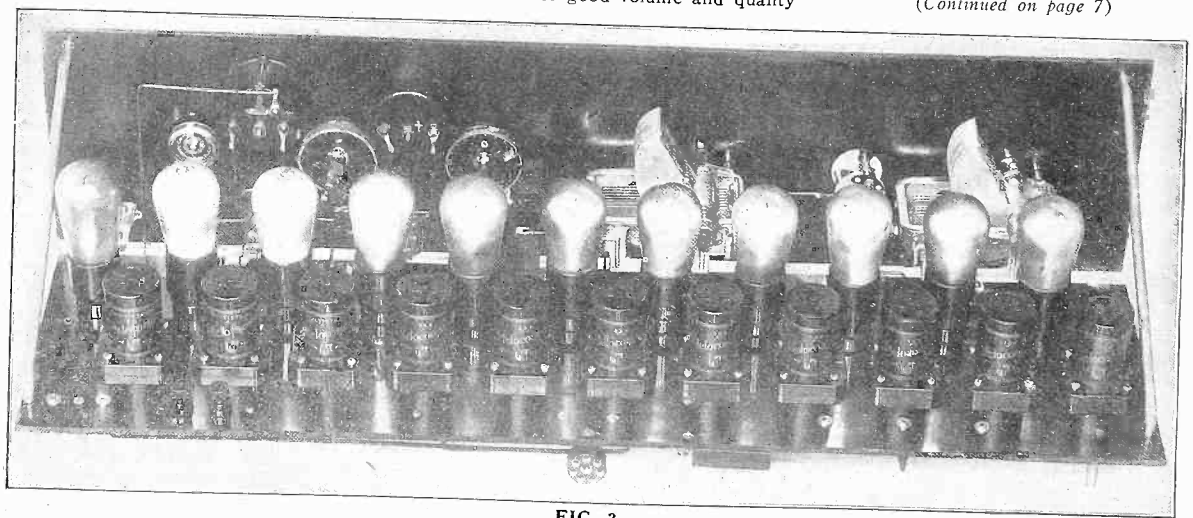


FIG. 3

A photograph of a Melo-Heald receiver as assembled by a fan. The arrangement is slightly different from that recommended, but it is, nevertheless, correct.

A Double 3-Ft. Cone
Expert Tells How to Build It, Cites Results

By W. H. Sinclair

EVERYWHERE and always—wherever radio listeners foregather—sooner or later the conversation turns to tone quality, and generally stays there.

Just exactly what is this radio will-o'-the-wisp, that broadcast listeners, from radio engineer to youthful set builder and plain dial twister, are trying to bag?

It is nothing more than complete and true reproduction.

What it is, is not nearly so important as how to get it, or rather, to get reproduction as nearly complete and true as possible.

No one thing by itself can possibly give you complete and true reproduction. In fact it requires a number of things—a combination of perfectly matched units working in absolute harmony.

First and foremost among these is the receiver. Next is the reproducer or loud speaker.

Take the finest receiving set that it is possible to build, hook to it a reproducer that is incapable of reproducing accurately or completely the energy transmitted to it, and the result is horrible.

Reverse the formula. The finest loud-speaker built will emit tones that agonize the sensitive ear if the set itself does not deliver the desired quality.

The big idea is to have a speaker that will enable a set to operate at maximum efficiency.

Somewhere, sometime you have read or been told that the solution for all your tone quality worries lay in the three-foot cone speaker.

"Plug a three-foot cone speaker to your set," you are told, in effect, "and you and your gathering have a reserved front row seat at the program to which you are listening."

How perfectly silly! Just as if there were magic in size *alone!* Just because a speaker is 36 inches across it is endowed with qualities that will overcome defects which may be no fault of the speaker itself.

Size alone is no cure-all.

Compare a cone to a watch. Surely you wouldn't buy an expensive watch wholly and solely because of the case. That isn't where the value lies. It is in the works—the engine that moves the hands and enables you to tell time *accurately.*

The cone itself is like the watch case. But you must look to the unit and its ability to resonate the cone, completely and accurately, for real value.

Please do not get the impression that I do not believe in the three-foot cone. I do believe in it; I most certainly do. But not simply because it is a three-foot cone.

I believe in the principle of the three-foot cone because it is scientifically correct. But I go farther. To be a *good* three-foot cone it must be scientifically designed; then the unit itself must have the power to cause a three-foot cone to resonate, the ability to reproduce low, intermediate and high frequencies without distorting; the unit must be delicate enough to operate at 90 volts and power ful enough to take 135, 180 and up to 450 volts without blasting or locking; it must also be able to take all the power that the tubes will pass; it must be a unit that is readily and easily adjustable to the output of the set with, which it is used, the magnet must be of fine cyanide hardened steel, preferably horseshoe in shape and thoroughly seasoned.

And to top it all, my ideal unit must be able to actuate a DOUBLE three-foot cone. By all means a double three-foot cone.

Please accept these few facts as conclusive. A properly designed double three-foot cone gives a deeper (not lower-pitched), more rounded, fuller tone than it is possible to get with any single cone so far designed. The depth, roundness and fullness manifest themselves at all frequencies. There is that "completeness" which I mentioned in the third paragraph.

Anyone who has heard a good double three-foot cone in comparison with a single three-foot cone will instantly recognize greater richness—a sort of musical creaminess, if you know what I mean—that the single cone cannot possibly have.

So, if you are going to build a three-foot cone /by all means spend a few minutes longer to build a double cone and get mountains of greater satisfaction.

A double three-foot cone is very easily made. The scariest thing about it is its size. But do not let that frighten you. Tackle it as I describe it, work carefully and almost before you know it you'll have it plugged to your set and really be enjoying reception. And you may say like one man did. "While listening to a band selection, I heard instruments I had never heard over radio; I heard ALL the band."

[*Mr. Sinclair in next week's issue, April 30, will tell how to build the cone.*]

Melo-Heald 11-Tube Set

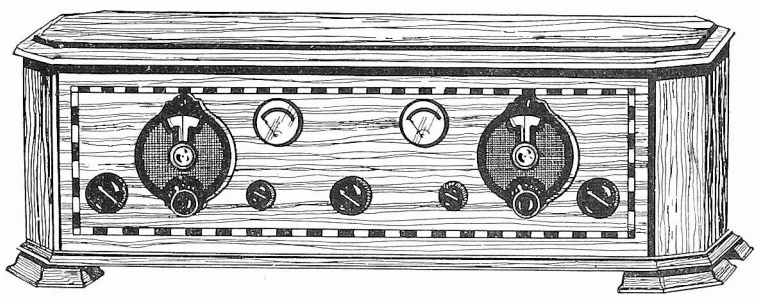
(*Continued from page 6*)

dition of the batteries, and they enhance the appearance of the panel. They give the set that Ritzy look. The plate current milliammeter is connected in the minus lead of the common plate return so that it measures the total drain on the battery. This meter then should have a range of about 0-50 milliamperes, or even a greater range. The voltmeter is of the double range type, one for filament voltage and one for plate voltage. The manner of connecting this meter was shown in Fig. 1 last week. A switch is built into the meter, whereby either the high or the low range may be used.

The plate voltage on the modulator and on the detector is 45 volts. The plate voltage on the oscillator and on the intermediate frequency tubes can be varied between 22½ and 45, according to which gives the best results. The first two audio frequency amplifiers should have at least 90 volts on the plates and the last should have between 135 and 180 volts, according to the volume desired.

Zero Bias on Oscillator

The grid bias voltage on the oscillator is zero, for the grid return is connected to the negative end of the filament. The grid returns of all the intermediate tubes, as has been stated, are connected to the sliding arm of a 400-ohm potentiometer, and the bias may therefore be varied between zero and 5 plus. The grid returns of the first two audio frequency amplifiers are connected to a common binding post which is maintained 4½ negative by a bias battery. A separate binding post is provided for the last or power tube, the voltage to be used depending on the plate and the type of tube.



THE front view of the Melo-Heald receiver.

All the tubes in the circuit should be of the —01A type, with the exception of the last, which may be a —12 or a —71.

A neat and orderly arrangement of the parts is suggested in Fig. 2. The positions of the various parts are so clearly shown that it is unnecessary to comment, except to say that great skill has been shown in complying with good practice as well as theory.

One important feature shown on Fig. 2 and not discussed previously in the text is the battery terminal plug. This is located directly back of the last intermediate and the first audio frequency transformers. It is a multiplug which takes the place of all the battery terminals save those for grid bias. This is a most convenient feature and is is a safeguard against accidental short-circuits.

A somewhat different arrangement of the circuit is shown in Fig. 3. The difference is mainly confined to the panel layout. This arrangement of the parts is slightly better from an electrical point of view, but it does not make possible a symmetrical panel. The location of the multi-tube socket is clearly shown in this figure.

STATION FOR ALGIERS

The contract for the construction of a large broadcasting station in Algiers has been awarded. The new station will be of the latest type with the most modern improvements. The power will be around 1,000 watts mimimum.

JOHANNESBURG RESUMES

The Johannesburg broadcasting station, which closed down January 31, has temporarily resumed operation. Johannesburg station is the one that rebroadcast many American programs picked up on short waves.

How to Assure Efficiency In the Nine-in-Line

Scratchy Noises, Self-Oscillation and Difficult Tuning In Stations May Be Remedied With Only a Little Effort

[*Part I, giving a general discussion of the receiver, was published in the April 2 issue. Part II, giving a detailed description of the mounting of the parts, was published in the April 9 issue. Part III, telling how to wire the set, was published last week, April 16 issue. Part IV, the conclusion, follows.*]

PART IV

AFTER you have completely wired up the receiver, procure your batteries or eliminators and a single tube. Connect the cable leads of the plug to the various posts on the batteries or eliminators. The idea is to test the A circuit, as well as any possibility of a short circuit in the B line. Insert this one tube in each of the sockets, turning up the rheostats wherever required to light the filament of the tube.

The loop, phones and rest of the tubes should now be connected up. Connect the loop leads to their respective posts on the set. Then insert the tubes and the phone tips. The condensers should be set at maximum, e. g., all plates in mesh. The radio frequency rheostat should be set at about half way, the oscillator rheostat about three-quarters of the way. The volume control R5 should be turned up all the way. Snap on the filament switch. This should be accompanied by a rushing sound. Turn the RF rheostat down until you hear only a soft rushing sound, very similar to that made when you blow your breath on your palm. Now turn the knobs on the controls slowly. If you turn them hastily you will skip over the stations. Much care should be exercised in turning the oscillator control. When you hit a station, turn both controls until you feel certain that you are obtaining the most volume possible from this station, at that dial setting. Then turn the loop. As you reach the direction of the station the volume should increase. Use the RF rheostat to louden the signals, and the oscillator rheostat to clear them up. Local stations should just roll in as you turn the controls.

When tuning in distance, you will note that the oscillation control seems to be subject to body capacity. Therefore tune in such a station to its maximum strength, with your hand near the panel. When you take it away, the signal will, of course, fade away. Don't readjust the control, though. Instead turn the oscillator rheostat to the right or to the left. The station should then come in with full volume. You will also note that the oscillator dial does not seem to be subject to body capacity on this particular station, after this adjustment. The RF rheostat can then be turned up for greater volume. If you turn up the rheostat too much these tubes will oscillate. This will throw off the oscillator adjustment. Therefore turn this RF rheostat to the point just before the tubes start to oscillate.

Increasing the Volume

If you don't get all the volume you should expect, try one of the following suggestions. Change the tubes around. It is possible to find tubes which act better as radio amplifiers than audio amplifiers, or detectors, etc. Increasing the voltage on the radio amplifier to 90 may help. Be sure that you have 90 volts on the first audio plate and 135 volts on the last audio plate. The proper C voltage for the RF tubes is also important. If the voltage is too high, the signal strength will be low, while if it is too low, the tubes will oscillate beyond control. The polarities should be watched. The condenser plates on the microdenser should be inspected for shorts. Reversal of the loop and phone or speaker tips may help.

A power tube, such as the —71 or —12, may be inserted in the last audio frequency stage for greater volume in case low volume was due to last stage overloading. Be sure that the fixed condenser C9 is not shorted, and that the resistance R5 is intact.

Over-Oscillation

If, as you turn up the RF rheostat, the tube bursts into oscillation, reduce the plate voltage. Disconnect the rotary plate connection of the oscillator condenser. Procure a battery and phone tester and search for a short between the plates at some point along the scale. Run the plate lead of the first detector tube to a separate B post. Apply 45 volts here, instead of 67½. A grid leak and detector inserted in series with the G post of the first detector tube socket, with the grid return brought to the plus A post may cure this, also. Test C7 for a short. If that is the condition of this condenser, the C batteries will be shorted out of the circuit.

Other Trouble Sources

Poor contact between the tube terminals and socket prongs may cause scratchy reception, whenever the set is jarred. Flimsy connections on the plug should be watched. Connections to Amperites and rheostats also should be checked up for rigidity. When the filament switch is turned on, be sure that the contact is positive and not swingy. That is, when the switch is pulled over, the lever makes contact, but only with a certain portion, the other portion being on the off side. Then whenever the set is jarred a bit, the filaments start to flicker.—Lewis Rand.

World Code Parley To Be Held in Autumn

The Radiotelegraph Conference, the first to be held since 1912, will take place in Washington next Autumn, and will be attended by officers of the Army and Navy and representatives of other Governmental agencies, if tentative plans announced orally at the Department of the Navy are carried through.

Captain Ridley McLean, director of Naval Communications, announced that the Navy had obtained a copy of the Book of Proposals, a compilation of all suggestions of the various governments and companies interestin in the conference.

The State Department is sponsoring the conference next Autumn and it is expected that the new Federal Radio Commission will take an active part.

