

VICTOREEN DE LUXE PORTABLE

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RADIO

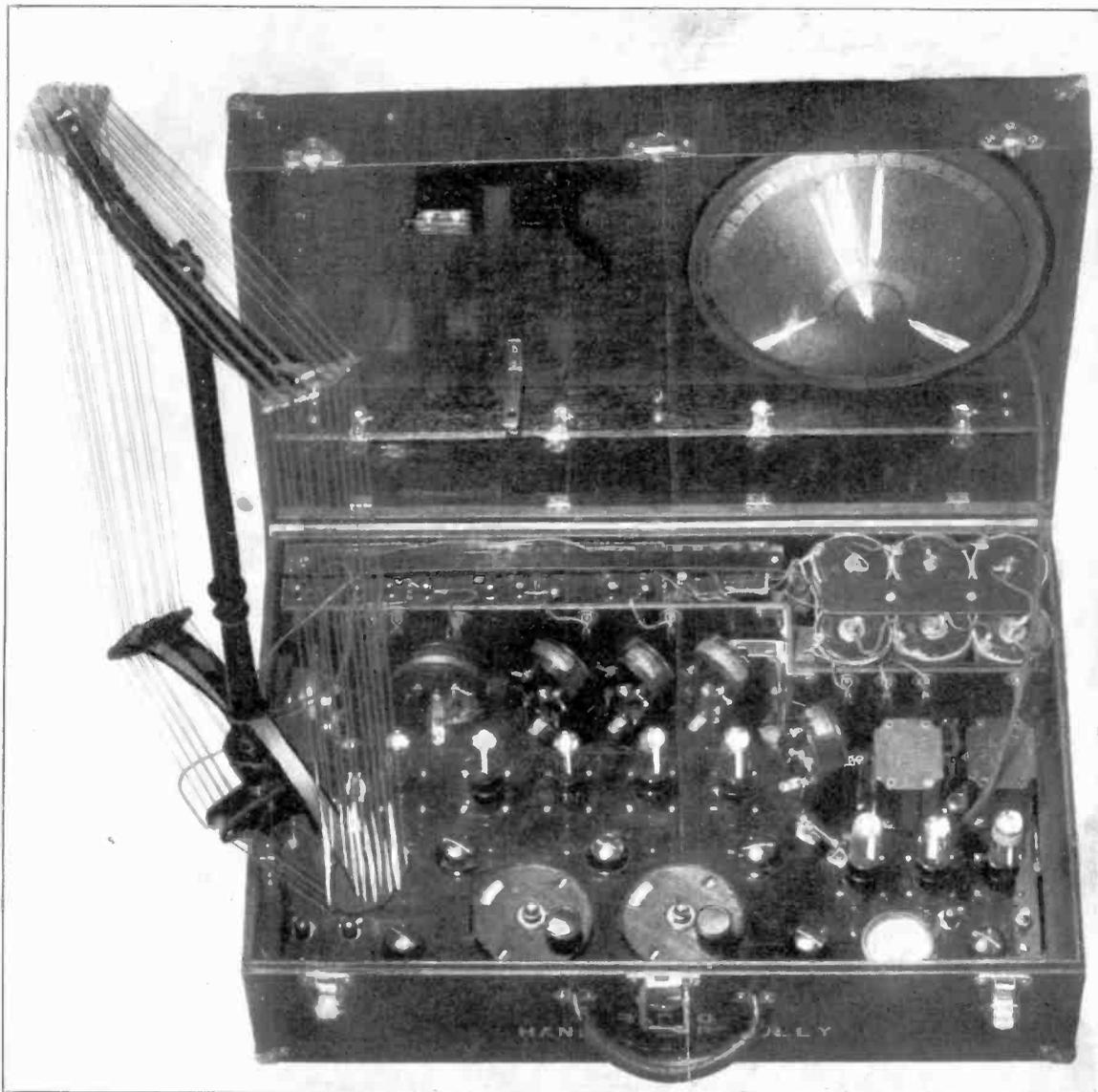
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WORLD

America's First and Only National Radio Weekly

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DISTORTION**



THE VICTOREEN DE LUXE PORTABLE Makes a Handsome Appearance. See page 3 for article.

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NEW YORK

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ALTOGETHER RADIO PROGRAM WEEKLY

Can be summed up as follows:

- 1st, A non-technical radio magazine, published and edited for the radio listener;
- 2nd, Brings to all radio listeners correct and exhaustive radio programs;
- 3rd, Keeps listener informed of each and every phase of radio broadcasting of interest to him;
- 4th, Serves as an effective link between the listener and the broadcaster;
- 5th, Helps uphold the listener's rights; and
- 6th, Is fair to broadcasters and artists.

10 c.
THE
ISSUE

RADIO PROGRAM WEEKLY

ON ALL NEWSSTANDS

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THE VICTOREEN As a De Luxe Portable Receiver

By Capt. Peter V. O'Rourke

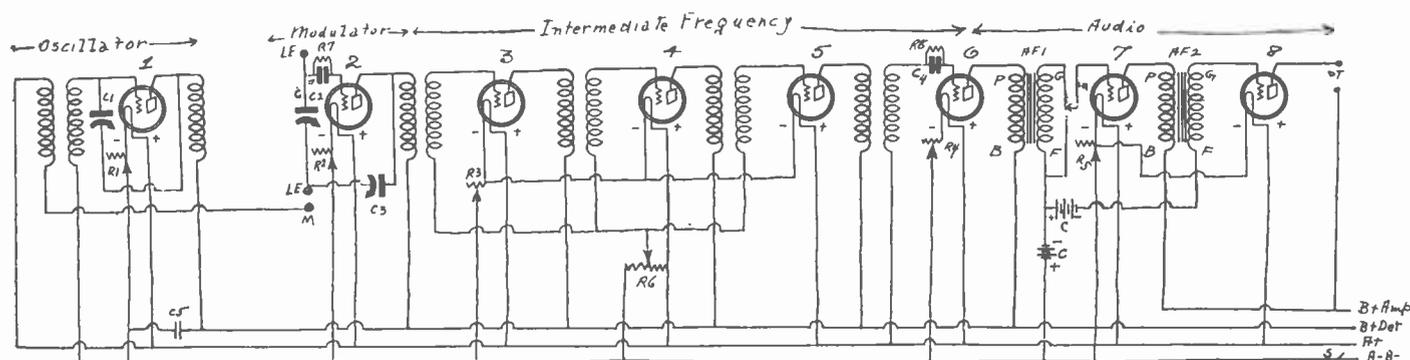


FIG. 1

In this portable model of the Victoreen the filament heating is given especial attention, so as to insure utmost sensitivity and amplification, without uncontrollable spilling-over. The modulator tube is regenerated, so that very weak signals may be heard even in the midst of a forest. No antenna coupler is shown, as loop operation is the rule, but a coupler may be included.

WHILE looking over the Victoreen De Luxe Portable receiver it is hard to realize that it is the work of a non-professional radio enthusiast. But it is, and yet it has the most attractive professional appearance. It is the work of an artist, not alone at building radio sets, but also at coaxing sweet sounds and melodies out of musical saws. It is the handiwork of Robert S. Alter, of Cincinnati, Ohio.

The receiver is built around the well-known Victoreen Super-Heterodyne, a schematic diagram of which is shown in Fig. 1. As will be seen from both the diagram and the photographs, the circuit contains eight tubes, the last of these being a power tube. These are dry-cell operated.

The first tube in the diagram is the oscillator, which is of the Hartley type. The oscillating coil is tuned with a .0005 mfd. condenser, C1. The oscillating circuit is completed through condenser C5, which should be of the mica type and may have any capacity in excess of .005 mfd. This condenser mainly keeps the oscillating current out of the batteries and therefore helps to confine the RF current to the oscillating circuit proper. The pick-up coil is on the same form as the oscillating coil and it is connected in series with the grid return lead of the modulator tube.

Regeneration Embodied

The second tube is the modulator, and this employs the grid method of detection. Regeneration is used for making the set more sensitive and selective in the RF level. The regeneration is controlled by means of condenser C3, which is a microdenser of about 15 mmfd. The loop is tuned with a variable condenser, C2, of .0005 mfd. There are three binding posts provided for loop connection, the mid-tap of the loop being connected to the

lead from the pick-up coil on the oscillator. The loop ends (L-E) go to the tuning condenser.

LIST OF PARTS

- C1, C2.—Two .0005 mfd. Precise condensers.
- C3—One No. 368-A General Radio microdenser.
- C4, C6—Two .00025 mfd. Sangamo moulded mica condensers.
- C5—One .01 mfd. Sangamo moulded mica condenser.
- R1, R2, R4—Three 30-ohm Carter rheostats.
- R3—One 20-ohm Carter rheostat.
- R5—One 10-ohm Carter rheostat.
- R6—One 400-ohm Carter potentiometer.
- R7, R8—Two 2-megohm Durham metalized resistors.
- R9—One 500,000-ohm Carter potentiometer.
- AF1, AF2—Two Amertran De Luxe audio transformers, first and second stage.
- S—One Yaxley filament switch.
- One Victoreen oscillator coupler (150).
- Four Victoreen intermediate frequency transformers (170).
- Eight Benjamin UX sockets.
- Two Marco vernier dials.
- One Fiat folding loop with mid-tap M (wound for .0005 mfd.).
- Nine binding posts.
- One Formica panel and five Formica strips.

ACCESSORIES

- One Crosley Musicone speaker.
- Seven —99 tubes.
- One —20 tube.
- Three 45-volt small B batteries.
- Six No. 6 dry cells.
- One 22.5 volt grid battery with taps.
- One suitcase.
- A quantity of Formica cut to size.
- Brass angles, screws, nuts, hooks and eyelets.

There are three intermediate frequency amplifier tubes and a detector. The four intermediate frequency transformers coupling these tubes are alike electrically and are of the same external appearance as the oscillator coil.

A feature of prime importance is the angular placement of the intermediate frequency transformers. Although these coils are placed very close together, their angular orientation is such that there is no magnetic coupling between them, that is, they are placed magnetically at right angles. The approximate placement to bring about this condition is shown in the photographs. The accurate adjustment can always be found by experiment. The criterion is freedom from oscillation in the intermediate frequency amplifier. The adjustment is not very critical, because there are two oscillation controls provided. One is rheostat R3, whereby the filament current to the intermediate tubes are controlled, and the other is potentiometer R6, whereby the grid bias on the intermediate tubes can be controlled within the limits of the filament battery voltage.

Leak Values

The sixth tube is the detector. This also operates on the grid blocking method of detection. Since this tube operates between the intermediate frequency and audio frequencies, the grid leak and grid condenser values should be somewhat different from the values used when operating between radio and audio frequencies. One of the two may have the usual 2 meg value, but the other, under some circumstances, had better be of a different value to give the best results.

But the signal level at the second detector point will ordinarily be so high that the detector will not be at all critical.

Two audio frequency transformers are used in the circuit, thus getting the greatest step-up of voltage consistent with

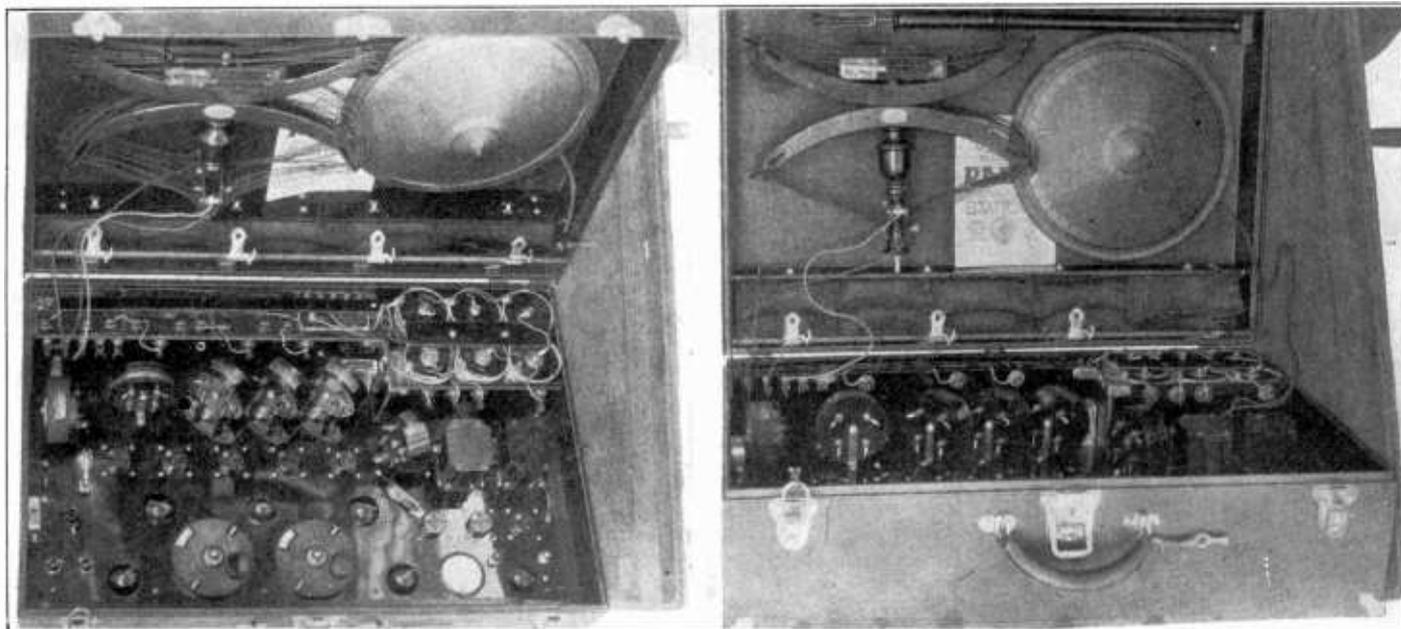


FIG. 2

Should one desire antenna option, the antenna coupler would be placed at left, as above. Next in order come the oscillator and the four immediate coils.

quality and minimum equipment. Transformers have been chosen with the object of getting the best quality without sacrificing voltage amplification.

All the tubes up to and including the seventh are of the —99 type and the eighth is a —20 power tube. This of course is used to get loudspeaker volume with good quality in the output.

Rheostats for Circuit

The filament current in the oscillator is controlled with R1, that in the modulator with R2 and that in the detector with R4. Each of these rheostats is of 30 ohms resistance. The filament current in the intermediate frequency tubes is controlled by R3. This rheostat carries normally .18 ampere and the drop in it may exceed 2 volts. Hence the resistance should be about 20 ohms. The filament current in the last two tubes is also normally .18 ampere, and the normal voltage drop in rheostat R5 is 1.5 volts. Hence the resistance should be 10 ohms. The resistance of potentiometer R6 should not be less than 400 ohms, since this resistance is across the filament battery and continually takes current while the set is in operation. When the resistance is high the current drain by this route is negligible, even from dry cells. However, the switch S should be so connected that when it is "off" one side of the potentiometer is disconnected.

The grid bias on the oscillator is the voltage drop in R1, or about 1.5 volts. This is enough for the plate voltage used on that tube. The grid bias on the first audio tube is obtained from a C battery and the bias on the last tube from this battery plus a few more cells. The bias on the first tube should be about 6 volts, that on the last about 22 volts.

Plate Voltage

The plate voltage on all the tubes with the exception of the two audio tubes is 45 volts. This is adequate to give great sensitivity and voltage step-up. The voltage on the audio tubes is 135 volts, which is necessary to give great volume without overworking the tubes.

Some additional volume control is desirable in a set as sensitive as this one. There is a 500,000 ohm potentiometer across the secondary of the first audio transformer for this purpose. This provides an adequate control for volume at least as far as the audio amplifier is concerned. If the gain in the intermediate

is so great as to overload the detector tube, the volume can be controlled with R3 and with C3.

The mechanical construction of the set can be seen from the photographs in Fig. 2. The chassis is made wholly of formica cut to size and secured together by means of brass angles, and flathead machine screws, to fit in a carrying case. All holes are countersunk so that no heads project on the sides of the chassis. All the transformers, tubes and controls are placed on the baseboard, while the binding posts are placed on the battery retaining wall at the back. The binding posts are of the clip type.

Placement of Apparatus

A double-range voltmeter is shown in the photographs, although this is not included in the drawing. While this is a very desirable and conventional feature



ROBERT S. ALTER, who built the De Luxe Victoreen Portable, plays the "vox ferro" or musical saw, as a hobby, and broadcasts from WLW, WSAI, WOR, WGR, WBZ and other stations.

of a Super-Heterodyne, it is a luxury not essential to the operation of the set. It furnishes a ready means of checking the voltage of both the filament and plate batteries. When this is used it is normally connected across the filament battery so that the correct voltage can be maintained at all times regardless of the condition of the A battery. A master rheostat is then also used and most of the excess voltage is taken up in this. It should have a resistance of 6 ohms. When this is used R5 may be dispensed with so that there will be no change in the number of variables nor in the mechanical arrangement of parts.

The set is placed in the suitcase. The chassis is in front, where all the controls are conveniently accessible. At the rear and left in a narrow compartment are the three 45-volt B batteries. In the rear right corner is a wider compartment which is just the correct size for six standard No. 6 dry cells for filament current. Three are series connected, then three more, and the two blocks parallel connected. Note the convenient placement of the binding posts with respect to the batteries.

Speaker Location

The cone loud speaker finds a suitable place at the right end of the lid of the suitcase, while the loop, when folded up, has a corresponding place at the left end of the lid. Even a complete and up-to-date list of all the broadcasting stations in the world is tucked away in the lid for ready reference. This is certainly a desirable part of the equipment of a portable set which might be used in any part of the world and which is sensitive enough to pick up most broadcasting stations over a great distance.

Front cover shows the set with loop in place and ready for operation. Note that there is ample room for the loop to swing completely around so that a station in any direction can be picked up with greatest intensity. [Part II next week.]

