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Tips for Custom Set Builders

How to Shoo the Buzz from a Speake

EVERY FRIDAY evening, beginning at 5:40 P. M., a ten-minute talk on radio topics is delivered by Herman Bernard, managing editor of *Radio World*, from WGBS, the Gimbel Bros. station, New York Listen in.

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The Biasing Resistor Fallacy Exposed!

Quality and Amplification Retained with Negligible Difference in Results as Compared with the Irreproachable Grid Battery

[The use of a resistor for obtaining grid bias, particularly for the final audio tube, has aroused much discussion among radio technicians, the usual finding being that the resistor injures quality and amplification because it is common to the grid and plate circuits. In the following article J. E. Anderson, Technical Editor, while showing that the grid battery is an irreproachable method of biasing, proves that a resistor may be used instead without more than a negligible difference in results, if certain precautions are taken. He also presents for the first time his original connections for a humless B supply, conceived on or prior to December 30, 1927, and which is the subject of a patent application.—Editor.]

By J. E. Anderson
Technical Editor

WHY is it that persons will challenge the accuracy of a statement that merely calls attention to an obvious fact? Why is it that persons get astonished when they witness a demonstration of a phenomenon that acts according to expectations? Why is it that some persons are still doubtful after their attention has been directed to the obvious fact and after a striking demonstration of it has been staged?

Mental habit, conservatism, excessive faith in established custom—these are some of the reasons. In some cases the reluctance to accept a new suggestion, obviously true though it may be, is due to the common error that the great majority is assumed to be right. Many a new-born idea has been smothered for a while in the ridicule of the unthinking majority. But ultimately the truth will force itself into general acceptance.

So it will be with the idea that the grid bias resistor must be detrimental rather than helpful to quality and amplification. A greater blunder was never perpetrated in radio than that which brought us the grid bias resistor.

Error in High Places

The error was not committed originally by a lowly disciple of the great masters in radio science, but it had its birth in the stronghold of the masters themselves. It must have been one of them that first committeed the error, and it must have been condoned by many of them, or it never would have found wide distribution.

The whole thing was built on a fallacy. It started logically enough but it degenerated into a case of reductio ad absurdum, except that not many have yet seen the absurdity of it.

The grid bias resistor came into being in this wise. Batteries must be done away with. Let us start with the grid battery. All we have to do is to put a resistor in the negative leg of the filament and connect the grid return lead to the negative end. Simple enough and effective! This expedient introduced the detrimental effect whereof we shall speak later, but introduced it only to a negligible extent. Its effect was scarcely measurable, much less a major cause for distortion.

The reason this introduces a negligible adverse effect is that the bias obtained is due mainly to the filament current which

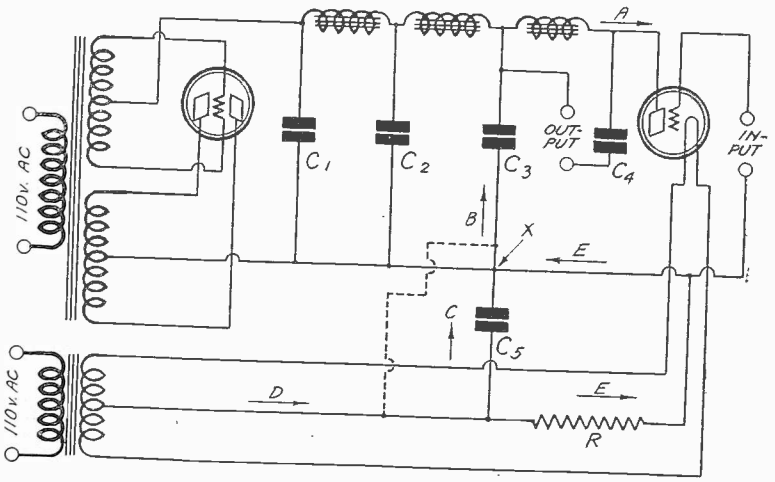


FIG. 1

DIAGRAM ILLUSTRATING THE PROPER WAY OF CONNECTING THE BY-PASS CONDENSERS IN A B SUPPLY SO THAT THE LEAST HUM AND DISTORTION WILL RESULT FROM THE USE OF A GRID BIAS RESISTOR IN THE POWER TUBE.

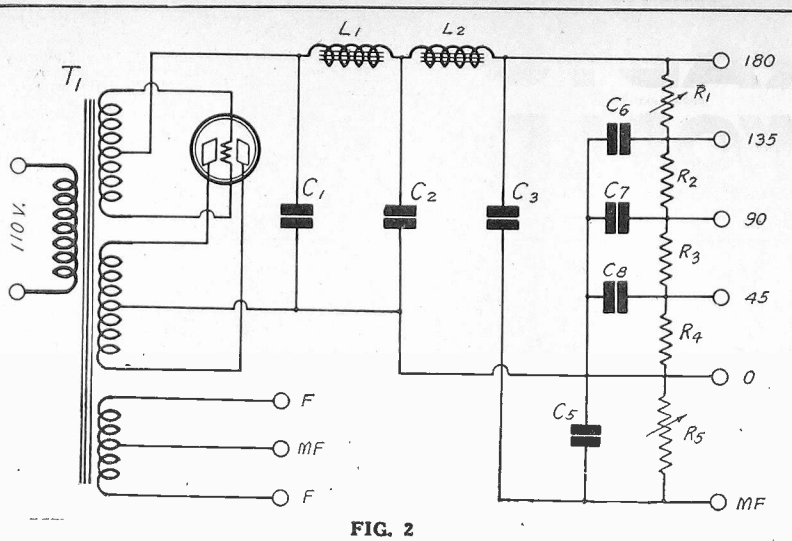


FIG. 2

DIAGRAM OF A B BATTERY ELIMINATOR INCORPORATING THE BY-PASS PRINCIPLES DISCUSSED IN CONNECTION WITH FIG. 1.

flows through the bias resistor. The plate current component is negligible in comparison with the filament current, and it is the plate current that does the damage.

A variation of this theme was introduced when circuits with series connected filaments were devised. In these the voltage drops in the various filaments were used to supply the bias for other tubes. In principle this does not differ from the preceding case. It is simply a more economical arrangement. The detrimental effects on the signal are still negligible except in direct coupled circuits. In these the adverse effects usually become major contributions to the misbehavior of the circuit.

Enter the B Supply

Then B battery substitutes were introduced. Higher plate voltages became common, and these required higher grid bias voltages than could be obtained by the drop in the filament circuit ballast. And then someone reasoned fallaciously that the plate current is mostly DC and if that be put through a resistor there will be a steady drop in the resistor. It may be possible to arrange the circuit so that this drop can be used as grid bias for one or more tubes.

A way was quickly found.

But the solution required that the resistor be both in the plate and the grid circuits at the same time. That is, the resistance was a coupler between the plate and the grid. In some connections a single tube was involved. In other cases the coupling extended to all of the tubes in the circuit.

The fallacy in the argument enters when it is assumed that the voltage drop in the grid bias resistor is steady. It is far from steady, but fluctuates widely as the signal fluctuates. The grid of the tube thus is given a variable grid bias, which amounts to another input voltage that adds to or subtracts from the signal input voltage. And since it depends on the signal voltage the effect is either to reduce or to increase the amplification.

Case Analyzed

When a single tube is involved the amplification is decreased, and the amount of decrease depends on the type of tube, on the value of the grid bias resistor, on the load on the tube and on the frequency of the impressed voltage. When two or more tubes are involved and share the same grid bias resistor the effect may be an increase or a decrease in the amplification.

In Fig. 1 is given a diagram of a typical B battery eliminator and attached power tube. The first two choke coils to the left are the regular eliminator chokes and the third is the speaker coupler choke. Condenser C3 is the final and largest condenser in the filter circuit. C4 is the stopping condenser which prevents any of the direct plate current from flowing through the speaker.

The resistance R is the main object of discussion. It has been put there to give the grid of the power tube a steady grid bias. But it does not do that; it gives the grid a "wobbulating" grid bias. Suppose we consider an instant when the signal voltage is increasing. The plate current in the power tube is also increasing, and this is indicated by arrow A (top right). The corresponding current in other portions of the circuit is indicated by the other arrows (B, C, D, E).

When Two Are Alike

Let us assume that the filtration is so thorough that no portion of the signal current flows through the filter chokes but that all flows through condenser C3. Then current B is the same as current A. This current is divided between the third choke and the loudspeaker in a ratio depending on the frequency and the impedances of the two paths. In a correctly designed amplifier only a negligible amount flows through the choke and practically all flows through the speaker.

Current D in the center lead to the filament heating transformer is also equal to A and B. Between B and D the current divides between C5 and R (lower right), the high frequencies tending to go by way of the condenser. Now if C5 is absent or is very small, current E through R is equal to current D, and any variation in E will cause a variable drop across R.

By tracing out the grid circuit of the tube it will be seen that R is in that circuit as well as in the plate circuit. The grid circuit is from the grid to the midpoint on the filament, or to the midtap on the filament transformer. Thus if there are any current fluctuations in R there will also be voltage fluctuations on the grid. Since a signal voltage put on the grid will cause the plate current to vary, and as E is the major part of the plate current fluctuation, the voltage put into the grid will be reflected, or fed back, to the grid circuit.

Effect Calculated

The quantitative effect that this feedback has on the signal in a typical case can be calculated very easily. If μ is the amplification constant of the tube, R the resistance used for grid bias, r the internal resistance of the tube, and R2 the resistance of the load on the tube, the reduction in the amplification as compared to the case when R is zero is given by

$$\frac{r+R_2}{r+R_2+R(\mu+1)}$$

assuming C5 to be zero. In a -71 type tube r equals 2,000, R equals 2,000, μ equals 3 and R2 may be taken as 4,000 ohms. When these are substituted in the above formula we get .43 as the reduction ratio. That is, the volume is reduced to less than ½ what it would be with a battery for grid bias.

Suppose that the load resistance is only 2,000 ohms, which is more nearly like the actual value for the low notes. The reduction ratio then becomes .333, or the volume is only a third as strong as it would be with batteries for grid bias instead of the resistor R.

On Way to Unity

Now let us assume that C5 be given a value of 10 mfd. with the other constants remaining the same as in the preceding case. That is, R2 is equal to 2,000 ohms. Let us see how a frequency of 25 cycles fares. Substitution in the formula shows that the reduction ratio at this frequency is .65. At a frequency of 100 cycles the reduction ratio is .84 and for higher frequencies still more nearly unity.

When C5 is not used across the grid bias resistor R, all the notes are suppressed about the same, and the suppression may amount to the gain in a stage of amplification. When C5 is of small value, say 1 mfd., the high notes will not be suppressed because they go through the condenser instead of through the resistor. As the capacity of the condenser is increased, more and more of the signal current will pass through the condenser and less through the resistor. And as the capacity is increased the amplification at any given frequency will increase toward normal value, that is, the value that would be obtained when a grid bias battery is used. When the capacity is about 10 mfd. it may be said that there is no appreciable suppression at a frequency of about 30 cycles. Of course the larger the condenser is, the more nearly is the reduction ratio unity and the more nearly does the quality of the output resemble that obtained with a grid bias battery.

Another Connection

Suppose condensers C1, C2 and C3 were connected to the midtap of the filament transformer instead of to the midtap of the high voltage transformer, then practically none of the signal current would flow through R but the steady plate current would. Hence R would not cause any appreciable reduction in the amplification even if C5 were not used. One might jump at the conclusion that that is a simple solution of the difficulty. But it is not.

When the three filter condensers are so connected the hum from the rectifier passes through R. This will cause a greater variation in the grid bias than was caused by the plate current flowing through R. And it will be of a frequency which is very objectionable when mixed with the signal. The circuit will hum badly but the volume will be high.

This hum may be reduced with condenser C5 just as the amplification was increased with C5. The hum now will never be lower than 60 cycles per second, and most of it will be 120 cycles per second. Hence it will be easier to eliminate the hum than to bring up the amplification on the lowest audible notes. Suppose we connect a 4 mfd. condenser across R and assume that all the hum is of 120 cycles. If R is 2,000 ohms the impedance of the resistor and the condenser will be reduced to about 1/7 the value of the resistor alone. The hum will

be suppressed in the same ratio. That is, 4 mfd. condenser will almost suppress the hum below audibility.

A Better Way

But there is a still better connection. Suppose condensers C1 and C2 be left where they are in the diagram. Now most of the hum in the eliminator will go through C1. That will pass directly to the return side of the rectifier without touching R. Very little of the hum reaches C2, but that which does also avoids R and goes directly to the rectifier. In C3 there is practically no hum because of the two previous condensers and the two choke coils. Then if we connect C3 to the midtap of the filament transformer there will be practically no hum passing through R, since only that which reaches C3 will pass through it. It should make very little difference then whether C5 is retained or not as far as the hum is concerned.

What effect will R now have on the amplification? Practically no effect. None of the signal current in the power tube passes through it and hence there will be no variable voltage drop in it. C3 is so large that nearly all the signal current passes through it directly to the midtap of the filament transformer. Extremely little of the signal current will pass through the chokes and the first two by-pass condensers and so find its way through R.

Even from this point of view C5 is not absolutely necessary in theory when this particular connection is used. But if it is used it can only aid in the proper operation of the set, and the larger its capacity, the greater its aid will be.

The connection which gives the least hum and at the same time the least reduction in the amplification as a result of the use of the grid bias resistor R is shown in Fig. 1 by the dotted line. The connection of C3 at the junction X is removed and the lead brought down to the midtap on the filament transformer.

Eliminator Described

Fig. 2 depicts an eliminator which incorporates the principles discussed above. The power tube with its coupler has been removed and a voltage divider substituted. The power tube filament transformer, however, has been retained and the proper connections have been indicated.

The power tube choke and one loudspeaker terminal should be connected to the 180 volt tap on the voltage divider strap. The midtap MF on the heating transformer should be connected to the MF terminal on the voltage divider to give the last tube an appropriate bias by means of resistance R5.

The by-pass condensers C6, C7 and C8 are not returned to the same point as condenser C3 because the tubes which will make use of the lower voltage taps will not get their grid bias from the resistor R5. The condensers are returned to the point to which the negative ends of the filaments of the other tubes will be connected.

Since the drop in resistance R5 will be subtracted from the effective voltage on the plate of the last tube, the point marked 180 volts should not measure 180 volts between zero or B minus but it should measure 180 plus the grid bias. That is, if the plate voltage is to be 180 volts and the grid voltage necessary is 40 volts, the voltage between B minus and the 180 volt tap should be 220 volts.

It will be observed that a condenser block cannot be used for supplying all the capacities in this power source. The reason for this is that in the condenser blocks all the condensers are connected on one side. In this eliminator C3 is independent of the others on both sides. But a regular block can be used for C1, C2, C5, C6, C7 and C8. A separate condenser is necessary for C3. C5 may well be the condenser which ordinarily would have been used in the C3 position, that is, the otherwise unused capacity in the block.