Slaying Over Program Makes a Good Yarn

A news dispatch from St. Louis discloses a remarkable coincidence, that of a tragedy that involved a man and his wife in consequence of a difference of opinion as to what should be heard over the radio, and the fact that a sketch with a precisely similar incident was being played in a sketch at the Lambs Gambol at the Lambs Club on 44th Street, at exactly the same hour. Fred Huber of St. Louis shot and killed his wife, Eleanor, because they disagreed as to whether or not they should get New York or a local station. The title of the Lambs sketch was "Guilty or Not Guilty," by John D. Ravold. There are three characters—the judge, played by John Kline; the prisoner, by Regnald Barlo; and the wife, by Maurice Lavigne. The sketch opens with the examination of the murderer. He says in his defense, that it "Happened like this!" There is a black-out, and on the side of the stage the auditor discovers that the prisoner is listening to a ball game. He is highly excited over the game, and when the report reaches the point where there are two strikes and three balls on Babe Ruth—his wife enters! She has no desire to listen in to a ball game—and just as the next ball is pitched, she turns on a jazz tune. The husband, frustrated and infuriated, pulls out his revolver and shoots his wife dead. Another black-out. The prisoner is again in the witness chair. The judge says, "I hardly think it necessary for the jury to retire. You (pointing to the audience) are the jury. What is your verdict?" The audience, at the Lambs, with one voice yelled: "Not Guilty!" This sketch proved so popular that it has been included in the program of the Lambs Public Gambol to be given at the Metropolitan Opera House on Sunday night, April 24.

5 Per Cent. of British People Have Radios

Sweden is reported to have a greatest number of radios, in proportion to the population, than of any other country in Europe with the sole exception of England. License statistics of Sweden would indicate that on December 31, 1926, there were 40.1 radios for every 1,000 inhabitants in Sweden, a figure which is surpassed only in England where there are said to be 49.5 radios to every 1,000 inhabitants.

Statistics showing the number of radio sets in operation in European countries show that England has the greatest number of radios per 1,000 inhabitants with 49.5. Sweden follows with 40.1 per 1,000 of population, while Austria is third with 37.8. Other countries in comparative sequence are Denmark, 35.3; Germany, 22; Norway, 15.5; Czechoslovakia, 12.9; Switzerland, 12.8; Netherlands, 7; Belgium, 3.4. and Finland, 3.1.

Although the development of radio in Sweden during the past three years has been very rapid, it is believed locally that the peak has not yet been reached. The chief reason for this optimism is the fact that a powerful new superior-broadcasting station will commence operation at Motala, Sweden, within a fortnight. This station, operating on a wavelength of 1,304.5 meters, will include many of the most densely populated districts of Sweden within its crystal set radius of 200 kilometers.

KHJ 10,000 HOURS ON AIR

Los Angeles.

With the signing off of KHJ at Los Angeles on the completion of its fifth anniversary program on April 13, the pioneer station of the west coast completed 10,000 hours on the air during its first five years of broadcast.

Coil Used as a Furnace Produces Cold Heat

Device That Removes Moisture and Gas From Vacuum Tubes Will Not Affect Non-Conductors, Like Hands and Mice

There is apparently such a paradox as cold heat—at least there is the fact that in the research laboratory of the General Electric Company there are men who nonchalantly thrust their bare hands into an electric furnace which melts metals with ease.

Still another astonishing fact about this furnace is that white mice will stay in it, even though the current is on and even though it is a simple matter for the mice to run out of it if they desire to do so. Again, it is possible to heat to incandescence the interior of a radio tube without heating the glass bulb itself, simply by inserting the tube in the furnace.

Another interesting performance can be performed with an incandescent lamp, to the base of which there has been attached a single loop of wire; by bringing the lamp near the furnace, the filament can be made to glow.

Heats Conductors Only

It will be noted, however, that before a person thrusts his hand into the furnace he is careful to remove any rings from his fingers. Similarly, the metal drinking cup for the mice is not placed in the furnace itself but in an extension of it, although the mice spend most of their time in the furnace proper.

The secret is that the furnace heats electrical conductors only and the reason is that the equipment is a high frequency induction furnace.

The furnace can be likened to a special transformer in which the primary is a coil of copper conductor, within which is placed the mass of conducting material which is to be heated or melted. This material serves as the transformer secondary. The current, fed into the coil at relatively high voltage, is reduced in voltage in the secondary, with a corresponding increase in amperage.

Secondary Is Heated

The current in the primary does not materially heat the coil, but the mass of metal serving as the secondary is rapidly heated to the melting point—and even higher if so desired—because of the rapid changes or oscillations in the current. These rapid changes also keep the melt in constant motion, so that thorough and complete mixing of alloys is assured. The operating voltage and amperage can be used to regulate the temperature, and the furnaces are so constructed that different frequencies can be employed—some work requires relatively low temperatures or low frequencies. Frequencies ranging from 90,000 to 1,000,000 cycles per second have been used, with from 300,000 to 500,000 cycles as average.

Ring-type induction furnaces, of which many of large size are in commercial use, are designed on a different principle—that of an iron-core transformer in which a loop of molten metal serves as the secondary. The two types of furnaces differ in many respects. The frequency of the current is not the controlling feature in the ring-type furnace; and the ordinary commercial frequency is employed in the primary.

Use in Making Tubes

High frequency furnaces have been in laboratory and commercial use for years. The melting of precious metals, the heat treatment of steel tools and the mixing of special alloys are among the industrial applications of this type of furnace; and there are many other fields in which the apparatus can, and will, be employed.

One of the most interesting applications of the high frequency furnace is in the manufacture of radio tubes. It is easy enough to say that, to obtain the necessary high vacuum within the tube, it is simply necessary to remove all instead of most of the gas by means of efficient vacuum pumps, but in actual operation the story is quite different.

A tube might appear to be so completely exhausted that no trace of gas is apparent, and yet as soon as the filament is lighted there might be plenty of evidence that the tube contains gas, the presence of gas being indicated by a bluish haze within the tube. The reason is that metals and glass absorb large amounts of gas and water vapor, and added quantities stick to the surfaces. The bubbles are driven out by the heat from the tube filament. They must be expelled from both the glass and metal parts of the tube, and it is not possible to subject the glass to anywhere near as high a temperature as the metal parts require. The high frequency furnace solves the problem.

Tube Put Inside Coil

While the tube is being exhausted it is kept at as high a temperature as the glass will withstand without softening and collapsing, but this temperature is not sufficient to boil the gas and moisture from the metal parts. Just before the radio tube is sealed from the vacuum pump it is placed for a moment within a high frequency coil. The metal parts immediately become red hot and the bubbles of gas and vapor are boiled out. The tube is then sealed from the pump, with the knowledge that later heating of the tube by the filament will not cause further release of bubbles.

In this age of machinery, it almost necessarily follows that the high frequency induction heating of the tube is automatic. Just before the tube is sealed from the pump a high frequency coil on the end of a mechanical arm automatically descends over the tube and for a few moments the tube is subjected to the field of the coil. The metal parts glow, the gas bubbles escape and are removed by the pump, the coil is automatically removed and the tube is ready for the sealing process.

A Coil That's a Furnace

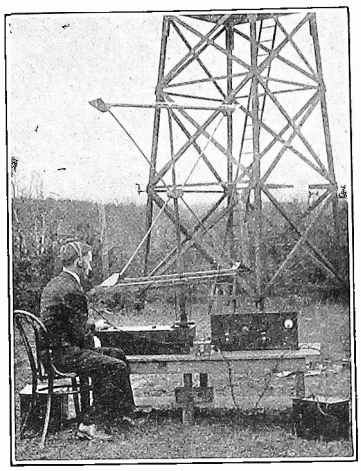
The high frequency furnace used in vacuum tube work would hardly be recognized as a furnace. It is simply a coil of copper conductor attached to a wooden handle, drawing its power from a nearby metal cage on wheels. Within the cage is the equipment for changing the ordinary 60-cycle power to oscillatory current of the desired frequency. It includes a step-up transformer, a couple of Radiotrons and a bank of high voltage mica condensers.

High frequency and high vacuum—millions of cycles and millionths of an atmosphere—are two requisites of vacuum tubes which research has conquered.

THE RELIABLE OCEANIC SPAN

Captain A. G. D. West, assistant chief engineer of the British Broadcasting Company, writing recently to Martin P. Rice, director of broadcasting for the General Electric Company reported that the B. B. C. had rebroadcast 2XAF's 32.77 meter signals on seven successive Tuesday evenings for half-hour periods. 2XAF transmits the programs of WGY the Schenectady station.

KEEPS HIM OUTDOORS



(Harris & Ewing)

THE OPEN-AIR receiving equipment of the Radio Laboratory of the Bureau of Standards, used to measure the signal intensity of broadcasting stations. S. S. Kirby of the Bureau is at the receiver. A 50-watt broadcasting station is used in checking up the reliability of the receiver.

Chess Match Played Over Amateur Stations

Dartmouth, N. S.

What is believed to be the first inter-Dominion chess match ever played by radio in the British Empire was recently staged between the chess club of this city and that of St. Johns, Newfoundland, through the cooperation of amateur station 1DD, operated by Major W. C. Borrett, of this city, and station 8AR, owned and operated by Loyal Reid, of St. Johns.

According to information furnished the American Radio Relay League, of which both men are members, the game was highly successful, and lasted nearly three hours, twenty-three moves being completed on each side of the board. The match resulted in a draw, but judging by the enthusiasm displayed by both teams, the two amateur stations will probably be called upon in the near future to assist in a deciding match.

Intercepted Message Delivered by Milkman

Hartford, Conn.

Before starting on his early morning deliveries, H. C. Jenson, a milkman of this city, makes a practice of listening in on his broadcast receiver. Recently, he tuned down to the amateur 'phone stations on 150 meters and was very much startled to hear an amateur phone station in Ohio sending a message addressed to K. B. Warner, secretary of the American Radio Relay League, the amateur's organization, at Hartford. Mr. Jenson, remembering that Mr. Warner was one of his regular customers, copied the message and delivered it on his regular round within the next hour.

2XAF ADDS THURSDAYS

Because of numerous requests from foreign listeners, particularly radio fans in the tropics and south of the equator, the schedule of 2XAF, the 32.77 meter transmitter of the General Electric Company, has been expanded to include Thursday night. 2XAF broadcasts the programs of WGY on the following schedule: Tuesday, 6:00 to 11:30 p. m.; Thursday, 6:00 to 12:30 p. m.; Saturday, 6:30 to 12:30 p. m.

Pairing of Loudspeakers Gives Chance to Old Horn

Low-Pitched and High-Pitched Reproducers in Proper Combination Avoid Cut-Off of Upper or Lower Notes

The loudspeaker, like the mirror, can do no more than to reflect that which is delivered to it. Poor radio programs cannot be made over into good ones; flaws of faulty transmission cannot be overcome; the distortion of amplifier or receiver cannot be corrected by the loudspeaker itself.

Under ideal conditions of operation, there are certain cone speakers which will provide a most realistic and pleasing rendition, because of full and impartial reproduction of the low frequencies for the bass notes and the higher frequencies for the overtones and harmonics, with everything in between. However, with most radio receivers and loudspeakers, the tone quality can be materially improved upon by several simple expedients herewith described.

To begin with, the average loudspeaker generally does not cover the entire range of frequencies necessary for good music and speech.

Causes of Muffling

If the higher frequencies are well handled, so as to provide detailed music and crisp speech, then the low frequencies are neglected resulting in shallow rendition and falsetto effects. If, on the other hand, the speaker caters to the low frequencies and slights the higher frequencies, the rich bass notes are included but there is booming and hollowness disagreeable to the extreme, while speech is muffled, blurred and indistinct, as if the speaker were doing his part in a tunnel or talking with a mouth full of soup. To obtain crisp speech on the one hand and realistic instrumental music on the other, is the compromise that must be struck in speaker rendition. Of course the amplifier should contribute its share if possible by way of passing all frequencies evenly and fully to the loudspeaker; but even with an amplifier that leaves much to be desired, the tone quality can be improved at the loudspeaker end.

The radio music lover, striving for the best possible rendition of radio programs, has three factors at his disposal so far as the loudspeaker end is concerned: (1) a choice of loudspeakers, with suitable combinations of two or more loudspeakers for the desired blend or tone; (2) fixed condensers, which serve to lower the pitch and especially the sharpness of a loudspeaker; and (3) variable high resistances, which offer a precise control of volume from any loudspeaker, as an aid to obtaining the desired tonal blend when two or more loudspeakers are employed.

With the majority of radio receivers the best results are obtained by employing two loudspeakers, one with a high-pitched rendition and the other with a low-pitched rendition. An ideal combination is to employ a cone that is particularly partial to the low notes, together with a high-pitched cone or even an old type horn loudspeaker of exceptionally sharp rendition. Many an old-time horn loudspeaker can now be taken down from the attic, brushed up a bit, and restored into favor as the soprano partner for the bass cone.

Occasionally, the correct combination of loudspeakers will be struck right the very first time, through mere coincidence. More often, however, the combination will not balance, since one loudspeaker will be too loud for the other, destroying the desired tonal blend. In this connection it is well to remember that fixed condensers and variable high resistors are handy devices for controlling the tonal qualities of loudspeakers.

The shunting of a small fixed condenser of say .001 to .01 mfd. across the usual speaker serves to by-pass the higher frequencies and therefore takes away from the excessive sharpness of pitch. The apparent effect is also a lowering of the tone, although as a matter of fact the result is more a muting or softening of the music or the voice.

Use of Variable Resistor

For reducing the volume of any speaker, without altering the tone quality, a variable high resistance should be employed, with a resistance range of almost zero to several million ohms. The Clarostat (practically zero to 5,000,000 ohms) offers the necessary resistance range in a single unit, together with a silent and constant resistance setting. The variable high resistor may be placed in series with one lead to the speaker, or shunted across its terminals, according to which arrangement works better. When two speakers are connected in series, then the shunted arrangement is preferable, but when the speakers are in parallel, the series arrangement is preferable.

The combination of condensers and variable resistors not only permits of adjusting any speaker for the desired tone and volume, but also in balancing two speakers for a remarkable tonal blend. This technique should be employed in addition to other well-known aids, such as a good amplifier, a speaker filter between output tube and loudspeaker, a power tube, and plenty of plate potential.

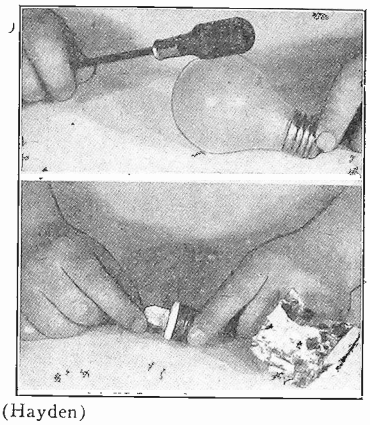
Longest Way 'Round Proves Short Cut

San Jose, Calif.

