RECEIVING TUBE CHART

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506th Consecutive Issue

TENTH YEAR

Dec. 5 1931

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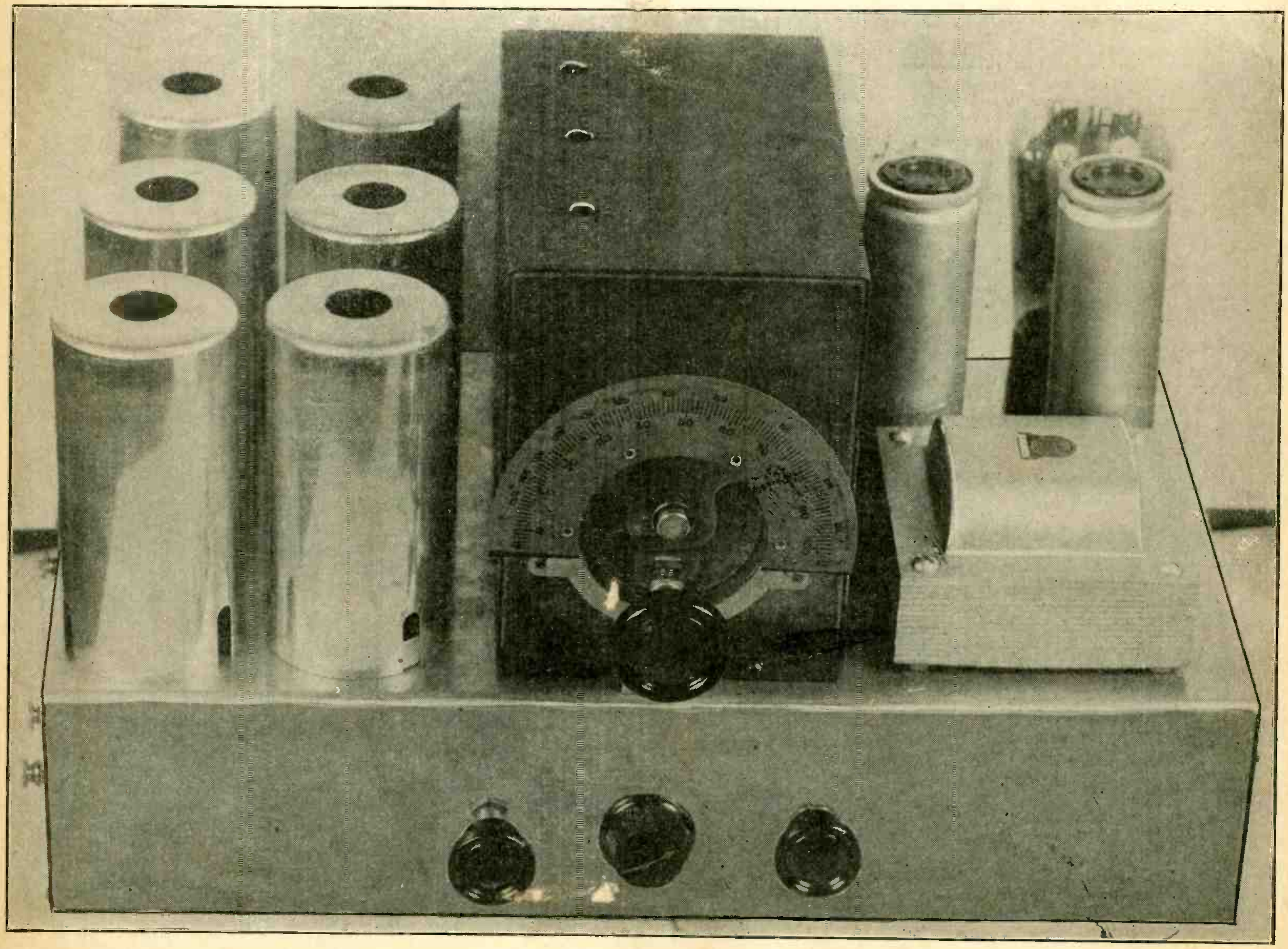
Monitor Receiver



View of an excellent 8 tube Superheterodyne. See page 3.

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Vol XX No. 12 Whole No. 506
December 5th, 1931
[Entered as second-class matter, March, 1922, at the Post Office, at New York, N. Y., under act of March, 1879]
15c per Copy. $6 per Year

TENTH YEAR
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A Weekly Paper Published by Hennessy Radio Publications Corporation, from Publication Office, 145 West 45th Street, New York, N. Y.
(Just East of Broadway)
Telephone, BRyant 9-0558 and 9-0559

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One Microvolt per Meter on an 8-Tube Receiver

Band Pass Intermediate Amplifier at 175 kc.

By Herman Bernard

A RECEIVER with a sensitivity of better than 1 microvolt per meter over the entire broadcast band is something many desire to possess, and of course with such sensitivity must go a high order of selectivity. Therefore the double detection method of reception must be used, for although tuned radio frequency can develop as much sensitivity, it always falls far behind on selectivity. In fact, whenever mention is made of the selectivity of one as compared to that of the other, engineers always say that the two circuits can not be fairly compared. But that is merely another method of expressing the fact that the t-r-f set falls very far behind on selectivity, and the reason is obvious.