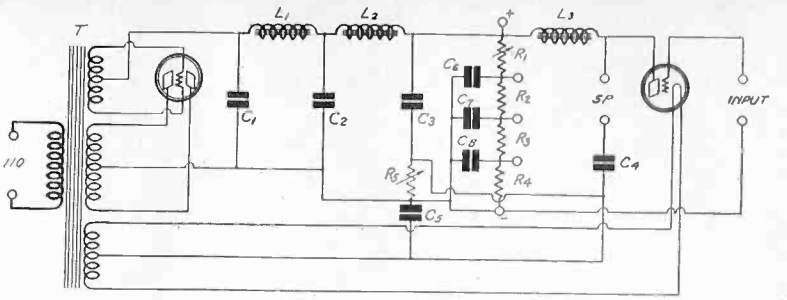


FIG. 3

THE SCHEMATIC DIAGRAM OF A COMPLETE ELIMINATOR AND ONE AMPLIFIER IN WHICH NEW AND IMPROVED CONNECTIONS ARE USED.

The capacities for the various condensers called for in the diagram Fig. 2 should not be less than the following: C1 and C2, each 4 mfd.; C3, 8 mfd.; C5, 4 mfd.; C6, C7, C8. each 2 mfd.

Condensers C1, C2 and C3 should stand a continuous voltage of at least 600 volts and the rest need not be designed for higher voltages than 300 volts.

Choke coils L1 and L2 should have inductance on full DC load of at least 30 henrys each, and the resistance of each should not be greater than about 400 ohms.

R1 should be a variable resistor with a range of from zero to 10,000 ohms and it should be able to carry continuously at least 25 milliamperes. R5 should be a variable resistor with a range of zero to 2,000 ohms.

By the addition of one separate condenser almost any B supply can easily be changed over.

R5 should be a variable resistor with a range of zero to 2,000 ohms.

By the addition of one separate condenser almost any B supply can easily be changed over.

Speaker Connection

In the circuit arrangement shown in Fig. 1 the loudspeaker is connected across the output choke coil alone. The signal current therefore must go through C3 before it can complete its circuit, or else it must find a way back through the rectifier and the filter. Obviously, a large current will flow by way of the choke coils and the rectifier when the speaker is connected as in Fig. 1 then if the speaker return were connected on the low side of C3. The proper way to connect the reproducer is that which sends the least signal current through the rectifier and the filter, as well as the least through the resistor R.

The speaker connection shown in Fig. 1 is the usual connection because this is the most convenient in most cases and it also subjects the stopping condenser C4 to a low stress. But it is not the best from the viewpoint of quality of reproduction, degree of amplification, and stability of the circuit. Fig. 3 shows the connections which will introduce the least hum in the signal, which will yield the greatest stability of the circuit, and which will operate with the least dependance on the resistor R.

The Reversal in Fig. 3

Note also in Fig. 3 that the positions of the speaker and the stopping condenser have been reversed. The speaker is next to the tube and the condenser is below it. This arrangement has been made so that the condenser C4 may be combined in a condenser block more easily.

It will be observed that condensers C3, C4 and C5 have one side in common so that they can be housed in one block if that is convenient. All of these should be large, say 4 mfd. or more, and C3 and C4 must stand the full voltage of the eliminator.

C5 can be combined also with the other condensers, since it has one side in common with C1. C2, C6, C7 and C8. The first of these, or C1 and C2, must be designed to stand the highest working voltage.

In many cases it is preferable to omit condensers C6, C7 and C8 from the eliminator and to put them in the receiver, if needed. There are many good reasons why they should not be put in the eliminator. In many circuits taps 6, 7 and 8 will not be used at all. In such cases the condensers will be idle. It would be a waste of money and space to use them. In other cases it is necessary to use bypass condensers in the set in order to bypass the leads to the eliminator. The duplication caused by using C6, C7, and C8 as well is unnecessary, and the condensers in the set are enough. Often they need not be more than .01 mfd. to serve the purpose.

Condensers Preferred

When building an eliminator like the one described above it should be remembered that it is better to use condensers for removing hum than to use inductances for this purpose.

Both inductance and capacity are necessary to remove the hum effectively, but for a given degree of residual hum the filtering will remain the same if the condensers are doubled in capacity and if the inductances are halved.

The eliminator will cost more if the filtering is done with small coils and large condensers, but it will give very much better service. It is a great mistake to try to save on the condensers.

Condensers across the line suitably decrease the effective AC resistance of the filter whether it is measured from the rectifier or from the receiver. Coils have the opposite effect. Not only do they increase the direct current resistance but they also greatly increase AC resistance.

On high frequencies, say from 5,000 upward, the by-pass condensers ordinarily used are very effective and the resistance of the filter measured from the receiver is negligible But for low frequencies, particularly sub-audible frequencies, the condensers are ineffectual and the resistance of the filter is that of the coils and the rectifier in series.

* * *

This concludes the theretical discussion of J. E. Anderson's original method of designing A B supply. Constructional data will be published next week.

The Shielded Grid Six

[The Shielded Grid Six began in the January 7 issue, was continued in the January 14 issue, and is concluded herewith. This is the first national presentation of a tuned radio frequency receiver using the new and powerful radio amplifying tubes.]

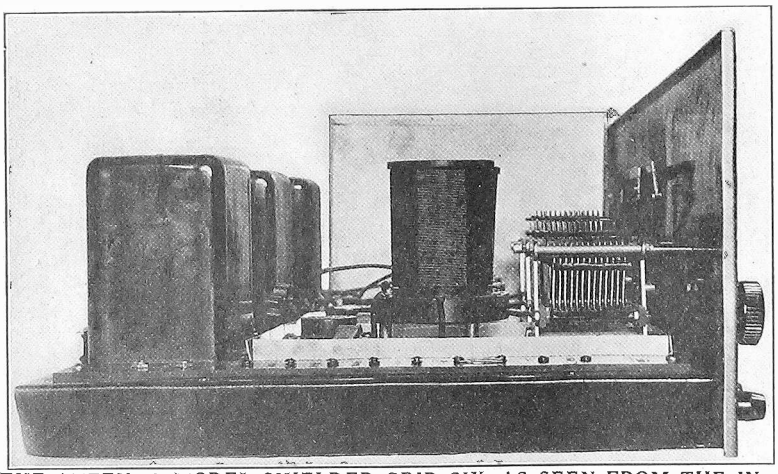
By McMurdo Silver

PART III

THE audio amplifier frequency characteristic is flat from about 30 cycles to above 5,000 cycles, thus giving distortionless amplification. Above 5,000 cycles the amplifier cuts off to reduce the all too prevalent "background noise" and heterodyne squeals uncontrolled under present congested broadcast conditions.

The voltage amplificaiton of the audio amplifier, with 112 or 112A power tubes, is about 400 to 450 times. The 221 output transformer protects loudspeaker windings and compensates for average poor speaker bass note performance.

Both models are assembled on a formed metal chassis 12 inches deep, 19¼ inches long and 1½ inches high, with beautifully decorated bronze control panel carrying two vernier tuning dials, volume control, on-off switch, and antenna switch.



THE ANTENNA MODEL SHIELDED GRID SIX, AS SEEN FROM THE INPUT END, WITH TERMINAL STRIP IN LOWER FOREGROUND, ONE SHIELD BEING REMOVED TO SHOW DETAIL OF THE COIL-CONDENSER INSTALLATION.

Advice on B Eliminator

If a B eliminator is used with the receiver, it is very important that it be only of the glow tube regulated, fixed voltage type, for it is necessary that the values of 45 and 135 volts required for the receiver B circuit be accurate to within 10 to 15 per cent—an accuracy which is absolutely impossible to obtain by guesswork with standard B eliminator equipped with variable voltage controls. Such eliminators may be used with the receiver only when preliminary adjustment of their output voltage may be made with a good high-resistance voltmeter.

The S-M 652 or 652A types are the only glow-tube-equipped power units now on the market, and one of these should be employed. The B minus, plus 45 and plus AMP posts should be connected to the similarly marked posts of the power unit. The plus 135 post of the receiver must be connected to one end of a 3,800 ohm resistance, as well as to one end of a 5,500 ohm resistance. The remaining end of the 3,800 ohm resistance may connect to the plus 90 post of the power unit, and the remaining end of the 5,500 ohm section may connect to the plus AMP post of the power unit—a Ward-Leonard type 659 resistor may be used satisfactorily for this purpose, the resistor being placed at some point near the power unit. One power unit, not equipped with glow tube regulator, but with fixed B voltage taps of sufficient accuracy for operation of the 630-SG, is the S-M type 675, which, incidentally, also supplies enough B power so that a 210 tube may be used in the last audio stage of the receiver to which this power unit will furnish A, B and C power, as well as B power to the rest of the receiver.

Simple to Operate

The operation of the receiver is simple. Turn it on with an On-Off switch, adjust the volume knob to the maximum or full right position and tune in stations which will be received with the two dials rotating approximately alike. Volume may be regulated with the volume knob and a coarse regulation of the selectivity selector I dial effected by throwing the antenna short and long switch from short to long position and vice versa.

For a Residential District

If the set is to be operated in a residential district three or four miles from a local broadcast station, the plate leads of the RF amplifier tubes should be fastened under terminal screws No. 2 of the B, C and D coil sockets, which is the position of greatest volume together with extremely good selectivity.

Moving the three plate leads to post 4 of the respective coil sockets increases the selectivity and decreases the volume very slightly. While connecting the plate leads to post 1 of the B, C and D coil sockets gives an extremely high value of selectivity at the expense of a slight decrease in volume, this connection is recommended only where the receiver is located within half a mile or a mile of a broadcasting station.

Recommended Connection

The three condensers in the B, C and D stage compartments should be ganged by fastening the link motion in them and adjusting it so that all three condensers begin to interleave and hit their stop rods at the same time. After the set has been in operation, the antenna length should be cut down until some station at about 300 or 325 meters is barely audible. The right-hand condenser should then be loosened from the ganging and tuned individually.

While the B and C condensers are tuned together for loudest signal, the condition of loudest signal will be when the D condenser lags slightly behind the B and C condensers, and the link motion should be tightly locked in place at this point after which no attention need be paid to ganging.

Will Not Oscillate

In operating the 630-SG receiver, remember that it tunes exactly like any ordinary neutrodyne or non-oscillating tuned RF receiver and that it will not oscillate if properly assembled (except in the case of very unusual operating conditions where it may oscillate with the plate leads connected to post 2 of the "B," "C" and "D" coil sockets, and with no antenna connected to the receiver.) With even a 15 foot antenna connected, the set will not oscillate at any wavelength.

The set in operation should give loud speaker signals upon stations barely audible upon other tuned RF or superheterodyne receivers, or it should give equivalent volume with far greater selectivity on any stations that may be heard with any standard tuned RF receiver operating on a 60 to 100 foot antenna, the Shielded Grid receiver for this test being equipped only with a 10 to 15 foot length of wire for an antenna. So operated, it will provide superheterodyne selectivity, surprising simplicity of operation, and volume equal or greater than that obtainable from standard tuned RF and ordinary superheterodyne receivers.

Air Waves Regulate City's Water Pressure

Marion, Ind.

Signals transmitted by radio regulate the pressure of the city water supply. The transmitting apparatus, located at the office of the Mario Water Company, which controls the water supply, is three miles from the plant. Every half hour, for two-minute periods, the transmitter automatically sends out regulating code signals, which are picked up by an employee at the plant. The wavelengths of the signals correspond to the water pressure. The code signal sounds when the pointer on the dial is at its proper spot.

How to Banish Buzzes

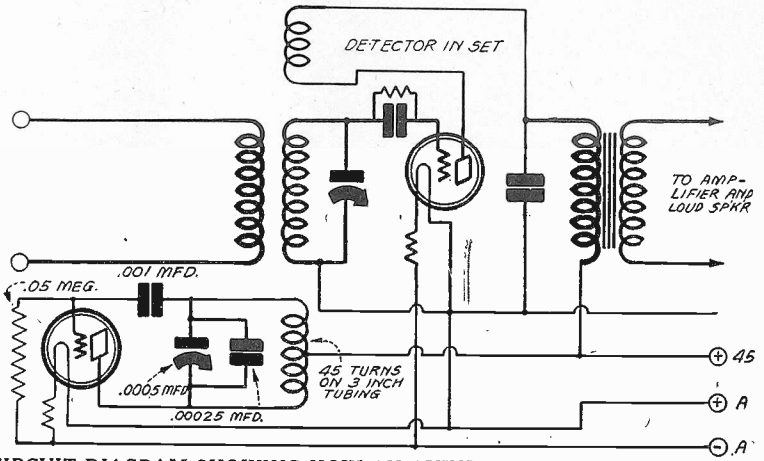
By Capt. Peter V. O'Rourke

Contributing Editor

DO you hear buzzing notes in your receiver which are always coincident with certain notes? For example, does your speaker emit a sound like a trapped fly every time the note "E" is sounded? If you do hear this buzzing something is loose about your receiver. It may be an integral part of the receiver itself or it may be some object near the reproducer. There may be a screw loose in the speaker itself which rattles when a sound of a certain pitch is struck. There may a bit of paper about the cone which has shaken loose. There may be a little button lying somewhere near the speaker. There may be a loose lamina in the core of one of the transformers or chokes in the receiver.

These are just a few of the possible causes of the buzz. There are countless places where the buzz may enter.

Another source of the buzzing is striking of the pole pieces by the armature in the loudspeaker. This occurs when there is audio regeneration on certain notes. These regenerative peaks in the amplification may occur at any point in the scale. Whenever they occur they sound like bzzzzz.



CIRCUIT DIAGRAM SHOWING HOW AN AUXILIARY OSCILLATOR CAN BE MADE AND CONNNECTED TO AN OSCILLATING DETECTOR IN A RECEIVER FOR GENERATING AN AUDIO FREQUENCY BEAT FOR BUZZING TESTS.

Step by Step Elimination

It is often extremely difficult to locate the source of the buzz, particularly when it is caused by something loose about the set. The best way of going about finding the source is progressive elimination.

Suppose there is something free to buzz in the room in which the loudspeaker is working, but not an integral part of the speaker itself. A pair of long leads can be connected to the reproducer so that it can be taken to another room. Close the door to the room in which it was before. Does the buzz persist? If it does, the first room probably does not contain the source of the buzz independently of the receiver. If the buzz stops when the loudspeaker is carried to another room, the source is probably in the first room. If that is the case place the speaker in several different positions in the room and note the intensity in the buzzing. It should increase as the speaker gets nearer the loose object.

If the speaker itself is suspected of entertaining the loose object, substitute another speaker, and carry the old speaker out of the room while testing. If the first speaker is found to contain the buzzer, investigate it externally to see that there is nothing loose. If all is well on the exterior, open up the speaker and check over the inside. Tighten all the screws and note particularly that there is no dust between the armature and the pole pieces. See that there are no loose bits of paper or other light objects in the cone or driving unit.

Testing the Eliminator

It is possible that the eliminator, if one is used, is the cause of the buzzing. The substitution of another eliminator or a battery will either convict or absolve the eliminator. Make this test, if possible.