The broadcast listener usually complains that he is unable to hear a certain station because it is too far away; the amateur radio telegrapher, on the other hand, often makes the complaint that he cannot hear another amateur station because it is too near!

A striking example of this is furnished in the story of a radio message that a San Jose amateur wished to send via short waves to his friend at Carmel, California. The distance between the two points is slightly more than 50 miles, but due to the habit that short waves have of angling into the upper atmosphere before being reflected back to earth, the two stations were unable to hear each other at all. Finally, the San Jose station, 6HB, recollected that 6HM, at Carmel, kept a regular schedule with an amateur in Singapore, Asia, and, since this point was quite easy for each to reach, he sent the message to the Singapore amateur, who immediately relayed it to the Carmel amateur. The answer came back over the same route the next night, message and answer together having covered a distance of 32,000 miles in order to bridge the fifty-mile gap.

AN EMERGENCY FUSE



(Hayden)

A SUBSTITUTE for a standard fuse may be made with the aid of a blown out electric light bulb and some tin foil. First smash the glass envelope as shown in the upper photo. Then break away the remaining glass with a pair of pliers. Don't break the leads going to the filament. Procure a piece of tin foil about six inches long and three inches wide. Wrap the foil so that it fits into the tube base. Then insert it so one filament lead touches one end of the paper, and the other filament lead touches the other end of the paper.

High Resistances for Use in Measurement

Certain articles have appeared in which high resistance units have been recommended for uses other than those for which they are intended. These articles have elicited some adverse criticism on the ground that the resistance units are not accurate enough for the purpose. It is claimed that the commercial units are not correctly rated and that any one unit has a considerable variation of resistance with temperature. This criticism is justified when the object is to use the resistances in very accurate measurement work. But they have not been recommended for that. It has always been expressly stated or clearly implied that these resistance units can only be used in practical work when no great accuracy is necessary. Furthermore, every time that these units have been recommended for measurement purposes the conditions under which they should be used to get trustworthy results have been clearly pointed out. Calibration of the units has always been insisted upon and this removes the objection against their use in measurements on the ground that they are not rated correctly. This also removes the objection on the ground the resistance varies with temperature, in so far as the variation in temeprature is caused by current flow in the resistance. The objection against the use of these units on the ground of temperature variation coincident with weather changes is removed by the requirement that the units should be used when the temperature is the same as it was at the time of the calibration. The variation in the resistance is not so great that any small changes in room temperature will make any appreciable difference in the results, unless a high degree of accuracy is required. Nobody who is interested in very accurate work would use the units anyway. A research worker who wants better than 1 per cent. accuracy would procure instruments of even much greater accuracy, or he would know just how to correct for any errors in the cheap commercial units.

Also, any fan who is doing experimental work would not expect an improvised meter to give the accuracy of a high-priced product.

High Voltage Is Needed For Resistance Coupling

Thus Is the Tube Properly Operated and Full Volume and Quality Obtained—What Capacity Isolating Condensers to Use

By Austin C. Lescarboura

International Resistance Company

Once again there rages the perennial controversy regarding the pros and cons of resistance-coupled amplification. On the one hand, there are advocates of the new and vastly improved audio transformers, as well as those who favor impedance coupling and double impedance coupling, while on the other hand there are the supporters of plain old resistance coupling.

The main reason for the controversy is that most individuals do not compare the various systems of audio amplification on a fair and thorough basis. Some are biased in advance, while others, quite unintentionally, fail to test each system under ideal conditions. Resistance coupling, as with transformer, impedance and double impedance coupling, is by no means a cure-all in the field of radio reproduction. It is safe to say that resistance coupling represents the less expensive and surest way of obtaining at least passable tone quality and fair volume. However, unless resistance coupling is properly employed, its advantages are not fully realized and, as a consequence, the better grades of transformers, as well as impedances and double impedances, may surpass it for tone quality and volume.

Needs High Voltage

To give resistance coupling a fair test, it must be employed with sufficient B or plate voltage. It is well to remember that the plate resistor of a resistance coupler introduces considerable voltage drop in the B current reaching the preceding tube, hence a high initial B voltage is necessary. While resistance coupling will provide good results on as low as 90 volts, and excellent results on 135 volts, its full value cannot be appreciated unless voltages of 180 and over are employed, so as to operate the tubes on the necessary high potentials required for their maximum efficiency, especially the new 30-mu tubes.

Again, the coupling condensers are of considerable importance. To pass the rich, deep, bass notes, so characteristic of proper resistance coupling, the coupling condensers of at least .1 mfd. are favored, although the percentage of cutoff is slight with values down to .01 mfd. In most instances, there is little gained in going beyond the .5 mfd. capacity. The condensers must be of high grade, so as not to introduce leakage from plate to grid, and without danger of breaking down, even at the highest voltages.

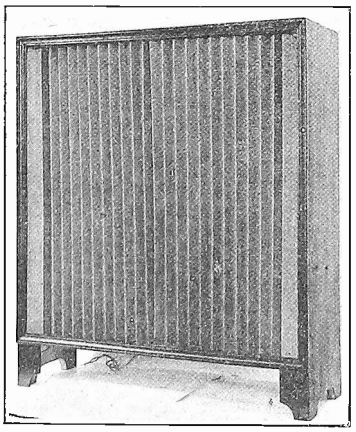
The grid leak is of prime importance, in that it clears the grid of the tube in time to make way for the next incoming charge. If the grid leak is of too low resistance, the signal strength is greatly reduced. If the grid leak is of too high resistance, the charges are piled up on the grid and the tube becomes blocked or choked, resulting in marked distortion.

The Volume Question

Now, the main objection made against resistance coupling is lack of volume. While it may be admitted that two stages of transformer coupling will produce an astounding degree of volume when compared with the soft and realistic music of resistance coupling, the fact remains that with high mu tubes resistance coupling leaves little to be desired in the matter of volume. Resistance coupling, be it noted, has no step-up effect such as is found in the differential windings of the transformer. The amplification is entirely dependent on the amplification factor, or mu of the vacuum tube employed for each stage, under operating voltages. With two stages of high-mu tubes, and a power tube in the last stage, the resistance coupled amplifier will have no apologies to make on the score of volume, consistent with real tone quality. A three-stage resistance coupled amplifier, with a 371 or 171 type of power tube, operating on 180 volts, will furnish volume far in excess of the requirements of the usual large living room.

Resistors are the very heart of resistance coupling. Just so long as inked paper resistors had to be employed, this method was severely handicapped, due to excessive noises and the rapid deterioration of the resistors. Today, the metalized resistors, such as Lynch, Durham and Dubilier, with the high resistance conductor in the form of a heavily-coated glass filament permanently sealed in the outer glass tube with ferrule ends, provide constant resistance values despite heavy current flow, without deterioration.

PLEATED SPEAKER

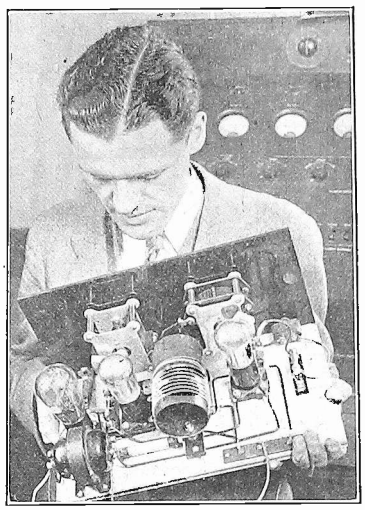


THE NEW 6 ENSCO pleated front speaker, designed for those who wish novelty in addition to the beauty of tone for which Ensco is noted. The speaker may be seen and heard at the Ensco Studios, 25 Church street, and 100 West 42nd street, New York City; 60 Park Place, Newark, N. J.; 121 North Broad street, Philadelphia, Pa., and 911 Steger Bldg., Chicago, Ill.

A USEFUL METER

A milliammeter is one of the most useful meters for experimenters. It measures plate current flow.

GETS "ALL OVER"



(Herbert Photos)

MALCOLM WOODMAN scrutinizing a 10-meter receiver, which was designed and constructed by T. A. Smith. Amateurs in all parts of the world have been heard with this set.

Amateur Examinations Resumed in New York

According to Arthur Batcheller, Federal Supervisor of radio in the New York district, examination of radio operators of all classes, both amateur and commercial, has been resumed in this district, and applications are now being received by letter at the second district office in the United States Sub-Treasury Building, New York.

Monday, Wednesday, and Friday of each week have been set aside for the examination of commercial operators, and Tuesday, Thursday and Saturday have been given over for the examination of amateurs. The examinations will begin promptly at 9:00 A. M. Mr. Batcheller said that examinations would be held only in accordance with appointments made in advance.

The old method of grading commercial operators has been done away with. The highest grade commercial license will now be known as "Commercial Extra First Class," which qualifies the appointee to operate or take complete charge of any commercial station under the jurisdiction of the United States in any part of the world.

Siberian Gets U. S.; No Aerial or Ground

From Tomsk, in the heart of Siberia, WGY has received a letter from a twenty-year-old student of electrical engineering, reporting successful reception of 2XAF on a one-tube set without ground and aerial. His log checked perfectly with the log of WGY and 2XAF for that night.

The correspondent is Alexander Kalachnikoff, living at 66 Krasnoarmeiskaja St., Tomsk Siberia, a student at the Siberian Technological Institute. He is anxious to correspond with some American "fellows" who are interested in radio. Mr. Kalachnikoff states that there are only fifty short-wave receivers registered in Russia or Siberia. Every receiver is assigned call letters and his are RK-37. "If I should be able to speak and understand American pronunciation better," writes Mr. Kalachnikoff, "I would be able to copy exactly all that was said, but it is very difficult for me to do so, as I never have heard Americans."

AVERAGE TUBE LIFE

The average life of a vacuum tube, as used in radio, is 1,000 hours of use.

Batteryless Tube Found By De Forest

Noted Inventor Returns From Europe With Spaniard's Product That Illuminates and Amplifies

(Wide World)

Dr. Lee De Forest with the combination illuminating and radio tube which he brought from Europe.

Dr. Lee De Forest, inventor of the three-element tube, recently arrived from Europe with a tube, the invention of Balsera, a Spaniard, said to do away with all batteries by operating directly from the house line. The tube can also be used as a means of illumination, a special filament surrounding the radio filament. Dr. De Forest has obtained the American rights to this tube.

"It is the simplest way of eliminating batteries that I know of," said Dr. De Forest. "It costs practically nothing to use the tube, because one would be burning an electric lamp any way, unless sitting in the dark."

He also stated that the leads feeding from the house line into the tube could be used as a means of pickup, doing away with other antenna or ground. He thought the tube could sell for $2 or $3.

Mrs. Hoover Thrilled; Telephone Girl Calm

Washington.

Mrs. Herbert Hoover, wife of the Secretary of Commerce, was almost swept off her feet when she saw the demonstration of television in the Washington laboratory of the American Telephone & Telegraph Co.

"I'm not sure I'd want people to see me all of the time when I'm telephoning," she gasped.

"It's amazing! It's marvelous. I'd been told we would have television, but I never expected to see it."

The telephone girl wasn't a bit thrilled.

New Television Adv

TELEVISION is leaping forward with giant strides. Only a few years ago leading scientists thought it impossible, but refrained from stating their opinions lest they be contradicated in a short time. Even the very men who have just announced the greatest contribution toward the successful accomplishment of practical television admitted a year or two ago that there was no means in sight whereby it could be brought about. They were well aware of the principles upon which all attempts have been based and they fully understood the requirements. They, however, seemed insurmountable. Yet these men have now taken the latest hurdle with a clean-cut leap. Radio vision is an accomplished fact.

The credit for this astounding accomplishment goes to the Bell Laboratories of the American Telephone & Telegraph Company. In these laboratories Dr. Herbert E. Ives and his co-workers, Dr. Frank Gray, H. H. Stoller, E. R. Morton, R. C. Mathes and J. W. Horton, have developed the intricate and ingenious details of a practical system of television.

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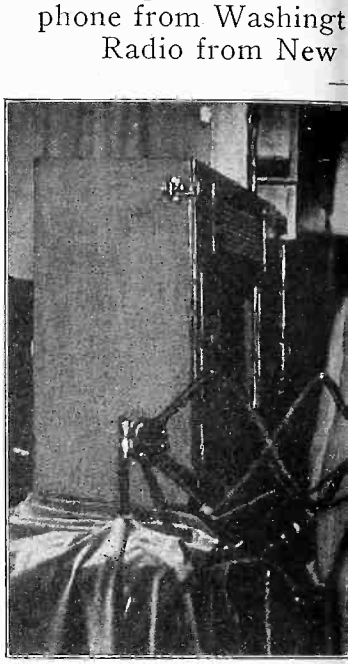

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Chief of Radio Section, Bureau of Standards

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As a preliminary indication of the realization of radio television, E. F. W. Alexanderson, chief consulting engineer of the General Electric Company, gave

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There is no reason in the world why it should not be shortly possible for audiences in Europe to see as well as hear prominent speakers in the United States through the radio transmissions

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In the Bell system just demonstrated the picture to be sent is divided up into 2,500 elementary areas, in 50 rows and 50 in each row. Each of these areas is brilliantly illuminated in regular sequence by the intense light from an arc light. A disk containing 50 holes arranged in a suitable order intervenes between the picture and the arc light.

This disk revolves 18 times a second and as it revolves it causes the light beam to linger a moment on each of the 2,500 units of the picture, and since the disk revolves 18 times a second every unit area is flashed 18 times a second. The scanning is in rows and progresses just like reading a book letter for letter.

The photo-electric cell "looks" at the picture thus illuminated and the amount of light that falls on the cell depends on the amount of light that is reflected from the areas. A dark area will not reflect much light, a bright area will return a good deal. The photo-electric cell converts into electric current the light energy that it receives, and this current is exactly proportional to the intensity of the light.

The photo-electric cell is very sensitive to light changes, but on account of the extreme speed of the scanning process the amount of light received from any one area is infinitesimal. The current is so weak that in this case it has to amplify 5,000,000,000,000,000 (five million billion) times. This would require 120 stages of CX-301-A tubes coupled so as to give a gain of 8 per tube, that is the amplification constant.