In a t-r-f set we have as many tuned stages as there are r-f amplifiers, plus one for the detector. These are manually controlled and stations are tuned in by varying the capacity in the tuned circuits. The object is to make the variations precisely the same, so that when the circuits are resonant at one selected frequency, by the process of adjustment of trimmers, or peaking, then resonance prevails at all other settings. But it is hardly to be claimed that such resonance really does exist as a scientifically accurate quantity at all settings. It simply does not, because it can't with gang tuning. Then there is also inductance to consider, and this varies somewhat with frequency, and the variation depends partly on the coupling, both its degree and type, so that varying factors enter to upset the desired balance.

Intermediate Channel Provides "Kick"

On the other hand, with the double detector system, while we also have a t-r-f receiver, in one sense, considering the r-f stage and the modulator (if not the oscillator), and resort to ganging, besides padding the oscillator, another or extra uncertainty, we do have, at all hazards, an intermediate channel that can be accurately set. Moreover, while this channel is tuned, the frequency is not changed, nothing is altered or adjusted, with a slight exception to be mentioned later, and whatever is expended for convenience sake on the r-f side is made up on the i-f side. So we attain high values of sensitivity and selectivity.

It is easy enough to obtain both too much sensitivity and too much selectivity by this system, in fact, the limit being reached, some compensation has to be introduced to make the circuit stable and workable. So, instead of the narrowest possible admittance band, which also would cut deeply into the sidebands, we may use a band pass filter system in the intermediate amplifier, accomplished by spacing 1⅛ inches apart the 800-turn honeycomb coils that serve as primary and secondary, and by tuning each separately with a 0.0001 mfd. equalizing condenser (20-100 mmfd.) in the special manner to be described. This method, to the best of the author's knowledge, never before has been published.

Effect of Band Pass Filter

When we establish the band pass effect we do not tune for maximum response from both tuned circuits, plate of preceding tube and grid of succeeding tube, and therefore we actually reduce the sensitivity theoretically. But since the sensitivity could not well exceed what we have left, without instability and bad overloading, so badly combined as to mitigate reception, we finally come out with all the honors that can be carried.

The requirements for the nearest possible approach to perfection in the construction of such a receiver are:

(1)—A stage of t-r-f to get rid of image interference.

(2)—A tuned modulator, which may be ganged with the r-f condenser.

(3)—A tuned oscillator which may be ganged with the two other condenser sections.

(4)—A stable, sensitive band pass filter intermediate amplifier.

(5)—A second detector or demodulator that will stand the immense voltage that will be impressed on it by the tuning system.

(6)—A stage of audio to couple to the output tube to provide excellent tone quality.

(7)—An output tube of sufficient power rating.

(8)—A good B supply, well filtered.

Eight Tubes Required

So there are eight cardinal requirements, and incidentally eight tubes are required to meet them. And besides the cardinal requirements there are of course some others, not specifically itemized. For instance, there should be absence of crosstalk and crossmodulation, but the variable mu tubes will take care of that adequately. Also there should be a volume control ahead of the demodulator. The control is as easily placed there as anywhere else.

It is the volume control that slightly detunes the intermediate amplifier, because the control is a rheostat that changes the negative grid bias, hence the d-c voltage distribution. As is well known now, change in the d-c voltages also changes the impedance, and this results in slight detuning. However, the frequency is 175 kc, and the voltage changes show up as important frequency alterants only at high frequencies. The frequency under discussion is far below the lowest of the broadcast band, and too low to be more than trivially affected. Besides, the volume control will be used at positions that effect such frequency change only when the set is playing much too loud for comfort, so whatever is spared can well be spared.

The Volume Control's Resistance

Because of the extremely high amplitude the volume control should have a larger resistance than for t-r-f sets. You can, in a way, compare the sensitivity of receivers that come from expert laboratories by the value of total resistance in such a volume control, because the greater the sensitivity the greater the resistance needed, for greater variation. For instance, a 5,000 ohm potentiometer or rheostat would make too scant a change in the volume, and even at highest resistance setting would cause the volume from even distant stations on the present set to be most annoying.

The limiting resistor has a relationship, of course, to the volume control resistance, for if the limiting adjunct is high,

(*Continued on next page*)