Perhaps a little exploration with the ear will locate the trouble. If the buzzing sound originates from something loose on the exterior of the receiver or in the room, it should be possible to locate it just as the source of any other sound is located. But if the buzz has its origin inside the set, or inside a transformer or choke, it cannot be located this way. The substitution method will usually locate the trouble whether it is of internal or external origin. Even if it is of regenerative origin this will aid in the search.

If the buzzing is due to regeneration and a high amplification peak and consequent striking of the pole pieces the trouble should disappear if the volume is turned down to the point where the armature will no longer strike even on the volume peaks. If the buzz is caused by something loose in or about the set this test will not remove the noise. It will persist even on low volume but it will be less marked on account of the less intense agitation to which the loose object is subjected.

In tracing down the source of a parasitic noise like this nothing at all should be taken for granted. For example, it should not be assumed that the window pane or the receiver panel are innocent. The rule should be that all are guilty until proved innocent. In one case of this kind the noise was traced to a thin wooden panel lying on top of a cupboard which was standing at a considerable distance from the loudspeaker or the set.

Resonance the General Cause

The buzzing noise is generally caused by resonance, electrical or acoustical. Everything in the room has a certain natural frequency of vibration, which is more or less pronounced. When the loudspeaker sounds a note of the same pitch as the natural frequency of an object, and holds it a moment, the object is set into sympathetic vibration. The buzz follows when the vibrating body strikes something. When the source of the buzzing is electrical it is usually electrical resonance which gives rise to the amplification peak, and the buzz follows when the armature strikes the pole pieces.

When hunting for the source of a buzz it is not practical always to depend on the signal to give the required note. It is best to have a local audio frequency oscillator which can be set at will to the note at which the buzzing is most severe. The most convenient audio frequency oscillator having a continuously variable frequency is a beat note oscillator. In this the desired audible frequency is obtained by beating two high frequencies and detecting the beat note and amplifying it. The audio frequency is varied by varying the frequency of one of the high frequency oscillator.

If the receiver has a regenerative detector this can be used as one of the high frequency oscillators. It is only necessary to hook up a simple oscillator and couple it to the detector. Just placing the oscillator coil of the second oscillator near the regenerative coil of the detector is enough to couple the two.

A Considerate Way

When the detector is used as one of the oscillators, the antenna and ground leads should be disconnected so that the squeals resulting will not be radiated to disturb the neighbors. This test should also be carried out at a time when few people would be tuned in on any station.

Again the detector and the auxiliary oscillators could be set so that the radiated frequency, if any, is out of the broadcast band. For example, the oscillator condenser could be set at maximum and the condenser of the auxiliary oscillator could be increased when changing the beat note from zero to the desired value. This would insure that the two beating frequencies were always below the broadcast frequencies.

HEAR WRNY ON 30.9 METERS

The programs of WRNY, which are heard on 325.9 meters, may also be listened to on 30.9 meters through 2XAL. On Tuesday the station is on from 7 to 12 P. M.; on Wednesday, from 7 to 9 P. M.; on Friday, from 7 to 11 P. M.; on Saturday from 7 to 10 P. M., and on Sunday from 4 to 6 P. M.

Radio University

A FREE Question and Answer Department conducted by RADIO WORLD for its yearly subscribers only by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 45th St., New York City.

When writing for information give your Radio University subscription number.

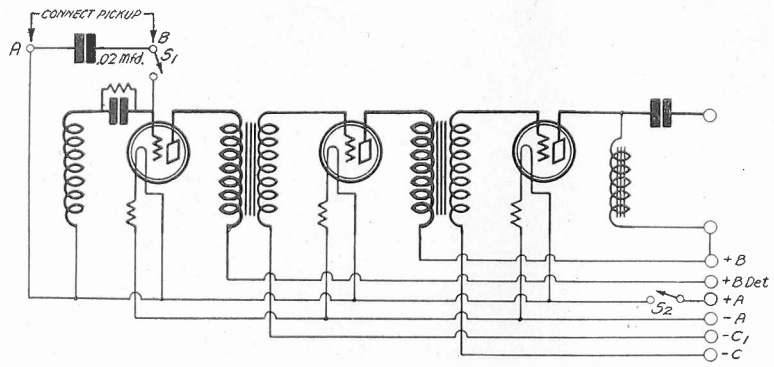


FIG. 594

HOW A PHONOGRAPH PICK-UP MAY BE HOOKED IN TO THE SECOND DETECTOR OF THE VICTOREEN SUPER-HETERODYNE.

I CONSTRUCTED a Victoreen Super-Heterodyne from the data which appeared in September 3, 10, 17 and 24 issues of RADIO WORLD. The results are wonderful. Is it possible to wire up this set, so that a phonograph pickup can be employed? If this is so, please show the wiring diagram. GEORGE DEACON, N. Y. City.

Yes, a pickup can be used very successfully on the Victoreen Super-Heterodyne, using the Victoreen 112 audio transformers. How to connect it is shown in Fig. 594. An extra pair of binding posts are mounted at the rear of the baseboard. From one post, which can be labelled B, run a lead to a switch (filament switch type). The other side of the switch is then connected to the G post on the second detector tube socket. Procure a .02 mfd. fixed condenser and run a lead from this condenser to the B post. The other terminal of the condenser is then connected to the binding post, which can be labelled A. This post is, in turn, connected to the A plus post. The pickup is inserted across the posts A and B. To use, simply snap on the Switch S1. It can be seen that the pick is inserted across the grid and plus A terminals.

* * *

IN MY 6-tube receiver, which consists of two stages of tuned radio and a detector, all ganged to a drum control, and three stages of double impedance coupled audio, I wish to install a choke coil and condenser at the output. I have a 100 henry choke and a 8 mfd. fixed condenser with a 600 volt DC breakdown guarantee. Could these both be used? I understand that the choke coil is connected between the plate and the B plus post. Also that one terminal of the condenser is brought to the post of the last tube and one terminal is brought to the speaker post, the other speaker post being brought to the minus A post. Is this correct?—L. P. BUNER, Tacoma, Wash.

Yes, you can use these parts. Your wiring data are correct. You can check this up and be more certain of it by referring to the diagram which appeared on page 18 in the Radio University columns, in the November 5, 1927 issue of RADIO WORLD.

* * *

I RECENTLY saw a circuit diagram of a 4-tube receiver, in which the 3-circuit tuner was incorporated in the radio frequency stage. The detector was non-regenerative, while the audio was transformer coupled. Now isn't this circuit fundamentally similar to the Superdyne which was described several years ago? I had an argument with a friend of mine about this and therefore wish to get the matter cleared up.

(2)—Another thing I would like to know is, if a 3-circuit tuner is used, with .0005 mfd. variable condensers in the input, will it be possible to use a loop also?—JOHN ROFERS, Beverly Hills, Calif.

(1)—Yes.

(2)—Yes, but you will not be able to obtain benefit of the tuner. To do this, you will have to build a special coil. Procure a 3 inch diameter tubing, 6 inches long; a tubing 1¾ inches in diameter and 2 inches long, and some No. 22 double cotton covered wire, as well as No. 26 single silk covered wire. Wind 10 turns on the larger tubings. This is for the primary. Skip a quarter of an inch and wind 50 turns, this for the secondary. Again skip a quarter of an inch, and wind 12 turns. The tickler is wound on the smaller form, and consists of 36 turns, using the smaller sized wire. The 22 wire is used for the windings on the larger tubing. The primary and secondary are connected up in the standard way. When it is desired to use the loop, the loop is shunted across the variable condenser and the secondary leads detached from this point. The extra winding is brought into use, here. It is connected between the stationary plate post of the variable condenser and the grid post of the socket. These connections can remain, when using the antenna ground, also.

* * *

I HAVE all the material necessary to construct the one-dial receiver described in the Feb. 5 issue of RADIO WORLD, on pages 8 and 9. I would like to know whether it would be feasible to add a tube using just a tube and a 1000 ohm fixed resistor before the first radio frequency amplifier, in the same fashion as employed in the Aero-Seven, which was described in the October 8, 15 and 22 issues of RADIO WORLD.

(2)—Could I use an Amperite to control the filament?—RAYMOND TRAIN, Marsteller, Pa.

(1)—Yes, this will work out all right.

(2)—Yes.

* * *

WHAT COULD be done to make my detector tube, with a variometer in the plate circuit, oscillate more readily?

(2)—Does it matter in which lead a filament switch is placed?

(3)—In my present receiver there are two transformer coupled audio stages, using three to one ratio transformers. Could I add another audio stage? If so, what ratio transformer would it be advisable to use?

(4)—Would I get better results if I connected the plate circuits of the detector and two audio tube plates to separate B plus posts? If so, what voltage would you suggest applying? Am using —01A tubes.—ELLIOT H. KILSTAR, Hollywood, Calif.

(1)—Insert a 1 mfd. condenser from B+ detector in the set to detector filament minus. Increase the detector plate voltage.

(2)—No.

(3)—No, it would not be advisable to add any more audio.

(4)—Just keep the detector plate voltage separate. Use from 45 to 67½ volts here. Use 135 volts on the audio plates, with a 4½ volt C bias in the grid circuit of the first audio tube, and a 9 volt C bias in the grid circuit of the second audio tube.

* * *

I AM going to build a 4-tube non-regenerative receiver and would like to get some information before going ahead.

(1)—Is it all right to place the 1A Amperites, of which there will be four, one in each filament leg, very close to each other?

(2)—I wish to use a loop with a .0005 mfd. variable condenser across it. Will you please give me the correct number of turns, size of form and kind of wire, necessary to build the loop? Also state how far apart the windings should be placed.—HARRY MILTON, Newark, N. J.

(1)—Yes.

(2)—Get a 2 foot square form and some No. 18 annunciator wire. Spacing each turn one-quarter inch, wind 14 turns.

* * *

I RECENTLY obtained a circuit diagram of a 3-tube reflex, designed for use with —99 type tubes, as well as obtaining a loop. There are a tuned reflexed radio frequency stage, a regenerative detector (using a 3-circuit tuner) and a stage of transformer coupled audio. All the filaments are rheostat controlled. The grid returns of the radio frequency and the first audio tube are brought to a minus C 4½ volt post. Now, I would like to use this receiver on the —01A type tubes. Are there any changes to make? Each B plus lead is by-passed with a 1 mfd. fixed condenser, to the minus A post.

(2)—Across the secondary winding of the transformer in the audio stage, (not reflexed) a 200,000 ohm variable resistance is shunted. Is this a volume control?—WILLIAM STRENTER, Providence, R. I.

(1)—No changes will be necessary, except to use a 6-volt source for the filaments. The —01+ tubes stand a higher plate voltage. To the radio frequency plate, apply 67½; to the detector plates, apply 45 volts, while to the first audio, you can apply 135 volts. It will be advisable to use separate C batteries; 3 volts for the radio, and 9 volts for the audio.

* * *

IN THE OCTOBER issue of RADIO WORLD a B eliminator to be used on direct current was described. I have constructed this device, using all the specified parts, which were tested before inserting, but cannot get good results. Will you be kind enough to enlighten me as to where I have erred, or if there are any errors in the diagram?—ALEXANDER H. FORMAN, Philadelphia, Pa.

You may have forgotten to connect the minus B to the plus A post. This connection was left out of the diagram because they are already connected together in most sets.

OUR CLUB wishes to build a 3-stage audio amplifier, using the following parts:

A 3 to 1 ratio audio transformer; three 2 to 1 ratio audio transformers with primaries burned out; two .1 mfd. fixed condensers; a 500,000 ohm fixed resistor; a filament switch; two 1 A Amperites; one 112 Amperite; two —01A tubes, and one 171 tube. Please show the circuit diagram of such an amplifier.—GIMBAL STEWART, Concord, Calif.

See Fig. 595 for the circuit diagram. The transformer which is O. K. is used in the first stage of coupling. The secondary of one of the burned-out transformers is used in the plate circuit of the first tube, this being coupled to the 500,000 ohm resistor by a .1 mfd. fixed resistor, to make up the second stage of audio. In the third audio stage, both secondary windings are used. The —01A tubes are used in the first and second stages, while the —71 is used in the last stage. For filament control in the first two stages the 1A amperites are used, while in the last stage, the 112 is used. Apply 135 volts to the first two audio plates. For the last plate, use 180 volts of B. The C bias here is 40½ volts. The speaker posts should be brought to some type of a filter, either of the condenser-choke or transformer type.

* * *

ABOUT SIX months ago I built a five-tube reflexed receiver. I have not had much time to play around with it, until recently. I am not satisfied with it. I was told that if I did away with the reflexing portion of the circuit I would get better results. The first two tuned radio stages are reflexed. The rest of the circuit is standard, with transformer audio. Is it only necessary to remove the audio transformers in the tuned radio stages to do away with the reflexing? If this is so, then I suppose you connect the grid returns directly to the minus A, instead of through the secondary windings of the audio transformers, and the plate of the detector tube to the plate post of the audio transformer to the first audio tube. Is this correct?

(2)—Are the terminals which went to the primaries of the audio transformers brought to the B plus posts?—TED WILIT, Adams City, Colo.

(1)—Yes, your results will be better. Your connections are O. K.

(2)—Yes.

* * *

I HAVE constructed the audio amplifier described by John F. Rider in the September 24 issue of RADIO WORLD and am well pleased with it. I used a B eliminator and an A battery. I decided to make the entire amplifier AC operated and purchased a transformer to light the filaments. Upon looking at the diagram, I notice that the transformer has a tapped secondary while the one I have has just one continuous winding. I would appreciate knowing just what must be done to my transformer so as to get the same results as when using the tapped secondary, or if it is at all necessary.—WILFRED HARLEIN, Pittsfield, Mass.

It is necessary to have a tapped secondary winding on the transformer, or if the winding is continuous, as in your case, a potentiometer shunted across the winding, or a center tapped fixed resistance. If a potentiometer is used 200 ohms would be the maximum. Only 50 ohms or so would be needed ordinarily.

* * *

I BUILT a 4-tube receiver consisting of a tuned stage of radio-frequency amplification, a 3-circuit tuner-detector and two stages of transformer coupled audio frequency amplification. The set works remarkably well on the low waves, but very poor on the higher waves. I use coils containing 8 turns on the primaries, and 47 turns on the secondaries. The .0005 mfd. variable condensers are employed. One thing I noticed, upon close inspection of the coils, which I have not seen on any other coils. That is, the primary is separated about ½ inch from the secondary separated by a piece of empire cloth which is ¼ inch thick. I have seen coils where the primary was wound on top of the secondary and separated by empire cloth, but never this. I did not notice this previously, because the coils were encased in hard rubber forms. Do you think the trouble could lie here?—HUDSON OSSEN, Baton Rouge, La.

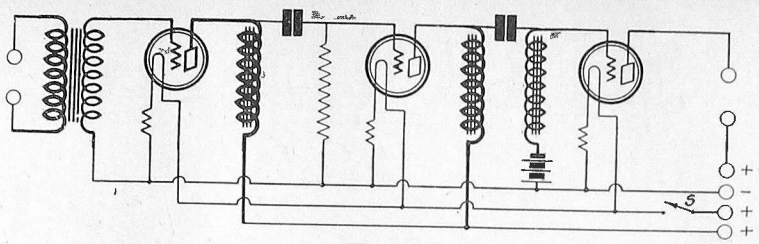


FIG. 595

THE THREE STAGE AUDIO AMPLIFIER REQUESTED BY GIMBAL STEWART.