The Transmission Work

After the current from the photo-electric cell has been amplified it is transmitted to the receiver either by wire or radio. It is made to enter a neon lamp which instantaneously changes its brilliancy to correspond with the amplitude of the current. This, it will be remembered, was proportional to the intensity of the picture units. When the light from the neon tube is projected on the screen in the same order and synchronously with the scanning of the original picture, this is reproduced in detail. The reproduction is intermittent, but due to the facts that vision in the eye persists after a stimulus about 1/10 of a second and that each area of the reproducing screen is illuminated eighteen times a second, the eye sees the picture as a continuous whole.

The size of the screen used in the Bell system when telephoning is a few inches each way. When this small screen is used the reproduced picture is full of details, but when a larger screen is used, so that several persons can see it at the same time, there is considerable blurring. To overcome this difficulty it is necessary to speed up the process in proportion to the increase in size of the screen. The original picture as well as the reproduced must be divided up into a greater number of units, say to 500 x 500 instead of 50 x 50. That improvement may come in the future.

An early announcement is expected.

ar Speakers in America"

g That Present Trans-At- Be Used for Television

of television as well as by telephony. The radio television apparatus could be connected into the New York-London telephone circuit.

While that is a possibility which will no doubt be realized, it must not be overlooked that it involves very difficult and very costly arrangements. The same holds true of the broadcasting of radio programs across the ocean.

By use of the same trans-Atlantic radio telephone circuit, genuinely acceptable musical programs can be broadcast across the ocean. On December 28, 1923, I made this statement:

"I confess that some of the realties of radio, on the other hand, seem almost as wild, and one of these is seeing by radio. This is no dream, but a fact that is being steadily perfected. Probably within five years radio audiences in remote cities will see the facial expressions as well as hear the words of the President or other important speakers on great public occasions in Washington.

"As to universal use of radio to communicate between individuals, I think not. Certainly not to such an extent as to supersede the present long-distance telephone.

"On the other hand, improvements in methods of concentrating the waves in a beam are being made."

Colored Scenes, Motion, Sound Are Envisaged

Standards Bureau Secretary Proclaims His Faith in the So-Called "Impossible" Feats of Science

WALTER S. GIFFORD, president, A. T. & T., receiving Hoover's voice and appearance.

By Henry D. Hubbard

Secretary, Bureau of Standards

It is no surprise that television has arrived. Those who have followed the labors of Jenkins, Baird, Belin and others have long realized that it was inevitable.

The discovery is based on the astounding responsiveness of photoelectric cells and electron tubes to minute variations in receiving impulses. Jenkins in Washington and Baird in Great Britain had already prepared us for the achievement in New York April 7.

When, several years ago, I saw the screen reproduction of the shadows of moving fingers of my hand transmitted and received by radio in Jenkins laboratory in Washington, I knew that the further development was certain.

The public will not know the long roots of the new art in the past. Years of effort that would brook no baffling awakened the dream of practical engineers and today the public overnight finds the dream come true.

It is but the beginning of a new art, the possibility of which in the days to come already baffles imagination. Once more the futility of the doubting spirit is demonstrated as it has so often been in history.

SIXTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

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

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52 consecutive issues	20%
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Entered as second-class matter March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

Broadcast Subpoena Produces the Witness

After all ordinary methods had failed to locate a witness for a trial in Rochester, N. Y., the radio was brought into use and proved successful. Clarence E. Akor, a carpenter, who formerly worked on the Sylvanus J. Macy farms in Livingston County, was wanted to testify for Mrs. Macy in her $200,000 suit against her husband. The morning after the message was broadcast from station WCKT Akor walked into the attorney's office ready to testify.

P. O'MANDLEBAUM FOILED

Schenectady, N. Y., April 7.—Patrick O'Mandlebaum was arrested here last night, the police charging that he tried to steal the entire plant of the General Electric Company, and take it with him to Pittsburgh, which is his birthplace, and which he declares is a regular city, smoke and everything. Fortunately, however, the watchful police stopped Patrick before he had loaded more than five brick buildings and eighty tons of machinery on freight cars during the night of March 17. Patrick declares that if two of his pals in the parade had kept their promise he would have accomplished his noble design before ten times as many cops as Schenectady has on its force could have stopped him.

Chain Programs Stir Debate Among Listeners

Some Radioists Utter Disgust Over Forced Limitation of Entertainment Choice, Others Laud N. B. C. Supremacy

An article giving the address made by Merlin H. Aylesworth, president of the National Broadcasting Company, before the Engineers Society of Western Pennsylvania, has evoked a great deal of comment by readers. In his address Mr. Aylesworth spoke of the development of chain broadcasting and of the steps National Broadcasting Company engineers were taking to learn how to handle links and transmissions. Below are a few more of the letters received.

EDITOR RADIO WORLD:

In reference to the article that appeared in your February 19 issue let me say that I can think of no better policy than that behind the National Broadcasting Company.

When my company tries to sell a product to 27,000,000 people that product must have something to it or else the company will never get any repeat business. And no business can be successful without repeat business, and especially is this true of the radio industry.

No doubt the National Broadcasting Company realizes that without their week-in and week-out listeners-in they can not hope to make a success of their business. Is it probable that they would not provide the very best entertainment possible for their audience? I certainly do not think so.

BERTRAM R. FINDER,
Paducah, Kentucky.

* * *

EDITOR RADIO WORLD:

I am one of those who read the article by the president of the National Broadcasting Company in your issue of February 19. I do not know how others feel, but I do know that these chain programs are a source of constant irritation to me. When I get home from business at night I do not feel much like turning the dial of my receiving set for fifteen or twenty minutes. But when chain programs are on the air that is exactly what I have to do. Those programs spoil the reception of other stations for me, and when I do not like the program the chain stations broadcast I have to spend a lot of time getting a station that is not hitched up with them. I must admit, however that the N. B. C. programs are usually very good.

FRANK K. SWAIN,
Fargo, North Dakota.

* * *

EDITOR RADIO WORLD:

In your magazine of February 19 there appeared an article called "An audience of 27,000,000." In a way it was surprising to read that a company would go to such lengths as has the National Broadcasting Company to please its customers, but in view of the extraordinary excellence of the programs it broadcasts it is readily understandable.

I do not know of any organization—even one which charges admission to those it amuses, entertains and instructs—which has done as much for people as has the National Broadcasting Company through its chain programs. The programs they broadcast are made up of such expensive artists that hardly any other amusement organization would dare to assemble them for a single performance under a single roof. These programs have not received enough publicity. More people should be told of them, so that a maximum of people might enjoy them.

GEO. BUSH,
Nyack, N. Y.

* * *

EDITOR RADIO WORLD:

I am one of those many who have been greatly annoyed, and, hence, have lost interest in radio, because of programs broadcast by a chain of stations. The program being broadcast would contain numbers or selections that I did not like and then I would try to tune in on some other station. Well, I would try, and that is about as far as I would get. The chain stations would give so much interference it would be practically impossible to get any other stations. I certainly think that these chain station programs have had a very bad influence on radio. Many other former radio fans have voiced the same objection to me.

GEORGE APFEL,
Belmar, N. J.

INCOMING TRAFFIC

EDITOR RADIO WORLD:

Regarding your article on acid-core solder in the home construction of radio sets, while I fully agree with you, in that the use of acid core solder is not always good and in a great many cases is not good, yet I believe that you are creating a false impression among a large number of your readers, namely, that a joint soldered with an acid core solder is never good. I would suggest that you call to the attention of your readers that this is not the case.

It is well known that some of our foremost radio manufacturers, as well as some of our leading amateurs, do use acid core solder. If the joint is improperly made the use of acid core solder should be condemned, but if the joint is properly made the use of this solder is all right.

Where a joint is made by the use of acid core solder every trace of the acid should be removed from the soldered surface; also good care should be taken to prevent the acid from getting on any part of the set other than the soldered surface. The best way to remove the acid from the soldered surface is by carefully washing the surface with a weak basic solution.

Another thing that I would like to see you bring before your readers is that rosin core solder can be used improperly just the same as acid core solder.

I have seen a great many cases of rosin-joint, in manufactured as well as home-built radio sets. By this I mean a very thin film of rosin between the solder and the soldered surface, or between the two respective soldered surfaces. This of course can be avoided by having the soldering iron at the proper heat.

HERB. CLARK.
Lutesville, Mo.

Bellows States Policies On Wave Assignments

Board Member Says Rule of Public Value Will Prevail, But "Little Fellows" Will Not Be Forced Off the Air, Either

Washington.

The issuance of temporary permits to operate all of the 732 broadcasting stations now "on the air" will be followed by the granting of short-time licenses to those stations which the Federal Radio Commission decides are serving the "public interest, necessity or convenience" under the Radio Act of 1927, Commissioner Henry A. Bellows announced.

The Commission issued a statement announcing that the temporary permits to operate after April 24, the date the broadcasters' period of 60 days' grace under the new law expires, are intended to permit the continuance of program service without liability to penalties while each individual station's case is taken up. The permits will not necessarily authorize continued use of present frequencies, the statement says, and after April 24 all stations using the six wavelengths exclusively allocated to Canadian broadcasting stations must shift from those frequencies.

States General Policies

In his statement, Commissioner Bellows emphasized that temporary permits will be granted only to stations licensed to operate under the Communications Law of 1912 and to those whose applications for licenses have been received by April 24. Respecting those stations in the United States now operating on Canadian wavelengths, they will not be assigned new frequencies but must themselves select new waves, he said. Such waves, however, must be acceptable to the Commission, he pointed out. This decision of the Commission will affect at least 24 stations, among them some of the larger ones.

General policies and attitudes of the Commission in approaching the broadcast problem were outlined by Commissioner Bellows as follows:

1. The Commission's policy at the outset in all cases will be to issue preliminary short-time licenses of perhaps 60 or 90 days duration instead of the three-year licenses which it has power to issue under the Radio Act of 1927. This is to permit trials and experiments with temporary allocations of wavelengths and assignments of power during the summer months particularly. It is the Commission's attitude, Mr. Bellows said, not to "freeze" the radio situation by at once granting long-term licenses. It is probable that the majority of the 732 stations now operating will be granted short-time licenses to continue operating, but only on wavelengths and with power the Commission determines it shall use.

No Arbitrary Classes

2. The Commission does not believe it possible at present to establish arbitrary classes of stations, such as national and local, as suggested at the recent public hearings held on the radio situation. There will be no limited number of preferred national stations, nor will any limitation be placed upon the number of local stations that may broadcast. Special attention will be paid, Mr. Bellows declared, to low power stations serving restricted areas and to special service stations such as those providing educational and religious programs. There will be no "choking off" of the "little fellows," said Mr. Bellows.

3. Broadcasters may apply for wavelengths within the 150 to 200 meter wave band, if they elect to do so and agree to utilize the wave assigned. As practically no receiving sets are now calibrated to receive on waves below 200 meters, it is expected that few, if any, such requests will be made. The Commission favors retention of this band for the use of amateurs and experimenters, particularly scientists working with television, or the transmission of both still and motion pictures by radio. Licenses will be granted by the Commission for such experimental work.

"Silent Night" Local Problem

4. Respecting "silent night" and other local restrictions upon broadcasting, such as compelling a transmitter to move outside a city's limits or ordering the removal of interference by regenerative receiving sets, the Commission takes the attitude that the Federal law does not interfere with the exercise of cities and States of their normal police power. If local ordinances or State laws violate the Federal law, however, they are superseded by the Federal law.

It was Mr. Bellows' opinion that "silent nights," during which all local broadcasting is shut off to permit the listeners to obtain outside programs, are entirely a matter of local option and do not come within the purview of the Commission.

He also believed that communities have a right to deal with stations in their residential or congested districts, and said the Commission proposes to limit sharply the power used to transmitters in such districts. Each case, however, will be determined on its merit, he said. As for the removal of local interference caused by regenerative apparatus, Mr. Bellows stated the Commission feels its authority is not clearly defined under the law to extend to such an action as ordering the use of an X-ray machine stopped because it interferes with local reception.

Plan Awaits Bullard

5. The Federal Radio Commission is now engaged in formulating definite plans of procedure which will be laid before Admiral Bullard (chairman) for his advice and council in view of his experience as former radio chief and director of communications of the Navy.

Following is the full text of the Commission's statement on the granting of temporary permits:

"The Federal Radio Commission, in granting temporary permits solely to enable broadcasting stations to operate after April 24 without rendering themselves immediately liable to the penalties provided by the Radio Act of 1927 for operation without a license, will be guided to a considerable degree by the conditions of the licenses granted under the 1912 law and by the requests made in the applications for new licenses.

"It will not, however, in all cases, authorize the continued use of frequencies previously employed, and in the specific cases of stations which have been using frequencies now reassigned for use by Canadian stations it will require an immediate change to some frequency assigned for use in the United States.

"Each temporary permit issued by the Commission will state the frequency assigned and the maximum power permissible, and such permit will continue in force only until the Commission has notified the holder thereof of its further action on the application for a license under the Radio Act of 1927.

"Temporary permits will not be issued for the operation of stations not licensed under the law of 1912 before the Commission has had full opportunity to consider the merits of the application from such stations, either for construction permits or for operating licenses. Under the law, no license, or temporary operating permit having the force and effect of a license, can be issued for any station constructed, or the construction of which was continued, after February 23, 1927, until a construction permit has been applied for and issued by the Federal Radio Commission."

Short-Time Permits Given for Broadcasts

Washington.

Temporary operating permits are being issued by the Federal Radio Commission to broadcasting stations to continue operation after April 24, the end of the 60-day period provided by Congress for stations to get new licenses. The permits are good for an indefinite time. After the permits have been issued, the Commission will then take up the problem of licenses.

They won't be issued for stations to operate on Canadian waves or on frequencies which do not end in units of ten. This means there will be a 10 kilocycle separation between each channel.

Stations to Get Lower Waves

Indications are that a number of stations which have been operating on split frequencies or on the Canadian waves will be given channels in the lower broadcasting band.

Some of the stations which have been operating on the Canadian waves or split frequencies may receive fairly good assignments. Most of them, however, will be forced to broadcast in the lower part of the band which has not been considered the most desirable, and which therefore is the least crowded at present.