GREATER PHOTO SPEED

Development of facsimile transmission goes on apace. From an average transmission time of 40 minutes per photograph, when the photo-radiogram service was established between New York and London by the Radio Corporation a year ago, the time of transmission has been reduced to 20 minutes. Under laboratory conditions photos have been transmitted in two minutes.

COILS COMPARED

As to Their Utility and Efficiency

By Ludlow C. Fraser

MANY types of efficient tuning coils have been placed on the market from time to time. Each type has had a long run of popularity. All have been inductances made of wire. The differences have been in the mode of winding, in the form of the support, in the color of the insulation. In every case the aim of the manufacturer has been to get a high value of inductance with the least resistance. Some of them have been about as efficient from this point of view as it is desirable to have them for the purpose of broadcast reception. When they have failed to give the desired selectivity the trouble has usually been in the placement of them in the set, which of course is no fault of the coils. Herewith are illustrations of ten typical inductance coils.

No. 1 is a single layer solenoid of length and diameter such as to give the greatest inductance for the length of wire used and the minimum resistance. It is nearly self-supporting and hence the dielectric losses in the support are very low. This is a very efficient type of winding.

No. 2 is also a single layer solenoid wound on a low loss support. This coil is smaller and is especially suitable for use when there are many tuned circuits in the receiver, on account of its small dimensions. This also is of the shape which gives approximately the highest inductance for a given length of wire and hence for a minimum of resistance.

Basket-weave Coil

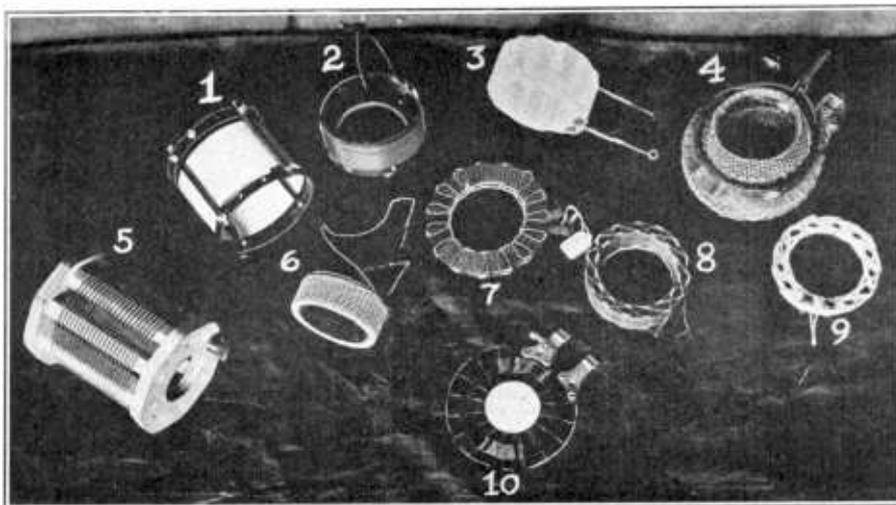
No. 3 is of the so-called basket-weave variety. This is a solenoidal type of coil but it is not a single layer coil. Yet the turns have been wound so that there is a minimum of distributed capacity between turns and layers, thus reducing losses from this source. It is also wound with heavy insulated wire, which makes the metallic resistance low. The coil is rugged, efficient and requires only a comparatively small space. It is much used for code reception but gives a good account of itself in broadcast receivers.

In No. 4 we have a variocoupler, or variometer, of the basket-weave variety. It possesses characteristics similar to the preceding coil in that it is compact, has a low distributed capacity and low metallic resistance. Where a variocoupler or a variometer is required and when the space available is limited this coil is of advantage.

In No. 5 we have another single layer solenoid. It is built along the lines of the U. S. Bureau of Standards standard inductance coils. It is space wound with bare wire on a wooden frame. The turns are held apart by notches cut in the wooden ribs. It is shaped so that the inductance for a given length of wire is maximum, thus giving lowest resistance. The small amount of solid dielectric near the wire also cuts down the dielectric losses and the distributed capacity. It is a coil of low inductance and hence suitable for high frequency work.

Honeycomb Type

No. 6 illustrates the well-known duolateral type of coil. This is a very compact coil containing a high inductance for the amount of wire it uses and the space it occupies. It is shaped to give greatest inductance for a given amount of wire. Although the type of winding used in this coil reduces the distributed capacity be-



(Leoni Adelman)

TEN TYPICAL coils used in tuning circuits of broadcast and code receivers.

tween turns and layers, its capacity is no longer considered good for high frequency work. However, for work with frequencies lower than those used in broadcasting the coil is very satisfactory. It is used a great deal in Europe and other places where broadcasting is done on frequencies below 300 kilocycles (above 1,000 meters).

No. 7 illustrates a form of spider web inductance coil. When this coil is suitably proportioned it has the same characteristics as No. 3. Its distributed capacity is low and its inductance is high for the amount of wire used in its construction. It is self-supporting and for that reason the distributed capacity and dielectric losses are low. It has the advantage of small space requirements.

No. 8 is like No. 3 but is wound with finer wire and therefore it occupies smaller space for a given inductance. It is eminently suited for broadcast receivers.

No. 9 is a coil of the same type as Nos. 3 and 8 and has the same characteristics as those coils. It is wound for high frequency work, that is, for the reception and transmission of amateur code.

No. 10 is a typical flat spider web or spiral inductance. When this is suitably proportioned it has the same characteristics as No. 1. It has a low distributed capacity, a high inductance for a given amount of wire, and therefore low losses. One of its greatest advantages is the small space that it requires.

Careless Extra RF Stage Will Make a Set Worse

Is there any real advantage in using an extra stage of tuned radio frequency amplification? Is there an increase in the sensitivity, in the selectivity and in the ease of operation?

By just adding another stage of tuned radio frequency amplification without adjustment there is no advantage whatsoever. All that is gained is a varied assortment of squeals. The set becomes more difficult to tune, the amplification may be less than it was before, and there may not be a gain in the selectivity.

However, if a stage is added with suitable oscillation control and suitable coupling between the RF tube and the detector, a great deal is gained. A voltage step-up of about 10 can be obtained, and this means almost a hundredfold step-up in the audio output. And this can be obtained without a great increase in the difficulty of tuning, particularly when the detector is regenerative.

The detector can then be set to oscillate feebly without interfering with the neighbor and the position of a weak carrier can be found easily. At the same

time the first tuner can be brought in step with the second without making ear-splitting squeals.

It is necessary to have a means of preventing the first tube from oscillating, and this can be done with a rheostat in its filament circuit or a high resistance rheostat in the plate circuit of that tube, or both. If the first tube is capable of oscillation when its plate and filament voltages are normal, the sensitivity of the circuit can be brought up many times by controlling the regeneration in that tube.

The greatest advantage of the extra tube is an increase in selectivity. This alone is enough of a gain to recompense for a great deal of trouble in tuning and squealing.

It is practically impossible to get enough selectivity out of a single tuner, even with regeneration, if the tuner is coupled to the antenna directly, even if the coupling is fairly loose. With another tuner poor selectivity is in the first stage and then the detector can be made very selective. The rheostat or high resistance controls will not impair the selectivity of the second tuner, but rather improve it.

A LOW-PASS FILTER

Keeps RF Out of Resistance AF

By J. E. Anderson

Consulting Engineer

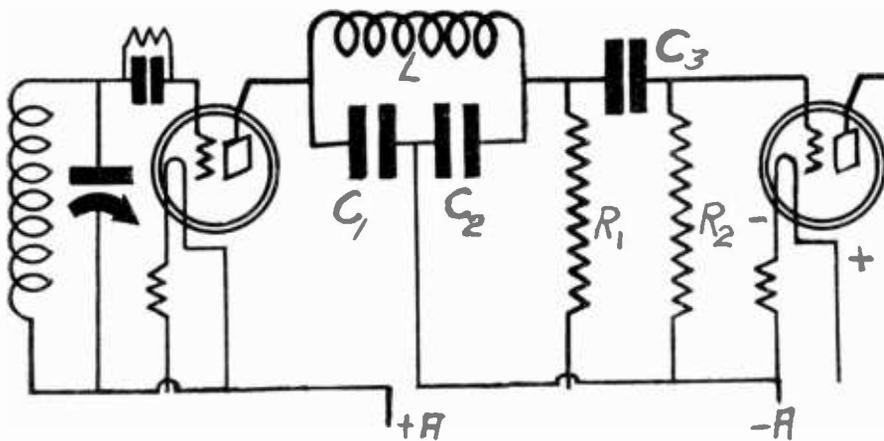


FIG. 1

Circuit illustrating the method of connecting the radio frequency choke coil and by-pass condensers in the plate circuit of detector in resistance coupled amplifiers for effectively preventing radio frequency currents from entering the amplifier. The same system may be used with other audio circuits. The arrangement is called a low-pass filter.

THE simplest low-pass filter is a condenser across the line. This has been used in radio since the beginning. The most common place for this type of filter is across the primary of the first audio frequency transformer in an amplifier, or from the plate of the detector tube to the negative A battery. The object of using the by-pass condenser here is to facilitate detection, that is, to make the impedance of the load of the detector tube very low at high frequencies without reducing the load impedance at the low frequencies. A secondary effect is to prevent the high radio frequency currents from entering the audio frequency amplifier.

When the coupling employed in the audio frequency circuit is by means of resistances, there is another and more important reason for preventing the radio frequency currents from entering the audio amplifier. A resistance coupled amplifier is efficient at radio frequencies, hence if these enter the amplifier they will be increased in amplitude, and since they are super-imposed on the audio frequencies they will give rise to overloading and distortion. It is therefore of prime importance to keep the radio frequency currents out of the audio frequency amplifier. This can readily be done with a low-pass filter of simple construction.

A low-pass filter consists of shunt condensers and series inductances. The more and larger the condensers the more will the high frequencies be by-passed and the more and larger the inductances the more will the high frequencies be suppressed. It is possible to choose the values of the shunt condensers and the series inductances to have the separation between the transmitted and the suppressed quite definite so that below the cut-off frequency there will be practically no diminution in the intensity of the transmitted current and above that cut-off frequency the suppression is practically complete. The larger the condensers and inductances the lower will be the cut-off frequency. The sharpness of the cut-off depends on the accuracy of the adjustment of the values and the resistance in the coils. The less resistance in the coils the sharper will be the point of demarca-

tion between the suppressed and the transmitted frequencies.

Keeping RF Out of AF

Designers of resistance coupled amplifiers have realized the necessity of preventing the radio frequency currents from entering the audio frequency amplifier and consequently they have put a shunt condenser across the first coupling resistor and a series inductance, or choke coil, in series with the grid lead, thus putting a one-section low-pass filter in the line. They have rested content that they have suppressed the radio frequencies. Does not a shunt condenser divert the radio frequency currents around the coupling resistor and does not the series choke coil prevent them from passing into the line?

The shunt condenser serves a useful purpose, all right, but the series choke coil is perfectly useless. In practical cases it does not suppress the radio frequency currents by more than one per cent. of one per cent. Why does not the series choke coil produce a greater effect in suppressing the radio frequencies? Because it is connected in series with the grid leak resistance, which may be of the order of 2 megohms. A radio frequency choke coil in series with that resistance has about as much suppressing effect on the radio frequencies as the same coil would have if it were left in radio dealer's shelf. A circuit designer who sticks it in the circuit in that manner is merely putting his head in the sand.

How It Should Be Done

How can the choke be made effective when it is used in series with a line of this character? It can be done by connecting a condenser across the line at each side of the inductance coil. The first of these condensers by-passes most of the radio frequency currents, leaving only a small portion for the coil. The second condenser is connected in shunt with the line but in series with the inductance coil. The total resistance in series with the choke is now practically nil. It is only the radio frequency voltage across the second condenser which gets into the audio frequency amplifier. But this is now exceedingly small, because

most of the voltage drop occurs across the coil, which is rejected. Thus by the simple process of connecting a condenser on the grid side of the choke coil the transmitted voltage is reduced thousand-fold.

This effective low-pass filter is shown in Fig. 1. The first tube is the detector. C1 is the first by-pass condenser connected across the line. L is the radio frequency choke coil connected in series with the line to prevent the radio frequency currents from passing to the second tube grid. C2 is the second by-pass condenser connected across the line to give the choke coil a chance to do its work. Without C2 the choke coil might just as well be left out.

The Favorable Values

When choosing the values of the two condensers and of the choke coil, due consideration should be given to the degree of suppression desired at radio frequency and the degree of transmission desired at the higher audio frequencies. The greater the suppression of the radio frequencies the greater will also be the suppression of the higher audio frequencies. Hence a compromise is necessary.

Still another point to be observed is to prevent the filter section LC1C2 from causing uncontrollable oscillation in the detector tube. Such oscillation will result if C1 is too large and if L has too great inductance. But it is a simple matter to be safe on this point.

Let us take a tentative design of the filter and then see how well it meets the conditions imposed on it. Let each of the two condensers have a capacity of .0005 mfd. and the choke coil and inductance of one millihenry. What will be the cut-off between transmission and suppression. The cut-off frequency is then 318,000 cycles, which is far enough below the lower radio frequency limit and far enough above the higher audio frequency limit to exert no appreciable effect on any of these. What is the suppression of the lowest radio frequency in the broadcast band and what is the suppression at 10,000 cycles in the audio scale? Both of these can be computed very easily if the constants of the circuits are known.

Four Parts in 70,000

Let us assume that the grid condenser and the grid leak resistance are both so large that their effects can be disregarded. Then if we determine the radio and audio frequency voltages across the coupling resistance R with and without the filter for equal voltage in the output of the detector tube we get a measure of the suppression. Let the effective voltage in the detector plate circuit be unity and let the internal resistance of the tube be 20,000 ohms and the resistance of the coupling impedance be 100,000 ohms. The effective voltage across R then is 5-6 volt for both radio and audio frequencies when the filter is absent. At 10,000 cycles with the filter it becomes 5-7 volt, which is a reduction of about 14 per cent. This is not a serious reduction at such a high radio frequency and it can be neglected. At the lower broadcast limit the voltage across R with the filter is 1-21 millivolt. Hence the transmission of radio voltage with the filter is only four parts in 70,000. Such a minute voltage would be completely

(Concluded on page 9)

SELECTIVITY LACKING? Here Are Some Remedies for That

By *Thomas L. McKay*
McKay Instrument Co.

“WHY isn't my set selective?” This question is asked every day. Sets that were selective enough several months ago are not satisfactory today. Why? Simply because so many new stations have “come on the air.”

The radio law recently passed by Congress has made it possible for the Radio Commission to cure the trouble caused by there being too many stations. It will take weeks or months to gain much relief.

In the meantime something has to be done to help that old set act as it used to.

People are likely to blame everything on the broadcast stations. There has been so much propaganda against these entertainers that many listeners have been led to feel that the stations are the sole cause, and that a little legislation by Congress could bring us back to the “good old days” when you could hear half way across the country on a one-tube set.

Whatever action is taken on the stations it is safe to assume that at least two-thirds of those now broadcasting will weather the storm. The trend is toward increased power, and this is very likely to remain the case with the highest class of stations.

Remedy the Set

The only sure remedy for lack of selectivity lies in the set itself. One must first gain a clear conception of what factors enter into selectivity control before the degree of selectivity of a particular set may be appreciated.

The selectivity of a circuit is measured by the looseness of coupling between the primary and secondary coils of the radio frequency transformers, by the ability of the variable tuning units to spread the stations out over the dials (though this is purely relative), and by the lack of resistance in the general design of the radio frequency stages.

Fig. 1 will help give a more clear idea of what requirements are necessary to gain selectivity. This figure shows a set with but one tuned stage, but the same principles apply where multi-stage tuning is used. The primary coil L_p and the secondary coil L_s should be loosely coupled to gain the greatest selectivity. C, the tuning condenser, should be of the new straight line type, better to spread the stations out over the dial.

Cause of Broadness

The grid and plate lines should contain as little resistance as possible. The addition of resistance tends to broaden tuning. Several of the leading manufacturers use fixed or variable resistors in either the grid or plate lines. These resistors are employed to dampen any tendency of the radio frequency stages to oscillate. Resistance is very effective as a damper but it is also injurious to selectivity. Efficiency may be increased in a set using resistance by simply cutting out this resistance and substituting another means of oscillation control.

Using only one tuned stage, as in Fig. 1, has a big disadvantage in that there is a distinct limit to the possible selectivity. The reason for this is quite evident if the current be traced as it goes through this circuit.

Referring to the figure, the station signal current comes in on the antenna and flows through the aperiodic coil L_p to ground. The pulses of this current are

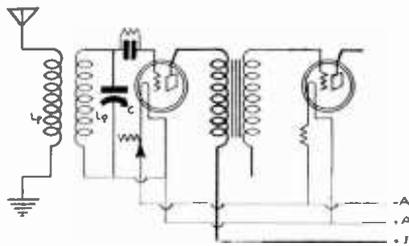


FIG. 1

induced in the secondary coil L_s. L_p and C form a combination that may be tuned very closely to the frequency of the incoming signal.

Some Steal Through

In theory it may look as if tuning should cut out everything but the desired station. This is not so. When a system such as L_pC is tuned to a certain frequency, the system simply offers less resistance to the flow of current of that frequency. Currents of frequencies near that of the one tuned to may also slip through, thus causing interference. The antenna coil, being untuned, lets all frequencies pass and all of these frequencies are attempting to induce themselves into L_s.

One or two tuned stages ahead of the stage shown in Fig. 1 will greatly enhance the selectivity. The reason for this is that each tuned stage attempts to cut out all but the desired frequency, and with several stages all attempting this selecting, there is a much better chance of close tuning. Each tuned stage acts as a filter and the more of these filters, the better the chances of getting just the one station desired.

There is a limit to the number of tuned stages used, however. More than three of these stages are difficult to control both mechanically and electrically. Too many tuning controls make the operation of tuning a task and it is difficult to balance several stages to operate from a one-dial control. The tendency to oscillate is increased where several radio frequency stages are used. Thus we see that two or three radio frequency stages are all that may be employed in the average case. Fortunately, two well-designed radio stages make a set selective enough for all ordinary purposes.