Yes. Suggest you remove the cloth and place the primary to within a ⅛ inch of the secondary. Then add about 6 turns to the primary. If there is no rheostat in the radio frequency filament circuit, insert one. It should have a resistance of 20 ohms.

* * *

I AM going to construct the AC 300 receiver described in the December 24 and 31 issues of RADIO WORLD, but before going ahead, would like to get some information.

(1)—Can a 210 power tube be used in the last stage of audio frequency amplification?

(2)—If this tube can be used, is it necessary to install a special transformer to heat the filament or can the same 5 volt winding used for the —71, be employed?

(3)—Are the B minus and the A minus connections made internally, as the set is wired up?

(4)—I notice that there is no provisions for an output device to prevent the speaker windings from becoming injured. Isn't one necessary? I have a standard output transformer. If one is needed, could this be used?—FRANK ELLIOT, Kansas City, Mo,

(1)—Yes.

(2)—You will have to use a separate transformer with a 7.5 volt secondary winding. Be sure that B supply has sufficient voltage, e.g., 450, for this is the voltage necessary for the successful operation of this tube.

(3)—Yes.

(4)—Yes, you can use your output transformer. The words speaker filter on the diagram refer to such a device, although not shown diagrammatically. Just connect the primary circuit across the two posts, between the B plus and plate. The secondary terminals are brought to the speaker.

* * *

WHAT METALS beside aluminum which will allow the current go one way and not the other, can be used in a rectifier cell?

(2) Are there any other metals beside lead that can be used as the other element in the cell?—HARRIS GRADER, Bennet, Colo.

(1) Tungsten, bismuth, magnesium, etc.

(2) Yes, carbon or iron.

* * *

USING A 2¾ inch diameter tubing, please tell me how many turns of No. 26 double cotton covered wire must be put on secondary windings, for use with .00025 mfd., .00035mfd., .0005 mfd. and .001 mfd. variable condensers.—ALEXANDER OPENTERTEIN, Silvana, Wash.

For the .00025 mfd. condenser, 80 turns are necessary. For the .00035 mfd. fixed condenser, 70 turns are needed. For the .0005 mfd condenser, 45 turns are required, and for the .001 mfd. condenser, use 31 turns.

* * *

WHEN USING No. 22 double cotton covered wire, how many turns can you put on within one inch?

(2) Can a dry B battery be used with a B eliminator to boost up the voltage?—KENNETH STRATFORD, Loving, Tex.

(1) There are 28 turns to the inch.

(2) Yes.

* * *

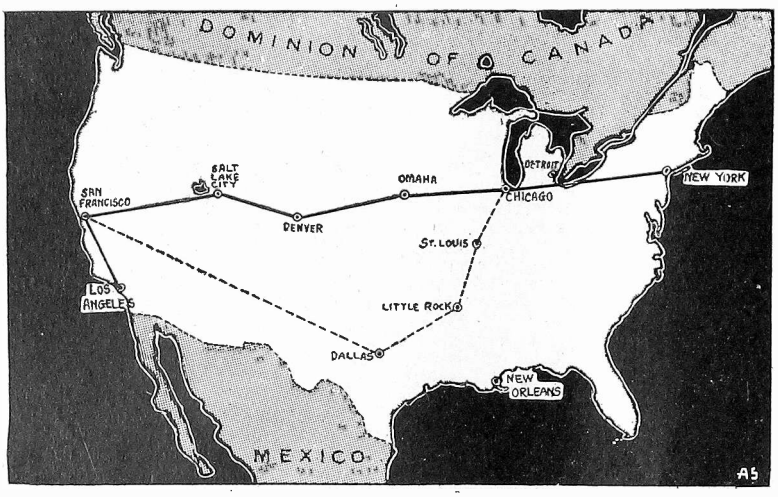
I USE a bakelite A battery charger. If it is used to charge the battery at the same time the set is going, I get an annoying buzz. Can you tell me what device I can employ, as a filter to destroy this noise? A friend of mine told me to use an Abox Filter. Would this work out all right?—SAM GELTERMAN, Rockdale, Wis.

Yes.

$1,000-a-Minute Prog from Nation-

Greatest Audience in "Victory Hour" from 47 Beverly Hills, Calif., New York, Fred and Dodge Bros. President at Orleans — A Complete

By Herman



THE TRANSCONTINENTAL TELEPHONE LINE THAT CARRIED WILL ROGERS' VOICE TO WEAF FOR BROADCASTING BY THAT STATION AND RETELEPHONING TO THE 46 OTHER STATIONS WAS ROUTED AS SHOWN BY THE HEAVY LINE. THE DASH LINE SHOWS THE EMERGENCY SOUTHERN ROUTE WHICH WOULD HAVE BEEN USED HAD BAD WEATHER PREVAILED ALONG THE SHORTER COURSE.

"I'M told I'm talking to 30,000,000 radio listeners—one of the greatest audiences ever reached by the human voice—more than one-quarter of the entire population of the United States."

So said E. G. Wilmer, president of Dodge Brothers, Incorporated, during the Victory Hour, recently presented by his company over a network of 47 stations.

Second in importance only to the magnitude of the audience was the electrical and mechanical feat of broadcasting the music and speech from points on a national quadrangle. But from the popular viewpoint the outstanding feature was the fame and talent of the performers.

Will Rogers, master of ceremonies, spoke from a chair in his home in Beverly Hills, a suburb of Los Angeles, Calif. Paul Whiteman and his orchestra played in a studio of WEAF in New York City. Mr. Wilmer addressed the audience from his home in Detroit. Fred Stone and his daughter, Dorothy, performed before a microphone in the dressing room of the Erlanger Theatre, Chicago, between acts of "Criss Cross," and Al Jolson sang and cracked jokes from his room in the Hotel Roosevelt, New Orleans.

The Long Routes

The program was sent out by WEAF. This required the transmission from the distant points by telephone, by so-called "land wires," and the retransmission by the same method to the 46 other stations. Some of these stations were relatively close to one point of origin. Yet a moneyed voice at a microphone traveled by land wire to New York and back again before being impressed on a radiated radio wave.

Take two instances among the several: Jolson sang in New Orleans, literally long-distance telephoning to WEAF, New York, and WEAF passed the song along by telephone wire to WSMB for broadcasting. WSMB is located in New Orleans, yet sent out a song rendered in New Orleans after it had traveled 4,000 miles by land wire. KFI, Los Angeles, sent out Rogers' talk after it had made a transcontinental round trip of more than 6,000 miles.

That the performers were great attractions is attested by the fact that a total of $25,000 was paid to Rogers, Jolson, the Stones and Whiteman. Besides, $35,000 was paid in telephone tolls and for mechanical work, while the station time—one hour—cost Dodge Brothers $7,600. Advertising the advance program in newspapers cost several thousands of dollars.

But prices do not tell the story. The nation cancelled its engagements to listen to the Victory Hour. This was the night of nights when there was no place like home.

An Outstanding Success

All told the hour was a magnificent success. It afforded the greatest listener interest in the history of radio—probably in the history of the world—and made every owner of a receiver doubly glad of being able to enjoy the constant advantages of reception generally, and this program in particular.

Not that the hour was without its drawbacks. Jolson showed bad taste in telling

Program Required Wire Line 30,000 Miles Long

At a cost of over one thousand dollars a minute, and using 30,000 miles of special wire-line facilities, the Victory Hour was conducted successfully. There were three transcontinental circuits totalling twenty thousand miles and a telegraphic communication circuit of ten thousand miles in length.

The program was the greatest mechanical achievement in radio telephony and the costliest radio program.

The engineers of the National Broadcasting Company, in conjunction with those of the Bell System, had been working on the plans for this intricate broadcast for several weeks. During the development of these plans many complications arose, particularly with respect to synchronizing the "switching centers" so widely separated. Very carefully timed program details formed the basis upon which the engineers scheduled their final arrangements.

The transcontinental line which carried Will Rogers' introductions was routed to San Francisco, through Salt Lake City, Denver, Omaha, Chicago and thence to New York. An emergency circuit was held in readiness routed from San Francisco to Dallas, Texas, to Little Rock, St. Louis, Chicago and New York. Had weather conditions been unfavorable along the northern route, the southern route would have been used for wire transmission.

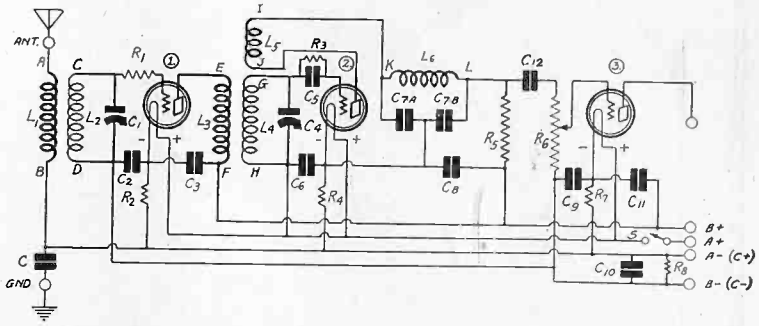
From each "pick-up" point a similar arrangement was planned. In all, a total of 20,000 miles of special telephonic circuits were used to put the program on the air on a nationwide scale. In addition to the special telephonic circuits, 10,000 miles of wire were used for the Morse telegraph circuit which enabled the engineers at the numerous radio station, "pick-up" points and telephone "repeater" stations to carry "switching" orders back and forth. Through this Morse wire communication service the engineers were also kept advised as to weather conditions along the routes of the various circuits.

The weather was excellent.

ram Reaches 30,000,000 wide "Studio"

World's History Hears Stations — Rogers, from introduces Whiteman at Dorothy Stone at Chicago, Detroit and Jolson at New Review of the Program

Bernard



THIS RADIO AMPLIFIER AND ONE STAGE OF AUDIO, FOLLOWED BY A TRANSFORMER COUPLED AUDIO STAGE BUILT INTO THE B SUPPLY, CONSTITUTES THE CIRCUIT USED BY THE AUTHOR IN RECEIVING THE VICTORY HOUR PROGRAM. HOW TO BUILD THIS PRE-POWER UNIT WILL BE DESCRIBED NEXT WEEK, ISSUE OF JANUARY 28.

two "jokes" that were not nice. One associated gin with a little girl and put a picture actress whom Jolson named in an awkward position for any mother—indeed any woman. The other referred in an equivocal way to a person lying in bed. Anybody who heard these "jokes" in the sanctity of his home and with his family around him must have felt a pang of regret that Jolson for once strayed from the path that has marked radio programs since the beginning.

Nothing Jolson said was utterly unfit for repetition, but he did misjudge his audience. It would be mere confounding of a regrettable incident to retell those two "jokes."

Sentimental Association

The selection of material for rendition also suffered somewhat when Whiteman's orchestra played excerpts from "Rhapsody in Blue," by George Gershwin, and when it played "Among My Souvenirs." Both of these have been overdone on the radio. It even so happened another musical organization had played excerpts from "Rhapsody in Blue" over WEAF just a little while before. Some excuse for lack of distinctiveness of choice existed, Mr. Whiteman evidently thought, in the fact that originally the "Blue" piece was written especially for his orchestra by Gershwin "four or five years ago." Mr. Whiteman, who personally announced the numbers, told the audience about the association between the composition and orchestra, so there was perhaps sentimental and association reason for this selection, but more freshness might have been developed by substituting for "Among My Souvenirs."

Both pieces are highly skillful in composition and engaging, too, only they have been hammered too hard of late to be entitled to place on a distinctive program.

Whiteman's orchestra played its string of pieces with fine skill and spirit. The choice of material was open to criticism. That is no reflection on the rendition. Whiteman is Whiteman, you know.

Technical Aspects

Technically there was some difficulty obtaining good quality. I listened in at my home in New York City. When Phillips Carlin announced the hour was about to begin it was easy to tell that transmission from Belmore, L. I., where the WEAF antenna is, of voice from the Fifth Avenue studio, was up to its usual level of about the best that there is.

Next Rogers was heard, and his voice was almost startingly clear, considering early expectations of fidelity losses due to land wire carriage. Stone and Dorothy suffered from frequency cutoff on both highs and lows, and the male chorus that sang with Dorothy didn't sound right, due probably to line faults. But Fred Stone alone and Dorothy alone, or in a duet, suffered less from the handicap imposed by the transmission because they were more nearly in the range of frequencies not subject to an extraordinary amount of distortion.

Kind of Installation Used

Jolson did not get an acoustical break at all. The entire frequency scale was subject to wave form and amplification distortion and severe cutoff at about 200 cycles and 2,500 cycles. That line work can be well done over long distances is indeed a fact, e. g., the way Rogers' voice came in; but that need of hasty routing through untried lanes plays havoc with quality was obvious. Quality was utterly missing from the electrical handling of the Jolson broadcast, and his voice sounded tinny.

The Victory Hour was in honor of a new Dodge, the Victory, then on the eve of exhibition to the public, and if the car is as successful as the hour it will earn never-to-be-forgotten gratitude.

By the way, my reception was on a four-tube set where the last tube was a 210 with 475 volts on the final plate. The reproducer was a Western Electric 540 AW. The combination has excellent frequency characteristics.

The technical shortcomings are a necessary part of progress and no doubt will show the way to better reproduction in future events of this spread-eagle nature. So good was the treatment of Rogers' voice, so superb the acoustical favors bestowed on Wilmer's voice, that correction of faults such as in the transmission from New Orleans, and to a less extent from Chicago, seems likely.

But one can scarcely avoid remarking that the Balkite Hour, a transmission from WJZ and a chain, of the Chicago Opera Company's stage performance weekly, although concerning a different network, is scarcely worth listening to, because the vocal art of the singers and

(*Continued on page* 21)

Rogers Is Criticized for Joke on Coolidge

Washington.

When Will Rogers, during the Victory Hour, merely made believe he was turning the microphone over to President Coolidge, he did not announce it was a joke, and that it was only his imitation of the President that the audience was to hear. Some letters and telephone calls, indeed even a few telegrams, protesting against the "misrepresentation" were received at the White House. But President Coolidge did not know of them Nor had he listened in during the hour.

Some listeners got the idea that it was truly the President himself who uttered the humorous speech, instead of Rogers, and they even seemed to get the impression that the President was speaking seriously. They deplored the lending of the prestige of a great office to the exploitation of a commercial product. Some quite frankly doubted the propriety of the imitation—but they did discover it was only an imitation.

Mr. Rogers has been President Coolidge's guest on a few occasions and the President has been known to smile at some of the comedian's remarks.

IN JOINT SONATA PROGRAMS

MATHILDE HARDING, PIANIST, AND ARCADIE BIRKENHOLZ, VIOLINIST, ARE HEARD OCCASIONALLY IN JOINT SONATA PROGRAMS OVER THE RED NETWORK.

Town Makes it a Crime To Create Interference

Des Moines, Iowa.