It is estimated that around 140 stations are affected by the decision of the Commission regarding Canadian and split frequencies.

Most Will Continue

Stations which have been operating on even frequencies probably will receive a permit to continue operating on the same wave they have been using.

Most stations will be permitted to continue operation with the same power they had been using up to the time the radio law went into effect.

Stations Under Way Get Permit Warning

Washington.

A sharp warning has been issued by the Federal Radio Commission to new broadcasting stations under construction that unless a construction permit is obtained before work is continued the law will not permit the granting of a license for operation of the station after completion.

The attention of Commissioner John F. Dillon has been called to violations of this provision.

"Even if the commission were inclined to grant licenses to such stations the law very definitely forbids our doing so," Commissioner Dillon declared.

TIME SENT TO EXPLORER

Three times a week 2XAF is broadcasting time signals to Francis Gow Smith, explorer, who has been in unexplored and almost inaccessible parts of inland Brazil for over a year.

These signals will assist him in making accurate maps, it is expected.

Batteryless Tube Found By De Forest

Noted Inventor Returns From Europe With Spaniard's Product That Illuminates and Amplifies

(Wide World)

Dr. Lee De Forest with the combination illuminating and radio tube which he brought from Europe.

Dr. Lee De Forest, inventor of the three-element tube, recently arrived from Europe with a tube, the invention of Balsera, a Spaniard, said to do away with all batteries by operating directly from the house line. The tube can also be used as a means of illumination, a special filament surrounding the radio filament. Dr. De Forest has obtained the American rights to this tube.

"It is the simplest way of eliminating batteries that I know of," said Dr. De Forest. "It costs practically nothing to use the tube, because one would be burning an electric lamp any way, unless sitting in the dark."

He also stated that the leads feeding from the house line into the tube could be used as a means of pickup, doing away with other antenna or ground. He thought the tube could sell for $2 or $3.

Mrs. Hoover Thrilled; Telephone Girl Calm

Washington.

Mrs. Herbert Hoover, wife of the Secretary of Commerce, was almost swept off her feet when she saw the demonstration of television in the Washington laboratory of the American Telephone & Telegraph Co.

"I'm not sure I'd want people to see me all of the time when I'm telephoning," she gasped.

"It's amazing! It's marvelous. I'd been told we would have television, but I never expected to see it."

The telephone girl wasn't a bit thrilled.

New Television Adv

First Example of Practica phone from Washingt Radio from New

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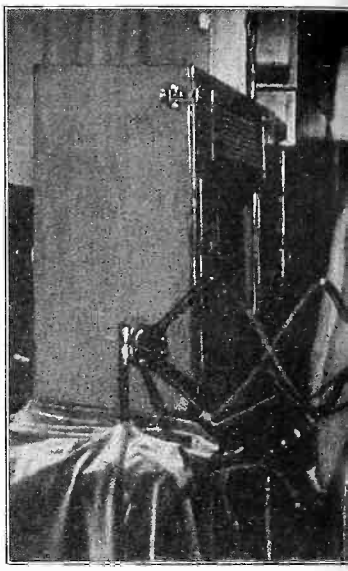

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the intensity of a light, and this varying light is thrown on a screen in the same order that the original picture was scanned. If this process is rapid enough the original picture will be reproduced on the screen. Different systems vary in details only.

In the Bell system just demonstrated the picture to be sent is divided up into 2,500 elementary areas, in 50 rows and 50 in each row. Each of these areas is brilliantly illuminated in regular sequence by the intense light from an arc light. A disk containing 50 holes arranged in a suitable order intervenes between the picture and the arc light.

This disk revolves 18 times a second and as it revolves it causes the light beam to linger a moment on each of the 2,500 units of the picture, and since the disk revolves 18 times a second every unit area is flashed 18 times a second. The scanning is in rows and progresses just like reading a book letter for letter.

The photo-electric cell "looks" at the picture thus illuminated and the amount of light that falls on the cell depends on the amount of light that is reflected from the areas. A dark area will not reflect much light, a bright area will return a good deal. The photo-electric cell converts into electric current the light energy that it receives, and this current is exactly proportional to the intensity of the light.

The photo-electric cell is very sensitive to light changes, but on account of the extreme speed of the scanning process the amount of light received from any one area is infinitesimal. The current is so weak that in this case it has to amplify 5,000,000,000,000,000 (five million billion) times. This would require 120 stages of CX-301-A tubes coupled so as to give a gain of 8 per tube, that is the amplification constant.

The Transmission Work

After the current from the photo-electric cell has been amplified it is transmitted to the receiver either by wire or radio. It is made to enter a neon lamp which instantaneously changes its brilliancy to correspond with the amplitude of the current. This, it will be remembered, was proportional to the intensity of the picture units. When the light from the neon tube is projected on the screen in the same order and synchronously with the scanning of the original picture, this is reproduced in detail. The reproduction is intermittent, but due to the facts that vision in the eye persists after a stimulus about 1/10 of a second and that each area of the reproducing screen is illuminated eighteen times a second, the eye sees the picture as a continuous whole.

The size of the screen used in the Bell system when telephoning is a few inches each way. When this small screen is used the reproduced picture is full of details, but when a larger screen is used, so that several persons can see it at the same time, there is considerable blurring. To overcome this difficulty it is necessary to speed up the process in proportion to the increase in size of the screen. The original picture as well as the reproduced must be divided up into a greater number of units, say to 500 x 500 instead of 50 x 50. That improvement may come in the future.

An early announcement is expected.

ar Speakers in America"

ıg That Present Trans-At- Be Used for Television

of television as well as by telephony. The radio television apparatus could be connected into the New York-London telephone circuit.

While that is a possibility which will no doubt be realized, it must not be overlooked that it involves very difficult and very costly arrangements. The same holds true of the broadcasting of radio programs across the ocean.

By use of the same trans-Atlantic radio telephone circuit, genuinely acceptable musical programs can be broadcast across the ocean. On December 28, 1923, I made this statement:

"I confess that some of the realties of radio, on the other hand, seem almost as wild, and one of these is seeing by radio. This is no dream, but a fact that is being steadily perfected. Probably within five years radio audiences in remote cities will see the facial expressions as well as hear the words of the President or other important speakers on great public occasions in Washington.

"As to universal use of radio to communicate between individuals, I think not. Certainly not to such an extent as to supersede the present long-distance telephone.

"On the other hand, improvements in methods of concentrating the waves in a beam are being made."

Colored Scenes, Motion, Sound Are Envisaged

Standards Bureau Secretary Proclaims His Faith in the So-Called "Impossible" Feats of Science

WALTER S. GIFFORD, president, A. T. & T., receiving Hoover's voice and appearance.

By Henry D. Hubbard

Secretary, Bureau of Standards

It is no surprise that television has arrived. Those who have followed the labors of Jenkins, Baird, Belin and others have long realized that it was inevitable.

The discovery is based on the astounding responsiveness of photoelectric cells and electron tubes to minute variations in receiving impulses. Jenkins in Washington and Baird in Great Britain had already prepared us for the achievement in New York April 7.

When, several years ago, I saw the screen reproduction of the shadows of moving fingers of my hand transmitted and received by radio in Jenkins laboratory in Washington, I knew that the further development was certain.

The public will not know the long roots of the new art in the past. Years of effort that would brook no baffling awakened the dream of practical engineers and today the public overnight finds the dream come true.

It is but the beginning of a new art, the possibility of which in the days to come already baffles imagination. Once more the futility of the doubting spirit is demonstrated as it has so often been in history.

SIXTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

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

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Broadcast Subpoena Produces the Witness

After all ordinary methods had failed to locate a witness for a trial in Rochester, N. Y., the radio was brought into use and proved successful. Clarence E. Akor, a carpenter, who formerly worked on the Sylvanus J. Macy farms in Livingston County, was wanted to testify for Mrs. Macy in her $200,000 suit against her husband. The morning after the message was broadcast from station WCKT Akor walked into the attorney's office ready to testify.

P. O'MANDLEBAUM FOILED

Schenectady, N. Y., April 7.—Patrick O'Mandlebaum was arrested here last night, the police charging that he tried to steal the entire plant of the General Electric Company, and take it with him to Pittsburgh, which is his birthplace, and which he declares is a regular city, smoke and everything. Fortunately, however, the watchful police stopped Patrick before he had loaded more than five brick buildings and eighty tons of machinery on freight cars during the night of March 17. Patrick declares that if two of his pals in the parade had kept their promise he would have accomplished his noble design before ten times as many cops as Schenectady has on its force could have stopped him.

Chain Programs Stir Debate Among Listeners

Some Radioists Utter Disgust Over Forced Limitation of Entertainment Choice, Others Laud N. B. C. Supremacy

An article giving the address made by Merlin H. Aylesworth, president of the National Broadcasting Company, before the Engineers Society of Western Pennsylvania, has evoked a great deal of comment by readers. In his address Mr. Aylesworth spoke of the development of chain broadcasting and of the steps National Broadcasting Company engineers were taking to learn how to handle links and transmissions. Below are a few more of the letters received.

EDITOR RADIO WORLD:

In reference to the article that appeared in your February 19 issue let me say that I can think of no better policy than that behind the National Broadcasting Company.

When my company tries to sell a product to 27,000,000 people that product must have something to it or else the company will never get any repeat business. And no business can be successful without repeat business, and especially is this true of the radio industry.

No doubt the National Broadcasting Company realizes that without their week-in and week-out listeners-in they can not hope to make a success of their business. Is it probable that they would not provide the very best entertainment possible for their audience? I certainly do not think so.

BERTRAM R. FINDER,
Paducah, Kentucky.

* * *

EDITOR RADIO WORLD:

I am one of those who read the article by the president of the National Broadcasting Company in your issue of February 19. I do not know how others feel, but I do know that these chain programs are a source of constant irritation to me. When I get home from business at night I do not feel much like turning the dial of my receiving set for fifteen or twenty minutes. But when chain programs are on the air that is exactly what I have to do. Those programs spoil the reception of other stations for me, and when I do not like the program the chain stations broadcast I have to spend a lot of time getting a station that is not hitched up with them. I must admit, however that the N. B. C. programs are usually very good.

FRANK K. SWAIN,
Fargo, North Dakota.

* * *

EDITOR RADIO WORLD:

In your magazine of February 19 there appeared an article called "An audience of 27,000,000." In a way it was surprising to read that a company would go to such lengths as has the National Broadcasting Company to please its customers, but in view of the extraordinary excellence of the programs it broadcasts it is readily understandable.

I do not know of any organization—even one which charges admission to those it amuses, entertains and instructs—which has done as much for people as has the National Broadcasting Company through its chain programs. The programs they broadcast are made up of such expensive artists that hardly any other amusement organization would dare to assemble them for a single performance under a single roof. These programs have not received enough publicity. More people should be told of them, so that a maximum of people might enjoy them.

GEO. BUSH,
Nyack, N. Y.

* * *

EDITOR RADIO WORLD:

I am one of those many who have been greatly annoyed, and, hence, have lost interest in radio, because of programs broadcast by a chain of stations. The program being broadcast would contain numbers or selections that I did not like and then I would try to tune in on some other station. Well, I would try, and that is about as far as I would get. The chain stations would give so much interference it would be practically impossible to get any other stations. I certainly think that these chain station programs have had a very bad influence on radio. Many other former radio fans have voiced the same objection to me.

GEORGE APFEL,
Belmar, N. J.

INCOMING TRAFFIC

EDITOR RADIO WORLD:

Regarding your article on acid-core solder in the home construction of radio sets, while I fully agree with you, in that the use of acid core solder is not always good and in a great many cases is not good, yet I believe that you are creating a false impression among a large number of your readers, namely, that a joint soldered with an acid core solder is never good. I would suggest that you call to the attention of your readers that this is not the case.

It is well known that some of our foremost radio manufacturers, as well as some of our leading amateurs, do use acid core solder. If the joint is improperly made the use of acid core solder should be condemned, but if the joint is properly made the use of this solder is all right.

Where a joint is made by the use of acid core solder every trace of the acid should be removed from the soldered surface; also good care should be taken to prevent the acid from getting on any part of the set other than the soldered surface. The best way to remove the acid from the soldered surface is by carefully washing the surface with a weak basic solution.

Another thing that I would like to see you bring before your readers is that rosin core solder can be used improperly just the same as acid core solder.

I have seen a great many cases of rosin-joint, in manufactured as well as home-built radio sets. By this I mean a very thin film of rosin between the solder and the soldered surface, or between the two respective soldered surfaces. This of course can be avoided by having the soldering iron at the proper heat.

HERB. CLARK.
Lutesville, Mo.

Bellows States Policies On Wave Assignments

Board Member Says Rule of Public Value Will Prevail, But "Little Fellows" Will Not Be Forced Off the Air, Either

Washington.

The issuance of temporary permits to operate all of the 732 broadcasting stations now "on the air" will be followed by the granting of short-time licenses to those stations which the Federal Radio Commission decides are serving the "public interest, necessity or convenience" under the Radio Act of 1927, Commissioner Henry A. Bellows announced.

The Commission issued a statement announcing that the temporary permits to operate after April 24, the date the broadcasters' period of 60 days' grace under the new law expires, are intended to permit the continuance of program service without liability to penalties while each individual station's case is taken up. The permits will not necessarily authorize continued use of present frequencies, the statement says, and after April 24 all stations using the six wavelengths exclusively allocated to Canadian broadcasting stations must shift from those frequencies.

States General Policies

In his statement, Commissioner Bellows emphasized that temporary permits will be granted only to stations licensed to operate under the Communications Law of 1912 and to those whose applications for licenses have been received by April 24. Respecting those stations in the United States now operating on Canadian wavelengths, they will not be assigned new frequencies but must themselves select new waves, he said. Such waves, however, must be acceptable to the Commission, he pointed out. This decision of the Commission will affect at least 24 stations, among them some of the larger ones.

General policies and attitudes of the Commission in approaching the broadcast problem were outlined by Commissioner Bellows as follows:

1. The Commission's policy at the outset in all cases will be to issue preliminary short-time licenses of perhaps 60 or 90 days duration instead of the three-year licenses which it has power to issue under the Radio Act of 1927. This is to permit trials and experiments with temporary allocations of wavelengths and assignments of power during the summer months particularly. It is the Commission's attitude, Mr. Bellows said, not to "freeze" the radio situation by at once granting long-term licenses. It is probable that the majority of the 732 stations now operating will be granted short-time licenses to continue operating, but only on wavelengths and with power the Commission determines it shall use.