If a set already has radio frequency stages ahead of the detector there should be no excuse for broad tuning. The substitution of straight line type condensers will be a help. All “lossers,” such as high resistances, should be removed from the circuits and a neutralizing system substituted. The radio frequency coils used should be well designed and well insulated. When working with high frequency currents it is well to remember that contact resistance is not as great a factor as insulation. Insulation and capacity effects must be closely watched.

Antenna Important

The antenna is of great importance. Three years ago a 150-foot aerial could be used with good results. Today the antenna used should be short enough to allow reasonably sharp tuning. No fixed length can be given as the best for all sets. The longer the antenna the more energy is picked up; and consequently the better are the chances of getting greater volume and distance. Conversely, the shorter the antenna the sharper the tuning will be with reduced volume and distance-getting ability. A happy medium should be found. Usually about fifty to seventy-five feet of aerial work best in town, while people living in the country may often use as much as 100 feet or even more.

Helpful Wave Traps

Wave traps are often employed to help sharpen a set. There are any number of different designs of these traps and they are frequently of real value in tuning. The theory of the trap is sound, and if properly applied, should prove helpful. The usual trouble is that the fan does not understand how to tune the trap and he expects it to be the golden key which closes the door on all station interference. He is disillusioned. The trap helps, but if not properly handled, it only makes matters worse.

Summing up the problem of lack of selectivity it is readily seen that there is no sovereign panacea. Many little things may be done to help, and the use of all of these should result in the desired selectivity. No two sets are exactly the same, and some experimenting must usually be done in order to get the most out of a particular set.

Desk and 'Plane Linked In Record Two-Way Talk

Washington.

Two-way radio telephony with an airplane in flight was established on May 4, when Assistant Secretary of Commerce for Aeronautics, William P. MacCracken, Jr., talked from his desk in the Department building, with Dr. J. H. Dellinger, of the Bureau of Standards, aloft over Bolling Field.

The successful conversation demonstrates, Dr. Dellinger said, that a similar conversation, through hook-up with long distance telephony, can be carried on between a plane flying above the United States and a second party anywhere in Europe.

This possibility fascinated many.

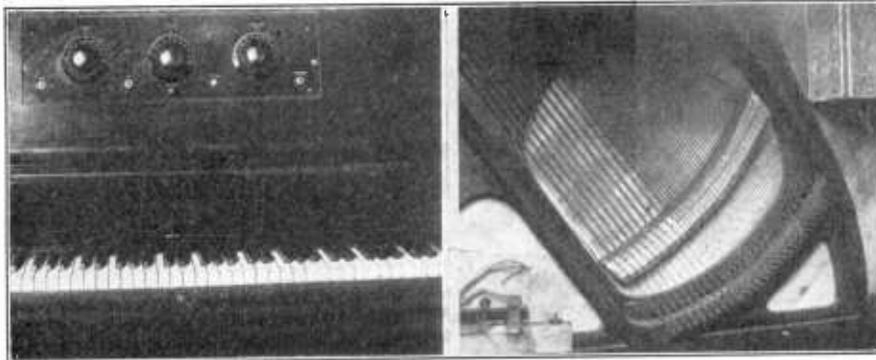
Dr. Dellinger stated that the demonstration represented one of three radio aids to air navigation upon which the Bureau of Standards is conducting active work at the experimental field at College Park; first, aid by telephony; second, aid by directive beacons, which function as aerial trolleys to keep the planes on their course; and third, aid through marker beacons, which consist of radio stations at intervals on the ground along the route to serve as mile-stones.

“The provision of these radio aids,” Dr. Dellinger said, “will go a long way toward bringing about real safety in air navigation. It will be possible to fly regardless entirely of fogs and darkness.”

DISTORTION ANALYZED.

As Effect of Missing Frequencies

By Clarence C. Hood



C. E. M. MILLER, of 170 West Newell Street, Rutherford, N. J., has installed a Diamond of the Air in his upright piano. In place of the usual loudspeaker he has coupled a powerful driving unit to the sounding board in the piano which then emits the sound. It is claimed that this arrangement is capable of exceptionally good quality. Piano music is brought out particularly well. The low notes of the piano which are exceptionally difficult to reproduce with an ordinary speaker are brought out with true brilliancy in this speaker. The front view is at left and the view of the unit secured to the sounding board is at right.

THAT something was missing from the music and speech as reproduced by most radio receivers and speakers in the past everybody knows. Engineers have long realized just what this something was and have endeavored to supply it. But the great majority of radio enthusiasts simply knew that something was missing and attributed the lack to everything from the aurora borealis to the antenna binding post. But those radio enthusiasts who attended the May meeting of the Institute of Radio Engineers are now able to put their fingers on that something even if it is missing. They were shown how to do this by J. B. Kelly of the Bell Laboratories, who read and illustrated acoustically as well as visually a paper "On Quality of Speech and Music."

At the beginning of his lecture Mr. Kelly discussed the mechanism of voice production and the acoustic analysis of different sounds. An artificial larynx backed up with a bellows to take the place of the lungs was used to produce simple tones. The mechanical larynx was then put in the mouth and the tone produced by it was modified so as to articulate such simple sounds as "papa" and "mamma." The tone produced by the artificial larynx was a deep basso and the simple sounds made with it were amusingly different from the same sounds when produced by the high-pitched voice of a baby.

Determined by Energy

The acoustic difference between various vowels and consonants was shown to lie in the energy distribution among the various harmonics of the fundamental tone. Thus the vowel "e" as pronounced by an average male had considerable energy around 200 cycles and again some energy at the high frequency of 2,100 cycles. The vowels all had considerable energy in the lower harmonics below 5,000 cycles, while the consonants had considerable energy in the frequencies above that value. The vowels are all produced by the vocal chords and modified by resonance in various cavities formed in the mouth while pronouncing. The consonants are nearly all produced by the lips, tongue and nose, and they are merely different modes of starting and stopping the vowel sounds.

The mechanism of hearing was also dis-

cussed. It was shown how the sound impinges on the eardrums, how it is transmitted and amplified by the hammer, stirrup and anvil, and finally how it reaches some 35,000 nerve fibres, each attuned to one particular frequency. When a nerve fibre is excited by an incident sound wave an impulse travels to the brain and gives to the sensation of hearing.

The acoustic demonstration of the effect of missing frequencies was most striking and instructive. This was carried out by means of specially prepared phonograph records. At first a little speech was made with all the frequencies present in their correct proportion. The intelligibility was perfect and the illusion of reality was perfect. No effort of concentration whatsoever was necessary to understand what was being said.

Something Lacking

Then the same speech was made with all notes below 375 cycles missing. The intelligibility was still very good, but that something was missing was evident. The effect was exactly the same as that obtained from a horn type of loud speaker with average length of horn.

Next the same speech was read off with all notes below 750 missing. The intelligibility was now very poor. A concentrated effort was required to understand what was being said, and it is possible that most words would have been missed had not the same speech been made twice before. The energy level was also decidedly low. The sound was just like that emitted by loud speakers of the tin cup size.

After a second reading of the speech with all its pristine purity it was repeated with all notes above 2,500 missing. The volume or energy level was now very nearly as high as when all the notes were present, but the intelligibility was low. The trouble was not now that the vowels were absent, but most of the consonants seemed to be slurred. The sound was unpleasant, and again it had a familiar twang. It reminded the listener of reception of distant stations with highly regenerative circuits. It was the well-known barrel effect.

The question of tone and harmonic suppression can be illustrated with the aid of a piano and a little imagination. Suppose

that the piano is played in the usual manner. Then suppose that the listener suddenly went deaf to all tones below A in the middle octave. How would the residue sound to the peculiarly deaf individual? It would sound very much like the piano music that is emitted by a horn type of loudspeaker that does not bring out the low notes. This, of course, assumes that, although the individual went deaf to tones below A, he could still hear the harmonics of those frequencies which he is deaf to, and that he can still hear the intervals between the harmonics.

The Tin Cup Effect

Now suppose he suddenly goes deaf to all below about 750 cycles. Much more would be missing from the piano selection, but he would still recognize what is being played because he can hear the higher tones as well as the higher harmonics of the low tones. What he now would hear is like a piano selection reproduced by a little tin cup speaker.

Again, suppose that he could hear all notes up to about 2,500, but that he was totally deaf to the notes in the highest octave and to all frequencies above. All the low tones would now come through with full force as would all the lower harmonics of the low tones. That is, he would hear everything up to 2,500 cycles but nothing above. The low notes would not be greatly affected because their harmonics above 2,500 cycles are exceedingly weak. But the tones in the middle octaves would have their harmonics chopped off and therefore they would sound unnatural. The music would sound as if it came from a radio receiver which is too selective or which has too many and too large by-pass condensers across the line. It would be boomy and lacking in detail.

Other Test Methods

It is necessary to imagine a peculiar type of deafness to make this illustration mean anything. A much more definite idea of the effect of cutting of the higher frequencies can be gained by putting condensers of varying magnitude across the terminals of the speaker. That anybody can do. The effect of cutting down the low notes can be heard by putting condensers in series with the speakers and choke coils in parallel with it. The smaller the condenser in series and the smaller the choke coil in parallel, the more will the low notes be cut off. The effect can also be noted by using poor audio frequency transformers and a horn of small dimensions in the amplifier.

Summary of Facts

What are the facts strikingly brought out by this demonstration? First, when the sound reproduced by the receiver is of the tin horn variety that the low notes are missing; second, when the reproduced sound is of the tin cup variety, that the low and the middle notes are missing; third, when the effect is boomy with the consonants slurred, that the high audio notes are absent; fourth, when the sound is natural, that all the notes are present in their proper proportion.

PITTSBURGH LIKES WGY

In a recent test held in Pittsburgh among the listeners to determine the most popular stations from an entertainment viewpoint, WGY, Schenectady, N. Y., was first with 783 votes. WLS, Chicago, was second with 663 votes.

A NEW RECTIFIER

Raytheon Has "A" Supply Device

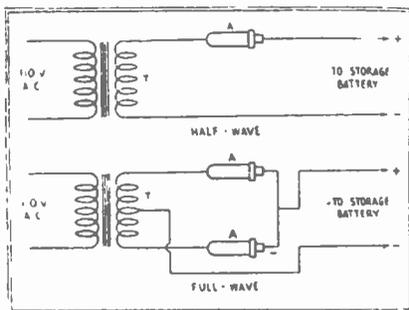
ESSENTIALLY a copper-finished cylinder no larger than a man's thumb, without delicate filaments, liquids or moving parts, sealed and foolproof yet affording a uni-directional conduction of heretofore unapproached efficiency without attention of any kind, the Raytheon A rectifier ushers in a new day both in the field of storage battery charging and in the development of a truly satisfactory A eliminator for supplying current directly to the filaments of existing tubes in standard radio receivers.

Raytheon A represents the culmination of long study and research on low-voltage, high-current rectification. The principle was discovered by a French physicist, M. Henri Andre of Paris, but the Raytheon Research Laboratories in Cambridge, Mass., as specialists in rectifying practice, developed it into a commercially feasible product, thus completing the possibilities of socket power for broadcast reception.

The remarkable efficiency of this new rectifier is due to a unique method of rectification, based on the little understood principle of obtaining rectification by the close association of two metallic conductors suitably arranged with a non-conducting agent.

This combination serves to reduce the resistance to the flow of current in one direction to a very low order—in fact, to a point closely approaching a continuous metallic conductor—while the resistance to the flow of current in the reverse direction is extremely high. The efficiency and economy obtained with the Raytheon A, therefore, closely approach the results which would be theoretically obtained with the ideal rectifier.

The Raytheon A metallic cartridge is as handy and as foolproof as the conventional cartridge fuse, and it is clipped in place in a suitable holder. Once installed, it may be entirely forgotten, because it requires no attention of any kind. At the end of a long and useful life, it is readily replaced with another. The polarity is so obvious that a mistake cannot be made if the holder has been properly connected in circuit. The small end or pin of the cartridge is the cathode, and should be connected to the positive side of the output circuit, while the body is the anode, and should be connected through the



SCHEMATIC diagrams of connections for half-wave and full-wave Raytheon A rectifier. T is the transformer.

transformer secondary to the negative side of the output circuit.

While the design and the operation of the circuit in which the rectifier will work best are quite simple, there are a few points which should be observed to obtain utmost satisfaction both in results and in maximum life from the rectifier itself.

First of all, the circuit employed with the Raytheon A is standard for rectifying practice. Reduced to essentials, it consists of a transformer, holder or clips for the cartridge rectifier, and a 5-ampere fuse. The fuse is required to protect the transformer and the rectifier, should the entire unit be short-circuited or incorrectly connected with the storage battery when serving as a charger. The rectifier, fuse and secondary of the transformer are connected in series to suitable binding posts or leads, the polarity marked, and the circuit is ready for operation.

While the Raytheon A opens up new possibilities in low-voltage, high-current rectification suitable for A elimination or filament supply practice in conjunction with the proper filter circuit, its immediate application is rather along lines of a most economical and satisfactory storage battery charger. For this purpose the transformer may be of any type giving suitable regulation and secondary voltage, as well as capable of delivering its rated current without undue heating. The secondary voltage should be approximately 9 volts under no-load conditions, with the transformer connected to a standard 110-volt lighting circuit.

Limits of Variation

A variation of line voltage of from 105 to 115 should not vary the secondary voltage to such an extent that it will rise higher than 9.5 volts or drop lower than 8.5 volts. Under no circumstances should the design and regulation be such that a current flow greater than 2½ amperes can take place with a line voltage of 120 applied to the primary. The transformer required is exceptionally small for the work done, because of the high efficiency of the rectifier.

If a charging rate higher than the full 2½ amperes be desired, it may be obtained by using two of the A rectifier cartridges, or the full-wave double A Raytheon, with a full-wave transformer. A charging rate of 4 to 5 amperes may be easily and economically obtained by this means.

As a storage battery charger, the Raytheon A has a most desirable characteristic in that it provides a taper charge, or one that is automatically adjusted to the condition of charge of the battery. Thus the charging rate is highest when the battery is at its lowest, and when heavy current flow is required to break down sulphate formation, but as the battery comes

up to full charge the charging rate becomes less and less.

Gassing Is Reduced

Not only does the taper charge tend to increase the life of the battery, but it reduces gassing and consequent liberation of excessive fumes from the battery, and eliminates noisy reception due to gassing even after the overcharged battery has been taken off the charger. With the Raytheon A the storage battery may be forgotten and left on charge for several days with no damage of any kind.

Aside from the taper charge feature, an overall efficiency of 50 per cent is possible with the Raytheon A when employed with a properly designed charging unit. This is fully appreciated when contrasted with the efficiency of the popular bulb type charger, which runs from 17 to 35 per cent under the best operating conditions. This efficiency represents a saving of several dollars a year in the electric light bill.

The efficiency of the Raytheon A makes it applicable to A eliminator practice, permitting of supplying current for the filaments of standard radio receivers, if a suitable filter circuit is employed. Several ingenious forms of low-voltage, high-capacity condensers have already appeared, together with certain chemical cells offering a very high DC resistance, but at the same time an extremely low AC path, for this type of filter.

Circuits on Way

The necessary low-resistance chokes have also been evolved. Several of these filter circuits have been submitted to the Raytheon Research Laboratories for approval for use with Raytheon A, and there is early promise of satisfactory filter circuits which will make the new rectifier available as an A eliminator.

Extensive life tests indicate that the life of the Raytheon A may be conservatively placed at 1,000 hours when operating under the conditions specified. An increase in the charging rate above 2½ amperes will materially shorten the life, while, as might be expected, the greatest life is obtained when the rectifier is operating at a lower charging rate of from 1 to 2 amperes. The rectifier is not recommended for use as a trickle charger at the present time.

Talks on U. S. History Win Listeners' Favor

That great numbers of radio listeners appreciate a short educational feature is demonstrated by the letter response received by WGY from its "Story of America" series. Fifteen minutes each week are devoted to the history of the Colonies and of the United States. The story is colorful, short and accurate, having been carefully compiled by Rosemary Cramb, a member of the WGY staff. In the tenth lesson the story has reached the period of the American revolution. "The Story of America" may be found on WGY's wavelength at 7:30 P. M. each Thursday night.

EARLIER WEATHER REPORTS

Washington.

The Weather Bureau, through the Navy Department, will hereafter broadcast aviation weather information, so that air stations can plan their daily schedules two hours earlier than formerly. It will also provide for those interested in crop production and prices an opportunity to obtain weather information much earlier than heretofore.

Low-Pass Filter Can Avoid Squeals

(Concluded from page 9)

negligible in the audio frequency amplifier.

So complete is the suppression that it would seem that smaller condensers could be used so that the suppression of the 10,000 cycle frequency would be less than 14 per cent. In fact, excellent results are obtained when the two condensers are half as large as those taken above, that is, .00025 mfd. each. However, when the detector is regenerative it will not oscillate as readily with the smaller condensers and it is necessary to increase the tickler somewhat.

If the condensers are made no larger than .0005 mfd. and the coil no larger than one millihenry there will be no danger of starting self oscillations in the detector. Use 200 turns of No. 30 wire on 2½-inch diameter, wind two such coils, place them side by side and connect in series aiding, to get this inductance. With the smaller condensers the circuit is still farther from being self-oscillatory.

New Miessner AC Tube Eliminates "A" Battery

B. F. Miessner, chief engineer of the Garod Corporation, has developed an AC tube now being marketed as the AC 100 Armor Oxide. This tube is used in the new Garod electric power receiver, model EM, but is suitable also for home-constructed sets. The following statement by Mr. Miessner explains the construction and operation of the tube, which eliminates the A battery:

"The tube itself has standard 201A grid and plate elements, but instead of the V type filament, it is provided with a straight filament of the oxide-coated type, of round section and operating at about 1 volt and 2.5 amperes. In the receiving set mentioned, this tube is used for detection as well as radio and audio frequency amplification, a 171 type power amplifier being used in the second audio stage. The amount of hum resulting, using a very high quality audio frequency amplifier and loud speaker, is so low that it can hardly be heard with the ear close to the speaker, and is in fact considerably less than that obtained when a B eliminator of the best type is used with an ordinary receiver. The filaments are operated at a temperature which hardly makes them visible, and extended tests have indicated an unusually long life for this tube. Its amplification constant, plate impedance, mutual conductance and grid plate capacity are similar to those of the 201A tube.