The City Council of Fairfield, Iowa, a college town of 5,000, has passed an ordinance prohibiting the use between noon and midnight of all electrical devices capable of causing interference with broadcast reception. The use of any "instrument, device or machine which shall cause electrical interference with radio reception" is prohibited during these hours. This includes certain battery chargers, washing machines, vacuum cleaners, motors, dynamos, thermostats, violet ray machines, sign flashers, and all other electrical devices which radiate spark interference in operation.

X-Rays Excepted

The only exception to the ordinance is the use of X-ray photographic instruments for examination "in emergency cases of physical injuries."

The ordinance is the result of continued and bitter complaints by radio fans that the use of household electrical instruments raised havoc with the reception of radio entertainment.

The ordinance has not yet been subjected to a test by any observed violations, but as the penalty for infraction is a fine of $100 or thirty days' imprisonment, it is thought that the first arrest will become a test case.

The Interference is Prohibited

It will be observed that the ordinance does not prohibit the use of all electrical devices which may cause interference but limits the prohibition to "any instrument, device or machine which shall cause interference."

Thus in reality only the interference is prohibited. There are many methods known whereby the disturbances caused by electrical instruments can be stopped, including by-pass condensers.

DX SPECIALIST

OWL'S NEST, WHERE PAUL GODLEY TUNES IN DX EACH SUNDAY FROM 12:30 A. M. TILL 2:00 A. M. THE LARGE RECEIVER IS THE RE BROADCASTING MACHINE; THI SMALL ONE ON THE TABLE AT THI RIGHT A SPARE EMERGENCY MA CHINE.

Godley Starts Series for DX Night Owl

An increased listener interest from th technical group of radio owners has bee reported regarding the DX weekly re broadcasting periods conducted by Pa Godley, radio enginer, at WAAM, New ark, N. J. These periods were tried fo the first time last season and attracte coast-to-coast attention.

Godley's purpose was to make distanc stations available for local radio-lover and to show them how to get the maxi mum distance results out of their ow sets. This year again, in response to man inquiries Godley announced a series c broadcasts every Sunday morning at a. m. to run up to February, or unt broadcasting conditions are atmospheri cally less favorable. Godley has fitted u a special set of apparatus at Cedar Grov N. J., where reception conditions ar good.

Power Companies Try New Wired Radio Stun

Electric light consumers in Ohio, Mi souri, Iowa, Illinois, Wisconsin, Califo nia and Kentucky, will be able within short time to snap a switch on a speci receiver attached to the light line and li ten in to any one of three radio pr grams, which will come from a New Yor studio, via short waves to the power st tion in each district. The North Amer can Power Company will operate th new system through its subsidiary, Wire Radio, Inc.

The system is based upon the majo part of the wired wireless inventions General George O. Squier. The speci receivers will be manufactured by th General Electric Company, which aide in its development.

WGY PICKS UP LONDON, SENDS DINNER PROGRAM

A dinner program originating at the London Music Hall and broadcast by 5SW, the powerful short wave station of the British Broadcasting Company at Chelmsford, England, was picked up and rebroadcast recently by WGY, Schenectady; WFBL, Syracuse; WHAM, Rochester, and WMAK, Buffalo, with great success.

The signals in the local sections as well as in many distant points came in with good volume. Very little fading was noticed. The American stations used broadcast waves.

CHILDREN'S HOUR THROUGH WJZ SPREADS DELIGHT

(Harold Stein)
SONG AND STORY COME FROM THESE YOUNG LIPS AND HANDS FROM WJZ EACH SUNDAY MORNING. THE PERFORMERS HAVE A LOT OF FUN. IT'S GREAT ENJOYMENT FOR THE ADULTS, TOO, INCLUDING MILTON J. CROSS, THE ANNOUNCER. HE WORKS DURING THIS HOUR WITH A HEART AS LIGHT AS ANY CHILD'S.

Heiser Was the Contact for Putnam Exploration

Charles T. Heiser made it possible for the outside world to learn of the progress of the Putnam-Baffin Island Expedition while its members were in wild, hitherto unexplored, Fox Basin.

Mr. Heiser, 8DME, member of The American Radio Relay League, during the five months ending in October was contact at his home in Auburn, New York, for Edward Manley radio operator aboard the Schooner Morrissey, which conveyed the Putnam party to the Arctic Circle. Operating under the code call VOQ, Manley sent messages and press dispatches through Heiser to the New York Times and to friends of the expedition.

His equipment for this important work, consisted of the following: Crystal control transmitter working on 38.45 meters. 5 watt oscillator, two 7½ watt frequency doubling and amplifying stages and one neutralized 50 watt power amplifier. 350 volts on the plate of the oscillator. 67½ volts negative grid bias. 600 volts on plates of frequency doublers, 225 volts grid bias, 1750 volts on plate of 203A (50 watts) and 180 volts negative grid bias. Eveready heavy duty "B" batteries for grid biasing supply were used all through work with VOQ, during June, July, August, September and part of October.

To. Mr. Heiser's cooperation, Manley ascribed the excellent results he had in maintaining communications with this country. Mr. Heiser is a noted amateur, and has been interested in both broadcasting and relay work for The American Radio Relay League and for the Army Amateur Stations.

CANARIES ARE ENJOYED

Several large orchestras broadcast with canaries singing with them

Communication Board Provided in New Bill

Washington.

The organization of a Commission of Communication, consisting of five members and exercising the powers and duties vested in the Radio Commission, as well as those vested in the Interstate Commerce Commission, to provide for the regulation of all interstate transmission of intelligence by wire or radio, was proposed in a bill by Senator Couzens of Michigan to the Senate.

Naylor Sales Manager of Arcturus Company

L. P. Naylor is the latest addition to the corps of radio pioneers, headed by George Lewis, added to the executive staff of the Arcturus Radio Company, AC tube manufacturers of Newark, New Jersey.

Mr. Naylor, sales manager of the organization, is a graduate E.E. (Columbia University) and made his radio debut in the rather distant days when crystals were used as detectors instead of oscillators.

Phantom Stations Stir Interference Protest

Washington.

The Radio Commission is constantly given new problems to solve. The latest is that of phantom stations. The commissioners are not only expected to allocate the frequencies to minimize interference between real stations but also to eliminate interference between a real station and an imaginary station.

At present the Commission is studying a report from F. J. Marco, a Chicago radio engineer, that considerable interference is being caused by phantom stations. Mr. Marco reports:

"It may interest you to know that the Radio Engineers Club of Chicago has spent considerable time in its recent meetings, discussing so-called 'phantom stations,' 'riding through' and 'combination heterodyning.'

"We are bothered a great deal with all of these troubles in the Chicago territory and believe that they have not been sufficiently considered in apportioning local frequency and power assignments, although, of course, the commission's work is recognized as being by no means simple.

"It is generally understood that the phantoms are caused by two local frequencies combining, due to unavoidable rectification in the first tube of the usual receiver, giving a third combination frequency on which chanel both locals can be heard simultaneously.

"Thus KYW on 570 kilocycles and WMAQ on 670 kilocycles may combine to form a third frequency of 1,240 kilocycles, which can be heard in some receivers at some locations.

"Riding through apparently occurs when one powerful local can be heard on top of another local's modulation or even on a distant station.

"Understand, this is not the apparent broadness of the local station, as the local may tune quite sharply, completely disappearing off his frequency, and then recurring as the new frequency is tuned in. This is probably due to modulation that takes place in the first tube."

$8,000,000 FIRST YEAR COST OF NBC PROGRAMS

Melvin H. Aylesworth, president of the National Broadcasting Company, recently said that during its first year more than $8,500,000 was spent on programs sent over N. B. C. networks. He said:

"Our first year of operation has been a year of preparation and of self-education. It has been a year of learning and of building.

"Through the company's Red, Blue and Pacific Coast networks, covering practically the entire United States, approximately $6,000,000 was spent in 1927 in presenting radio programs.

$2,000,000 for Talent

"In addition to this amount, over $2,000,000 was spent for talent alone on sponsored programs presented by some fifty American industries who are clients of the company. The company itself spent over $500,000 for talent utilized in sustaining programs presented by itself.

"Wire service tolls alone, for special circuits to hook up the stations associated with our networks, were in excess of $1,350,000.

"We were the largest user of the American Telephone and Telegraph Company's telephone wire service. Our permanent specially constructed wire line facilities utilize 10,270 miles of wire and on numerous occasions during the past year, when broadcasting over a nation-wide hookup, we have used more than 20,000 miles of wire."

50 Stations Grouped

Fifty stations, Mr. Aylesworth points out, are now regularly associated with the three networks. Of these, however, only one—WEAF, in New York—is owned by his company. Two others—WJZ, in New York, and WRC, in Washington—owned by the Radio Corporation of America, are managed and operated by the National Broadcasting Company.

WGY SHORT WAVE SCHEDULE

WGY, Schenectady, which broadcasts on 790 kc. (379.5 meters) also sends out the programs on short waves as follows: on Monday, Tuesday, Thursday and Saturday nights, on 32.77 meters, over 2XAF; on Wednesday, Friday and Sunday nights on 21.96 meters, over 2XAD.

LOW NOTE SUPPRESSION

When the output of your loudspeaker sounds thin and tiny it is because the low notes are not present in full force. Only the higher notes are reproduced.

Movie Interest Acquired By R.C.A. for New Outlet

FBO Pictures Corporation announced that the Radio Corporation of America has acquired a substantial interest in that company, through which methods for the reproduction of sound and synchronization of sound and movies—methods controlled by the Radio Corporation and affiliated companies—will be made available to the motion picture corporation. The announcement was made soon after negotiations had been concluded by Joseph P. Kennedy, a Boston banker, president of the FBO Pictures Corporation, and David Sarnoff, vice-president and general manager of the Radio Corporation.

The devices and developments of the Radio Corporation and affiliated companies will not be exclusive to the FBO Pictures Corporation but will be available to the entire motion picture industry.

Opens Radio to Movies

A statement accompanying the announcement declared:

"This affiliation opens to motion pictures for the first time the tremendous resources and potentialities of radio. It will give the movies the use of all present patents and prospective developments of sound reproduction and synchronization, radio broadcasting, television, etc., of the Radio Corporation of America, the General Electric Company and the Westinghouse Electric and Manufacturing Company.

"A complete revolution of present-day entertainment may easily develep as the result of the close affiliation between the important leaders of motion pictures and the powerful engineering organization of the radio group. The services of the technical staffs of the three greatest electrical companies in the world thus become available to the motion picture industry to help that industry in its constant endeavor to give the public a new and better entertainment.

New Sound Producer

"The first important development of the combination will be the presentation of a new method of sound reproduction and synchronization perfected by General Electric. The officials of the Radio Corporation of America feel that the method and apparatus excel all previous efforts in the direction of 'talking movies.'

"The Radio Corporation and its associated companies have been experimenting with and developing a method of sound reproduction for use in connection with motion pictures for several years, and as it reached perfection decided upon a direct affiliation with an established motion picture company as the practical way of putting it into general use."

According to the announcement, two representatives of the Radio Corporation and the General Electric Company will become directors of the FBO Pictures Corporation and its affiliated companies within a short while.

Trick "Studio" Provides Plenty of Fun in Home

By H. G. Cisin

Each season seems to bring some new accessory or device to add to the entertainment or pleasure of the radio set owner. An interesting little device has made its appearance this year, which shows promise of developing into a full-fledged radio fad. This is known as a Homekaster. The Homekaster plugs into a radio set, like an ordinary vacuum tube. It can be used with any receiver which utilizes tubes.

There is an extension cord attached to it, which may be strung to another room. At the other end of the cord is a small microphonic device or transmitter. Anyone can talk into the transmitter from the other room and the sounds will be greatly amplified, coming out of the loudspeaker, just as if the speaker were in the broadcasting studio. It is possible to change readily from Homekaster to ordinary broadcasting.

Hundreds of interesting, entertaining and mystifying stunts are possible with the Homekaster. Take your friend the DX hound, who is always bragging about vast distances which his radio can receive. Set him before your radio and show him how easy it is to get 2LO, London. This ought to keep him quiet for a while.

A Homekast party is enjoyable. The hostess invites talented friends to "Homekast," locating the "studio" in a room upstairs. The other guests are informed that the broadcasting is from one of the local stations. Immediately after the completion of the performance, the entertainers surprise everyone by walking in as their praises are being sung. Of course, it is just possible that a performer may arrive from the "studio" in time to hear comments not so complimentary. At any rate, this hoax furnishes plenty of amusement for the guests, say persons who tried out the Homekaster.

Political Problems Put On Air By Noted Experts

The "Voters' Service," a school in citizenship conducted by radio by the League of Women Voters, broadcast the first program recently from Washington and New York over the station WEAF and nine associated stations. The principal speakers on the first program were Representative Theodore E. Burton, of Ohio, who spoke in Washington, and Dean Virginia Gildersleeve, of Barnard College, New York.

Mr. Burton made a plea for stricter law enforcement and less sympathy for condemned criminals. Dean Gildersleeve spoke on "America First." Merlin H. Aylesworth, president of the National Broadcasting Company, and Miss Belle Sherwin, president of the League of Women Voters, addressed the radio audience. The Paulist Choir sang several numbers.

The object of the "Voters' Service," as outlined by Miss Sherwin, is to give the voters an impartial review of current political problems. With this aim in view, addresses will be broadcast by eminent men and women every Tuesday evening from 7 to 7:30 P. M. until election.

NO CHANGE BEFORE FEB. 1

Washington.

The broadcasting stations' waves, power, hours on the air, etc., as now constituted, will not be changed until February 1, the Federal Radio Commission decided.

DR. GOLDSMITH ELECTED HEAD OF INSTITUTE

Dr. Alfred N. Goldsmith, Chief Broadcast Engineer of the Radio Corporation of America, was installed as President of the Institute of Radio Engineers at its first executive session of the third annual convention in the auditorium of the Engineering Societies Building, New York City. L. E. Whittemore, of the Department of Development and Research of the American Telephone and Telegraph Company, was elected Vice-President.

New managers elected by the institute were: Dr. J. H. Dellinger, Chief of the Radio Section of the Bureau of Standards, Washington, and R. H. Manson, Chief Engineer of the Stromberg-Carlson Telephone Manufacturing Company of Rochester, N. Y.

Hogan Honored

J. V. L. Hogan, consulting radio engineer of New York, was appointed by the directors to fill the place of the late Col. John F. Dillon, Federal Radio Commissioner. Other managers appointed by the directors were Louis A. Hazeltine, Alfred H. Grebe, Dr. W. G. Cady, and Arthur Batcheller.

Dr. A. Hoyt Taylor, of the Radio Division of the United States Naval Research Laboratory, Bellevue, Anacostia, D. C., won the Morris Liebmann Memorial Prize for 1927 for his investigation of radio transmission on short wave lengths.

Gets $500 Cash

The award carries a medal and $500 in cash.

The presentation of the award was made by Dr. Ralph Bown, of the American Telephone and Telegraph Company, retiring President of the institute.

Dr. Taylor was graduated from Northwestern University in 1899 with the degree of Batchelor of Science. Then he taught physics in Michigan State College, Lansing, and in 1909 he obtained his doctor's degree from the University of Gottingen, Germany.