No Arbitrary Classes

2. The Commission does not believe it possible at present to establish arbitrary classes of stations, such as national and local, as suggested at the recent public hearings held on the radio situation. There will be no limited number of preferred national stations, nor will any limitation be placed upon the number of local stations that may broadcast. Special attention will be paid, Mr. Bellows declared, to low power stations serving restricted areas and to special service stations such as those providing educational and religious programs. There will be no "choking off" of the "little fellows," said Mr. Bellows.

3. Broadcasters may apply for wavelengths within the 150 to 200 meter wave band, if they elect to do so and agree to utilize the wave assigned. As practically no receiving sets are now calibrated to receive on waves below 200 meters, it is expected that few, if any, such requests will be made. The Commission favors retention of this band for the use of amateurs and experimenters, particularly scientists working with television, or the transmission of both still and motion pictures by radio. Licenses will be granted by the Commission for such experimental work.

"Silent Night" Local Problem

4. Respecting "silent night" and other local restrictions upon broadcasting, such as compelling a transmitter to move outside a city's limits or ordering the removal of interference by regenerative receiving sets, the Commission takes the attitude that the Federal law does not interfere with the exercise of cities and States of their normal police power. If local ordinances or State laws violate the Federal law, however, they are superseded by the Federal law.

It was Mr. Bellows' opinion that "silent nights," during which all local broadcasting is shut off to permit the listeners to obtain outside programs, are entirely a matter of local option and do not come within the purview of the Commission.

He also believed that communities have a right to deal with stations in their residential or congested districts, and said the Commission proposes to limit sharply the power used to transmitters in such districts. Each case, however, will be determined on its merit, he said. As for the removal of local interference caused by regenerative apparatus, Mr. Bellows stated the Commission feels its authority is not clearly defined under the law to extend to such an action as ordering the use of an X-ray machine stopped because it interferes with local reception.

Plan Awaits Bullard

5. The Federal Radio Commission is now engaged in formulating definite plans of procedure which will be laid before Admiral Bullard (chairman) for his advice and council in view of his experience as former radio chief and director of communications of the Navy.

Following is the full text of the Commission's statement on the granting of temporary permits:

"The Federal Radio Commission, in granting temporary permits solely to enable broadcasting stations to operate after April 24 without rendering themselves immediately liable to the penalties provided by the Radio Act of 1927 for operation without a license, will be guided to a considerable degree by the conditions of the licenses granted under the 1912 law and by the requests made in the applications for new licenses.

"It will not, however, in all cases, authorize the continued use of frequencies previously employed, and in the specific cases of stations which have been using frequencies now reassigned for use by Canadian stations it will require an immediate change to some frequency assigned for use in the United States.

"Each temporary permit issued by the Commission will state the frequency assigned and the maximum power permissible, and such permit will continue in force only until the Commission has notified the holder thereof of its further action on the application for a license under the Radio Act of 1927.

"Temporary permits will not be issued for the operation of stations not licensed under the law of 1912 before the Commission has had full opportunity to consider the merits of the application from such stations, either for construction permits or for operating licenses. Under the law, no license, or temporary operating permit having the force and effect of a license, can be issued for any station constructed, or the construction of which was continued, after February 23, 1927, until a construction permit has been applied for and issued by the Federal Radio Commission."

Short-Time Permits Given for Broadcasts

Washington.

Temporary operating permits are being issued by the Federal Radio Commission to broadcasting stations to continue operation after April 24, the end of the 60-day period provided by Congress for stations to get new licenses. The permits are good for an indefinite time. After the permits have been issued, the Commission will then take up the problem of licenses.

They won't be issued for stations to operate on Canadian waves or on frequencies which do not end in units of ten. This means there will be a 10 kilocycle separation between each channel.

Stations to Get Lower Waves

Indications are that a number of stations which have been operating on split frequencies or on the Canadian waves will be given channels in the lower broadcasting band.

Some of the stations which have been operating on the Canadian waves or split frequencies may receive fairly good assignments. Most of them, however, will be forced to broadcast in the lower part of the band which has not been considered the most desirable, and which therefore is the least crowded at present.

It is estimated that around 140 stations are affected by the decision of the Commission regarding Canadian and split frequencies.

Most Will Continue

Stations which have been operating on even frequencies probably will receive a permit to continue operating on the same wave they have been using.

Most stations will be permitted to continue operation with the same power they had been using up to the time the radio law went into effect.

Stations Under Way Get Permit Warning

Washington.

A sharp warning has been issued by the Federal Radio Commission to new broadcasting stations under construction that unless a construction permit is obtained before work is continued the law will not permit the granting of a license for operation of the station after completion.

The attention of Commissioner John F. Dillon has been called to violations of this provision.

"Even if the commission were inclined to grant licenses to such stations the law very definitely forbids our doing so," Commissioner Dillon declared.

TIME SENT TO EXPLORER

Three times a week 2XAF is broadcasting time signals to Francis Gow Smith, explorer, who has been in unexplored and almost inaccessible parts of inland Brazil for over a year.

These signals will assist him in making accurate maps, it is expected.

Board is Working Out Plan to Divide Up the Channels

Stations Put in Four Groups Under Tentative Proposal, the Largest Broadcasters Receiving Favored Waves and Exclusive Use, too

Washington.

Definite plans for a rearrangement of broadcasting stations to eliminate interference are under consideration by the Federal Radio Commission.

The Commissioners have been studying a number of plans. There has emerged a fairly comprehensive scheme which, while it has not yet been officially adopted, is receiving serious consideration.

The first step of the Commission was to prepare a chart of existing stations. The chart divides broadcasters into four groups. Class A includes stations of 750 watts or more. Class B takes in stations from 250 to 750 watts. Class C consists of stations between 100 and 250 watts. Class D stations are those under 100 watts.

Assignment of Waves

At present there are 127 A stations, 207 B stations, 176 C stations and 222 D stations. For the entire group there are 90 wavelengths.

Tentatively, consideration has been given to an assignment of wavelengths in the following manner: 48 channels to A stations, or one for each state; 26 channels for B stations; 10 channels for C stations, and 6 for D stations.

The best of the 127 A stations would be given exclusive waves in that classification; some of them would be required to divide time. The rest would be required to reduce their power and drop back into B class.

The Commission does not know how many stations the B waves will provide for; that will depend on the geographical location of the stations. The best of the B stations will be taken care of in that group; the rest would be required to reduce their power and transfer to C class.

The C waves should take care of most all of the stations in that grouping, provided too many of them are not located in the same district. But if there is an overflow it will go into D class. The power limitation imposed upon D stations would make it possible to put a very large number of them on these waves.

Duplicated at Distances

Under the plan, the wavelengths of A stations would be duplicated at distances of 2,000 miles; that is, an A station could be placed on an A wave every 2,000 miles. B waves would be duplicated at 1,500 miles. C waves would be duplicated at 1,000 miles, and D waves at distances of 500 miles.

Class A stations less than 15 miles apart would be separated by 60 kilocycles. Class B stations less than 100 miles apart would be separated by 60 kilocycles. Class C stations less than 100 miles apart would be separated by 40 kilocycles. Class D stations less than 50 miles would be separated by 40 kilocycles. For greater distances, there would be a general frequency separation of 10 kilocycles.

The Commission does not plan to adopt any policy until it has completed the job of issuing temporary operating permits to stations. But no plan or policy will be adopted until every possible phase and angle has been taken into consideration.

The Commission has decided that it is better to be slow but right than quick but wrong.

Sykes Asks Stations To Be Self-Sacrificing

In Address He Reveals Commission Will Attempt "Voluntary" Solution—Board Puts Service to Public First

In an address to the national radio audience over an N. B. C. chain, Eugene O. Sykes, vice chairman of the Federal Radio Commission, said the doctrine that broadcasting exists for the purpose of properly serving the radio public is the basis of every action that the Federal Radio Commission will take.

Mr. Sykes compared the present broadcast situation with a crowded city street — a street without traffic policemen or well-understood traffic rules—and said the duty of the Radio Commission is to eliminate the dangers of accident with as little interference as possible with legitimate traffic. It is the plan of the Commission, Mr. Sykes stated, to find out how many applicants there are for licenses to operate broadcasting stations, what service each can give the listening public, and with this information in hand, to deal at once with each individual case.

He said:

Most of you, I imagine, think of radio only in terms of broadcasting and broadcast listening, and I wonder if you realize that in the United States today we have more than 18,000 radio transmitting stations, all operating under Federal license, of which only about 700 are engaged in broadcasting. I am pointing this out to you because I want you to get some idea of the vast scope of the task which confronts the Federal Radio Commission . This evening, however, I am going to talk almost exclusively about broadcasting, because that is the phase of the subject which most directly concerns you, and which presents some of our most urgent problems.

You all know that Congress has recently enacted a new radio law, replacing the Radio Act of 1912 which, until about three weeks ago, provided the principal basis for all Federal regulation of radio transmission. The new law was the product of an immense amount of discussion, both within Congress and outside of it.

You have heard a great deal about this law, and yet perhaps many of you have not discovered its most significant feature. This is the provision that in the determination of every radio question the dominant influence is and must be public interest. This doctrine, that broadcasting exists only for the purpose of properly serving the listening public, is the constitutional basis for every action the Commission may take. You who are listening tonight, you and the millions of others for whom radio has become an integral part of normal life, are the ones who, in the long run, must determine what is in the public interest—and may I say here that I count myself as one of you, for until I was unexpectedly called to serve on this Commission, my only connection with radio communication was as a listener, doing just what all of you are doing now.

This conception of broadcasting as a public service is new in law, but it has for some time past guided both the Government and, to a large extent, the broadcasters as well. Sixteen months ago it was this spirit of service which the Fourth National Radio Conference—and it may interest you to know that three of the present Radio Commissioners were members of that conference—incorporated into its resolutions.

Dominating Principle

Shortly thereafter both Senator Dill and Congressman White adopted this same spirit as the foundation for their respective bills, which resulted in the present law. It is this principle which dominates the radio law as it stands today, and it is this principle which must guide the Federal Radio Commission in every phase of its new work.

You must remember, however, that we face a situation which has been developing for several years, a situation involving many conflicting interests and rights. You, for example, may dislike the programs of a station which your neighbor finds of particular value. You may urge that some particular station should even be denied the right to broadcast, forgetful alike that its service may be highly regarded by many listeners, and that the refusal of a license may mean loss and perhaps financial ruin to people who have invested their time and money in that station, all in the best of good faith. If you will think of these things, I am sure you will see the dangers in anything like ruthless, arbitrary or hastily considered action.

I think you will get our picture of the present broadcasting situation. if you will think of a crowded city street without any traffic policemen or any well understood traffic rules.

Most Are Careful

Most of the drivers are, to be sure, careful and considerate, and there are not many accidents, but there are always some people who insist on driving too fast, or turning in the wrong places, and occasional disastrous collisions, most of which would be avoided by the drivers themselves, if only they all understood the rules, and had somebody on the spot to tell them what to do.

Our hope is to interfere with the legitimate traffic just as little as we can, and still eliminate the danger of accident. We are counting on the drivers, which means the broadcasters, to help us, because it is they who in the long run are the worst sufferers from the accidents. We believe they will recognize that even though they cannot all have everything they want, they will achieve better results for themselves by serving a satisfied radio public than by attempting to run counter to the spirit of the new radio law—the spirit of public service.

We cannot solve this problem overnight, nor would you want us to attempt any partial solution which, though it might clear away one local difficulty, would do so only to set up new troubles elsewhere.

Board's Order Protects Canada from Piracy

Thirteen Stations That Squatted on Six Dominion Waves Are Consigned to "Graveyard Frequencies," Including WJAZ Chicago

Washington.

Punishment of United States stations that pirated Canadian wavelengths and caused an international diplomatic complication was foreshadowed by the Federal Radio Commission when it informed the thirteen squatters on these wavelengths they must not stay there, but had better select some wave between 199.9 and 220.4 meters. This region was suggested to the Commission, as a "graveyard" for all wave jumpers, by George Furness, of the National Carbon Company, at the commission's recent public hearing.s

One of the unlucky thirteen was WJAZ, whose occupancy of 329.5 meters, a Canadian wave, was challenged by the Department of Commerce in a court action more than a year ago. WJAZ, owned by the Zenith Radio Corporation of Chicago, won the case. The station had contended the Department had no authority to assign wavelengths, at least not to WJAZ, because that station was engaged in experimental radio work. The court went farther than expected, holding that the Department totally lacked the power to assign wavelengths, etc. That marked the breakdown of Secretary Hoover's control and led finally to enactment of the White-Dill bill by Congress.

All the occupants of Canadian waves now want to move to some other channel, and so informed the Commission, but they got a big surprise when the "graveyard" alone was offered to them.

Besides the thirteen stations actually on Canadian waves, twenty-seven are within 10 kc. of such frequencies, and these, too, will have to move, it is expected, although perhaps without penalty.

Commission's Statement

The Commission issued a statement the full verbatim text of which follows:

"Carrying out its policy of dealing with application on their individual merits, the Federal Radio Commission has already received applications from a number of broadcasting stations which have been using frequencies allocated to Canada. None of these stations has asked permission to continue to use the Canadian frequency, but has suggested other frequencies which they would like to use.

"In each of these cases, the Commission has notified the station that it cannot permit use of the frequency suggested by the station, as such would create interference with stations already operating on such frequencies. It has indicated that each station which has been using a Canadian frequency must find a place for itself which will not cause serious interference, and has suggested that the only frequencies where permits are likely to be granted are those above 1,360, that is to say, in the wave band between 199.9 and 220.4 meters.

"The six wavelengths exclusively assigned to Canada under the agreement between the Department of Commerce and Canadian radio authorities—an agreement recently continued by a special radio committee appointed by the Secretary of State and by which the Federal Radio Commission has repeatedly stated it will require American stations to abide—are those at 291.1 meters, 1,030 kilocycles; 312.3 meters, 960 kc.; 329.5 meters, 910 kc.; 356.9 meters, 840 kc.; 410.7 meters, 730 kc.; 434.5 meters, 690 kc.