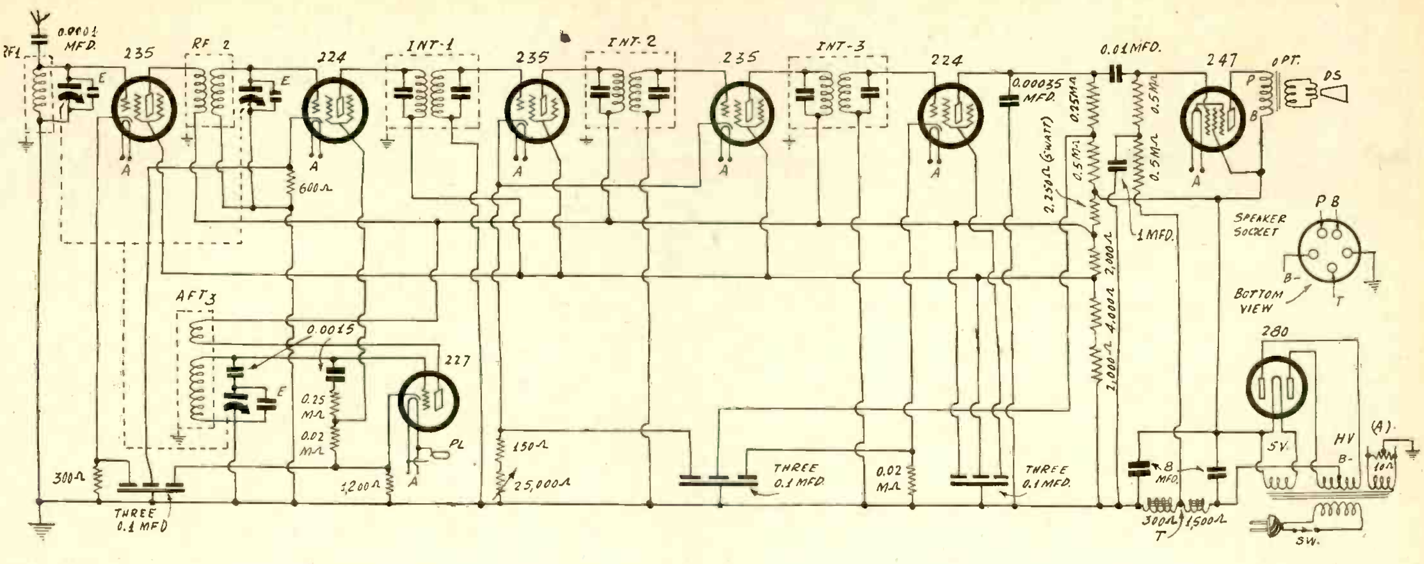


FIG. 1

(Continued from preceding page)

then the volume control may have less resistance, but there is a deterring consideration, that of resultant critical adjustment. If one control in any set should not be critical it is the volume control.

Circuit Theory

The circuit theory may well be discussed now on the basis of the eight cardinal requirements, as it is very helpful in the construction of a receiver to have an understanding of its performance.

A stage of tuned radio frequency is the first in the chain. Its advisability is generally admitted. A modulator circuit alone would tune rather broadly, as and as whatever comes out of the modulator, as a frequency resulting from a mixture, is subjected to intense amplification, this output should be as free as practical of interference, particularly as double detector systems develop a form of interference known as image interference, unless special precautions are taken to avoid this. Just as it is possible, with a separately tuned oscillator, to bring in the same station at two different settings, so it is possible to bring in a second station at either one of these two settings, because any one setting usually represents an oscillator frequency which will bring in two different carrier frequencies.

Let us consider the case numerically.

Suppose the original carrier or signal frequency to be tuned in is 1,300 kc. The modulator in all cases would be tuned to that. The oscillator could be tuned to a frequency equal to that plus or that minus the intermediate frequency, i.e., 1,475 kc or 1,125 kc, for in each case the difference between the two yields 175 kc, the intermediate frequency of the present receiver.

Image Interference

Since we may subtract the oscillator frequency from the modulator frequency, or the modulator frequency from the oscillator frequency, we get the two repeat points. However, the low frequency oscillator setting for bringing in a given original carrier frequency is also the high frequency setting for bringing in a different original carrier frequency, and the two stations come in at the same dial setting, the one strong perhaps, the other weak, or as an "image." Therefore the better the selectivity ahead of the modulator, the better the suppression of the undesired station. Gang tuning hides the repeat points, as the gang must be worked as a unit, but does not affect image interference. Only t-r-f can assist in getting rid of that.

Tuning of the modulator is a requisitive to sensitivity of a high order, but the coupling must not be so close as to make the effect of modulator tuning show up simply as a small added variable capacity across the oscillator. When coupling is too close it seems that different stations can be tuned in just by tuning the modulator, and leaving the oscillator fixed, but this is not so. The true effect is that the modulator tuning detunes or tunes (as you prefer) the oscillator, hence different stations are heard. The present coupling is an original one and will be discussed later.

Tuning of the oscillator is imperative, of course, even though the oscillator itself really has no selectivity. What seems to be its selectivity is the actual selectivity of the intermediate channel. All the oscillator does is to generate different frequencies.

Obtaining Band Pass Filter

A stable intermediate channel is a requisite, too, and is obtained by using the band pass filter, which filter has the added advantage, its principal one perhaps, of giving a flat top tuning characteristic.

This is obtained by disconnecting one of the tuning condensers (say from the plate circuit) for all three coils, and tuning only the grid circuit condenser, leaving that condenser where it should be for loudest response. The measurement may be made, instead of aurally, with an output meter, connected across the speaker terminals (P and B plus of pentode). Such a meter is an a-c voltmeter.

Then the plate circuit condensers are reestablished, and the condensers disconnected from the grid circuit. The plate condensers now are tuned for maximum response. The result, where proper spacing exists between coils, is a band pass filter. The sensitivity is not as high as it would be if the grid and plate circuit condensers of the intermediate transformers were tuned so that conjunctively they gave greatest response, for this response would exceed the result compared to where each circuit independently was tuned for greatest response. Moreover, this method provides an easy way to attain a band pass filter effect without resort to any intricate systems or measurements, or any mathematics whatsoever.

Summary of Action

So the frequency desired to be finally rectified has been tuned in by the t-r-f stage and the modulator, the oscillator frequency has been mixed with that in the modulator, the mixture producing a frequency equal to the intermediate frequency, while the intermediate frequency amplifier builds up the amplitude of the voltage to great heights, until the detector is reached.