He became transatlantic communication officer of the Navy in 1917 and was assigned to the radio station at Belmar, N. J.

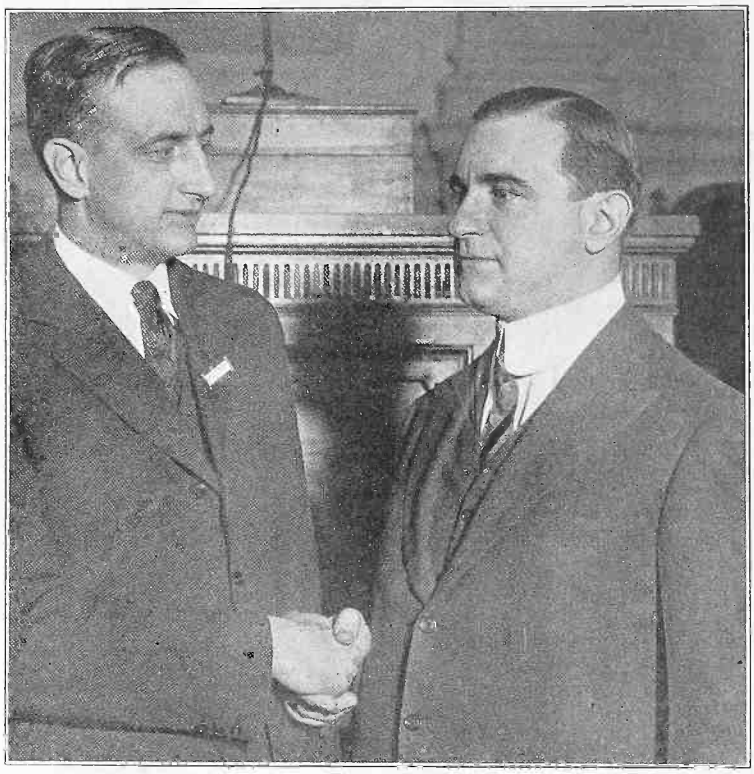
HARMONIC INTERFERENCE

There is still interference between broadcasting stations, although the Federal Radio Commission has accomplished a great deal to reduce it. There remains one type of interference which apparently could be eliminated without much trouble, and that is the interference between two stations one of which operates on the second harmonic of the other.

SPEECH NEEDS HIGH FREQUENCIES

When the output of your loudspeaker sounds well on music but is not easily understood on the spoken voice it is very likely due to the absence of the higher audible notes. Frequencies as high as 5,000 should be strongly reproduced if speech is to be clearly understood. Not many receivers are able to reproduce much over 5,000, particularly very selective receivers.

"SHAKE!" SAID BOWN; GOLDSMITH DID



(Herbert Photos)

DR. RALPH BOWN, RETIRING PRESIDENT OF THE INSTITUTE OF RADIO ENGINEERS, WELCOMING HIS SUCCESSOR TO THAT HIGH OFFICE—DR. ALFRED N. GOLDSMITH (AT RIGHT).

de Gogorza Will Teach Kent Audition Winners

Banking their $10,000 cash prizes and packing away their laurel wreaths and congratulatory telegrams, Miss Agnes Davis and Wilbur Evans, the Denver soprano and Philadelphia baritone who won first place in the Atwater Kent Foundation's National Radio Audition, have started to collect the second part of the Audition reward—two years' musical conservatory scholarship, which is intended to make them even greater singers.

Both of these young soloists, who outclassed 50,000 other vocalists in the audition, have been accepted as personal pupils of Emilio de Gogorza, the world-renowned baritone, formerly of the Metropolitan Opera in New York and now a celebrated concert artist.

To musicians, that announcement spells a triumph for Agnes Davis and Evans—for de Gogorza takes less than half a dozen pupils, and those who, after severest tests, convince him that they can be developed into singers of the finest operatic quality. No amount of money or "pull" could obtain the services of de Gogorza for a pupil he felt was unworthy of his time.

For two years de Gogorza will personally tutor Miss Davis and Wilbur Evans, at the Curtis Institute of Music in Philadelphia.

Evans has been studying under de Gogorza at the Curtis Institute for three years, pluckily acquiring funds for these valued lessons by various tasks such as teaching swimming to children, chauffeuring and clerking. Now, as the Atwater Kent Foundation's protege, he can concentrate his efforts on making his winning voice even finer. Next Summer, expending part of the Foundation's cash award, he will accompany de Gogorza to Paris, for advanced study there.

Miss Davis also is planning to study abroad next Summer.

Winners of second and third places in the National Radio Audition, who also received scholarships of one year each, are preparing to start this study. Ted A. Roy, "the singing blacksmith" of Corvallis, Ore., who placed second, has arranged to complete his studies at Oregon State College, graduating in 1929, before taking up the musical scholarship.

Miss Emilia Da Prato of South San Francisco, Cal., who placed second in the ladies' division, and Marie Bronarzyk of Chicago and Ben P. De Loache, Jr., Asheville, N. C., third place winners, are expected to decide soon where they will study.

BILLS PROVIDE FOR EXTENDING LIFE OF BOARD

Washington.

Extension of the administrative life of the Federal Radio Commission for one year is proposed in a bill which Senator Watson (Rep.), of Indiana, introduced.

A similar bill was introduced in the House. It was indicated that early action by Congress would be sought, as the Commission's original jurisdiction over radio expires in March, 1928.

Under the Radio Law of 1927, the present Commission adverts to quasi-judicial functions, handling appeals from the Radio Division of the Department of Commerce, which assumes the control and regulation of radio in the United States.

The full text of Watson's bill follows:

"Be it enacted by the Senate and House of Representatives in Congress assembled, That all the powers and authority vested in the Federal Radio Commission by the Radio Act of 1927, approved February 23, 1927, shall continue to be vested in and exercised by the Commission until March 16, 1929; and wherever any reference is made in such act to the period of one year after the first meeting of the Commission, such reference shall be held to mean the period of two years after the first meeting of the Commission.

"2. The period during which the members of the Commission shall receive compensation at the rate of $10,000 per annum is hereby extended until March 16, 1929."

* * *

Hoover Approves Extension

Washington.

Secretary of Commerce, Hoover, expressed approval of the proposals in Congress to prolong the Federal Radio Commission's authority over radio until March 10, 1929.

BOARD PLANS ENDING CONCURRENT USE OF WAVE BY TWO STATIONS

Washington.

Itself not satisfied that even great geographical separation does not prevent interference between two stations operating at the same time on the same frequency, the Federal Radio Commission is planning to afford 5 kilocycle separation to replace identical assignments to distant stations.

AN INTERFERENCE FACTORY

The fellow who lives on the other side of the wall, who has strung his antenna parallel to yours, and who operates a single circuit regenerative receiver, can create all the interference tabulated in the office of the Radio Commission and a good many brands of his own.

Commission's Policies Criticized by White

Finds Licenses Too Freely Granted, Number of Stations Still Same and Court Decision on Powers Averted—Chain Advertising and Monopoly Up For Discussion

Washington.

The Federal Radio Commission's work fell short of Congressional expectations, said Representative Wallace H. White, Jr. (Rep., Lewiston, Maine), chairman of the Committee on Merchant Marine and Fisheries, but he introduced a bill in the House to continue the Commission for another year so that the Commission would have a good opportunity to make up for lost ground. He proposed amendments to the law other than mere continuation.

He recognized the handicaps the Commission had to suffer and directed his criticism toward policies of the Commission. He said in part:

"It has seemed to me that the Commission has completely failed to measure up to expectations in some particulars.

"It did not require applicants to make an affirmative showing that the operation of their stations would serve the public interest but it automatically issued licenses under the new law to all applying therefor.

"This may not be strictly accurate but it is sufficiently so for the present statement.

Sentence 218 Words Long

"The result is that today there are substantially the same number of broadcasting stations as when the Commission began its activities; there is the same utterly inexcusable concentration of stations in certain congested areas; there is the same absence of stations in many parts of the United States; and it seems to me that the fact itself of the issuance of a license under the new law makes it much more difficult now either to reduce the number of stations or to force a relocation of them in less congested areas throughout the United States; and it seems to me that the fact itself of the issuance of a license under the new law makes it much more difficult now either to reduce the number of stations or to force a relocation of them in less congested areas throughout the United States (for the station which the Commission might now seek to eliminate is in operation with the express approval of the Commission, and is fortified in its claim for continued existence and operation, by the finding, express or implied, of the Commission that it is serving a public interest or convenience, otherwise it would not be licensed at all), and all of which threatens increased confusion in transmission, if the areas now without stations are to have their local needs met by additional stations within such areas."

Following this sentence, containing 218 words, Representative White said the Commission should not have issued licenses promiscuously and should not have averted a legal determination of the right to order stations to discontinue.

Opens Way to Discuss Claims

On the subject of claim broadcasting and monopoly he said:

"Another amendment which I am offering enlarges the authority of the Commission with respect to chain broadcasting. It gives the Commission the power to fix the time during which chain broadcasting may be carried on, to designate the stations which may be in a general or in a particular hookup, to limit the number of stations which may take part in one of these chain broadcasting programs and it authorizes the Commission to impose special conditions with respect to the wave length and power to be used.

"It also gives the Commission authority to prohibit commercial advertising through a chain of stations.

"I am introducing this provision to provoke discussion of this general subject in the hope that from such discussion there may come a clarification of views, rather than because I am affirmatively for the provision as I have drafted it. I am in a doubtful frame of mind as to what can be done or as to what should be done, if anything. I hope this proposed amendment will be productive of discussion from which Congress can reach some settled and sound opinion on this phase of radio communication.

Wants Monopoly Question Studied

"Another amendment is aimed directly at the alleged monopoly in radio patents. I am not yet certain that in the Committee I shall approve this provision. I have included it in this bill for much the same reason that I have incorporated the provision with respect to chain broadcasting.

"This question of radio patents is continually discussed. There is a widespread feeling of dissatisfaction with the existing situation. I hope that the question can be opened up before our Committee."

Work of Commission Splendid, Says Sarnoff

By DAVID SARNOFF
Vice-President and General Manager Radio Corporation of America

The work of the Federal Radio Commission has been splendid. The Commission has brought order out of impending chaos in the air. It is effectively policing the channels of space and is giving the radio listening public of the country the deserved opportunity for unimpeded reception of the musical, educational and informational features which radio brings to the home.

SALTZMAN TO RETIRE

Major General Charles McK. Saltzman, chief of the Army Signal Corps, and director of Army radio activities, is soon to retire, after 30 years of service.

Home Models Duplicate Horse Race at the Track

London.

Another use for radio was discovered when Dr. J. H. Roberts, electrician, devised a home race course with wooden model horses, which run the course as do the thoroughbreds at the track. Radio impulses from the operator at the field determine the speed and position of the models, based on the actual track performance.

"Telemotion" is Dr. Roberts' name for it, and he sees possibilities for it in all branches of sport.

His invention aroused much interest

WAVE MAZE STILL HERE, SAY MANY

Readers have written to RADIO WORLD on the subject of wavelength assignments, hours on the air, power, etc., and while nearly all admit improvement, many complain there is still far too much interference. Heterodyne whistles, wave wobbling and assignment of two stations to broadcast on the same wave at the same time stirred protests.

Panels for All Circuits

Upon their removal to their new quarters at 165 Greenwich Street, Cortlandt Panel Engraving Company have inaugurated the policy of carrying in stock drilled and engraved panels for all popular circuits. This means a great saving in time to fans, dealers, manufacturers and mail order houses in need of such panels at once. Among the panels are Magnaformer 9-8, Silver-Marshall circuits, World's Record Super 8, 9, 10, Camfield 7, 9 and 10, Tyrman 10 and 7, Nine-In-Line, Karas Equamatic models, Victoreen, Melo-Heald Eleven and Fourteen, Browning-Drake, Lynch Five, Hammarlund Hi-Q, the Everyman 4 and the old popular favorite, Diamond of the Air. Under the direction of J. Sprung this concern is far in the lead. The concern is one of the oldest in the business.—J. H. C.

A TICKLER EXPERIMENT

Any regenerative receiver can be tuned so that the low notes predominate strongly and thus make speech as reproduced by the receiver poorly understood. It can be tuned also to bring out the high with equal force to the low. It is only necessary to reverse the tickler.

Kickers Have Their Say on Commission's Work

WASHINGTON.

Senator Watson, chairman of the Committee on Interstate Commerce, presided over a hearing of his Committee on the confirmation of President Coolidge's appointments of three members of the Federal Radio Commission—O. H. Caldwell, of New York; Sam Pickard, of Kansas, and H. A. Lafount, of Utah.

Independent broadcasters entered complaint against alleged arbitrary rulings and assignments on the part of the Radio Commission which, they claimed, were favorable toward chain stations than toward those not affiliated with the national networks.

Commissioners Pickard and Caldwell testified in their own behalf as to their qualifications for office. Commissioner Lafount has not yet returned from the inspection tour of his far western radio zone.

The Senate Committee's inquiry, however, was directed largely to the policies pursued by the Commission in its assignments of wavelengths, power and hours of broadcasting to the 685 stations in the United States. The patent situation in the radio industry was also mentioned, as was the short wave situation.

Commissioner Pickard, a Democratic appointee, testified that he claimed that party affiliation and that his residence was Kansas, in response to the question raised as to his qualifications to represent the fourth radio zone of Middle Western States. Senator Dill (Dem.), of the State of Washington, quoted the radio law and the statutes to elucidate Commissioner Pickard's status under the "actual residence" requirement of the radio law, when Mr. Pickard stated that he had come to Washington, D. C., from Manhattan, Kans., to organize the Radio Division of the Department of Agriculture and later had become secretary of the Federal Radio Commission.

Although Congress had intended the radio appointees be actual residents, Mr. Dill said he was satisfied that under the law Mr. Pickard fulfilled legal requirements.

Intends No "Freezing"

Commissioner Pickard, responding to questioning by Senator Fess (Rep.), of Ohio, asserted that since he took office last November 1, succeeding former Commissioner H. A. Bellows, resigned, he has been viewing the broadcast problem solely from the viewpoint of the listener, particularly the rural and remote listener.

He said that the Radio Commission has no intention of "freezing" the present broadcasting situation by assigning long-term licenses either to the chain or to any other stations before its administrative life lapses about March 15, 1928, under the radio act.

He said he had not given consideration to the short wave problem, which was in the hands of the late chairman of the Commission, Admiral W. H. G. Bullard, and is now being handled by Commissioner Caldwell.

Senator Dill produced a letter which charged that 47 short waves had been granted the Radio Corporation of America and 39 to land communication companies, but he also quoted the secretary of the Radio Commission, Carl H. Butman, to show that of 56 short wave licenses that have been granted 15 were assigned the R. C. A. and four to the American Telephone and Telegraph Co.

5,000 Short Waves Available

Mr. Pickard said that recent estimates have shown that at least 5,000 waves are available in the short wave band, where long distance code communication, television and facsimilie transmission, can best be carried out, but that the Commission has not issued any licenses since November 1, as far as he was aware.