All Who Must Move

Following is the list of stations on or within 10 kilocycle frequencies of these wavelengths which are expected to be required to shift to other frequencies under the decision of the Federal Radio Commission, the Canadian frequencies being in bold type, thus disclosing the "unlucky thirteen:"

291.1 meters—KGDX, William Erwin Anthony, Shreveport, La.; KFWX, L. W. Wall, San Bernardino, Calif.; WBKN, Arthur Faske, Brooklyn, N. Y.

312.3 meters—KWKH, W. K. Henderson, Shreveport, La.; WAFD, Albert B. Parfet Co., Detroit, Mich.

315 meters—KGRC, Gene Roth & Co., San Antonio, Texas.

329.5 meters—WJAZ, Zenith Radio Corp., Mt. Prospect, Ill.; WFRL, Robert Anderson Lacay, Brooklyn, N. Y.

330 meters—KGEQ, Fred W. Hermann, Minneapolis, Minn.

331 meters—KGCB, Wallace Radio Institute, Oklahoma City, Okla.

332 meters—WLBG, R. A. Gamble, Petersburg, Va.

356.9 meters—WFHH, The Acme Mills, Hopkinsville, Ky.

354 meters—WNMK, H. C. Barton Electric Co., LeRoy, N. Y.

355.1 meters—KOIO, Gerald K. Hunter, Durango, Colo.

355.4 meters—WFHH, Clearwater, Fla.

357.1 meters—KRLD, Dallas Laboratories, Inc., Dallas, Tex.

357.4 meters—WOAN, James D. Vaughan, Lawrenceburg, Tenn.

360 meters—WEW, St. Louis University, St. Louis, Mo.; WMBS, Mack Battery Co., Harrisburg, Pa.; KSOO, Sioux Falls Broadcasting Ass'n, Sioux Falls, S. D.; WKBN, Radio Electric Service Co., Youngstown, Ohio; WRRS, Racine Radio Co., Racine, Wis.; WMBK, John C. Slade, Hamilton, Ohio.

407.6 meters—WTHO, W. J. Thomas Radio Corp., Ferndale, Mich.

407 meters—WNBQ, Gordon P. Brown, Rochester, N. Y.

410 meters—WMBL, Banford Radio Studios, Lakeland, Fla.; WOK, Neutrowound Radio Manufacturing Co., Homewood, Ill.

410.7 meters—WCRW, Clinton R. White, Chicago, Ill.; KFCR, Santa Barbara Broadcasting Co., Santa Barbara, Cal.; WABF, Parko Broadcasting Co., Pringleboro, Pa.

434.5 meters—KFKB, J. B. Brinkley, Milford, Kan.; KGCH, Wayne Hospital, Wayne, Neb.

430.1 meters—WNAC, Shepard Stores, Boston, Mass.; KFXF, Pikes Peak Broadcasting Co., Denver, Colo.

431 meters—KWLC, Luther College, Decorah, La.; WHAP, William H. Taylor, Financial Corp., New York, N. Y.

435.7 meters—WJAX, Cleveland Radio Broadcasting Co., Cleveland, O.

440 meters—WFLA, Boca Raton Radio Corp., Boca Raton, Fla.; KRLO, Freeman Land and A. B. Scott, Los Angeles, Calif.

THE "UNLUCKY THIRTEEN"

The thirteen stations consigned to the "graveyard" frequencies by the commission are: WFHH, WABF, WCRW, KFKB, KGCH, WJAZ, WFRL, WAFD, KWKH, WBKN, KFCR, KFWX and KGDX.

Public Taste Elevated by Broadcasting

Pittsburgh.

The continued expansion and development of sponsored program broadcasting will be determined by the response and support of listeners, in the opinion of Harry P. Davis, vice-president in charge of radio of the Westinghouse Electric and Manufacturing Company. Speaking from the University of Pittsburgh studio of KDKA recently, on the occasion of the third anniversary of the studio, Mr. Davis declared that the business institutions which now are using the broadcast waves as their spokesmen to the public are presenting the very finest type of entertainment.

Public Support Asked

"It is the duty of the radio public," asserted Mr. Davis, "to support these sponsoring institutions wherever possible in order that their meritorious programs may continue on the air."

Mr. Davis, who has been at the helm in Westinghouse radio affairs since the inception of broadcasting by KDKA in 1920, reviewed the amazing progress of broadcasting with particular respect to the place held by educational programs. By means of the far-reaching voice of the broadcasting station, he said, "the knowledge of the university-trained mind is being spread over the world." People have risen to a higher level of appreciation of entertainment and education, he added.

University's Part Important

"The future of broadcasting," continued Mr. Davis, "lies in the bettering of reception and in the widest dissemination of cultured information and entertainment, no matter in what guise it is offered. The university programs always should be of higher than average grade so that they may serve as inspiration and education to the listener.

"In this future, the university has a very definite responsibility, perhaps the most important of any of the agencies which make up the exceedingly complex institution of broadcasting."

Canada's Six Waves; Twelve Others Shared

The six channels assigned to Canada are in meters 291.1, 312.3, 329.5, 356.9, 410.7 and 434.5.

A gentlemen's agreement assigning these wavelengths to Canada dates back two years. It also provides that Canadian stations might "share" twelve other designated wavelengths which were to be used by American stations on a time division basis when Canadian stations were not operating.

On March 24 the Radio Commission gave notice that no licenses would be issued for broadcasting on the six Canadian channels. Thereafter all American "wave-jumping" stations applying for licenses asked for location on the eighty-nine channels left in the broadcasting band.

Board to Pass On Attacker of Religions

One of the stations close to a Canadian wave is WHAP, run by the Taylor Financial Corporation, New York City. The wave is 431 meters. The nearest Canadian wave is 434.5 meters.

WHAP has aroused much opposition because of its attacks upon the Catholic and Jewish religions and members thereof. What the commission will do with this station is a matter of speculation.

Radio University

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When writing for information give your Radio University subscription number

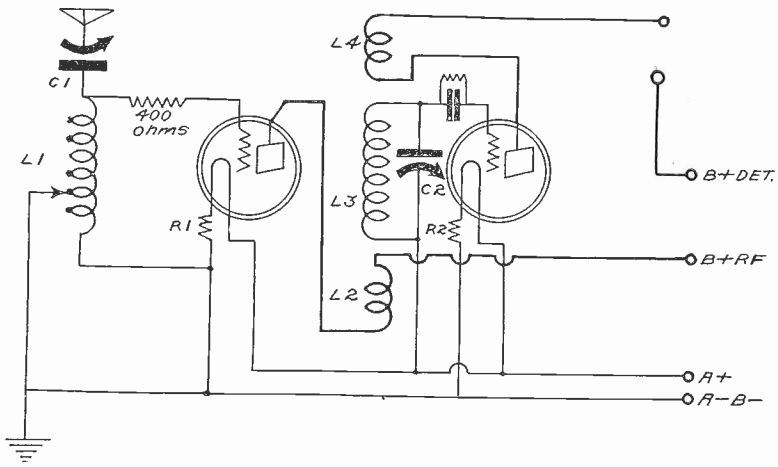

FIG. 530
The circuit diagram of the two-tube regenerative set requested by Alfred Down.

MY COUSIN recently presented me with two type X sockets, two .00035 mfd. variable condensers, two No. 1A Amperites, a 400-ohm fixed resistor, a pound of No. 24 double cotton covered wire and three six-inch long, three inch diameter tubings. Could I have the circuit diagram of a two-tube regenerative receiver employing these parts? Please state how to wind the coils also.—Alfred Down, Albany, N. Y.

Fig. 530 shows the circuit diagram of such a set. The antenna coil L1 consists of sixty turns wound on one of the tubings, tapped at every tenth turn. C1 is one of the .00035 mfd. variable condensers. L2 consists of fifteen turns, while L3 consists of fifty-nine turns. Both are wound on a single tubing, with a one-quarter inch space between them. L4 is the tickler, which consists of thirty-five turns wound on a one and three-qquarter inch diameter tubing. It is also one and one-half inches long. This coil is inserted in the grid end of the secondary winding. The filaments of both the radio frequency and detector tubes are controlled by the 1A Amperites. C2, the other .00035 mfd. variable condenser is shunted across the secondary of the tuner coil. The 400-ohm resistance is inserted in series with the grid post of the radio frequency tube socket. This is to prevent over oscillation on the lower wavelengths. Use the —01A type tubes in both sockets, applying sixty-seven and one-half volts to the plate of the radio tube and forty-five volts to the plate of the detector tube. The phones are inserted across the two small loops indicated between the B plus Det. and the end of the tickler winding. The grid condenser has a capacity of .00025 mfd., while the grid leak has a resistance of 4 megohms. It is suggested that a two and six megohm type be also tried. This complete set may be built on a baseboard, which is six inches deep and twelve inches long. The tuner coil is placed in the center. The tuner condenser is placed to the right on the panel, which is seven inches high and fourteen inches long. The antenna variable condenser is placed to the left on the panel. A filament switch should be inserted in series with the negative A lead. This is important, since if this is left out the tubes will burn all the time. Should you desire to add audio frequency amplification, the input of the audio stages is connected to the output of the set, at the phone posts.

* * *

THE SEVEN tube receiver on page 13 of the Sept. 25 issue of RADIO WORLD has struck my fancy and I wish to build it. Will you please tell me if the following coils, condensers, tube, etc., can be used? The radio frequency transformers contain twelve turn primaries and fifty turn secondaries, wound on two and three-quarter inch diameter tubings, using No. 22 double cotton covered wire. About one-eighth inch exists between each primary and secondary winding. The resistance amplifier is a standard unit. Two —01A and one 112 tubes are provided for in this amplifier. The grid leak is a Bretwood, while the condenser is a .00025 mfd. fixed. The triple condenser has a total capacity of .0015 mfd., while the single condenser has a capacity of .0005 mfd. Two rheostats are of the twenty ohm type, while the other is of the fifteen ohm type.—Kenneth James, Auburn, N. Y.

Yes, all this apparatus can be used.

* * *

REGARDING A four-tube reflex receiver which I have. The first tube is reflexed, the next tube is a non-regenerative detector, while the next two are straight audio frequency amplifiers, using transformers. The results from this set are great, but I do not get enough distance on it. Could I increase its range by adding regeneration to the detecter stage?

The secondaries of the tuned radio frequency transformers consist of seventy turns, wound on two and three-quarter inch diameter tubing, using No. 22 double cotton covered wire. Across these secondaries .00035 mfd. variable condensers are shunted.

(2) How?

(3) I now have a single ballast resistor controlling the filaments of AF tubes, which are of the -01A type. I would like to install a 112 power tube in the last stage. Could I install a ¾ ampere ballast resistor to control the filaments of both these tubes?

(4) I now have a single ten ohm rheostat controlling the filaments of both the radio and detector tubes. If I add regeneration will it necessitate the use of single rheostat for each tube?

(5) If so, what value could be used?—Henry MacRiderson, Paterson, N. J.

(1) Yes. This will also make the receiver more difficult to tune. (2) Procure a one and three-quarter inch diameter tubing and some No. 26 single silk covered wire. Wind thirty-five turns. This should be inserted in series with the plate post of the detector socket and the P post of your audio transformer in the reflex stage. (3) Yes. (4) Yes. (5) Use a twenty ohm for the detector tube and a ten for the audio-radio amplifier.

* * *

I HAVE a six-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector, and three stages of resistance coupled audio frequency amplification. I wish to use dry B batteries for plate supply. If I placed a separate forty-five volt B battery on the detector plate circuit and three forty-five volt B batteries connected up in series on the combination audio and radio plate supply, will I get the benefit of the four batteries?—Edgar S. James, Chicago, Ill.

No. The detector B battery is not included in the series connection of the three other batteries. This is best explained by seeing page 14 of the Dec. 25 issue of RADIO WORLD.

* * *

I HAVE been told by someone that it is quite difficult to neutralize a receiver containing more than two stages of tuned radio frequency amplification. Is this true?—Joseph Judge, Atlantic City, N. J.

Yes.

* * *

WILL A reduction in the number of turns on the primaries on radio frequency transformers increase the selectivity of a set? That is, I have a five tube receiver which gave me very satisfactory results until a month ago, when I moved. The new antenna and ground installation was O. K., since it was tried out on another five-tube set with much success. However, when it was tried on my set, the tuning was amazingly broad. I noticed that the primaries on this other set looked slim. My present home is about three miles closer to the local station. The coils in my set contain fifteen turn primaries, while the secondaries contain forty-three turns, wound on a three-inch diameter tubing. Across these secondaries, .0005 mfd. variable condensers are connected.

(2)—Will the volume go down when the primary turns are decreased?—Wallace Exter, Los Angeles, Calif.

(1)—Reduce these primaries to eight.

(2)—Yes.

* * *

THE RECEIVER shown on page 14 of the Sept. 18 issue of Radio World was built by a friend of mine for me. While the results are excellent, the volume is not very great. Could two stages of transformer audio coupling be added?

(2)—Is the output taken at the phone posts?—Leonard Barton, Long Island City, N. Y.

(1)—Yes.

(2)—Yes.

* * *

IN THE March 21 issue of Radio World in the Radio University section, there appeared a circuit diagram of a three-circuit tuner in a detector circuit. I would like to build this simple set for a friend of mine. I have some two-inch and one-inch diameter tubing, also a .0005 mfd. variable condenser, an —01A tube, a .00025 mfd. fixed condenser and a twomegohm grid leak. Please tell me how many turns to wind on this tubing.

(2)—Can the other parts be used?

(3)—The negative filament circuit is not connected up. Will you please explain how to do this?

(4)—What is the resistance in series with the B plus lead?

(*Concluded on page* 19)

(*Concluded from page 18*)

(5)—What value is the fixed condenser running from the plate to minus A.—Eric Weinger, Hollywood, Calif.

(1)—The primary consists of ten turns. The secondary consists of ninety-five turns. Use No. 22 double cotton covered wire. The two-inch diameter tubing is used. The tickler is wound on the one-inch diameter tubing and consists of fifty turns, using No. 26 single silk covered wire.

(2)—Yes.

(3)—A twenty-ohm rheostat is connected in series with the negative leg of the filament. That is, the resistance wire post of the rheostat is brought to the minus F post of the socket. The post connected to the arm is connected to the minus A post.