It is generally considered all right if as much voltage is obtained from the detector as is put into it, but it is probably true in nearly all cases that less comes out than is put in. Only audio is taken out, the radio frequencies being not desired any longer, so are sidetracked by a condenser. What we desire principally is capability of handling a high input without overloading, and attaining virtually linear detection, which in general requires for a 224 tube that the screen voltage be lower than usually recommended. The plate voltage of the modulator is low, and it may be used as the screen voltage of the demodulator (around 50 volts). These unusual voltages need not cause any qualms as they have been verified experimentally.

After the second detector or demodulator the circuit is familiar enough, with a resistance coupled audio stage having capacity-resistor filter in plate and grid circuits to prevent hum from backing into the tubes, and with the pentode bias obtained from the drop in part of the field coil used also as the B supply choke. This method of pentode bias introduces audio regeneration and renders totally practical the omission of large bypass condensers from detector cathode and screen circuit and condenser from the biasing section of the pentode circuit.

(Continued next week)

Short Wave Oscillators

Magnetrons Used—Capacities Minute and Leads Short

By Frank Leland

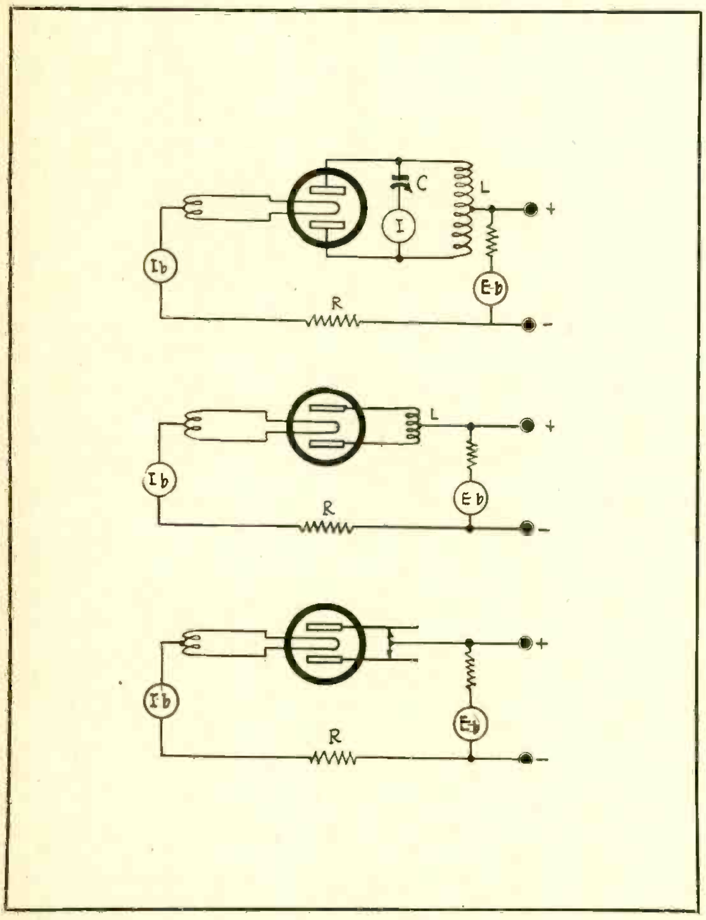


FIG. 1 (Top)
The circuit of a push-pull magnetron oscillator.

FIG. 2 (Middle)
The external capacity has been reduced to zero to increase the frequency of oscillation.

FIG. 3 (Bottom)
The inductance has been reduced to a minimum as well as the external capacity.

THE magnetron is not a new device, for it is about as old as the ordinary vacuum tube. The difference between the magnetron and the three element vacuum tube is that in the three element tube the electron stream is controlled by the electric potential of a grid placed between the plate and the cathode while in the magnetron the electron stream is controlled by a magnetic field at right angles to the direction of movement of the electrons.

The form of the magnetron used for short wave production is that known as the split anode tube. There are two equal plates of semi-cylindrical form facing each other with a wire cathode in the center of the cylinder thus formed. The magnetic field is applied so that the direction of the magnetic force is parallel to the axis of the cylinder.

To form an oscillator the tuned circuit is connected between the two plates just as if two tubes were used and the plate supply is applied at the middle point of the inductance coil. Fig. 1a shows a typical split-anode magnetron, with the exception of the magnetic field. The tuned circuit is made up of C and L and C includes the plate-to-plate capacity of the tube, which is extremely small.

Reducing Wavelength

As the value of the capacity C decreases the wavelength generated, for a given value of L, decreases, but the decrease is limited by the plate-to-plate capacity of the tube. In Fig. 1b we have the same circuit with the external capacity removed, in which case the wavelength depends on the internal capacity and on the inductance of the coil. In order to decrease the wavelength still further all that can be done is to reduce the value of the inductance. How this is done is shown in Fig. 1c, in which the inductance is only that of the wire connecting the two plates. This wire is tapped at the middle point for the positive connection.