A Three-Element Tube

"Unlike other AC tubes recently announced, this is not a four-element tube with a separate heater for a separate cathode, but the cathode filament itself carries the raw alternating current, which

heats it as would the direct current in tubes of ordinary type. It is, therefore, a three-element tube with only the four connecting prongs customary to other tubes, and requiring no extra connections, such as those required by the four-element uni-potential cathode tubes.

"Measurements of the new tube indicate them to be about twenty-five times as good, with respect to hum, as the 112 type tube, which is the best of the standard tubes. That is to say, the hum is about 1-25th as much as that produced by the 112 tube. At the same time, the signal amplification is of the same order, while the plate current is only about 1-3 that of the 112 tube under their best operating conditions. Furthermore, the new tube can withstand a voltage variation of about 25 per cent without perceptibly increasing the hum, or very noticeably affecting the signal amplification, whereas a voltage variation of 10 per cent will considerably increase the hum for the 112 tube. It requires only about one second to become operative as contrasted to thirty to sixty seconds for heater type tubes.

Circuits Soon

"The solution of this problem does not lie merely in the use of a low voltage filament, or in a high current filament. The standard WX-12 type tube operates at approximately one volt and one-quarter ampere, but produces a hum of the order of one hundred times that produced by the new tube.

"Technical data telling how to build circuits using the Armor Oxide Tube will be released shortly."

"A" Eliminator Snag Overcome By Engineers

By Charles Golenpaul

The success of the B eliminator has naturally had its echo in the insistent public demand for an A eliminator, as well.

Three methods have so far been advocated for solving the A eliminator problem, two dealing with genuine A eliminator practice, and the third, which happens to be the most popular at the moment, dealing with a very practical improvisation or substitute.

First, there is the low-voltage, high-current rectifier, such as the Tungar, Rectigon, new Raytheon A cartridge, and others, capable of rectifying and smoothing out a heavy current with the aid of suitable transformer and a filter system characterized by heavy chokes and very large condensers. It has the advantage of operating the tube filaments of an existing set, without alteration of the filament connections.

Secondly, we have the high-voltage, low-current rectifier, such as the Raytheon BH already in use for the -99 type tubes, and the newer gaseous rectifiers of Raytheon and other types, as well as the filament type of rectifiers.

Need Ample Output

These A eliminators are really extra heavy duty B eliminators, with sufficient output to operate a number of vacuum tube filaments connected in series to take advantage of the high voltage available, in addition to the plate requirements of

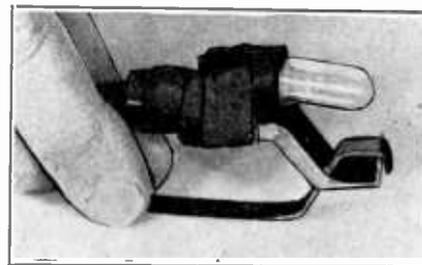
receiver and amplifier. This method has the advantage of reasonable sized chokes and filter condensers, but the necessity of series-connected filaments means that this type of eliminator must be employed with a specially wired receiver and amplifier. However, as a built-in feature of socket-power receivers, it is bound to prove very popular in the near future.

Thirdly, we have the so-called A eliminator making use of a small capacity storage battery and a low-current or trickle charger in combination. This arrangement is an ingenious means of always having a fully charged storage battery available, but it is not a true A eliminator. It requires some attention, particularly by way of adding distilled water and making sure that the battery is kept up to the proper charge.

A Big Step

From the viewpoint of practicability, then, the series-connected filament arrangement, operated by high-voltage, low-current rectifier and filter, is an especially good solution. This is bound to come into extensive use for the -01-A type tube, just as it has already met with considerable favor for the -99 type tube. However, the step from the 60-milliamperere current required by the -99 type tubes connected in series, to the 250-milliamperere current required by -01-A type tubes connected in series, has been a very

CLIP TESTER



A NEAT, compact and efficient testing device may be made with the aid of a storage battery clip and a flashlight bulb, usually supplied with the pilot light outfit. A flexible lead is soldered to the base terminal of the lamp. The lamp is then taped to the clip with the side of the lamp touching the metal. The flexible lead is then brought to the battery. Another flexible lead is then brought from the battery. When testing, the lamp lights up when there's a "short."

large one, requiring no mean degree of engineering in rectifier tubes, filters and even the variable resistors. Special rectifier tubes of the gaseous type with a 350 milliamperere output at 300 volts or more, have now appeared, furnishing the basis for the A eliminator for -01-A type tubes.

With series-connected filaments, the matter of current regulation assumes new proportions. Ordinary rheostats cannot be used, because of the high voltage and therefore the high resistance required. Fixed resistors do not fully meet the problem because of the wide variation of conditions encountered. The variable resistors heretofore available, even with the highest current rating of 20 watts as in the case of the universal range Clarostat, cannot handle the necessary current for long. To meet the new requirements, therefore, larger and heavier variable resistors had to be developed, notably the 40-watt Clarostat.

Photos Transmitted; Enlarged 9-Fold

Radioed photographs can now be enlarged to nine times their original size with the aid of a special receiving apparatus developed by the Radio Corporation of America. Photographs of David Sarnoff, vice-president of the corporation, and General James G. Harbord, president of the corporation, sent from New Brunswick, N. J., to 66 Broad Street, N. Y. City, via the R. C. A.'s station at Riverhead, L. I., were received in their enlarged form without any lost details. Full page advertisements also were transmitted and received clearly.

A small piece of specially treated paper does the enlarging. A rubber tube, through which hot air is pumped, is attached to the paper. When this air blows on the paper, black marks are made. Another tube through which cold air passes is placed so that the air emitted therefrom will interrupt the hot air. This cold air is controlled by radio signals. Therefore, as the radio signals vary, so do the hot and cold air impressions, thus making a series of black spots, interspersed with white space. The rapid interruptions cause these dots to be closely spaced and thus the image is formed.

HIS BEST PUBLICITY RELEASE

What he describes most enthusiastically as his best publicity release was the recent announcement of the engagement of R. W. McAdam, WEAF publicity representative, to Miss Ruth O. Stewart of Arlington, N. J. Miss Stewart is the cousin of Kathleen Stewart, WEAF's hostess-accompanist.

New Circuits Require Precision of Resistance

By Ralph A. Sayres

Sales Manager, Electro-Motive Engineering Corp.

[Mr. Sayres is widely known in radio circles. For many years he was in charge of advertising for A. H. Grebe & Co., Inc. Later he served the Daven Radio Corporation as special sales representative. Until recently he was in charge of advertising and sales for both J. B. Ferguson, Inc., and Arthur H. Lynch, Inc.]

Soon after radio amateurs bought their first audions, seventeen years ago, they discovered that by placing their fingers across the grid and filament terminals reception was greatly improved. Strips of paper with lead pencil paths for the electric current were soon substituted with gratifying results. This method was the forerunner of the modern grid leak.

Specially inked carbon papers soon came into vogue as grid leaks, but these possessed many inherent defects. The paper was not moisture-proof and gave varying resistance within wide limits, with changes in the temperature and humidity. Again, the current from the grid did not have a clear path. The molecules of conducting material were separated by wider spaces of dielectric paper. This led to arcing and resultant deterioration in resistance value due to carbonization. This carbonization meant a continually greater variation in resistance and eventuated in either open circuit or hissing.

The march of engineering progress led finally to various metallized substances which proved more dependable. This metallized deposit was applied on glass which eliminated some of the trouble, such as the absorption of moisture, wide variations in the resistance, hissing, poor contact, etc.

Splendid for Modern Circuits

Resistance-coupling and other forms of audio amplification employing power tubes, emphasized the need for accurate, absolutely noiseless fixed resistors, capable of carrying heavy plate circuit current drains in regular service without change in resistance value.

The need for non-inductive, no-arcing, heavy duty, fixed resistors was further accentuated when public taste turned to the "electrified" socket power radio set. The development of the new Raytheon and Q. R. S. tubes has meant the refinement of elaborate circuits in which the fixed resistors are many.

The most exact calculations of the most skillful engineer call for definite values of fixed resistance, with definite current carrying capacities and constant voltages, yet these calculations are upset by wide variations in resistors, due firstly to inaccuracy in manufacture and secondly to change in resistance caused by excessive heating of the resistance unit itself. For example, many types of fixed resistors have a pronounced positive or negative temperature coefficient that precludes their use in even the most fundamental "power" circuit. In others corrosion, due to excessive heating, results in an open circuit which means that the unit, often an expensive one, must be replaced.

Accuracy Attained

The new "Hy-Watt" resistors, grid leaks and heavy duty resistors, are the mature development of seasoned resistor experts. Their process of manufacture is unique, and affords accuracy and rugged dependability. A special metallized deposit is amalgamated with the outer surface of a vitreous tubing, which gives rigidity and ruggedness. This metallized deposit is impervious to moisture, heat, water and acids, and will not deteriorate

with the passing of time. The "Hy-Watt" metallized deposit gives positive, non-arcing, absolutely noiseless conduction to electric current.

In the "Hy-Watt" method of construction, the ends of the tube are then specially treated and silver plated for perfect contact with the terminal caps that are later eyeletted onto the finished product. The plated unit is then placed into a "spiralling" machine, and a laboratory calibrated ohmmeter connected into circuit with the "Hy-Watt" unit. The machine is then started and the film spiralled until the exact desired resistance is obtained. This method has proven far more accurate than any in which an attempt was made to gauge the resistance accurately by mechanical means. While the latter method of procedure resulted in from 5% to 25% variation, the "Hy-Watt" method gave that hair-splitting degree of accuracy so essential to 1927-8 electrified radio.

Carry High Current

"Hy-Watt" units are then capped and treated with several coats of a special composition paint, which possesses neither



HEAVY-DUTY type fixed resistor.

conductivity nor resistance. This composition paint "seals-in" the matchless accuracy forever and renders the unit impervious to moisture, heat and water.

Up to the time of the development of the "Hy-Watt" units, contact between the resistance element and terminal caps was made with low melting-point metals which would break this contact where more than one watt is dissipated. Also, the radiating surface in these types has been very small, resulting in concentration of heat in the comparatively small element.

"Hy-Watt" units have an unusually high current-carrying capacity, due to their large radiating surface, afforded by their unique construction. The "Hy-Watt" metallized deposit dissipates up to 25 watts per square inch with absolute safety. Hence the ordinary grid leak sizes are rated at 6 watts. These units are available in all values from 50 ohms to 10 megohms, while the "Hy-Watt" heavy duty resistors, ideal for all power work, are produced in all popular sizes between 100 ohms and 100,000 ohms, and rated at 12 watts. Special "Hy-Watt" units are also built to order to the most exacting specifications.

"Hy-Watt" resistors, grid leaks and heavy duty resistors have blazed new trails and established new standards for accuracy and noiseless dependability in resistors. They have overcome skepticism and gained the enthusiastic approval and indorsement of engineers, designers, manufacturers and experimenters everywhere.

NEW TUNER ON LOW WAVES IS SLIDING COIL

Utilizing an entirely new principle in tuning, Dr. Louis Cohen, formerly of the Bureau of Standards, consulting engineer for a number of years for the War Department and now professor of electrical engineering in George Washington University, and Dr. August Hund, prominent radio engineer, have designed a receiver which will go below 100 meters, without any of the common regenerative troubles and with maximum signal strength on the entire band. This is said to be a step toward making receivers that will go down below the 200 meter band, so as to enlarge the broadcasting band and ease up wavelength allotments.

"In this new method of tuning, variable condensers are not required, and it also has the inherent property of preventing regeneration, and this without the aid of any auxiliary neutralization circuits," Dr. Cohen said. "Also, with this method of tuning it is feasible to design a receiver to operate on any range of wavelengths, to go down even to 100 meters or less without any troublesome difficulties from regeneration.

"The method of tuning employed in this invention is based on the discovery that by a special combination of a closed metal cylinder sliding over an induction coil, a variation in the inductance is effected by which tuning can be accomplished."

Studio in Boston Opened by Ensco

New England fans will be afforded the privilege of hearing the famous Ensco cone speaker and examining the Ensco direct-drive distortionless unit at the newly opened studio and demonstration rooms of the Engineers' Service Company, 73 Cornhill Street, Boston, Mass. The location is ideal and can be easily reached from any part of the city or suburbs, and the studio is furnished with every care for the comfort and convenience of visitors. The studio is under the supervision of Daryl B. Tilson, well-known in the radio field, and with a large acquaintance in the New England territory, particularly. The main office of the Engineer's Service Company is at 25 Church Street, New York City, and they have branch offices and audition rooms in Newark, N. J., Philadelphia and Chicago. Announcement of others will be made shortly. This concern will gladly give information on speaker problems on application to the main office.—J. H. C.

STATIONS AID FLOOD FUND

Many stations throughout the United States put on special programs in the interest of the Mississippi flood relief fund and were instrumental in raising many thousands of dollars.

OPENS OWN SHOP

Spokane, Wash.

Fred A. Anderson, formerly of the H. D. Alton Electrical Company, recently opened a radio and electric shop here.

WBAL ON STANDARD TIME

Baltimore.

WBAL, Baltimore, will not operate on Daylight Saving Time.

Broadcasts Bring Out Artist's Supreme Talent

Broadcasting is stimulating many artists to put forth greater efforts and is enabling them to present better performances than they could ever achieve in physically appearing before audiences, according to several musical students and musicians experienced in both microphone and stage presentations.

"We are discovering in our work," states Julius Mattfeld, musical librarian of the National Broadcasting Company, "many artists who are at their best when performing for the microphone. In the quiet of the broadcasting studio, divorced from the mental pressure which a visible audience always causes, these artists can more completely utilize their talents. They are inspired by the fact that countless numbers of people are hearing them, while they are free from the nervousness which arises from the actual presence of listeners in any sort of a personal appearance. Moreover, we are discovering many artists experienced in stage work who prefer the broadcasting studio to the theater or the concert hall."

Prior to his connection with the National Broadcasting Company, Mr. Mattfeld was acting chief of the Music Division of the New York Public Library. His regular contributions to the musical press have made him known as a student of music whose opinions are worth-while.

Couldn't Face Audience

"There have been outstanding examples in musical history," he remarks, "of artists who could never do their best before large audiences. Consequently, they have been listed among the great musicians of their day merely through their compositions. Stephen Heller, for instance, was an exceptionally fine pianist, but he never appeared to the greatest advantage outside of his own salon.

"Chopin is another example of a marvelous performer whose real ability was never known beyond the comparatively small circle which included his intimate friends. Before them he could present his own and other composers' music in a manner which probably few pianists have achieved. But the thought of facing a great audience of people who were strange to him kept his remarkable gifts as an artist from the world. We know him as a great composer, not as a great performer.

"I believe that both Chopin and Heller would have made outstanding radio artists. Alone with the microphone and a few of their friends, they could have allowed the world to enjoy their extraordinary gifts."

The fact that broadcasting stimulates rather than hinders the performances of artists is borne out by the statements of two musicians who have had wide experience in both personal and microphone appearances — Jessica Dragonette, lyric soprano, and Arcadie Birkenholtz, violinist. Both are being heard regularly over the air through the associated stations of the National Broadcasting Company's Networks.

Miss Dragonette is known to theater audiences along Broadway. She sang the only solo part in Max Rheinhardt's original production of "The Miracle" at the Century Theater in New York. The following season she proved her versatility by her performance of the leading female role in "The Student Prince." Still

later, she played the ingenue part in the "Grand Street Follies of 1926."

Radio More Difficult

"Radio work is more difficult than stage work in many respects," Miss Dragonette says. "For that reason, I believe that it gives an artist a better opportunity to show his true worth. On the stage, there are tricks of gesture and other artificialities which enable a singer to cover up vocal laziness or voice imperfections. But the microphone, by removing the visual appeal, shows up all vocal tricks as just what they are.

"I know that I work three times as hard during a broadcast appearance as I would on the stage. And yet I love the work. It is interesting and intensely stimulating. Radio, by the very fact that it appeals to the ear alone, quickens people's imaginations.

"Practically everyone who attends a performance of a play carries with him some pre-conceived ideas of what he is about to see, with the result that the majority of theater-goers are disappointed when the final curtain falls. Radio listeners can have no pre-conceptions of what they are to hear when they tune in a program. Music over the air is bound to conjure up memories and mental images in the minds of those who hear it. That is the basis of the lure of the microphone. It is very nice to feel that I am helping people to build air castles and dream dreams."

Arcadie Birkenholtz is noted as a concert as well as a broadcasting artist. The great master, Leopold Auer, has called him one of the most gifted violinists of the younger generation.

"I enjoy my appearances before the microphone," Mr. Birkenholtz states. "In some strange manner, I can sense the fact that people are listening to my playing, even though I can not see them. And I believe that the fact that my audience is invisible enables me to concentrate upon my work to a greater extent than I can hope for on the concert stage. In the broadcasting studio, I am not annoyed by the petty disturbances which are bound to occur when a large audience assembles in a concert hall. If my radio listeners cough or rustle their programs, I can not hear them, and if they move about in their chairs, they can not disturb me.

Wide Tastes

"Beyond the fact that conditions in the studio help me to concentrate upon my playing, I believe that radio work possesses other advantages from the artist's standpoint. A performer makes as many appearances over the air in six months as he would in the ordinary course of two or three years on the concert stage. This necessitates a much greater repertoire on the part of artists who are facing the microphone regularly.

"Another advantage for broadcasting artists arises from the great catholicism of musical tastes possessed by those who listen to radio programs. On the concert stage, I find it necessary to suit my selections to the tastes of the comparatively small group of people which will hear me, but when I face the microphone, in the hope of pleasing a large number of those who are listening-in, I broaden the scope of my programs. This gives me experience in playing in public works I could never attempt to present in concert."