(4)—This resistor was a portion of the audio amplifier which followed. However, all you need to do, is to bring a binding post or a terminal of a single circuit jack to the end of the tickler winding. The other terminal of the jack or binding post is connected to the B plus post. Either a plug containing the phone tips should be inserted in the jack or phone tips alone should be connected up to the binding posts.

(5)—This is a .0005 mfd. fixed condenser.

* * *

I HAVE a one-tube reflex receiver consisting of a regenerative RF-AF tube and a crystal detector. Will I get good results if I cut the crystal detector out of the circuit and use the tube as a detector also?—Chester Malboro, East Pittsburgh, Pa.

No.

R. C. A. Grants License To All-American Co.

The All-American Radio Corporation of Chicago has been licensed under the one hundred or more basic patents owned by the Radio Corporation group.

The All-American Radio Corporation is a pioneer in the field of radio. Among its numerous products is the Rauland-Lyric audio transformer, so named for its founder and president, E. N. Rauland. It is also the owner and operator of the broadcasting station WENR, Chicago.

Enter City Enlarges

Enter City Radio Co., now at 221 Fulton Street, New York City, in order to meet the rapidly growing demands of their larger clientele, will remove on May 1 to larger and more up-to-date quarters and showrooms at 218 to 222 Fulton Street. Here a larger and more complete line of radio apparatus, sets and parts will be carried. A full line of Bruno precision instruments will be constantly on hand. The new and improved Diamond of the Air kits will be featured, and here will be headquarters for the Powertone Wave Trap. Courteous service will be the keynote, also expert advice for fans. An expanded mail order department will render efficient servioe to out-of-town sustomers.

RECEPTOR CO. LICENSED

Negotiations have been concluded between the Radio Receptor Co., Inc., the Radio Corporation of America, General Electric Co., Westinghouse Electric & Mfg. Co., and the American Telephone & Telegraph Co., whereby the Radio Receptor Co., Inc., is licensed under the patents of these companies.

MacDONALD TO BE HEARD

J. Ramsay MacDonald, former Prime Minister of Great Britain and now leader of the Opposition Party in Parliament, will be heard speaking before the annual banquet of the Foreign Policy Association, at the Hotel Waldorf Astoria, New York, through WJZ and the stations of the National Broadcasting Company's Blue Network, WBZ-WBZA, KDKA and KYW, on Sunday, April 26.

THE 5-TUBE DIAMOND

Fully described by Herman Bernard in a booklet, with diagrams, including blueprint, and sent on receipt of 50 cents. The Diamond is automatically adaptable to phonograph pickup. RADIO WORLD, 145 West 45th St., N. Y. City.

Montreal Dealers Form Branch Association

Montreal, Canada.

With a view to co-operating in the distribution of radio supplies and dealing with radio problems as they arise, seventeen retail radio dealers of Montreal have formed a section of the Retail Merchants' Association of Canada, to be known as the radio dealers' section of the association. The section is the first of its kind in the Dominion, but it is the intention to form sections in other cties and eventually have them meeting throughout the whole of Canada.

At a meeting George S. Layton, of Layton Brothers, was elected president, and the following were named to a committee which will study the various problems as they are brought to the attention of the section: W. J. Storey, representing C. J. Lindsay and Company; G. C. Payette, of the Whiteman Company, Limited; J. Fauvel, of the Gouin Electric Company, and I. Rosenthal, of the Canadian Electrical Supply Company.

At this meeting, Mr. Lapointe, provincial secretary of the association, addressed the new members on the benefits to be derived from mutual discussion of the problems affecting trade and distribution. It is proposed to have the committee study several problems which now face radio dealers and users in Canada, among them being that of wavelength pirating; about which the new section will approach the Dominion Government with a view to initiating discussions leading to an arrangement with the United States Government. Another problem that is likely to arise is that of municipal legislation concerning overhead aerials, and this also will be studied by the new section.

WLW ON SHORT WAVE, TOO

WLW, Cincinnati, besides broadcasting on 422.3 meters, is also sending out the same programs on 52.02 meters.

Good Back Numbers of RADIO WORLD

The following illustrated articles have appeared in recent issues of RADIO WORLD: 1926:

Sept. 4—The Four Rectifier Types, by K. B. Humphrey. A Simple Battery Charger, by J. E. Anderson.

Sept. 11—The Beacon (3-tubes), by James H. Carroll. The 1927 Model Victoreen, by Herman Bernard.

Sept. 18—The 1927 Victoreen, by Arthur H. Lynch. Eliminator in a Cash Box, by Paul B. Fernald.

Sept. 25—The Lynch Lamp Socket Amplifier, by Arthur H. Lynch. Wiring up the Victoreen, by Herman Bernard.

Oct. 2—The Victoreen (Continued), by Herman Bernard. New Equamatic System, by Capt. P. V. O'Rourke.

Oct. 9—A Practical "A" Eliminator, by Arthur H. Lynch. Building the Equamatic, by Capt. P. V. O'Rourke.

Oct. 16—The Bernard, by Herman Bernard. How to Box an "A" Supply, by Herbert E. Hayden.

Oct. 23—The 5-tube P. C. Samson, by Capt. P. V. O'Rourke. Getting DX on the Bernard, by Lewis Winner.

Oct. 30—The Singletrol Receiver, by Herbert E. Hayden. How to Get Rid of Squeals, by Herman Bernard.

Nov. 6—Reduction of Interference, by A. N. Goldsmith. Variations of Impedances, by J. E. Anderson.

Nov. 13—The 4-tube Hi-Power Set, by Herbert E. Hayden. A Study of Eliminators, by Herman Bernard.

Nov. 20—Vital Pointers About Tubes, by Capt. P. V. O'Rourke. The 4-tube Diamond of the air, by Herman Bernard.

Nov. 27—The Antennaless Receiver, by Dr. Louis B. Blan (Part 1). Short Waves Yield Secrets, by M. L. Prescott.

Dec. 4—The Regenerative 5-Tube Set, by Capt. P. V. O'Rourke. The 8-tube Lincoln Super, by Sidney Stack. The Antennaless Receiver, by Dr. Louis B. Blan (Part 2). Winner's DC Eliminator, by Lewis Winner.

Dec. 11—The Universal Victoreen, by Ralph G. Hurd. Some Common Fallacies, by J. E. Anderson.

Dec. 18—Selectivity on One Tube, by Edgar Speare. Eliminating Interference, by J. E. Anderson. The Victoreen Universal, by Ralph G. Hurd (Concluding Part).

Dec. 25—A New Coupling Device, by J. E. Anderson. Functions of Eliminators, by Herman Bernard.

Jan. 1, 1927—The 2 Tube DeLuxe Receiver, by Arthur H. Lynch. The Twin-Choke Amplifier, by Kenneth Harkness.

Jan. 8—Tuning Out Powerful Locals, by J. E. Anderson. A Choice Supéheterodyne, by Brunsten Brunn. The 2-Tube De-Lux Receiver, by Arthur H. Lynch (Part 2).

Jan. 15—The DeLuxe Receiver, by Arthur H. Lynch (Part 3). The Simple Meter Test Circuit by Herbert E. Hayden. The Superheterodyne Modulator Analyzed, by J. E. Anderson.

Jan. 22—The Atlantic Radiophone feat, by Lewis Rand. An Insight Into Resistors, by J. E. Anderson. A Circuit for Great Power, by Sidney Stack.

Jan. 29—The Harkness KH-27 Receiver (Part 1), by Kenneth Harkness. Use of Biasing Resistors, by J. E. Anderson.

Feb. 5—5-Tube, 1 Dial Set, by Capt. P. V. O'Rourke. The Harkness KH-27 (Part 2), by Kenneth Harkness. What Produces Tone Quality, by J. E. Anderson.

Feb. 12—Phone Talk Put On Speaker, by Herbert E. Hayden. All Batteries Eliminated, by Herman Bernard. The Harkness KH-27 Receiver, by Kenneth Harkness (Part 3) conclusion.

Feb. 19—The 6-Tube Victoreen, by Herman Bernard, (Part 1.) The Big Six Receiver, by Wentworth Wood. "B" Eliminator Problem, by Wm. P. Lear. The Phasatrol Circuit, by Capt. P. V. O'Rourke. The 6-Tube Victoreen, by Herman Bernard (Part 2) conclusion.

Feb. 26—The 5-tube Diamond in a Phonograph, by Hood Astrakan. How To Read Curves, by John F. Rider. Proper Tubes for 5-Valve Receiver, by J. E. Anderson.

Mar. 5—Introduction of 4-tube Universal, by Herman Bernard. Discussion on DX, by Capt. P. V. O'Rourke. Sensible Volume Control, by Chas. Gribben.

Mar. 12—Ten Tell-Tale Points, by J. E. Anderson. How To Figure Resistors, by Frank Logan. The 4-tube Universal, by Herman Bernard, (Part 1.)

Mar. 19—Psycho-Analyzing Circuits, by Thomas L. McKay. The Universal, by Herman Bernard (Part 2). How to Use a Wave Trap, by James H. Carroll.

Mar. 26—The Universal, by Herman Bernard, (Part 3). Flow of Current in a Vacuum Tube, by Radcliffe Parker. Broadcasting Hypnotism.

April 2—Facts Every Experimenter Should Know, by J. E. Anderson. A Ship Model Speaker, by Herbert E. Hayden. The 3-tube Compact, by Jasper Henry. The Nine-in-Line Receiver, by Lewis Rand (Part 1.)

April 9—A 5-tube Shielded Set, by Herbert E. Hayden. The Power Compact, by Lewis Winner. The Nine-in-Line Receiver, by Lewis Rand, (Part 2.)

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AT YOUR SERVICE

A 100-Volt DC Eliminator

It is possible to make a DC B eliminator in a short time and for very little money. Its construction is extremely simple, so simple in fact that it can be described without recourse to a diagram. True, such an eliminator cannot be made to furnish more than 90 to 100 volts, but should additional voltage be wanted a B battery can be connected in series with it.

The parts needed are:

Two choke coils.
Two to four fixed condensers
One variable high resistance
Three binding posts
Two fuse bases with fuses
Six feet of electric light cord and plug.

Care must be taken in wiring this unit to see that the leads are kept from touching each other or touching any apparatus other than that to which they are connected. Should accidental contact occur a short circuit will result. But, even if this should happen, there is no fire hazard because of the fuses.

Wiring Connections

The first step is to connect the socket plug to one end of the flexible electric light wire, then all the remaining parts are fastened to a baseboard, the fuse bases at one end and the binding posts at the other.

The electric light wires are then connected, each to one side of one fuse block. The other side of one fuse block is connected directly to the negative B post. The remaining fuse block has its open terminal connected to one side of one of the choke coils and a wire is then run from the other terminal of the choke coil to a terminal of the second choke. The last terminal of the second choke connects directly to the amplifier positive B battery binding post.

If only two condensers are being used they may be of 2 or 4 mfd. capacity. One of them is connected from the junction of the two chokes to the negative B line and the other from the positive B amplifier post to the negative B line. The variable high resistance has one of its terminals connected to this amplifier B binding post and its other end connected to the detector positive B binding post.

Getting Rid of Hum

Should you desire to get rid of a little more of the hum, an additional condenser of about 1 or 2 mfd. may be connected from the detector post to the negative B, and another of the same value across the terminals of the fuse plugs, that is, one from the first choke coil to the negative B lead.

When connecting this device to a power line and to the set it is necessary of course to determine the polarity of the

BUILD the new Universal, described in the March 12, 19 and 26 issues. Send 45c. for these copies or $1 extra for blueprint, or $1.30 for all four. RADIO WORLD, 145 W. 45th St., N. Y. C.

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power line. This may be done by taking an ordinary drinking glass filled with water, to which a pinch or two of salt has been added. The bared ends of the power leads, which are attached to the fuse plugs, are dipped into the solution, care being taken to keep them from touching and causing a short circuit. It will be found that bubbles arise from both leads, but that more bubbles arise from one. That one is the negative lead and should be connected to the fuse plug which runs direct to the negative B binding post.

Offers a Surprise

It is not guaranteed that this B eliminator will be entirely free from hum, for it probably will hum a little. However, when a station is tuned in with volume the hum will not be very annoying.

The eliminator described will doubtless be just as efficient as many other cheap eliminators which can be bought or built. Though no broad claims are made for it you will probably be favorably surprised with the results.

* * *

I READ your very interesting and helpful department in RADIO WORLD, for which I am a subscriber, and am wondering if I can get a little help myself. I am going to build the nine-tube Fenway Super-Het, in fact I am already well advanced on it, and am only waiting for some new parts, namely, the meters and audio transformers. I wish to use a power tube in the last stage, either a 371 or a 112. Which would you advise using? Please give changes in wiring, if any, and amount of C battery if I use 135 volts B current. Is it a good plan to run the tube directly off the A line, without any rheostat? Would you advise using power detector tubes, CX300-A in the detector sockets? If so, what B battery should I use, and what grid return? Also, is any trouble met with in tuning in the low waves? How can this be remedied? The audio transformers will be Rauland Lyrics. I will use a Western Electric cone speaker. Do you think this is a good combination?

I have been wanting to get these things cleared up for a long time, and am very glad to be able to have them answered by one who is unbiased toward hook-ups and apparatus.

ROBERT J. BERGLUND

A 371 will probably give you better results in handling the great volume of which the Fenway Super is capable. When used with 135 volts of B battery, 27 volts of C battery are needed. Use a rheostat or fixed resistance for the 371 or 112. Both have a rated filament voltage of five volts. The type 300-A tube will give you somewhat better distance reception than the 301-A, particularly in the first detector. Its grid return lead is run to the negative filament instead of the positive. 22½ to 45 volts should be used on the plate. Experiment will show you which one. If the set is properly designed, there should be no trouble in tuning in the low wavelengths.. Use an output device, such as I described recently in Radio World, or an output transformer, because the 371 passes enough current to burn out some speakers. The combination is O. K.

HOVGAARD IN NEW POST

O. M. Hovgaard, graduate in radio communication, Massachusetts Institute of Technology, has joined the staff of the Briggs and Stratton Corporation, automobile accessory and A eliminator manufacturers. He will assume charge of the A and B eliminator research department.

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