Commissioner Pickard's appointment and that of Commissioner Caldwell were opposed by D. W. May, operator of WTRL, of Midland Park, N. J., operated by the Technical Radio Laboratory, who asserted that both of these men have ruled or have shown arbitrary attitude in favor of a "monopoly of the air," which he said was represented by the chain of the National Broadcasting Company. He asserted that the small broadcasters have been unable to carry their troubles to the courts because of the expense entailed in instituting suits in the District of Columbia courts.

Opposition by May and Baker

Judge E. O. Sykes, acting chairman of the Federal Radio Commission, upon request of the Committee, asserted that though several suits have been fied against the Commission those alleging unconstitutionality of the radio law or of the Commission's rulings under the law have been dropped, while several are pending which relate only to appeals from findings of fact.

Mr. May offered as a possible solution of the congested broadcasting situation an assignment plan by Paul Ware, consulting radio engineer, director of the laboratory of Splitdorf Radio Corporation, Newark, N. J., and he urged the synchronization of all chain programs on the same or on only a few wavelengths.

Further testimony in opposition to the policies was presented by Norman T. Baker.

Ormiston's Magnaformer Ahead With CeCo Tubes

Such great distance reception was obtained by K. G. Ormiston on his Magnaformer 9-8 that many readers of the Magnaformer article by J. E. Anderson in our December 10 issue asked that the exact tubes he used be cited. So a letter was written to Mr. Ormiston in care of "Radio Doings," Los Angeles, of which he is Technical Editor. His reply follows:

Editor RADIO WORLD:

Early in September, before the Summer static had really abated, I was able to bring in two Japanese stations (JOAK and JOCK) and two Australians (2BL and 5CL) at Manhattan Beach, California, using the standard Magnaformer 9-8, operating on eight tubes. Tubes used were CeCo throughout; "H" type as first and second detectors, "K" type in the intermediate frequency stages, an "A" in the first audio and "J-71" in the output stage. I used only the loop for pick-up and these stations were brought in on the loudspeaker, a large Newcombe-Hawley aircolumn. This performance has been repeated very often since that date, and at many locations.

At Lake Arrowhead one night we logged 60 stations outside California,—including WGY, WABC, KDKA, eight in Chicago, eight in Canada, etc.

We presented the Magnaformer 9-8 with a three terminal loop and small midget condenser controlling regeneration of the first detector.

K. G. ORMISTON,
Technical Editor "Radio Doings."

A THOUGHT FOR THE WEEK

WHERE'S that man we've been expecting to hear from? We mean the chap who some day will tell a palpitant world that if all the wire used in wireless in one year were placed end to end it would reach from the R. C. A. offices in New York City around the world four thousand, six hundred and seventy-seven times and that there still would be enough over to cover the distance between the finite and the infinite.

SIXTH YEAR

RADIO WORLD

Trade Reg. U. S. Pat. Off.

The First and Only National Radio Weekly

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

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MARCONI FACED RIDICULE

When Marconi went to England with his wireless invention many persons scoffed at him and he was the subject of many newspaper jokes. Bankers advised their clients to avoid the stock of the Marconi company, even after wireless had been demonstrated to be practical.

"ELECTRIC" AND "ELECTRIFIED"

All receivers are electric sets. But popularly a set is only electric when all the tubes in the receiver are heated with raw alternating current and no batteries are used for any purpose. If the set is so arranged that standard DC tubes are used with trickle charger it is called electrified.

What Shall Be Done About Stations?

Must Get Rid of Excess, Says Head of Iowa League—Complains Direct Selling Talks "Make American Radio the Laughing Stock of Other Countries"—Comment by Readers.

Francis St. Austell, president of the Iowa Radio Listeners' League, Des Moines, broadcasting from WEAF, said:

"The only claim that the broadcaster has to the use of the air must be based on service to the listening public. But up to the present the public has been having things done to it instead of doing things for its own benefit.

"Listeners, broadcasters and authorities may just as well realize now that there are too many stations on the air and that some must go. The listening public had better get busy and tell the authorities which stations it is desirable to retain.

"It is of public interest that the people hear the best that radio has to offer. It is a real necessity that this should be provided if the radio industry is to live. But it is not of public interest, necessity or convenience that mediocre performances coming from stations so anxious to serve their own interests that they become a nuisance to the general public, remain on the air.

"Laughing Stock"

"Stations that devote their efforts largely to direct selling—pouring out voiciferous calls for orders for prunes, pickles, toothpaste, peaches or potatoes—make American radio the laughing stock of other countries.

"What the listener wants is radio and good radio—all the year round, regardless of weather conditions. Such a service can only be given by a chain of powerful stations extending completely across the country.

"The listener wants radio delivered to his loudspeaker in a dignified, pleasing way, with good announcing and correct speech. He wants the best and he is entitled to it. He gets that from those stations that not only employ good local talent but which also provide their audiences with the wonderful programs originating in New York and sent out over the chains of the National Broadcasting Company.

Question of Investment

"Broadcasters clamor about their investment. Their investment amounts to very little when compared to that of the listening public. And often it is the broadcaster who delivers the least in real service who shouts loudest about his rights to be on the air.

"Listeners are coming to realize that the greatest programs originate in the large centers, particularly New York, because the talent is there and can be produced in one studio. The sponsors of these programs could not afford this talent even if it was available, if he had to send it by train to each station.

"It is quite certain that the listeners throughout the country are going to demand a clear right-of-way for national programs. By national programs I mean programs sent from our real national centers, such as New York or Chicago, and delivered to our speakers through the local stations affiliated with one or more of the great hookups.

Difference In Tastes

"Of course tastes in radio differ. The city man apparently wants entertainment first and education and information in small doses later. The farmer wants information, religious services, markets, weather and crop reports and agricultural information first and then is ready to be entertained.

"But both farmer and city man agree on one point. Both want to hear clear radio, without the interference and heterodyning that so often takes possession of the air today."

* * *

EDITOR RADIO WORLD:

I do not blame the Federal Radio Commission, but the promised clearing of the broadcasting channels has not helped a great deal. Much squealing and heterodyning can be heard every evening, particularly when an attempt is made to reach out 1,000 or 2,000 miles for a program. It is evidently short wave stations which cause interference with the stations operating on the longer waves. And this coupled with the fact that nobody is interested in the small stations for their own service to the public, seems to afford a simple solution to the whole intolerable situation, and it is a radical reduction in the number of stations permitted to operate.

If there is any objection from the owners of stations threatened with extinction, let the public aid the commission in deciding the issue. Public service, convenience and necessity according to the law are to determine which are to remain and which must go. Certainly the stations to which nobody listens willingly are no public convenience, and the fans would not hesitate to state that in a vote on the subject if given a chance to vote. And nobody can claim that it is a necessity to have three or four hundred stations all over the country when 99% of the entire body of listeners confine their attention to about a score of the best stations.

JOSEPH P. SULLIVAN.

EDITOR RADIO WORLD:

I have been a rabid radio fan for several years but the present state of broadcasting makes it almost impossible for me to retain full interest in the subject. Not only is it impossible to get any of the distant stations clear without heterodyne interference but often the programs from local stations are spoiled by whistles and growls which do not originate in oscillating receivers. No, they are due to the many superfluous stations which are continually on the air with their selfish interests in the guise of entertainment.

If these stations offered something worthy of a radio listener's attention now and then it would not be so bad, but they never do. They put on singers who never will be able to sing; they put on players who do not know the difference between a cello and a saxophone; they put on educational features by persons who themselves do not know what they are talking about. Some of them put on phonograph and player piano music and convert good reproduction into burlesque transmission.

The only solution to this intolerable situation is to force half of the present stations off the air. They do not serve the public as the law requires them to do and therefore they have no claim whatsoever to a place in the ether.

Speed up the day when all this interference is eliminated.

FRANCIS R. ABERCROMBIE.

Tube Patent Decision Boon to Independents

Grant to Langmuir on High Vacuum Set Aside by Lowest Federal Court as G. E. Loses Suit Against DeForest—Two Other Patents Voided, One Sustained

Wilmington, Del.

Federal Judge Hugh N. Morris has handed down an opinion dismissing the suit of the General Electric Company against the De Forest Radio Company in which it was sought to restrain the De Forest Company from making and using radio apparatus, claiming infringement of four basic radio patents. The General Electric Company will take an appeal, it is expected.

The General Electric Company charged that the De Forest Company was infringing on patents, granted to Irving Langmuir and assigned by him to the General Electric Company, for electrical discharge apparatus and the process of manufacture and the use of tubes employed in radio broadcasting and reception. The tubes are known in the electrical field as "high vacuum tubes."

The court held that the first and main patent of the four is invalid in view of prior art and because it lacked patentable novelty as well as for other reasons. The court upheld only one patent, which covers the use of potassium in radio tubes.

* * *

Arthur D. Lord, receiver for the DeForest Radio Company, reviewed the decision given by Judge Morris as follows:

Judge Morris decided the suit of the General Electric Company against the DeForest Radio Company brought for infringement of the Langmuir high vacuum patents.

The principal patent of this group, which it has been asserted by the Radio Corporation, the General Electric Company, and their associated companies, to completely blanket the vacuum tube art, specifically including radio tubes, had all its claims declared invalid for a number of reasons. This patent—No. 1,558,436—was granted on October 20th, 1925. Irving Langmuir, research engineer of the General Electric Company, was the patentee.

If the patent had been sustained it would have run for seventeen years from the date of its issuance and hence would not have expired until October 20th, 1942. The patent was asserted to cover any vacuum tube which had a high enough vacuum in it to permit a plate voltage of 40 volts to be employed without appreciable ionization effects. This in effect covered every vacuum tube used today.

Lists Three Reasons

The court held the patent to be invalid for each of the following reasons:

(1) Because Langmuir was not the first inventor of the subject matter, in other words other and prior investigators had done the same thing. As stated by the opinion:

"But disclosures of the prior art reveal that Langmuir, great and renowned physicist that he is justly stated to be, in this instance, travelling all unknown to him, over a field already well explored."

(2) Because Dr. Lee DeForest had had previous knowledge of the invention and had actually used the alleged invention in California in 1912, a year before Langmuir had ever seen a vacuum tube of the three electrode type.

(3) Because Dr. Harold DeForest Arnold of the Western Electric Company had conceived and utilized the vacuum tubes operating on the pure electron flow theory, as distinguished from gas ionization theory, before Langmuir, had any conception of the alleged invention of the patent. Arnold and Langmuir fought through an intereference proceeding in the Patent Office, each claiming to have been the inventor of the subject matter of the patent. The Examiner of Interferences and the Board of Examiners-in-Chief in the Patent Office both held in favor of Langmuir but the Commissioner of Patents held in favor of Arnold.

One Way and Another

The Court of Appeals of the District of Columbia, to which court appeal was taken by Langmuir, held in favor of Langmuir. Judge Morris in this case disagreed with the Court of Appeals of the District of Columbia and adopted the opinion of the Commissioner of Patents, holding that if any invention had been made Arnold made it.

The determination of this point, however, is of no practical effect, because the court concluded that no invention had been made by anyone and went into this subject to show that Langmuir, the patentee. had wrongfully obtained a patent, as even if it were conceded that an invention had been made, Langmuir was not the first inventor.

The Logical Thing

With respect to the companion Langmuir vacuum patent involved in the litigation, the court in its opinion concluded that the second patent—No. 1,244,216—granted October 23rd, 1917, directed to the use of a thoriated tungsten filament in a high vacuum for radio tubes, was invalid as being the mere adoption and use of a filament standard in incandescent lamp practice in vacuum tube practice.

The court pointed out that with the advent of carbon filament in incandescent lamps carbon filaments were adopted for carbon tubes and that, therefore, as rapidly as a filament was developed for incandescent lamp work it was adopted for vacuum tube work.

Hence when thoriated tungsten filament was adopted for incandescent lamp work it was the most natural and logical thing to do to use it with filament for vacuum tubes. Consequently, anyone who did it made no invention in doing it.

The third of the associated patents—No. 1,529,597, granted March 10, 1925, and known as the magnesium flash patent, was likewise declared to be invalid. This patent is directed to employing magnesium as a vaporiable agent for "getting" and "keeping" a high vacuum chemically. The court found that this patent disclosed no invention in view of the knowledge many years before it of the employment of flash material for the same purpose, specifically including magnesium, the subject of the patent, in vacuum tubes, specifically including radio tubes.

Where Langmuir Led Way

The fourth patent, of the group—No. 1,244,217—granted October 23rd, 1917, was held to be valid by the court and claims 1 and 4 to be infringed by the defendant. This patent is known as the potassium getter and keeper patent. This material is used for assisting the getting of a vacuum and maintaining the vacuum after it has been obtained.

The court concluded that while many in the prior art had used a similar material to get a vacuum Langmuir, in his opinion, was the first to use that material for not only getting the vacuum but for keeping it after it had been gotten.

If the first of these patents had been sustained it would have been impossible for anyone to manufacture independently any radio tube used today until after 1942.

Dr. De Forest's Comment

"Had the Langmuir patents been sustained," said Dr. De Forest, "there is no question that within the next year nearly all of the independent manufacturers of radio tubes would have to go out of business. We expected the decision."

An appeal is being prepared by the plaintiff.

Daven A C Resistors Provide Exact Center

To minimize the hum in electrified receiving sets, many manufacturers incorporate center top AC filament resistors. The value of these resistors ranges from 2 to 60 ohms, depending upon the number of tubes and the current supply.

Efficiency of these center tap resistors depends upon how closely the tap approaches a true electrical center for grid return connections. To this end, the Daven Radio Corporation has developed a wire wound center tap AC resistor that is wound from each end inward, with the two matched windings connected at the mid-point. This is the best known practice for arriving at a true node point.

Resistors of this type are now available to set constructors for application in any circuit calling for 10, 25, and 60 ohm sizes.

FRACTIONAL HENRYS

The terms millihenry and microhenry confuse many. A millihenry is equal to .001 (one one-thousandth) of a henry, while a microhenry is equal to (one one-millionth) of a henry.

More Space for Splitdorf; Four Executives Honored

To meet the needs for the enlarged radio programme for 1928 the Spiltdorf Radio Corporation, of Newark, N. J. has acquired an additional 100,000 feet of floor space by taking over the building nearby, formerly occupied by the Boyden Shoe Co. Every facility for the building of radio receivers and loudspeakers is provided.

At the same time announcement is made that the Splitdorf Radio activities have been placed under the direction of Hal P. Shearer, general manager; Noel S. Dunbar, advertising manager; Paul Ware, director of laboratory, with Sam Schaeffer as assistant advertising manager.

SAMSON'S BOOK FOR STATIONS

In the discussion of the 24 page booklet on transformers issued by Samson Electric Co., Canton, Mass., it was stated that the equipment applied to telephone transmission. This of course includes broadcasting stations, for whose benefit in particular the booklet is issued.