As will be noticed, the centertapped wire is arranged so that it can be moved over two parallel wires. This is a tuning arrangement. As the centertapped wire is moved away from the tube the inductance and the capacity increase, and the wavelength increases. We can easily determine the approximate length of the shortest wave that can be generated. The plate-to-plate capacity of the tube when the filament is grounded is 0.5 mmfd. and the inductance of the shortest length of wire may be assumed to be one microhenry. This would make the frequency of the resonant circuit equal to 225,000 kc, and the wavelength would be 1.333 meters. Since the tube in this circuit can be made to oscillate at about 75 centimeters, it appears that the inductance of the short lead can be reduced to about 0.316 microhenry. That is a very small inductance and even the plate-to-plate capacity is large for tuning it.

Tube Has Negative Resistance

The split-anode magnetron oscillates by virtue of the fact that the plate circuit has negative resistance when the plate voltage and the intensity of the magnetic field have been adjusted to the proper values. For a fixed value of the magnetic field, the plate current first rises as the plate voltage is increased, then it reaches a maximum, after which it decreases as the plate voltage is increased. It is in this region where the tube will oscillate, that is, in the region where the plate current decreases as the plate voltage increases.

In effect, the split-anode oscillator is a push-pull oscillator in which the flow of electrons from the cathode to the plates is controlled by a magnetic field. The arrangement of the plates and the cathode is such that the magnetic field will increase the plate current in one direction while it will decrease it in the other. This is just the way a push-pull amplifier or oscillator acts. If the magnetic field were alternating, there would be true push-pull actions and the major portion of the electrons emitted would be sent alternately to the two plates. The magnetic field could be produced by putting the tube inside a coil with the axis of the tube cylinder parallel or coincident with the axis of the coil. An alternating current through the coil would then control the flow of current to the plates of the tube. Incidentally, it is not necessary to operate the magnetron in the region where the resistance is negative for it may be operated so that the plate resistance is positive, in which case the tube can be used as an amplifier.

Tube Chart in this Issue Is Well Worth Keeping

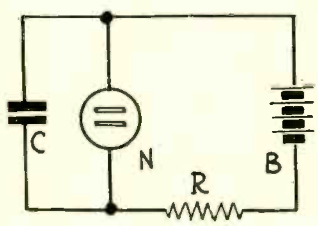
The data on thirty-four tubes, giving just the information you are seeking, will be found on pages 12 and 13 of this issue, in tabulated form. The information given on the chart is as follows:

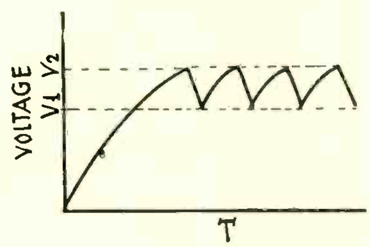
> Type of tube; purpose of tube; type of base, designating the kind of socket the base fits into; physical dimensions of the tube, giving the base diameter and the overall length of the tube, including glass envelope; cathode type, whether of the filament or heater variety, it being remembered that the cathode is always the electron emitter; the filament or heater voltage and current and type of supply, whether a-c or d-c; the maximum plate voltage and maximum screen voltage, these simply being the values not to be exceeded, though not always to be used, as appears subsequently; classification of different plate supply voltages within the working limits, with negative grid bias voltages assigned, and a difference being noted for bias values for a-c or d-c on filament, a necessity stressed in RADIO WORLD by J. E. Anderson; plate current; notations on screen current; a-c plate resistance; mutual conductance; voltage amplification factor; ohms load for stated power output; power output in milliwatts.

The Neon Glow Lamp

Wide Range of Frequencies

By Brunst





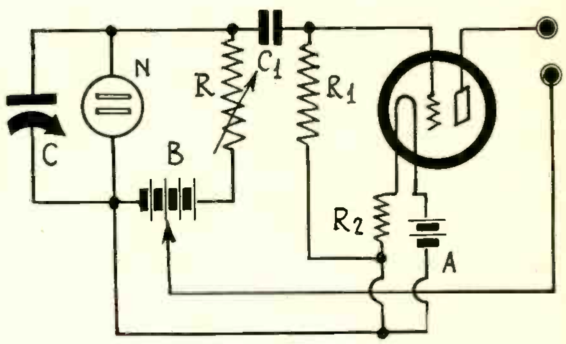


FIG. 1 (left)
The circuit of a simple neon tube audio frequency oscillator.
FIG. 2 (middle)
The wave form obtained with a neon tube oscillator. The oscillation occurs between the flashing and extinguishing voltages of the neon tube.
FIG. 3 (right)
The neon tube oscillator coupled to a vacuum tube amplifier for utilization of the audio oscillation generated.

AUDIO frequency oscillators utilizing coils and condensers which are connected in the customary oscillator circuit are quite expensive and bulky. To cover a wide range of frequencies with one of these oscillators it is necessary to have several coils and a variable condenser having a very wide range of capacity change. Because of this they are not very popular and other devices are used. One is a beat note oscillator which utilizes the beat between two high frequency oscillator which is a satisfactory oscillator for covering a wide range of audio frequencies with a very small tuning condenser and only a single set of high frequency coil. In this oscillator, however, there are two tubes. Another oscillator is the carbon button and vibrator type, the vibrator often being a tuning fork. The difficulty with this is that its frequency oscillation cannot be varied.

Neon Tube Oscillator

One of the simplest of all audio frequency oscillators is that depending on its functioning on the properties of the neon tube. We shall describe this in detail and show some of its applications. It is, perhaps, the least expensive of all. Its only drawback is that the tone it generates is not pure as it contains many harmonics. However, in one of its applications it is the peculiar wave form giving rise to the harmonics which is utilized advantageously.