BELLANCA SET



(Herbert Photos)

LLOYD BERTAUD, navigator of the Bellanca 'plane, with the 30-watt transmitter on the New York to Paris flight.

WABC Programs Sent On 64-Meter Wave, Too

WABC has been transmitting programs of 64 meters through experimental station 2XE. The transmission and reception of broadcasts on low wavelengths presents many interesting problems, and as this field offers an opportunity for much experiment and observation it has gained the interest of many radio enthusiasts.

With the assistance of the listener, broadcasting of programs on low waves may soon be developed to the point of practical services. Believing that many in the WABC audience are now experimenting in the short wave field and that they may wish to report on the transmission of WABC and 2XE, a special card has been prepared which WABC forwards to those interested. The regular wave of WABC is 316 meters.

Sarnoff Answers Wells

SYRACUSE, N. Y.

Answering H. G. Wells, British author, who called radio "an inferior substitute for better systems of transmitting news or evoking sound," David Sarnoff addressed the faculty and students of Syracuse University. Mr. Sarnoff, vice-president and general manager of the Radio Corporation of America, cited the great vocal and instrumental artists heard over the radio here and in England, as well as leading public officials whose speeches were broadcast. He outlined in detail the technical progress achieved.

AERIAL CAPACITY MEASURED

Dr. F. W. Grover, consulting physicist of the Bureau of Standards, has prepared a pamphlet containing formulas and tables for calculating the capacity of all types of antennas, e.g., single wire inverted, single wire T, horizontal cage, parallel wire V, conical, umbrella, single horizontal and fan-shaped.

DIVER BROADCASTS



(Henry Miller)

THE GERMAN DIVER who broadcast from the bed of the sea had a microphone inside his headpiece. An airplane picked up his talk, as did a swimmer who was equipped with an airtight cap housing earphones and a small set.

Sign Forces Removal Of WPCH Transmitter

The broadcasting equipment of WPCH, which was formerly located in the Park Central Hotel in New York, was recently moved to Brighton Beach, L. I. The change was due to the erection of a huge electric sign atop the hotel, which absorbed the energy from the antenna.

"The new location is on the site of a former amateur transmitting plant reported at one time to have broken records for distance," said George H. George, manager of WPCH. "Two new eighty-foot towers have been erected. Tests during the last week have shown that better reception will be gained by the change."

The studio remains in the hotel.

"Sound of Face" Sent Over Ocean, Says Baird

LONDON.

Continuing with his experiments in transmitting moving pictures by radio, J. L. Baird, inventor of the televisior, says he sent the "sound of a face" across the Atlantic. His own image was the picture seen and sent. According to reports from the American side it sounded like a scratch. Plans are being made by Baird to visit the United States some time in June, to install a receiving set, which will change the sound of the face into the actual picture, so he says.

242,559 SETS IN SWEDEN

Four thousand radio licenses were issued in Sweden during the month of December, 1926, bringing the total of licensed radios to 242,559 for the year which averages 40.1 licensed radio owners for every thousand inhabitants. In Stockholm the rate per thousand inhabitants was 81.6, in Goteborg, 82 and Malmo, 102.8. Considerable increase in the number of radio licenses in the districts of south Svealand and northern Goteland is said to be due to the installation of a new station.

Organ is First Choice In Milwaukee Fan Poll

The mighty strains of organ music, coming in on ether waves, strike a most responsive chord in the ears of Milwaukee men, according to a survey by the Milwaukee "Journal's" research bureau. The first choice of the male audience is "popular organ selections," and that of the women "popular orchestra dance selections." However, taking the listeners as a whole, without division as to men and women, "popular organ" ranks first, "popular orchestra dance selections" second, and "symphony orchestra" third. Female singers are ranked last, by both men and women!

Because of the results of this survey, the "Journal" equipped its station, WHAD, with an organ, said to be the first in the country built solely for the purpose of broadcasting.

The percentage chart gives an idea of what forms of radio entertainment are most popular with the Milwaukee audiences:

	Women	Men	Total
Popular organ selections	92.86	84.82	91.13
Popular orchestra dance numbers	93.97	82.60	90.56
Symphony orchestras	86.78	80.09	85.59
Male quartette	80.24	82.60	83.52
Male singers of popular numbers	78.93	72.50	77.67
Mixed popular music	57.82	55.20	57.97
Humorous talks or songs	53.24	56.11	56.09
Classical string music	55.76	52.04	55.29
Classical organ selections	58.27	48.82	54.93
Semi-classical string music	49.77	43.19	47.68
Popular request program	48.82	40.42	45.77
Theater reviews	39.01	35.60	38.27
Mixed classical music	35.29	28.36	32.65
Classical singing	28.91	22.57	26.40
Female singers of popular numbers	21.87	12.25	20.58

Rickard to Use Chains and Shut Down WMSG

George L. (Tex) Rickard, prominent sports promoter and showman, completed arrangements for the future broadcasting of sporting events under his sponsorship through the Red and Blue Networks of the National Broadcasting Company, of which WEAJ and WJZ, New York, are

the key stations. Broadcasting through WMSG, now located in Madison Square Garden, where practically all of Rickard's sports events take place, will be abandoned.

Mr. Rickard said

"At various times since the radio has come into use I have been accused of being opposed to broadcasting our fights because I feared that the Garden attendance would be affected. On the contrary, I never was opposed to broadcasting on sound judgment. My only thought was to go slowly in the matter, because I did not feel that broadcasting any sports events from Madison Square Garden was worth while unless properly handled.

"I wanted to test the public pulse and for this reason I decided to give the broadcasting one year's test. I have found during the year that the radio has done more to create new fans for sporting events than any amount of advertising could possibly do.

"All such events as cannot be handled by WEAJ and WJZ and are not broadcast by the National Broadcasting Company will be sent over the air by some other competent station."

New Wave Line-Up For New York Stations

In accordance with orders issued by the Federal Radio Commission, several stations in the New York district have moved to new waves and have also been made to share time with another station. None of the waves is permanent, according to O. H. Caldwell, Radio Commissioner, who was recently in New York. A complete survey of the country will have to be made before permanent waves can be allotted, he stated. He also said that the goal of the commission was to allot twenty waves for the New York district, with a 50-kilocycle separation. Doing this will necessitate the removal of at least eleven more waves.

Following is the latest list of stations in New York with their new waves:

Stations	M.	Kc.
WCDA	199.9	1500
WIBS	202.6	1480
WFRL	205.4	1460
WMBQ	209.8	1430
WKBO	212.6	1410
WRST	215.7	1390
WJBI, WIBI	218.8	1370
WBMS, WARS	223.7	1340
WLEH, WMRJ	227.1	1320
WLEX	230.6	1300
WAAT, WBOQ	236.1	1270
WTRC, WTRL	239.9	1250
WGBB	243.8	1230
WBKN, WBRS	247.8	1210
WGCP	253.8	1190
WWRL, WBBC	258.5	1160
WAAM, WSDA	263.0	1140
WEBJ, WPCH	272.6	1100
WMSG, WRNY	280.2	1070
WSOM, WKBO	288.3	1040
WBNY, WHAP	296.9	1010
WGBS, WABC	315.6	950
WDWM, WNJ	322.4	930
WMCA	340.7	880
WHN, WQAO, WPAP	361.2	830
WODA, WLWL	384.4	780
WOR	405.2	740
WGL, WBBR	416.4	720
WJZ	454.3	660
WEAF	491.5	610
WNYC	526.0	570

Australian Program To be Sent by KOA

Beginning a few minutes before 1 A. M., Sunday, May 29, KOA, Denver, Colo., will broadcast an All-Australian program, running through till 3.30 A. M. This novelty feature, arranged by "Wireless Weekly" and 2FC, Sydney, Australia, will not only furnish a treat for DX-ers, but will be listened to by thousands of fans in Australia and New Zealand. Tests have been made, insuring satisfactory reception there, and many towns in Australia have declared a silent night, honoring the General Electric station. All numbers played will be typically Australian.

GERNSBACK BECOMES A CITIZEN

Hugo Gernsback, editor of "Radio News," got his final citizenship papers in the New York Supreme Court recently. He is head of the company that operates WRNY.

Current Flow Changes Resistance of all Units

One of the primary requisites of a good resistor is the permanence of calibration. If a resistor changes its value from time to time, or under load, the results may be most undesirable. Temperature co-efficient may be defined as an expression of resistance change with temperature. The resistance of practically everything changes with temperature. In the case of most metals, the resistance rises as the conductor becomes hot. Such materials are said to have a positive temperature co-efficient. Copper, for instance, has a temperature co-efficient of .0039, which indicates the fractional part of the original resistance which will be added to the circuit with each degree centigrade increase in temperature within certain limits.

If we multiply the temperature co-efficient by the degrees change in temperature, and move the decimal point two places to the right, we shall have the percentage of change in resistance with the given temperature change.

The resistance of some materials, such as electrolytes and carbons, decreases with heat; and such substances are said to be characterized by a negative temperature co-efficient.

All Heat Up

All resistors become hot under load. The heat generated is measured in watts and equals the current squared times the resistance (current in amperes squared times resistance in ohms gives watts). The heat generated raises the temperature of the resistor in an indeterminate ratio which depends upon the rapidity with which the resistor loses heat, which in turn again depends upon the radiation characteristics of the unit, temperature of the surrounding air, etc. Some resistors have very fine heat-dissipating characteristics, not getting very hot under reasonable loads, while others are less satisfactory in this respect.

It can therefore be seen that the resistance of any resistor will necessarily change when it is used in any circuit carrying current. The amount of change is of course proportional to the temperature co-efficient of the resistor. If the temperature co-efficient is high, the change may be so great as to unbalance such circuits in which the resistor is included. For instance, in B eliminator arrangements, the change with temperature may be sufficient to apply inefficient potentials to various plate circuits.

Effect in Eliminators

Wire-wound resistors have a positive temperature co-efficient which, in proper-

ly designed units is so low as to be negligible, unless the unit is operated at high temperatures. (This, however, is occasionally the case).

The temperature co-efficient of the Amsco Metaloid power resistor is .000446 per degree Fahrenheit.

A slight negative temperature co-efficient is highly desirable in resistors employed in eliminator circuits, where they tend to counteract the poor regulation curve of such apparatus.

As more current is drawn from a B battery eliminator, the voltage drops rather excessively. However, if the various voltages are obtained through drops across resistors having slight negative temperature co-efficients there will be less of a drop with the increased heating, thus counteracting to an extent the drop taking place through the rectifying system.

Dielectric Measures Thickness of Rubber

One of the great difficulties of rolling rubber to the correct thickness is solved through the use of a radio circuit similar to that utilized for broadcasting. In fact this method was discovered by a broadcast listener as he was tuning in on concerts.

The inventor, Albert Allen, of Boston, happened to put a piece of tissue paper in a condenser of his receiving set one night, thinking that the station he was listening to would come in better. Much to his surprise, he heard an entirely different station. This interested him and he put in a thicker piece of paper and, strangely enough, got a third broadcasting station.

Allen had not discovered a new radio principle, for it is well-known that changing the dielectric in a condenser changes the wavelength of the receiver. But there came to his mind's eye a practical use. If, he thought, changing the size of the paper, changes the wavelength of the radio set, why cannot we measure the size of paper placed in a condenser by noting the actual change in wavelength?

And, as a result of this thinking, there is, in the plant of The Miller Rubber Company of Akron, Ohio, equipment that actually measures the thickness of rubber going through the calenders to the 1/1000 of an inch. By means of an indicating

CRACKLING IN SET IS A TIP TO GET BUSY

Many fans note that upon turning the variable condensers to a certain setting, loud crackling noises are heard. The set also becomes totally unstable, rheostat and plate voltage adjustments failing to help.

The trouble usually lies in the condenser plates, which are touching at that point either directly or via some dust particles which contain metal and have accumulated on the plates.

Whatever the case may be, either a small 1½-volt dry cell or 4½-volt C battery and pair of phones or phone will aid you in running it down. Simply connect one terminal of the battery in series with the phone. This leaves you two terminals. Then disconnect one terminal of the condenser from the rest of the circuit and bring on the two testing leads. A click will show that there is a short.

meter, the calender operator can watch closely the thickness of the rubber as it is rolled and if it is too thick or too thin he can adjust the rollers to make it the proper size. In addition, the apparatus is connected to a recording meter and after the job is done the operator can be checked up as to how close he is holding his production to the pre-determined size.

The operation of the radio device is very simple. The rubber sheet as it comes out of the calender, passes between two large brass plates. The plates act as the two conductors of the condenser, and the rubber sheet and the small air space between the rubber sheet and the plates act as the dielectric. If the rubber is exactly the size for which the calender is set, the indicating meter registers zero position. This is accomplished by connecting the condenser to a tuned radio-circuit exactly like the transmitter of a broadcasting set. The meter measures the resonance of this radio circuit and any change in the resonance causes the needle of the meter to move. Therefore, if the rubber sheet is too thick, the capacity of the condenser decreases and causes the needle on the meter to go to one side of the zero mark. If the sheet is too thin, the needle goes in the other direction, indicating this fact to the calender operator.

Voltage Tests Used to Find Corrosion

A search for an accelerated test to determine the resistance of metals to corrosion is being made by the Bureau of Standards, Department of Commerce.

The Bureau believes, it was stated, that such a process may be found in the voltage required to cause the metal to corrode at a definite rate. The full text of a statement by the Department of Commerce follows:

The Bureau of Standards is interested in the development of an accelerated test corrosion, and believes that this may exist in the voltage required to cause the metal to corrode at a definite rate.

It is now generally agreed that the corrosion of metals, at least when immersed in liquids, is an electrolytic process. This

means that a current flows through the solution between the part of the metal that is dissolving (i. e., acting as an anode), and some other part which serves as a cathode and is not attacked. Such corrosion may be due to differences in the purity or physical condition of the metal at different parts, or to differences in the composition of the solution adjacent to different parts of the metal.

In order to determine the relative corrosion resistance of various metals, accelerated tests are often employed. Among these are electrolytic tests in which corrosion is hastened by the passage of a current.

Among such methods the one most fre-

quently used has depended on the loss in weight that occurs when the current passes for a given time. The present investigation has shown that these results do not give a satisfactory indication of the natural tendencies of the metals to corrode.

By measuring the potential or voltage required to cause the metal to corrode at a certain rate, a better indication of the resistance of the metals to corrosion is obtained. Further work will be required, however, to determine whether such an accelerated test can be depended upon to indicate the probable life of any metal under any given conditions of actual service.

DX Received in North at 52 Degrees Below

Winnipeg, Manitoba.

When any member of a certain class of popular fiction writer sets out to use "The North" as the locality for narrative, invariably his pen (or typewriter) quickly formulates a series of special adjectives to be applied to the terrain and intended to convey picturesque description.

Soon the place becomes barren, "waste," or "desolate;" there must be "spaces," always "vast" and a novel without references to the "silent" North can hardly be expected to progress via the bookseller's stalls to the best seller list.

But this has been changed. The North is no longer "silent." The radio has formed a link between the great spaces that are snow-clad throughout a long winter and the rest of the world. Its usefulness, not only as a means of relieving the monotony of life far from the other comforts of civilization but also as a practical means of communication has just been definitely proved.

Location Parties Sent Out

During the past Winter the engineering department of the Canadian National Railways was required to send out location parties into that same ambiguous "North," one proceeding on a survey in the Peace River District and the other striking out northward from the Hudson's Bay line, now under construction. On each occasion the equipment of the party included a radio receiving set, and the engineers in charge of the Peace River party, which has just returned to Winnipeg, declare that no feature of camp equipment has ever been previously devised to add so much to the morale of the men.

When the question of providing radio receiving apparatus for a location party was first taken up the matter was placed in the hands of A. R. McEwan, an American radio engineer now in charge of the Canadian National Radio Department. Under his direction a special six-tube super-hetrodyne was built with special attention to the particular conditions which would have to be served. The battery question formed a great problem in itself

and this was solved by the manufacture of special dry batteries designed for all necessary radio purposes. These batteries were placed in an appropriately designed box for protection against low temperatures, a factor even in dry batteries. The thermometer registered as low as 52 below during the recent survey, but no troubles to the set were caused by temperature.

Messages Are Received

There were practical uses for the radio receiving set while these parties were in the field. Notes sent back to the base by dog team or runners were relayed on to Winnipeg and there checked. In the ordinary course of events, weeks would elapse between the time of writing and the return message. Here the radio department came in. As occasion demanded, messages from the chief engineer were sent to the broadcasting station of the Canadian National Railways here and were placed on the air at certain specified times. This proved most satisfactory and in a report written by J. L. Charles, locating engineer, from Owl River, in Northern Manitoba there occurs this statement:

"Your messages have been received very clearly on loud speaker."

A further statement is this: "Last Saturday we heard Sir Henry Thornton's address from the Fort Garry very distinctly. The radio has been a source of much entertainment to all of our party and has given excellent results."

With the Western Region survey party in the North Country, there travelled a colored worker, J. Watson, who was very proud of the fact that he was the first of his race to travel in those particular parts. Watson was a keen listener-in and in this he was ably assisted by two Indians, who accepted the radio philosophically as another of the white man's contraptions.

WJR ON BLUE CHAIN

WJR, Detroit, operating on 516.9 meters, has joined the "Blue Chain" of the National Broadcasting Company.

Voice of King George May be Heard in U S.

In connection with the diamond jubilee celebration to be held in July, a Canadian committee is planning the most extensive chain station broadcast ever attempted. They hope to have the carillon bells of the Peace Tower in Ottawa and a message of King George, which will be made in reply to the playing of the national anthem by the bells, heard all around the world.

The first broadcast is expected to take place at about 4 P. M. on July 1. The program will be relayed from Ottawa via telephone lines to Drummondville, Quebec. Here it will be picked up by a Marconi beam station and sent to England. Telephone lines will carry the signals to London, from where they will be broadcast throughout Europe. The message from the King will follow, by the reverse route.