Action of a Condenser Explained for Novices

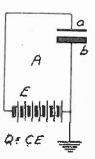

FIG. 1A

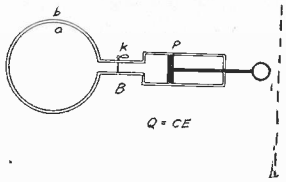

FIG. 1B

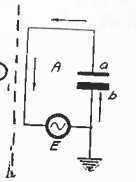

FIG. 2A

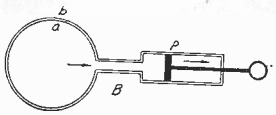

FIG. 2B

By Brewster Lee

THE electrical condenser often is a stumbling block to students of elementary electricity. First they are told that a condenser can be charged with electricity and that it retains this charge for a while. Then they are told that a condenser is an open circuit through which no electricity can flow. These two statements are not contradictory and offer no trouble. The student simply visualizes a closed vessel into which some kind of fluid is poured. The vessel can be filled and no more.

But when the student takes up the subject of alternating current he is told that current can flow through an electrical condenser, indeed that under some conditions the condensers is a short circuit which offers practically no impedance to the flow of the current. How can the condenser be an open and a closed circuit at the same time? That question in some form or other always enters the student's mind.

As a matter of fact the condenser, if it is a good condenser, is a closed circuit to alternating current as well as to direct current. But that does not prevent alternating current from flowing in a circuit in which a condenser forms a part. The alternating current does not flow through the condenser. It bows in and out of the condenser.

Instructive hydraulic analogies can be constructed easily to help to understanding the action of an electrical condenser. With respect to a condenser, electricity acts much the same as does an elastic fluid like acts. It resists compression.

Let us then liken the condenser to an airtight tank into which air may be forced with a suitable pump. The pump then takes the place of a charging battery. By means of it air can be pumped into the tank until the pressure exerted by the air in the tank is equal to the pressure on the piston. Likewise electricity can be forced into a condenser with a battery until the back pressure of the electricity in the condenser equals the pressure of the battery.

Equalized Pressures

When the pressures have been equalized the condenser is said to be charged to the voltage, or pressure, of the battery, and the tank is said to be pumped up to the pressure of the piston. The electrical pressure is measured in volts, the pressure of the air in atmospheres.

If there is a leak in the condenser the charge will leak off at a rate depending on the magnitude of the leak. The discharge may take minutes or days. The same holds of the air tank. If there is a leak, the compressed air escapes at a rate depending on the size of the opening.

But suppose there is no leak in either. The condenser can be charged to a very high voltage or electrical pressure. But it cannot withstand unlimited pressure. As the voltage is increased a time will come when there will be an explosion, a rupture of the condenser dielectric. This is not unlike the explosion which occurs when the air pressure in the tank exceeds a certain critical palue. Both of the explosions may be disastrous, and the damage resulting would depend on how much work had been done in charging the condenser or in pumping up the tank.

Knowing that the pressure in either may be made too great, we assume that the condenser is used within such limits that charging and the pumping stop before any disastrous explosion takes place.

Suppose the two plates of the electrical condenser be joined with a wire. At the instant the juncture is made there is a sharp spark. The condenser has been discharged. Both plates are now at the same potential pressure. Before the spark one of the plates was probably at ground potential; after the spark both are then at ground potential. While the discharge of the condenser seems to take place instantaneously, actually it takes some time for the discharge to be completed.

A Violent Rush

Now suppose that the stop cock which held the air in the tank be opened. The compressed air will rush out. At first the rush is violent and later less so. Toward the end of the air discharge there is just a feeble movement of air from the tank to the open air. The discharge of the condenser takes place in the same manner, rapidly at first then more slowly until there is only a very feeble electric current flowing in the connecting wire.

The electric discharge is much more rapid because the connecting wire between the plates offers less resistance to the electric current than the tank outlet offers to the current of air.

When the air tank has been discharged the pressure inside the tank is the same as the pressure in the open air. One might call the pressure in open air atmospheric potential.

A condenser can be charged in two ways depending on the direction the charging battery is connected. In one connection the ingrounded plate is given a potential higher than the potential of ground. In the other the ungrounded plate is given a lower potential than ground.

Likewise the air tank can be "charged" in two ways, depending on the arrangement of the valves on the pump. The air can be forced into the tank, thus making the pressure inside the tank greater than atmospheric pressure. The air also can be sucked out of the tank, thus making the pressure in the tank less than atmospheric pressure.

Same Law for Both

Electricity can flow into a condenser only until it is fully charged. The amount of electricity that can be forced into the condenser depends directly on its capacity, or electrical size, and on the electrical pressure, or voltage. The amount of air that can be forced into an air tank depends directly on the size of the tank and on the pressure exerted by the pump. The two are thus closely analogous. If Q is the quantity of air or electricity, C the capacity of the tank or the condenser and E the electrical or the hydraulic pressure, then in both cases Q equals CE.

In Fig. 1 A is shown a condenser ab one plate of which is grounded. A charging battery of voltage E is connected so that the potential of the ungrounded plate is E volts lower than ground potential when the condenser is fully charged.

In Fig. 1B is the hydraulic analogue. The "grounded plate b" is now simply the outside of the tank. The "ungrounded plate a" is simply the inside of the tank. The battery of voltage E is replaced with a pump P. The stop cock k is simply interposed between the tank and the pump so that the charge will remain in the tank when the pump is removed.

Direction of Flow

The flow of alternating current in and out of a condenser can also be illustrated with the same hydraulic analogy. It is shown in Fig. 2, A and B. The battery of voltage E has now been replaced with a source of alternating emf of effective value E. The stop cock k has been removed from the hydraulic analogy and it is assumed that there is no valve in the pump. When the piston moves one way the air is sucked out of the tank and when it moves the other way the air is forced into the tank.

Since in A Fig. 2 one plate of the condenser is grounded the potential of that plate cannot change. But that of the other changes with respect to that of ground in accordance with the emf of the generator. The plate A is either positive or negative and the electricity flows in the connecting wire and generator either as shown by the arrows or in the opposite direction. No current flows across the space between the plates. But there is a pressure across it.

In B Fig. 2 the air flows in the direction that the piston moves. When the piston is out the air flows out, and the pressure in the tank becomes less atmospheric; when the piston moves in the air flows in, and the pressure in the tank becomes higher than atmospheric. Thus as the piston oscillates there is an alternating air current flowing in and out of the tank. Likewise there is an alternating air pressure which either tends to burst the tank open or tends to crush it in.

What Current is

An electric is only the rate at which electric quantity is transported from one point to another. It may be measured in the outside circuit or it may be measured as it is withdrawn from the condenser.

The current is the same at every portion of the circuit no matter how wide or how narrow the conductor may be. The same holds in B Fig. 2, or in the case of a river. The air current is the same in the connecting pipe between the piston and the tank as it is in the piston chamber or in the tank.

The $67,000 Radio Hour

(*Continued from page* 11)

the fine playing of the orchestra are so badly distorted before Bound Brook, N. J., sends out Chicago's best.

There is much to be done in bringing live transmission up to the quality standards of radio over long distances.

The Words and Music

Before Carlin, at the WEAF studio, been listening to Carlin with earphones, had introduced Rogers, the comedian had Rogers in his usual amiable voice and way began:

"Hello, folks! I'm the town crier!"

He continued:

"This is a cinch of a job Dodge Brothers is giving me. All I got to do is stand here and talk. I got all the movie folks around me here, all of 'em. There's Ben Turpin, Jack Barrymore, Mary Pickford, Douglas Fairbanks and fifteen others—they're all right around me here, within fifteen blocks, and if I only knew their telephone numbers they'd all be sitting right here at the fire with me. Say I oughtn't to mention fires. They don't need any fires in California. By the way, all the movie stars out here are making New Year's resolutions and taking new wives. It's a question which they're going to drop first."

This comment came from a man deeply devoted to family life and who spends every available minute with his wife and their children.

Rogers continued:

"You know I just came up from Mexico where I have been an Ambassador for Cal. Some of our Mexican friends are going to hear this stuff."

Thereupon Rogers spoke a few words in Spanish for the particular benefit of folk across the Mexican border. His Spanish pronunciation seemed only fair to one who studied the language twenty days, twenty years ago, and had heard so little of it since that he had begun to doubt its continued existence. Rogers' "buenos noches" and "estados unidos" came over well but the other Spanish words sounded blurred.

(*Continued on next page*)

Radio World's CLASSIFIED ADS *for Quick Action*

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

Good Back Numbers of RADIO WORLD

The following illustrated articles have appeared in back issues of RADIO WORLD in 1927.

MAY 21.—Part I of a three-part article on the Victoreen Portable receiver, by Capt. P. V. O'Rourke. Data on the new Raytheon cartridge.

MAY 28.—A three-tube reflex, using a special low pass filter system, by Edgar B. Francis. Part II on the Victoreen portable receiver with layout data, by Capt. P. V. O'Rourke.

JUNE 4.—Part III of a three-part article on how to construct an efficient portable Victoreen Super-Heterodyne, by Capt. P. V. O'Rourke. A complete discussion on the RCA AC tubes.

JUNE 18.—The six-tube Equamatic, a neutralized two-stage tuned RF, three-stage AF resistance coupled set, by Herbert E. Hayden. How to get the low notes with transformer or impedance AF, by Dennis J. O'Flaherty.

JUNE 25.—The Lindbergh Plane Speaker, an excellent cone type reproducer, by Herbert E. Hayden. A tube and set tester, by Herman Bernard.

JULY 2.—The Planofier 7, single control super-sensitive set using resistance AF by R. F. Goodwin and S. S. Bruno. Discussion on the new Freshman Equaphase, by Robert Sagala. Data on the six types of units used for loud speaker operation, by J. E. Anderson.

JULY 9.—How to build a DC A supply where the line voltage is 220 or 240, by Frank Logan. Important data on RF choke coils, by Horatio W. Lamson.

JULY 16.—How to use a voltmeter as a milliammeter, by D. Barretti. How to build a 4-tube, 2-control regenerative portable set.

JULY 23.—Building a 7-tube Super for your auto, using Victoreen IFT, by John F. Rider (Part I). How to build a 6-tube neutralized set, using three tuned RF, two transformer AF, by John F. Rider. Inside dope on motorboating, by J. E. Anderson.

JULY 30.—A 5-tube standard TRF set adapted to AC operation by the use of the ORS 400 mill rectifier tube, with the aid of series filament connections, by RF Goodwin and S. S. Bruno. Shielding the 11-tube Melo-Heald Super-Heterodyne receiver, by Clifford Denton. Part II of the two part article on the Super in the auto by John F. Rider. How to control volume in AC sets by D. Ferrup.

AUG. 6.—A three-tube regenerative portable with portion of the cabinet as the speaker, by M. J. O'Reilly. The Cashbox Unitune, an ingeniously contrived four-tube quality receiver by Wendell Buck. How to use AC tubes by C. T. Burke.

AUG. 13.—Hints on constructing a portable set, by Herbert E. Hayden. A seven-tube, two-control AC operated receiver by Capt. P. V. O'Rourke. Obtaining the C bias in an ABC unit, using the BA Raytheon 85 mill tube.

AUG. 20.—The Four AC, a four-tube regenerative set employing AC tubes. Tim Turkey's argument on why rheostats should not be used as volume controls. The Drum Powertone, a five-tube single control set, using resistance coupled audio.

AUG. 27.—Part 1 of a four part article on building the 1-Dial Witz, a single control, voluminous selective 5-tube set, by A. Irving Witz. A detailed explanation of the exponential type of horn by H. B. Herman. Details on the revolutionary Reisz condenser type of speaker. Constructional data on a special 5-tube, 2-dial regenerative set, with three stages of AF, by Tim Turkey.

SEPT. 3.—Part I of a four-part discussion on the new 1928 Victoreen Universal, a super-sensitive 8-tube Super-Heterodyne, by Capt. P. V. O'Rourke. Complete data on the three types of phonograph pickups, by J. E. Anderson. Part II of the 1-dial Witz, wiring hints emphasized.

SEPT. 10.—The Puratone AC set, a 6-tube duo-control receiver, using AC tubes, by R. F. Goodwin and S. S. Bruno. Part II of the 1928 Victoreen Universal, discussing the placement of parts. Part III of the 1-Dial Witz on the special placement of the coils.

Any Copy 15c. Any 7 copies, $1.00 All these 16 copies for $2.00, or start subscription with any issue. Any 8 of these numbers sent as premium with NEW yearly subscription. No other premiums allowed. RADIO WORLD, 145 West 45th St., New York City.

The $67,000 Program

(Continued from preceding page)

Rogers then returned to English, as will be obvious:

"By the way, I have a great surprise for you folks. I want to switch you in on Washington. I want to introduce our president, Cal Coolidge."

Now Rogers continued by making believe President Coolidge was talking. To achieve this impression—that is, the impression that Rogers was making believe—he adopted a stage type of Down East accent, which does not take into account the effect of a college education on nasalness. Four years in the White House are not to be compared with four years at Amberst with Dwight Morrow. Rogers' way of "doing" Coolidge fitted the occasion icely, for it was all for fun and fun for all; only the New Englanders may have had not so easy a time understanding what Coolidge was supposed to be saying.

Rogers then reported on the state of the nation, as if Coolidge really were speaking. (I stress the fact that it really was not Coolidge, to avoid correspondence).

Rogers always can be relied on to fill out his part on an occasion and in the Victory Hour he simply filled out his part. His humor was not "there" but with enough puns and natural good sport he saw the thing through. He has done much better. As Coolidge he said:

"You know, the nation is in a hole, but I think the nation is perfectly all right as a whole." When you see this in type you way make a sour face at it but when you hear it with your family surrounding you, why you keep painful silence. Rogers (as Coolidge) said Congress was in session to spend the money Secretary Mellon had saved

"It would have been cheaper to have had the Congressmen stay at home," he said, "and let the Government send each of them the pro rata of the money by mail."

On farm relief he said: "Plenty of rain and bigger crops are better than all the McNary-Haugenism." *(See next page)*

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It was enjoyable to listen to Rogers' nonsense. You could forgive the poor puns and strained humor that crept in at times because you realized he is overburdened with this type of work, and is entitled to off moments.

Rogers introduced Whiteman. Then came "The Rhapsody in Blue," well done, by piano and wind instruments especially.

Rogers next discussed the artists who would appear individually, describing them as "the three outstanding men of their lines in the world." He mentioned Fred Stone by name first—and also by first name, but later—and said of him:

"The finest actor on the American stage and the best example of a man." Rogers complimented Dorothy Stone, too, and introduced father and daughter. Dorothy sang "True Blue," of which she wrote the words. She was assisted by the Criss Cross Four (not a car) Dorothy said of the song:

"If you like it, I wrote it; if you don't like it, daddy wrote it."

Stone later disclosed Dorothy's age thus:

"She's 20 years old in her stocking feet."

Stone sang "Chinese Song" from "Chin Chin. This couplet was caught by yours truly:

"Di silli lilli lei chu;
Yay nony louk hoo."

The punctuation may not be correct. The second word positively is.

Stone then adverted to the topic broached by Rogers—the model family life of all the Stones.

"I have often been asked," said the great comedian and man, "why I permit my children to go on the stage. Because I love my profession, and the stage needs just such girls as mine. If everybody respected his profession as much as I do mine those professions would progress more than they do. I gladly give my daughters to the stage because the stage is a vehicle for public service, side by side with every other form of entertainment. Good, clean, wholesome amusement is, and always will be, a necessity."

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