The circuit diagram of the neon tube oscillator is shown in Fig. 1. C is a condenser of comparatively small value, N is the neon tube which is connected in shunt with the condenser, R is a resistance of suitable value, and B is a battery the voltage of which is greater than the flashing voltage of the neon tube.

Oscillation depends on the fact that in the neon tube there is one voltage at which the glow begins and another, a lower one, at which it ceases. The circuit oscillates between these two voltages at a rate depending on the choice of circuit constants.

In Fig. 1, suppose we apply a certain voltage B which is greater than the flashing voltage of the neon tube. A current begins to flow, the rate of which is limited by the resistance R, and this current charges the condenser C. While the condenser is charging the voltage across the neon tube rises, and when it has reached the flashing point the neon tube begins to glow. In the glowing state the resistance of the tube is comparatively low. Hence the condenser discharges through the tube, and at the same time the current through R increases so that the voltage across the neon tube drops rapidly. Finally the extinguishing voltage is reached when the glow stops, and the condenser begins to charge again.

The variation in the voltage across the condenser, or across the neon tube, is shown diagrammatically in Fig. 2. When the voltage is first applied the potential across the condenser and tube rises gradually to the value V2, the flashing voltage. At that time the tube bursts into a glow and the condenser begins to discharge. Hence the voltage drops rapidly to a value V1, where the light goes out. The charging begins again and the voltage across the tube and the condenser rises to the flashing point. The voltage variations occur between the flashing voltage V2 and the extinguishing voltage V1.

The rapidity with which the voltage varies, that is, the frequency of oscillation, depends on the capacity C, on the resistance R and on the conductivity of the neon tube during the conducting period. The higher the product of C and R the lower is the frequency. The conductivity of the tube enters only during the glowing period and it causes a rapid drop in the voltage. The serrated wave form shown in the diagram is typical, a slow curved rise and a rapid straight fall.

Use of Serrated Wave Form

The peculiar output of the neon tube generator has been used for the purpose of testing the fidelity of audio frequency amplifiers. If the output of the neon tube oscillator is impressed on the input of the amplifier and the output of the amplifier is viewed through a cathode ray oscilloscope, the fidelity of the amplifier is shown by the degree of change in the wave form. If the wave form on the oscilloscope is identical with the wave form of the neon tube oscillator the fidelity of the amplifier is perfect. If there is a rounding of the sharp corners, the high frequencies are not amplified as well as the low. It is clear that the test may be made at any audio frequency.

The frequency range of the oscillator is very wide. Frequencies as low as one-tenth cycle per second and as high as 100,000 per second can easily be generated by the proper choice of the condenser C and of the resistance R. Decreasing the product of these two increases the frequency, and increasing the product decreases the frequency.

We might take RC as the measure of the period of oscillation in the neon tube, or 1/RC as a measure of the frequency. The expression for frequency is not quite so simple but this will do for a qualitative examination. Suppose R is 100,000 ohms and C is 0.001 mfd. Then the product of the two, using ohms and farads, is 0.0001 second, or a frequency of the order of 10,000 cycles per second. If R is 10 megohms and C is 0.001 mfd., the product is 0.01 second and the frequency is of the order of 100 cycle per second. These must not be taken literally but only comparatively for the frequencies will be less than the above.

As the circuit stands in Fig. 1 it is not of much use for there is no way indicated for utilizing the oscillation. If the neon tube glow is visible and of considerable intensity the light may be used for stroboscopic purposes or it may be made to modulate a photo-electric cell. But we want to use the oscillations in the simplest way in an electric circuit. In Fig. 3 is shown a way of coupling the neon tube oscillator to a vacuum tube oscillator by means of a resistance coupler. In this circuit C is the variable condenser across the neon tube, R is the resistance involved, in this case variable to extend the frequency range of the circuit. C1 is the isolating condenser and may have a value of 0.01 mfd., R1 a grid leak of about half megohm, and R2 a small ballast suitable for the tube used and the filament voltage. If the tube is a 230 A battery voltage might be 3 volts, when R2 should have a value of 20 ohms.

The same battery is used for both the neon tube and the amplifier tube. The neon tube, however, requires a higher voltage than is necessary to use on the smaller tube. Hence the plate return of the amplifier is made to a tap on the battery.

In case the amplifier receives too much signal voltage from the oscillator it is only necessary to use a lower value for R1, or to

as Audio Oscillator

Obtained With Only a Few Parts

en Brunn

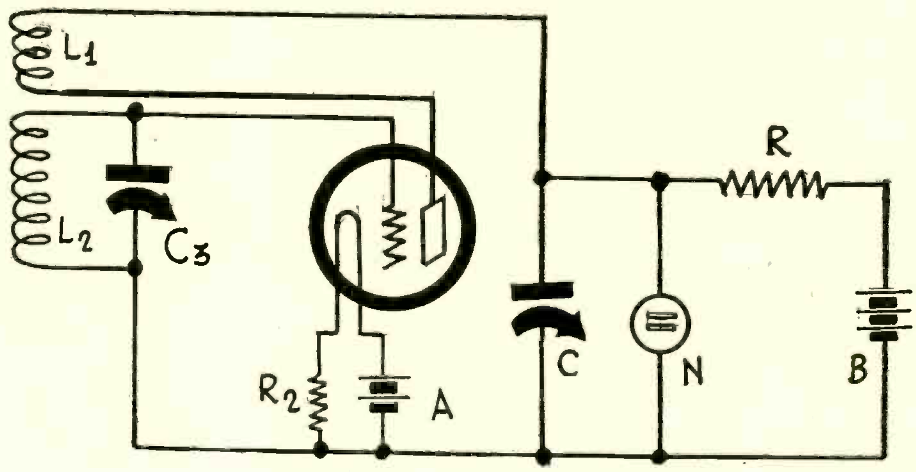


FIG. 4

In this circuit the neon tube oscillator is used for modulating the radio frequency wave generated by the vacuum tube oscillator.