Baltimore to Resume Municipal Band Music

Baltimore, Md.

Due to the success of the semi-weekly outdoor concerts broadcast all last Summer over WBAL by the Municipal Band and the City Park Orchestra, the city recently appropriated \$1,500 to provide a permanent hook-up with the music pavilion at Patterson Park, which will permit these two popular concert hours to return over WBAL this Summer. These concerts are scheduled to begin around the first part of June.

It is planned to broadcast two of these municipal concerts a week, the Municipal Band and the City Park Orchestra alternating on these nights. Nelson C. Kratz is conductor of the Municipal Band, which has been on the air all Winter over WBAL, while Robert Iula is conductor of the City Park Orchestra.

Parlor Cars Equipped With Built-In Sets

The Canadian National Railways have equipped the new parlor cars used on the special fast day train, operating between Montreal and Boston, with radio receivers. All the apparatus was built into the cars during construction of the cars. At each chair there is an outlet with a pair of phones hung on the wall. A cone loud speaker is also provided.

Paradise to Old Folks

"Many of us fail to realize what radio means to the aged," H. V. Kaltenborn in a recent talk over WOR said. "Old people have always lived in the country rather than in the city. Old people have leisure. Old people are cut off from contacts. They do not get about easily. Often they do not hear well or see well. To them radio has brought a new heaven to earth. Their active minds have received new stimulus and refreshment. They can hear the loud speaker when they can't hear across the dining room table. Their eyes get needed rest while they listen. One reason why the old songs are so tremendously popular over the radio is that they bring happy memories to the aged. The great men of our generation step into the little sitting room that represents the limits of the physical world for millions of old folks. They spend hours at these humble firesides bringing news and views, information and inspiration. They bless radio because radio has blessed them."

WOC TO GO ON BLUE CHAIN

WOC, Davenport, Iowa, arranged with the National Broadcasting Company to join the Blue Network of Stations, fed by key station WJZ, New York, for some of the outstanding "Blue Chain" programs.

Filament Overheating Causes Tube Paralysis

Most of the present-day tubes contain the thoriated-tungsten type of filament, although a few types make use of the oxide-coated type. The thoriated tungsten type depends for its electronic emission upon a surface layer of active material. This surface layer, however, is not applied by mechanical means, as in the case of oxide-coated filaments, but is automatically formed on the surface by the operation of the filament at a certain temperature. Therefore, operated at its critical temperature, the thoriated-tungsten filament will constantly replenish its surface layer, so that the tube will function at maximum efficiency. If the filament is consistently operated at an over-voltage, however, the electron emission will drop off more or less rapidly, due to the destruction of the active surface, and in time the tube will become inoperative. A tube may be paralyzed even in a few minutes by filament over-

load, this being a common occurrence. The baffling feature of the thoriated-tungsten filament is that it may be burning quite brightly, yet the tube will fail to function. This is due to the destruction of the electron emitting surface layer. As a plain tungsten filament, the tube must be operated at a temperature of from 400 to 500 degrees Centigrade higher, which is usually not attained where everything has been arranged for the thoriated-tungsten filament. Hence the tube is inoperative or paralyzed.

The smaller thoriated-tungsten filament tubes, particularly the dry-cell 199 and 120 types, are most subject to paralysis, due to the critical voltage. For this reason, the careful radio enthusiast, anxious to enjoy normal life and best results from his tubes, will employ an accurate voltmeter so as to keep the voltage at the proper mark, or an Amperite for the automatic regulation of filaments.

A THOUGHT FOR THE WEEK

RADIO may be in its infancy, as declared bromidically by our more or less brilliant after-dinner speakers, but it is such a bawling, yowling and really unmanageable youngster that it will take something more than a dose of paregoric to keep it in order. But it's all worth the trouble. Radio is here to stay—which also sounds bromidic, but it is true to 101 per cent.

SIXTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

Member, Radio Publishers Association

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

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1/2 Page, 7 1/4" x 5 1/2"	231 lines..... 150.00
1/4 Page, 8 1/2" D. C.	231 lines..... 150.00
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Ultra-Violet Waves Modulated by Voice

Rome.

Before some of Italy's foremost scientists in the Academy, Professor Quirimo Majorana, announced the perfection of a system by which voice may be transmitted via ultra-violet rays.

He uses a mercury vapor lamp, the rays of which are modulated by a microphone. These are projected in a beam toward the receiving station by means of reflectors. In the receiver these rays fall upon a photo-electric cell. They are then transformed into a current of varying intensity and amplified by audio amplifiers in the standard fashion.

The system has proved successful over a distance of ten miles, he said. The method is secret, since signals can not be intercepted unless the receiver is in the direct path of the signal.

Women Need Vocal Art to Speak to Mr. Mike

Interviewed by Hildegarde Fillmore, Bertha Brainard, manager of WJZ, discussed the woman's voice on the air. The interviewer, in the June issue of "McCall's Magazine," quotes Miss Brainard as follows:

"It is hard to realize fully how tremendously important the human voice is in reaching the millions that make up the radio audience. I never knew before how vital it was in transmitting to a great number of people the fine quality of one's personality. The success of a performer depends almost entirely on its effective handling and control. I cannot help feeling that it is time we were learning that all this applies, too, in daily intercourse with each other. The radio has taught me some of our greatest weaknesses, weaknesses which only common sense and a critical ear can do anything to correct.

Hearing One's Broadcast

"It is difficult, for instance, to make a woman's voice sound natural on the air. When we're under tension or nervous strain our voices seem to show it immediately. Sometimes the voice is the only thing about us which gives us away.

"Do you know that in a broadcasting station it is actually possible to hear yourself over the radio? When the doors between the broadcasting room and the reception room are opened, you can hear your own words coming back to you through the loud speaker.

"This is one of the best ways I've ever encountered to detect faults of diction and modulation. When I began to broadcast I was horrified to hear how affected my voice sounded. When I pitched it high, it came out shrill; when I tried for

low tones it sounded heavy and theatrical. After some practice I found the radio level for my particular voice.

"This may sound like an experience limited only to the microphone, an instrument which does queer things to the voice. But has it ever occurred to you that our nerves and temperaments act the same way? Only the trained actress, or the exceptional woman whose voice is beautifully under control, can keep it firm and even under stress.

Advises Some Imitation

"Frankly, I know of nothing so un-beautiful as the effect of anger or hysteria on an uncontrolled voice. It wouldn't surprise me at all to discover some day that this is the cause of much unhappiness in this world, in homes where children are screamed at, in business offices where women capable and expert in other ways, lose control and raise their voices in anger or irritation. No one will deny that a lovely, well-controlled voice is a social and business asset. I should go a step further and say that it is one of the true essentials of beauty. It carries a great deal more weight than we think in our judgment of the poise and charm a woman possesses.

"When you go to the theatre, notice how your favorite actress plays upon her voice, as if it were a separate instrument, like a violin. And over the radio try to analyze the charm of some speaker you love to listen to. They will all help you to develop the 'unseen beauty' which lies in that marvelous instrument we call our vocal cords. All my life I have reacted quickly to the quality of a stranger's voice, but in working with the radio, this sensitivity has greatly increased."

Wait a While for Your Television 'Phone Unit!

Washington.

The time is now in sight when television will be an attachment to every telephone, according to Dr. Edwin E. Slosson, director of Science Service, and member of the National Research Council. Dr. Slosson has been in close contact with the laboratory development of radio motion pictures and believes the latest demonstration was successful and that the future is a matter of simplification.

"It is one of the greatest triumphs in the history of communication methods," says Dr. Slosson. "Despite the elaborateness of the apparatus, television depends essentially upon the fact that a film of potassium metal in a vacuum tube can be

made to give a small electric current when light shines on it. This is the photo-electric cell. The method of its use in the new process is quite different from previous attempts to attain the same result.

"In other methods the subject whose visage is to be transmitted is flooded with brilliant light, and a lens picks up the illumination and focusses it on a small photo-electric cell. In the new method by the idea of Dr. Frank Gray, the subject is illuminated with a tiny moving spot of light, which is picked up by a battery of large photo-electric cells—the largest yet made.

"The result is the most successful transmission of the actual view of the human face that has yet been achieved."

Navy Memorial Night Is Arranged by WIP

The U. S. Navy will present a memorial program through Station WIP, Gimbel Brothers in Philadelphia, on Saturday night, May 28, starting at 9:00 o'clock, Eastern Daylight Saving Time, sponsored by the League Island Navy Yard of Philadelphia.

A patriotic program will be played by the U. S. Navy Band, and addresses will be made by Admiral Thomas McGruder, Commandant of the Philadelphia Navy

Yard, and other high ranking officers. The U. S. Army will also be well represented in this program with addresses by Colonel Louis S. Sorley, Chief of Staff of the 79th Division, U. S. A., and other army officers.

The program is under the personal supervision of "Mother Katherine" Moore, known throughout the entire country for her philanthropic work in the various Navy Yards. She also gained fame in cantonments during the war.

JOINT SENDING PLANTS GIVEN BULLARD O. K.

Washington.

Chairman William H. G. Bullard, of the Federal Radio Commission, believes that a consolidation of broadcasting service whereby two or more stations would use a single transmitter would greatly relieve the present congestion on the air. "One of the plans whereby the Commission hopes and expects to get better broadcasting service and at the same time to bring about far greater economy and efficiency in the broadcasting service," says he, "is that of encouraging the consolidation of radio stations through the use of two or more sets of call letters for a single transmitter.

Call Letters Important

"For instance, here is a city with four or five radio stations, all with low power, all dividing time, and all finding it more or less difficult to secure adequate program material.

"Each station owner, however, is convinced of the publicity value to him of his station call letters, and though he often feels that he is actually losing money in his broadcasting venture, he is unwilling to give up his station because of what the call letters mean to him.

"How much better it would be, from every standpoint, to have these four or five stations consolidated into a single one, with adequate power and full time, each of the former broadcasters paying his share of the overhead and each retaining his call letters for the hours assigned to him.

Costs Less

"For the broadcaster this means less expense and better results; for the listener it means far better service and less confusion. This plan has actually been put into operation in a number of places, with admirable results, and the Commission is definitely encouraging it as one way to provide better service for the listening public."

FAR PLACES LIKE JAZZ

That dance music is appreciated in the corners far from civilization, even if jazz is not the favorite music close to home, is evidenced by the letter received from Africa by George Hall, director of the Royal Arcadians. His programs are broadcast direct from the Arcadia Ballroom, New York, by WGS, Gimbel Bros., New York, every Saturday, 3 to 4 P. M., and in the evening from 7:45 to 8:45.

Board Rules Call Letters Be Given Every 15 Min.

Washington.

The Federal Radio Commission issued the following order that all stations give their call letters at least once every fifteen minutes.

"For the purpose of facilitating a more accurate check on station frequencies, both by the Federal Radio Supervisors and by the public, each radio broadcasting station licensed under the Radio act of 1927 is hereby directed to announce its call letters and location as frequently as may be practicable while it is broad-

Fight to be Made on New Law's Constitutionality

By Thomas Stevenson

Washington.

The authority of the Federal Radio Commission to deprive a station of its license is one of the most acute problems in the present situation.

The framers of the Dill-White radio bill believe that it gives the Commission ample authority to close down stations which it considers to be opposed to the "public interest, necessity or convenience."

But some of the best legal minds of the country have declared that such a step would be unconstitutional; that it would amount to confiscation without due process of law and without just compensation, which would be in violation of the Fifth Amendment.

Sykes Studies Subject

Eugene O. Sykes, of the Federal Radio Commission, a former judge, has considered the arguments advanced on both sides. He is not yet prepared to give his opinion.

"It is the duty of the Commission to enforce the law according to its interpretation of its provisions," said he. "If in our opinion the public interest, necessity or convenience will be served by refusing a license to a station, the Commission will consider it its duty to do so.

"It does not come within our province to question the constitutionality of the law or any of its provisions. That is a matter for the courts to decide."

Representative Wallace White, one of the authors of the bill, has been in close touch with Judge Sykes on the matter and if the present law should prove inadequate, a new law or an amendment to the present one will be introduced in the next Congress.

It is expected that there will be a test of the case in the courts within a very short time. The Commission, it is understood, already knows of a case that will be projected.

Lawyers' Report Studied

One of the main things that is figuring in the considerations of Judge Sykes and others who are studying the question is the report of the Broadcasting Committee of the American Bar Association which was written when the Dill-White bill was under consideration in Congress. The Bar Association Committee doubted the Constitutionality of depriving an existing station of a license. The report set forth:

Drastic Provision

"To close stations in which large sums of money have already been invested is obviously a drastic provision. We do not believe that the courts will hold constitutional legislation which permitted such closing either directly or indirectly by way of declining to issue new licenses, unless just compensation were paid."

Relief for Chicago Air Promised for Next Month

Washington.

The air angle in the Chicago territory is being tackled, said Commissioner Bellows of the Radio Board, with the expectation that the remedy will be nearly complete by June. The frequencies of the stations elsewhere in the United States also are tied up with the Chicago problem.

"If the commission were merely to rearrange the Chicago stations," said Mr. Bellows, "half of them would be on wave lengths used by powerful outside stations, and the situation would be worse than ever. Changing the wave length of a single Chicago station ten kilocycles may mean the shifting of stations in Iowa,

Missouri, Ohio and Michigan in order to clear the channel.

"This is the task the commission is now working on, and it expects to have the whole national traffic system for broadcasting readjusted very shortly. Until that is done, any attempt to reallocate the Chicago wave lengths would do nothing but harm.

"The more than forty stations in the Chicago area will, within the next few weeks, find themselves assigned to channels fifty kilocycles apart. Preference will be given to those stations with a consistent record of satisfactory public service. Time division or consolidation of service will be general and great progress has already been made toward bringing about such consolidations."

Classic Is Defined By Director of WLW

Fred Smith, director of WLW, Cincinnati, said:

"The public's conception of a classic is a musical selection written by some one who is dead. The selection must be beyond comprehension."

Wherein, Smith insists, the public is wrong, because some "classical" selections have eventually become "popular" music while some so-called "popular" numbers have in the end been recognized as "classics."

Smith contends that the real meaning of "classical" is music that is approved as standard for whatever it represents, that is, music that best expresses feeling.

Radio University

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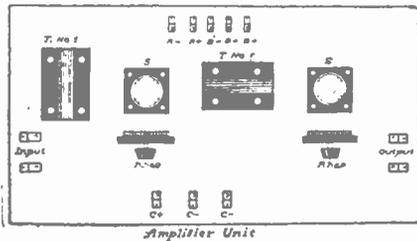


FIG. 535

Layout for a 2-stage transformer coupled audio frequency amplifier requested by Howard Rignon.

WILL YOU please give me the following information?

(1)—When was the first press message sent across the Atlantic?

(2)—Did Dr. A. J. Fleming take out his original patent for two-element tubes in 1904?

(3)—When did the S. S. Republic send out her historic CQDs (distress signals)?

(4)—When did Michael Faraday discover electro-magnetic induction between two circuits?—WALLACE GORDON, Troy, N. Y.

(1)—On January 20, 1904.

(2)—Yes.

(3)—On January 23, 1909.

(4)—1831.

* * *

A FRIEND of mine gave me the circuit diagram of a five-tube receiver, in which two stages of tuned radio frequency amplification, a regenerative detector and two stages of transformer coupled audio frequency amplification are used. According to the data stated on the diagram, the primaries contain 10 turns, while the secondaries contain 45 turns, both wound on a three-inch diameter tubing, using No. 22 double cotton-covered wire. The tickler in the detector coil consists of 36 turns of No. 26 single silk-covered wire wound on a 1 3/4-inch diameter tubing. The method of connecting the second RF coil is a bit different. That is, instead of bringing the grid return lead to the minus A post, it is brought to the minus C post. I do not understand this point. Please explain how to hook it up.—H. MORRIS LEHORN, Albany, N. Y.

The C minus connection just supplants the A minus connection. That is, instead of connecting the grid return to the minus A post, it is connected to the minus post of a C battery. This system is used to increase selectivity. Anything from 1 1/2 to 4 1/2 volts may be tried. About 3 volts is usually found to be the best. The larger the bias the lesser the volume. Fig. 563 illustrates the method of connection. The beginning of the primary winding goes to the plate, the end to the B plus. The beginning of the secondary winding is, of course, brought to a low potential point, since it is next to the B plus connection, in this case C minus. The end of this winding is brought to the grid post of the second socket.

* * *

I HAVE the circuit diagram of a seven-tube receiver in which three stages of tuned radio frequency amplification, a regenerative detector and three stages of resistance coupled audio frequency amplification are used. I have the constants of all the parts, except the fixed resistors, which are inserted in series with the grids of the radio frequency tubes.

(1)—What is the resistance of these resistors?

(2)—What is the function of these resistors?

(3)—Two double condensers are employed, one pair in the first and second RF stages and one in the third stage and detector. Could I use midget condensers across the secondaries of the coils in these circuits for vernier adjustment? If so, could I use 15 mmfd. variables.—CHARLES LENCOLNER, Jersey City, N. J.

(1)—200 ohms, fixed.

(2)—To prevent oscillations or stabilize the circuit.

(3)—Yes, with very good results.

* * *

IF I USE 90 volts B on the plates of audio tubes in the last two transformer stages of my set, can I use a common 4 1/2-volt C battery as grid bias?

(2)—My set is of the three-tube regenerative type, using a three-circuit tuner. The tuning is very broad, although the signals are loud. Could this be due to the primary winding, which consists of 15 turns? My antenna is 120 feet long, including the lead-in, while the ground wire is 15 feet from the set. Is this all right?—GEORGE HARRISS, Davenport, Ia.

(1)—Yes, use the same battery.

(2)—It is due to the large primary and long antenna. Put a fixed condenser of .0001 mfd. or less in series with the aerial.

* * *

ABOUT THREE months ago I constructed a B eliminator and power amplifier, using a CX316 B tube in the rectifier circuit and a 210-power tube in the audio circuit. I would like to insert a 0 to 100 milliammeter, so as to read the amount of plate current drawn by all the tubes. Is one meter terminal connected to the B minus, which is also C minus? Is the other terminal connected to the terminal of the resistor that is in series with the mid-tap of the secondary winding supplying AC to the filament of the power tube? That is, should I just break the connection between the resistor and the B minus, and insert the meter?—F. THOMAS ROMER, Atlantic City, N. J.

Yes.

* * *

PLEASE GIVE some advice as to the proper placing of an acid storage battery, on how to remove acid from anything it may come in contact with, on the use of the "quick charge" solutions on the market, and on years' service that can be expected from a battery.—GERALD HUMPHREYS, Portland, Ore.

It is advisable to place your storage battery on a rubber or glass tray, in order to prevent damage by the sulphuric acid should it by any chance or mishap leak out.

Sulphuric acid is harmful to almost anything with which it comes in contact but can be effectively neutralized or killed by ammonia or bicarbonate of soda solution. Should acid get on your hands or face, it should be removed with clear water.

Do not use or permit anyone else to put any "patent electrolyte" or "quick charge" solutions into your battery. These solutions will ruin the battery in a short time. Never permit an open flame near a storage battery.

Three to five years' service is not too much to expect from any standard make if it is given a reasonable amount of care. Many last even longer.

It has been truly said that most batteries die of neglect and abuse rather than from wearing out in service.

* * *

PLEASE GIVE me the layout for a two-stage transformer coupled AF unit,

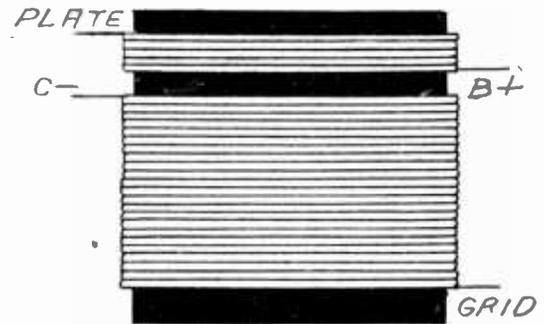


FIG. 536

How the connections of an RF coil are made, a C bias being used on the grid of the tube.

using two 20-ohm rheostats, two navy base sockets and clips. The unit is to be used for testing.—HOWARD RIGNON, Wichita, Kans.

This is shown in Fig. 535. The board should be about 7 inches wide and 10 inches long. Provision is made for two C batteries, should you desire to use a higher plate voltage on the last one than on the first stage. Two B plus clips are also provided for this purpose.

* * *

I CONSTRUCTED the receiver diagrammed on page 15 of the Dec. 15 issue of RADIO WORLD. The signals on all stations, of course, are not loud enough to work a speaker. I would therefore like to add a 3-stage resistance coupled audio frequency amplifier, such as diagrammed on page 7 of the May 14 issue of RADIO WORLD, using the tubes specified. Is this all right?

(2)—Does the 1-meg. resistor in the input circuit supplant the phones on the input of the receiver?—LAWRENCE C. LAUGERSON, Newark, N. J.

(1 and 2)—Yes.

* * *

I CANNOT get my set working anywhere 100% so I would like some information.

I have a three-tube, three-circuit set with 199 tubes. Tubes all new since first of year. Test OK now. My main troubles are lack of volume; cannot get distance, and not selective.

Until one month ago, I had a two-tube set. It worked the horn on locals. I could get Dallas, Lincoln, New Orleans, Florida, Atlanta, etc. on phones after midnight and sometimes during early evening. Since making the three tuber, I must turn detector rheostat 1/2 on, to get Detroit on phones before midnight. It works horn on locals very good by just turning rheostat on.

(1)—Works almost as well without grid leak. Have tried 2, 3 and 5 meg. leak and .00025 grid condenser, but to no avail.

(2)—Set does not regenerate properly. Have to use fixed condensers across primary of first audio most of time. Then, when I tune in distant stations by whistle. I hear a voice or some music very plain but accompanied by the whistle. Turn back tickler to where whistle stops and lose station completely.

(3)—My tuning coil was originally a commercial product, Litz wound. But insulation started to wear off, so I rewound it. It is now 4 1/2" from first audio. Is this too close? If it is, I can move closer and shorten tickler leads. If too close I must lengthen leads.

(4)—No matter how I turn coil, second lead to rotor is only about 1/2 to 5/8" from grid condenser and passes either over or under grid condenser to variable condenser. Does this hurt?

(5)—Set is wired with both insulated wires and bell cord which is insulated.

(6)—Had terminal strip at right end of set with A plus and B leads from No.

3 socket only about 1/2 as long as now marked. Changed it to present place to shorten B+ leads from each audio. Which is best?

(7)—I installed new dry cells lately, now testing 22 to 24 volts. B batteries test 33 and 42.

(8)—Ground direct to cold water pipe in basement, pipe cleaned, use copper clamp. Aerial 85 feet, 22 feet high rear end, 3 feet above chimney of three-story block, 35 feet lead in to first aerial and 7 strand enameled copper wire is used.

HALLAM S. WHITNEY.

(1)—It is quite likely that you have a defective grid condenser or defective socket which is leaking so badly that the addition of a grid leak makes practically no difference.

(2) It is all right to use a fixed condenser across the primary of the first audio. Your trouble is probably caused by defective parts.

(3)—4 1/2 inches from transformer should be sufficient.

(4)—Yes. Move grid condenser.

(5)—Don't bother about the 1/2 inch. See that the terminals on the flexible insulated wires are tight.

(6)—It doesn't make any difference.

(7)—Try grounding —A battery on detector. I would suggest using a C battery. Run grid leads of audio transformers to —C battery. Connect +C battery to —A battery. B batteries testing under 34 are ready for the discard. Better buy new batteries.

(8)—Aerial sounds fine, provided joints are good. Be sure to scrape enamel off the wire before connecting the lead-in to it. A lot of people don't and that may be the cause of all your trouble.

* * *

HOW SHOULD the 200-A grid return be connected? Can you tell me which tube matches the Farrand Junior cone and also must a heavy output be put on this speaker to get its full tone quality? Could you print hook-ups showing how to use the 0-50 milliammeter to measure current drain of detector tube and also how to measure the current drain of the whole set?

ISIDORE GOLDSTEIN

It is best to run the grid return to filament minus, through the resistance. This is because you have a drop of one volt through your resistance and do not need this greater bias when running di-

rectly to the lead on the battery side of the rheostat. Zero bias is best for the 200-A and 300-A. A 112 tube would give you somewhat better results with your Farrand Junior cone. However, should you wish to continue using your 201-A and decrease the distortion which is indicated by the fluctuation of the milliammeter needle, increase your B battery voltage on this stage. To measure the current drain of the detector, connect the milliammeter to the B battery lead to the detector stage. To measure the current drain of the entire circuit, connect the milliammeter in the B— lead. If the needle gives minus zero reading, simply reverse the meter connections.

* * *

WILL YOU please inform me as to how

I can magnetize my speaker line. Please give capacities of meters to be used if any.

P. GALE.

If your loudspeaker is demagnetized it can be remagnetized by winding approximately 100 turns of well insulated No. 28 wire around the magnets and letting current flow through it. Tap the coil with a hammer a few times at first, having a 10-ampere fuse in series with this coil. It would probably be cheaper for you to either send the magnet back to the manufacturer or take it to one of the many radio shops that do remagnetizing for a dollar or less.

WOC FIVE YEARS OLD

WOC, Davenport, Ia., recently celebrated entrance into the sixth year of broadcasting.

More Volume! Greater Distance! Better Quality!

All of These at Your Command
When You Use a De Luxe
Model BRETWOOD VARIABLE
GRID LEAK

When you are deciding on what parts are to go into the receiver you are about to build, under no circumstances dismiss the grid leak with only casual consideration. Respect the grid leak as something well worthy of expert choice.

The best course is to select a variable grid leak with an ample resistance range, one that may be mounted on baseboard, sub-panel or front panel, as you prefer.

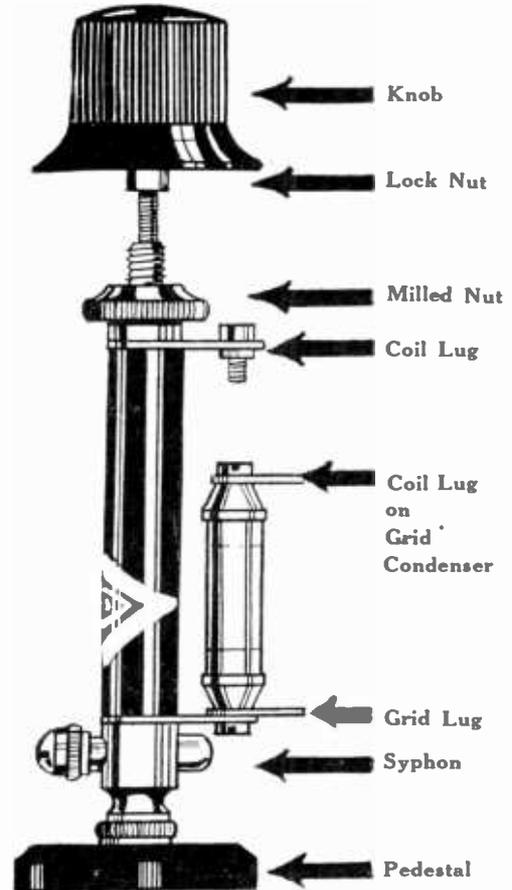
Such a leak is the BRETWOOD VARIABLE GRID LEAK, which is now on the market in new de luxe model, representing improvements in mechanical strength, electrical efficiency and utility.

Higher Efficiency

You should use a variable grid leak like the BRETWOOD VARIABLE GRID LEAK in a set you are about to build, or should put one in your present receiver, because it will enable you to get highest operating efficiency from the detector tube. As nearly all tubes used as detectors draw grid current, the resistance value of the leak is important for biasing and discharge purposes. Not only can exactly the right degree of flow be established to discard excess electrons, but the grid-to-filament impedance is so affected as to afford best selectivity under the circumstances. Only a variable leak gives this precision choice.

Overloading Prevented

You prevent overloading of the detector tube by correct leak setting. This improves tone quality considerably. Often if your set sounds distorted, this is immediately and permanently remedied. Hence you reap greater volume, better selectivity and purer tone quality—all by the simple insertion of a BRETWOOD DE LUXE MODEL VARIABLE GRID LEAK.



The De Luxe Model Bretwood Variable Grid Leak is shown in actual size. The lock nut secures the knob to the threaded shaft. The milled nut secures the leak to the front panel, if such mounting is desired. The coil lug goes to the outside of the secondary and to the corresponding lug on bullet grid condenser. The grid lug is connected to the grid post of the detector tube socket. The syphon contains the secret resistance element. The pedestal is for baseboard mounting.

The De Luxe Model Bretwood Variable Grid Leak is specified by Herman Bernard for Radio World's four-tube Universal receiver.

North American Bretwood Co., 145 West 45th St., N. Y. City.

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

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Good Back Numbers of RADIO WORLD

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

- Sept. 4—The Four Rectifier Types, by K. B. Humphrey. A Simple Battery Charger, by J. M. Anderson.
- Sept. 11—The Beacon (3-tubes), by James H. Carroll. The 1927 Model Victoreen, by Herman Bernard.
- Sept. 18—The 1927 Victoreen, by Arthur H. Lynch. Eliminator in a Cash Box, by Paul E. Fernald.
- Sept. 25—The Lynch Lamp Socket Amplifier, by Arthur H. Lynch. Wiring up the Victoreen, by Herman Bernard.
- Oct. 2—The Victoreen (Continued), by Herman Bernard. New Equamatic System, by Capt. P. V. O'Rourke.
- Oct. 9—A Practical "A" Eliminator, by Arthur H. Lynch. Building the Equamatic, by Capt. P. V. O'Rourke.
- Oct. 16—The Bernard, by Herman Bernard. How to Box an "A" Supply, by Herbert E. Hayden.
- Oct. 23—The 5-tube P. C. Samson, by Capt. P. V. O'Rourke. Getting DX on the Bernard, by Lewis Winner.
- Oct. 30—The Singletrot Receiver, by Herbert E. Hayden. How to Get Rid of Squeals, by Herman Bernard.
- Nov. 6—Reduction of Interference, by A. N. Goldsmith. Variations of Impedances, by J. M. Anderson.
- Nov. 13—The 4-tube Hi-Power Set, by Herbert E. Hayden. A Study of Eliminators, by Herman Bernard.
- Nov. 20—Vital Pointers About Tubes, by Capt. P. V. O'Rourke. The 4-tube Diamond of the air, by Herman Bernard.
- Nov. 27—The Antennaeless Receiver, by Dr. Louis B. Bian (Part 1). Short Wave Yield Secrets, by M. L. Prescott.
- Dec. 4—The Regenerative 5-Tube Set, by Capt. P. V. O'Rourke. The 8-tube Lincoln Super, by Sidney Stack. The Antennaeless Receiver, by Dr. Louis B. Bian (Part 2). Winner's DC Eliminator, by Lewis Winner.
- Dec. 11—The Universal Victoreen, by Ralph G. Hurd. Some Common Fallacies, by J. M. Anderson.
- Dec. 18—Selectivity on One Tube, by Edgar Sears. Eliminating Interference, by J. M. Anderson. The Victoreen Universal, by Ralph G. Hurd (Concluding Part).
- Dec. 25—A New Coupling Device, by J. M. Anderson. Functions of Eliminators, by Herman Bernard.
- Jan. 1, 1927—The 2 Tube DeLuxe Receiver, by Arthur H. Lynch. The Twin-Choke Amplifier, by Kenneth Harkness.
- Jan. 8—Tuning Out Powerful Locals, by J. M. Anderson. A Choice Superheterodyne, by Brunston Brunn. The 2-Tube De-Lux Receiver, by Arthur H. Lynch (Part 2).
- Jan. 15—The DeLuxe Receiver, by Arthur H. Lynch (Part 3). The Simple Meter Test Circuit by Herbert E. Hayden. The Superheterodyne Modulator Analysed, by J. M. Anderson.
- Jan. 22—The Atlantic Radiophona feat, by Lewis Rand. An Insight into Resistors, by J. M. Anderson. A Circuit for Great Power, by Sidney Stack.
- Jan. 29—The Harkness KH-27 Receiver (Part 1), by Kenneth Harkness. Use of Bypass Resistors, by J. M. Anderson.
- Feb. 5—5-Tube, 1 Dial Set, by Capt. P. V. O'Rourke. The Harkness KH-27 (Part 2), by Kenneth Harkness. What Produces Tone Quality, by J. M. Anderson.
- Feb. 12—Phone Talk Put on Speaker, by Herbert E. Hayden. All Batteries Eliminated, by Herman Bernard. The Harkness KH-27 Receiver, by Kenneth Harkness (Part 3) conclusion.
- Feb. 19—The 6-Tube Victoreen, by Herman Bernard. (Part 1.) The Big Six Receiver, by Wentworth Wood. "B" Eliminator Problem, by Wm. P. Lear. The Phasatrot Circuit, by Capt. P. V. O'Rourke. The 6-Tube Victoreen, by Herman Bernard (Part 2) conclusion.
- Feb. 26—The 5-tube Diamond in a Phonograph, by Hood Atrakan. How To Read Curves, by John F. Rider. Proper Tubes for 5-Valve Receiver, by J. E. Anderson.
- Mar. 5—Introduction of 4-tube Universal, by Herman Bernard. Discussion on DX, by Capt. P. V. O'Rourke. Sanible Volume Control, by Chas. Gribben.
- Mar. 12—Ten Tell-Tale Points, by J. E. Anderson. How To Figure Resistors, by Frank Logan. The 4-tube Universal, by Herman Bernard. (Part 1.)
- Mar. 19—Psycho-Analyzing Circuits, by Thomas L. McKay. The Universal, by Herman Bernard (Part 2). How to Use a Wave Trap, by James H. Carroll.
- Mar. 26—The Universal, by Herman Bernard. (Part 3) Flow of Current in a Vacuum Tube, by Radcliffe Parker. Broadcasting Hypnotism.
- April 2—Facts Every Experimenter Should Know, by J. E. Anderson. A Ship Model Speaker, by Herbert E. Hayden. The 8-tube Compact, by Jasper Henry. The Nine-in-Line Receiver, by Lewis Rand (Part 1.)
- April 9—A 5-tube Shielded Set, by Herbert E. Hayden. The Power Compact, by Lewis Winner. The Nine-in-Line Receiver, by Lewis Rand. (Part 2.)

Any copy, 15c. Any 7 copies, \$1.00. All these 32 copies for \$4.00, or start subscription with any issue, RADIO WORLD, 145 West 45th Street, New York City.

THE RADIO TRADE

Trade Men All Over To Attend June Show

Radio dealers, jobbers, manufacturers and their salesmen from every part of the United States are planning attending the first annual radio trade show at the Sherman Hotel in Chicago the week of June 13, according to George H. Kiley, vice-president of the Farrand Manufacturing Company, who has just completed a tour covering the leading jobbing points in the United States.

SCHWARTZ IN NEW POST

Jay M. Schwartz is the new sales promotion manager of the Freed-Eisemann Radio Corporation.



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LET US QUOTE you on Standard Kits and Parts. S. & T. Radio Co., 724 Blake Ave., Brooklyn, N. Y.

ORGANIZERS WANTED—Write for particulars. Mutual Radio Association of America, 75 Elm Street, New Britain, Conn.

A PAYING POSITION OPEN to representatives of character. Take orders shoes, hosiery—direct to wearer. Good income. Permanent. Write now. Tanners Shoe Mfg. Co., 5-710 C. St., Boston, Mass.

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated March 5. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE 4-TUBE DIAMOND

How to build this very efficient circuit described by Herman Bernard in the November 20, 1926, issue of RADIO WORLD. Send 15c for a copy. Blueprint of 4-tube Diamond, \$1.00 extra. Send \$1.15 and get both. Or send \$6 for a year's subscription to RADIO WORLD, and get both the blueprint and the Nov. 20 issue FREE. RADIO WORLD, 145 West 45th Street, N. Y. City.—Adv.