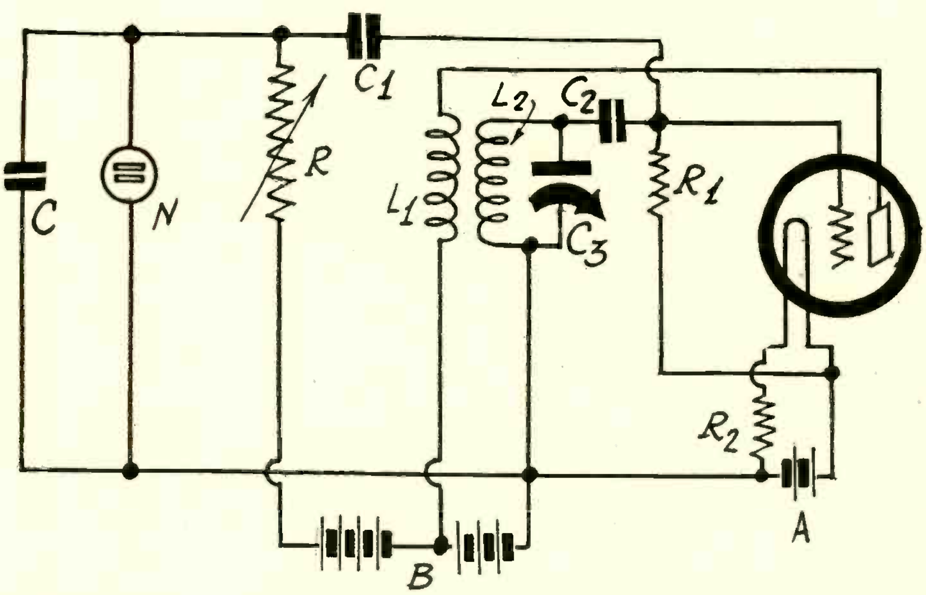


FIG. 5

Another arrangement for modulating a radio frequency oscillator with the output of the neon tube audio oscillator.

use a 500,000 ohm potentiometer and return the grid to the slider. If the latter method is used any portion of the alternating voltage across C can be impressed across the grid. Thus overloading of the amplifier can be prevented.

If the audio oscillator is to be calibrated from the lowest audio frequency to the highest, the variable condenser C should be used to obtain fine variations and R for obtaining frequency ranges. That is, R should not be a continuously variable resistance but rather a resistance variable in definite steps.

The output of the neon tube oscillator can also be used for modulating the wave of a radio frequency oscillator. There are many ways in which this may be done, and in Fig. 4 is one possible way. The output of the neon tube oscillator is impressed across the grid lead R1 of the radio frequency oscillator. C2 in this case is a small condenser used for the purpose of preventing the audio frequency currents from escaping through the oscillating coil L2, and C1 is a small coupling condenser of about 0.001 mfd. capacity. The constants pertaining to the neon tube oscillator are the same as the corresponding constants in Fig. 1. It will be observed that the two variable condensers C and C3 are coupled by C1 and C2 connected in series. Therefore the radio and audio frequencies will be mutually interdependent. This effect will be less the smaller and condensers C1 and C2 are.

When accuracy is required the circuit in Fig. 4 is not recommended because of the interdependence just referred to. A better arrangement is shown in Fig. 5. In this case the plate voltage applied to the oscillator tube is varied with the audio oscillator. The process is as follows: When the power is first turned on condenser C begins to charge up. At some point the radio frequency tube begins oscillating. The intensity of oscillation increases as the voltage on condenser C increases. Then the flashing voltage of the neon cell is reached and there is a sudden increase in the conductivity. C discharges through N and the voltage across the tube decreases, not only because the condenser discharges but because the drop in R increases. While the condenser is discharging down to extinguishing voltage of the neon tube, the amplitude of the radio frequency oscillation decreases. As soon as the extinguishing voltage is reached the process is reversed and the amplitude begins to increase. Thus the generated radio frequency wave is modulated by the peculiar wave form of the neon tube oscillator.

The flashing voltage is not the same for all neon tubes. Some will strike a glow at 80 volts while others will not strike until the voltage is around 150 volts. Also, a neon tube will flash sooner on a-c than on d-c. In one case of a small commercial neon tube a glow appeared when it was plugged into a 110-volt a-c outlet but it would not strike a glow when connected across a 135 volt dry cell battery. The reason for this apparent absurdity is that the peak voltage of the a-c line was higher than the flashing voltage of the neon tube, while the voltage of the battery was below. The peak voltage of a 110 volt a-c line is 155.7 volts, assuming that the wave is pure. The flashing voltage of this particular lamp was therefore between 155.7 and 135 volts. Another lamp of small size had a flashing voltage between 90 and 112.5 volts.