New Line For Seedman

The G. J. Seedman Automotive & Radio Co., Inc., of Brooklyn, has been appointed distributor of Freed-Eisemann sets in Brooklyn and Long Island, New York. The Seedman Co. now distributes also for R. C. A., Grebe, Burgess, Unित्रon, Ampion, Bakelite, Modern, Receptrad and Sonochorde.

DOUBLES FLOOR SPACE

Portland, Ore. The Portland store of the L. C. Warner company has doubled its floor space to care for increased business. The addition, which includes the store adjoining the former quarters, will be used for offices and display room. The display room will be maintained for the Northwest dealer organization, which will be privileged to take its customers into this room. J. J. Condon, Jr., manager, hopes to keep one type of every model handled on display. The addition will also permit the carrying of a greater parts stock on the first floor, thus giving quicker service over the counter.

A new test room is also being fitted out in the rear of the store for the use of the technicians. This department will permit local servicing of all sets handled.

BIALEK CO. IS NEW NAME

The Pioneer Radio Sales Company has changed its name to the Bialek Company. The address is 154 Nassau Street, New York City. The Bialek Company is eastern sales representative of the Webster A, A and B, B, and C socket power units, chargers and automatic control switches. Samuel Bialek is head of the Bialek Company.



ELIMINATE INTERFERENCE WITH POWERTONE WAVE TRAP PRICE, \$2.00 At all Good Dealers, or Direct Positively Guaranteed Powertone Elec. Co., 221 Fulton St. N. Y. City

Nine-in-Line Super

Described in the issues dated April 2, 9, 16 and 23 in such a clear manner that the wisest novice can learn all about it. This circuit has proven its worth in distance, selectivity, volume and tone quality. Send 60c for these issues or send in your subscription for one year and get these copies as a premium. RADIO WORLD, 145 West 45th St., New York City.

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

Literature Wanted

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

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

I desire to receive radio literature

Name

Address

City or town

State

- R. W. Tyler, P. O. Box 359, Rockland, Me.
- J. McEwan, Box 18, Eureka, Calif.
- C. S. Hilyard, Fortfield, Me.
- C. G. Trout, Suite 6, Alfred Apts., Furby and Portage, Winnipeg, Manitoba, Canada.
- Carl Winingger, 20 William Street, St. Catharine, Ontario, Canada.
- Frank L. Marks, 247 Riley Street, Buffalo, N. Y.
- Stanley Regg, 142 Laurier, St. Johns, Quebec, Canada.
- William Banuks, 316 Normal Avenue, Buffalo, N. Y.
- Cari Valimont, 219 Coleman Street, Bridgeport, Conn.
- Thomas Daley, 2521 Washington Street, Wilkes-Barre, Pa.
- Vern Olsen, 3374 South East, Salt Lake City, Utah.
- Ralph Morse, 1143 North Hamilton Avenue, Indianapolis, Ind.
- C. F. Faulhaber, 517 Main Street, Glen Ellyn, Ill.
- M. V. McCloskey, P. O. Box 127, Waukegan, Ill.
- E. G. Tamerlin, 1824 Dunham, Toledo, O.
- E. S. Ramsdell, 12 Holyoke Road, West Somerville, Mass.
- Byron Hammond, 120 West South Street, Hastings, Mich.
- J. D. Sasser, Albany, Ga.
- Leslie A. Didsbury, care Crane Co., Bridgeport, Conn.
- William Gregory, 1267 Broadway, Flint, Mich.
- Ray Mefferd, 176 East 92d St., N., Portland, Ore.
- A. Fleischman, 155 Bay 37th St., Brooklyn, N. Y.
- C. A. Thompson, 651 Forsyth St., Macon, Ga.
- L. S. Maxfield, 446 Prospect, Brooklyn, N. Y.
- Fred L. A. Penner, 574 Thomas St., St. Paul, Minn.

Schickerling Eliminator

Conrad Schickerling, developer and manufacturer of the well-known Schickerling line of tubes, has brought to perfection in co-operation with Julius Korany, engineer, the new Schickerling A, B and C eliminator. It works in conjunction with new Schickerling special receiving and rectifying tubes, furnishing full power to receivers employing as many as ten tubes without any changes in wiring. The unit is a finely-made job, enclosed in a steel container, finished in black crystalline and measures but 7 inches high, 10 inches wide and 12 inches deep. The eliminator is being demonstrated at the Schickerling Laboratories, 401 Mulberry street, Newark, N. J., and full information will be sent to those interested upon application to the manufacturer.—J. H. C.

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For
Satisfactory and Lasting Results
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More than HUMAN

The only automatic self adjusting filament control, supplying at all times just the current your tubes require. Insures 100% tube performance. Safeguards against damage. Eliminates hand rheostats. Simplifies wiring. Insist on Amperite. Refuse substitutes claimed just as good. Price \$1.10 complete.

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Hook-Ups



AMPERITE
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The "SELF-ADJUSTING" Rheostat

D. X. ON A LOOP WITH THE TROPADYNE



SUPER-HETERODYNE

THE World famous Tropadyne has never been surpassed.

It gets volume, clarity and marvelous D.X. reception, all on a loop antenna—No outdoor cumbersome aerial necessary.

It's a powerful Super-Heterodyne simplified, which makes it possible for anyone to construct it.

Conrad Pattern No. 16 shows you how to build this Receiver at home. New system blueprints of Wiring and Panel layout take the mystery out of blueprints. A child could understand them.

Blueprints are 19 x 44 inches.

There is also a 14-page instruction booklet, illustrated, that gives in full, all steps in the construction.

20,000 have used this Pattern

ORDER THIS PATTERN TODAY

PRICE 50c

Guaranty Radio Goods Co.

145 West 45th Street New York

An Important Issue of RADIO WORLD SIXTH ANNUAL VACATION and RADIO TRADE SHOW NUMBER

now in preparation dated June 11

Vacationists having radio sets are glad to tune in on baseball and other sports results, play by play, and are thus adding to their vacation joys. This issue of June 11 will tell our thousands of readers who are going on vacations, how to install radio in summer homes, pleasure boats, summer cottages, camps, hotel rooms, etc. This issue also will give our readers the latest and best information on portables, battery eliminators, DX getters, new sets and hookups.

This special Vacation and Radio Trade Show Number will cover the activities of the Trade Show opening in Chicago June 13.

Here is a chance to reach immediately our big army of radio subscribers and newsstand purchasers as well as the radio trade at large. Summer schools, camps, and hotels throughout the country will receive a copy of this special issue of Radio World. Also radio dealers, jobbers, manufacturers and servicemen. No increase in advertising rates.

GENERAL ADVERTISING—R. O. P.

1 Page, 7 1/4" x 11" 462 lines.....	\$300.00
1/2 Page, 7 1/4" x 5 1/2" 231 lines.....	150.00
1/4 Page, 4 1/8", D. C., 115 lines.....	75.00
1 Column, 2 1/4" x 11", 154 lines.....	100.00
1 inch.....	10.00
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Center spread, two pages.....	700.00

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Ten cents per word, minimum 10 words. No time discounts. Cash with order.

Wire or phone us immediately for preferred positions. There is no increase in rates for these preferred positions in this special number, as they will go to advertisers in the order of receipt of contracts.

Last advertising form closes June 1.

Address Advertising Manager, Radio World, 145 W. 45th St., New York City

Phones: Bryant 0558-0559

Make any Good Receiver BETTER

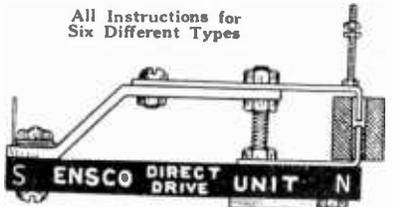
CEC TUBES

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



J71

J. C. Spreckles
Selected the ENSCO
over all others for his
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in RADIO WORLD—May 14th, Page 5
\$10 THE ENSCO KIT \$10
COMPLETE
Roll Your Own and Save 80%
All Instructions for
Six Different Types



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The Famous Ensco Unit—the heart of the Ensco Cones. The Only Direct-drive Distortionless Unit for Big Cones
SOLD UNDER MONEY-BACK GUARANTEE
Manufactured under Clyde J. Fitch Patent No 1630119 and other patents pending. Beware of infringements. We use Genuine Alhambra Fonotex Endorsed by all leading radio magazines. The choice of the foremost engineers.
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For best results with Raytheon and other power circuits you must have permanently accurate resistors capable of carrying heavy loads without change or deterioration. "HY-WATT" Heavy Duty Resistors dissipate up to 12 watts.
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Write for full details and literature on El Menco Gridleaks and Resistors
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AT YOUR SERVICE

THE "AT YOUR SERVICE" addition to RADIO WORLD is, in my opinion, one of the biggest hits of the day with the readers. And I for one wish to express my appreciation, having been a constant reader of RADIO WORLD for three years. There are some questions I would like to have explained more fully.

(1) One of the best sets I have built or heard anywhere is the 1926 five-tube Diamond of the Air, parts and kit from B C L Radio Service Co. I am using for RF, a UX201-A; Det. a Ce Co type H; first two audio two UX201A and a UX-112 power tube and a 135 volt wet B battery on a 100 R. C. A. cone speaker, with 9-volt C battery. The C battery has no effect whatever.

(2)—I use different antennas and am unable to bring in the high wave stations with any volume, while I can tune in 180 meters or less on loud speaker. Would rather have this reversed.

(3)—Do resistors wear out or fag? Have used two Bretwood leaks and find to get best results by adjusting both leak and battery voltages the leak must be

screwed almost all the way in. Is this proper? Also leak is not critical.—H. J. WENNING.

(1)—It is a characteristic of resistance coupled amplifiers, for the disconnection of the C battery not to make a great deal of difference at first. However, I believe that if you were to test with a milliammeter you will find that is made some difference in the amount of plate current drawn from the batteries.

(2)—In regard to the tuning in of high wave stations, I will say that you might add a coil of about 10 turns of wire wound on three inch form in series with the antenna lead.

(3)—A resistor should not wear out or become defective unless excessive current is run through it. From your description your Bretwood leaks seem to be all right. They will not be particularly critical because the adjustment on them is extremely fine. On DX they may prove critical, as they increase sensitivity.

* * *

REFERRING TO the 5-tube shielded receiver described by Herbert E. Hayden in the April 9 issue of RADIO WORLD.

(1)—What is the inductance of each of the radio frequency choke coils, L7, L8 and L9?

(2)—What is the inductance of each of the audio frequency choke coils, L11 and L12?

(3)—When placing the forms with the primary windings inside of the larger forms with the secondary windings, should they be placed parallel?

(4)—Can nickel binding posts be used to both hold the inner forms to the outer forms as well as the winding terminals?

(5)—Can a 200,000-ohm variable resistance without a filament switch be placed across the secondary winding of the first audio frequency transformer?

(Continued on next page)

CARTER
New
All Metal Self Cooling



"MIDGET"
RHEOSTAT AND
POTENTIOMETER
specified as usual in
VICTOREEN

50c
All Resistances
Half Size
Portable
Your dealer will show you why

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Subscribers will note that the end of their subscriptions is indicated on the labels on wrappers. If your wrapper shows a date earlier than the current issue, please send payment for renewal. Changes in expiration dates on wrappers appear two weeks after receipt of renewal.
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Indicate if renewal.

Offer Good Until

June 10, 1927

Name

Street Address

City and State.....

(Continued from preceding page)

(6)—Can a 2-megohm fixed grid leak be used?
 (7)—I have an extra 10-ohm rheostat which I would like to use. Can this be inserted in place of the ballast resistors in the radio frequency filament circuit?—CHARLES HELTON, Bangor, Me.

(1)—Each of these has an inductance of 85 millihenries.
 (2)—These each have an inductance of 3½ henries.
 (3, 4, 5, 6 and 7)—Yes.

WILL IT pay me to improve my Fada Neutrodyne of 1925? If so, what can I do to get more volume, selectivity and greater distance? Also how can I bring out the bass notes on my Metro cone speaker? I am using a B eliminator.

This receiver functioned very well up until this season. It is not up to what it used to be. My aerial is about 135 feet all told, batteries and tubes are in good shape.

WILL M. SCHWINGEL.

You will increase the selectivity by putting a .0005 mfd. condenser in series with your antenna lead. To clear up your loud-speaker, try putting a .006 mfd. fixed condenser across the terminals of the speaker.

Two More Transmitters To Leave the Big City

Following the examples set by other New York stations of removing their transmitting apparatus out of the city, due to the many metal obstructions which absorbed their signals, WGL, located in the Hotel Majestic, and WLWL, located in the Paulist Fathers Church, are also looking for new sites for their transmitters. WNYC, located at the Municipal building, and WMSG, in new Madison Square Garden, will be the only

WANT DISTANCE?
 Help your detector tube get far-away stations with a
TILSON
 VARIABLE GRID LEAK
 attached in a second — 75 cents
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Why is the Karas Equamatic the Most Efficient Receiver Ever Designed?

Write us for Full Information

KARAS ELECTRIC CO.

1148 Association Bldg. Chicago, Ill.

How to Build Radio World's UNIVERSAL Four-Tube Receiver

Fully described by Herman Bernard, and fully illustrated, in the March 12 and 19 issues of Radio World. Trouble shooting set forth in the March 26 issue. Send 45 cents and get all three issues.

Blueprints of the Universal, \$1.00 each.

The March 12, 19 and 26 issues and the blueprint, will be sent immediately on receipt of \$1.30. Or send \$6 for a year's subscription (52 numbers) and get the three copies and blueprint as a premium. No other premium with this offer.

RADIO WORLD

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

BUILD the new Universal, described in the March 12, 19 and 26 issues. Send 45c. for these copies or \$1 extra for blueprint or \$1.30 for all four. RADIO WORLD

two stations having their transmitters in the city. Christie R. Bohmsack, director of WNYC, stated that the reports on the station's signals have always been favorable and therefore he sees no reason for a change. The extreme height of the antenna, with no obstructions, is the reason, he states.

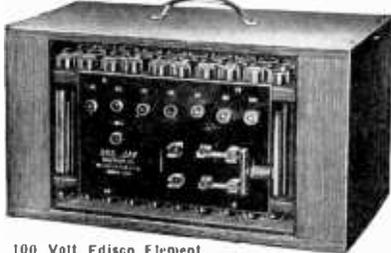
New York's Big Show Set For Sept. 19 to 24

The fourth Radio World's Fair, under the management of G. Clayton Irwin, Jr., will be held in New Madison Square Garden, New York, September 19 to 24, inclusive.

It will be one of the greatest industrial displays ever held under a single roof, with every leading manufacturer of radio apparatus exhibiting the latest products.

The foremost scientists, engineers, professors, and other acknowledged experts, many of international fame, will deliver addresses on up-to-the-minute developments in the radio art, and demonstrations of new developments in this field will be given for the first time in public. Among the visitors will be foreign celebrities. There will be daily meetings of the chief radio merchandisers.

Dependable "B" Battery Power



100 Volt Edison Element. Non-Destructive. Rechargeable "B" Battery. Shipped dry with solution, \$9.00. 140 Volt. \$13.00.
 SEND NO MONEY PAY EXPRESSMAN
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 How to Build the Famous Fenway Receiver.
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 The second question book
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VICTOREEN
 A Super Set
 Without an Equal!
 Build it with
VICTOREEN Parts



The Victoreen Super will satisfy your craving for a set that has range, volume, clarity and selectivity.
 The heart of the Victoreen circuit is found in the four Victoreen RF Transformers and the Victoreen Coupling Unit used with them. These units are precision instruments—tuned to a guaranteed precision within 1/3 of 1%—a Victoreen feature.
 They make the Victoreen a Super Set without an equal.
 No. 100 Victoreen RF Transformer. **\$7.00 each**
 No. 11 for dry cell tubes. **\$5.50 each**
 No. 100 Victoreen Coupling Unit. **\$5.50 each**
 No. 100 Victoreen Antenna Coupler. **\$3.50 each**
 (if a outside aerial only)

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 Zero temperature coefficient resistance remains absolutely constant. Double the number of turns of wire used in ordinary rheostats. Three terminals simplify wiring.
 Five resistances—2, 6, 10, 20, 30 ohms, \$1.20. Victoreen Postometers—20 and 400 ohms resistance, \$1.50.



VICTOREEN MASTER CONTROL UNITS
 A completely assembled unit with one dial reading controlled by a compensator on the Vernier dial which compensates for any difference in the capacities of your condensers within 20 points on the dial. Used in circuits employing two or more condensers of the same capacity. Easy to mount—no change of wiring necessary.
 Victoreen Master Control Unit, 2 Condenser type, **\$19.50.** Extra Condenser, **\$4.50.**

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The GEO. W. WALKER CO.
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 Merchandise of Victoreen Radio Parts

you can enjoy a fine radio at these *low* prices

Ever increasing manufacturing facilities, made possible by the great public demand for the Freshman Masterpiece, enables us to produce these Quality Radios at very moderate cost.



This sturdy console is panelled entirely of genuine mahogany. Contains built-in cone speaker and spacious compartments for all accessories. Model 7-F-3. **\$79.50**

A new radio that "gets" everything SIX TUBES — ONE CONTROL

Merely turn the dial from point to point and station after station comes in separately, clearly and distinctly. The one dial is the only tuning device on this new Freshman radio. Its amazing power assures reception from great distances with "hair-line" selectivity and fine tone quality.

The powerful new line of

Six tubes ~ One Control FRESHMAN MASTERPIECE

radio receivers now provides a model for every home — and for every pocketbook.

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BY AUTHORIZED FRESHMAN DEALERS

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Freshman Building

New York



The new Freshman Masterpiece six-tube one-control receiver encased in a ruggedly constructed genuine mahogany cabinet. Model 7-F-2. **\$49.50**

Freshman Master Speaker, as illustrated, ten dollars