Whatever neon lamp is used the voltage applied to circuit must be high enough to strike the glow. If the circuit does not work at first, raise the voltage applied until the neon tube glows. If there is no glow when the applied voltage is 150 volts, there may be something wrong with circuit and the voltage should not be increased further until this has been checked.

In the case of the modulated radio frequency oscillator, the best way to detector whether or not the circuit oscillates in the two frequency levels is to set the circuit near a good radio receiver and then try to pick up the signal. If the audio frequency oscillation is heard in the output of the receiver, the modulated oscillates in both levels. If squeals are heard when the oscillator tuning condenser is turned, then the radio frequency oscillator is functioning. These squeals can be made very intense by setting the receiver on broadcast stations. Audio oscillation in the circuit can be detected by connecting one side of a head set to the stator of C, leaving the other end open, or holding it in the hand. The oscillation will be revealed as a sound in the phones.

Separate Tuning of Convert

Style of Flexible Intermedia

Built in —A-C and

By Henry

A GREAT deal of the difficulty attaching to development of highest sensitivity in a converter is removed if the modulator and oscillator both are tuned and if separate tuning condensers are used. While just as good results are actually obtainable by scientifically padded circuits, for single control, this padding must be done under laboratory conditions, which few can supply. Therefore the plan is proposed to use two separate condensers, not a gang, while a stage of intermediate frequency amplification is built in without restricting the converter to any particular intermediate frequency, as will be explained.

Switching can take the place of plug in coils, separate coils being preferable, so the inductances applicable to any one band must be considered, in Fig. 1, as on one form. The coupling of modulator and oscillator is inductive. Therefore L3, L6, L9 are on one form. L2, L5, L8 are on another form, and L1, L4, L7 are on the third form.

To avoid having to switch the primaries, a series antenna condenser may be used, so the switching is confined to throwing three different circuits to three different positions, by single knob operation.

The number of turns on the modulator grid impedance coils, and on the oscillator grid and plate coils, will depend on the capacity of condenser used for tuning.

The problem is ever present as to maintenance of a high inductance to capacity ratio, but with any given condenser the ratio, high for one extreme band, becomes low for the other extreme. The higher the capacity, the fewer coils needed, the closer together stations come in on the dial.

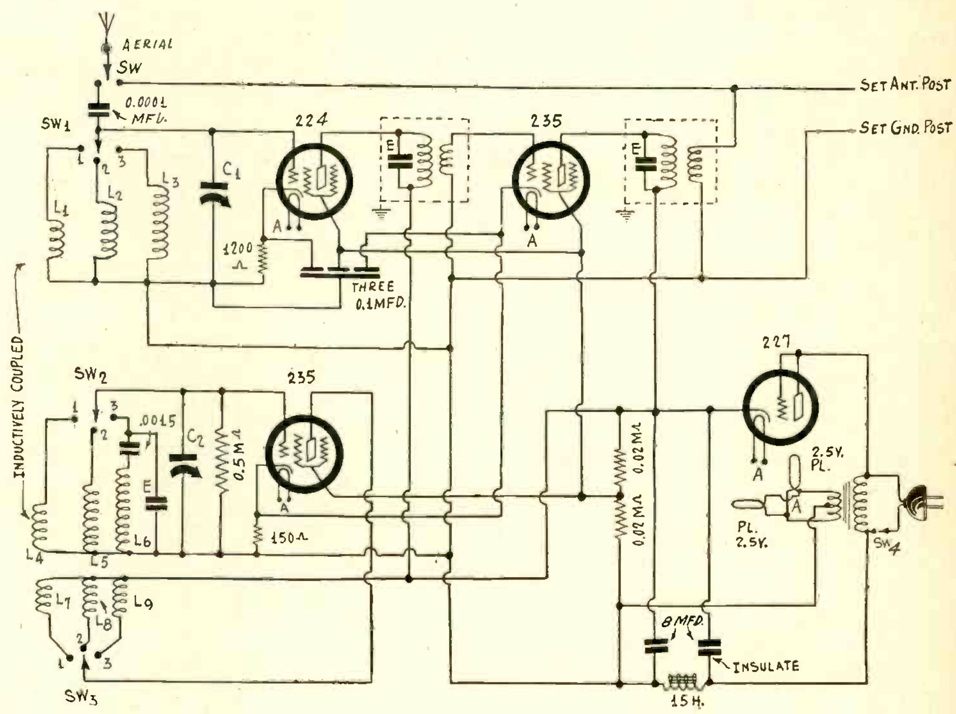


FIG. 1

An a-c operated short wave converter, from below 15 meters to above 200 meters, using two separate condensers and dials for tuning.

To avoid a large number of coils the tuning condensers, C1 and C2, may be 0.0002 mfd., which produces a frequency ratio of 2.6. In that way, allowing for sufficient overlap, so not to miss out on any frequencies, the practical ratio of the system would be more than 15, so if one begins at 200 meters, one reaches around 13 meters, which is entirely satisfactory.

Intermediate Frequency Choice

It is only the independent tuning of the two circuits that permits the selection of any intermediate frequency. Ordinarily if there is a built-in stage of intermediate amplification, it is of a partcular frequency, and the receiver has to be set to just that frequency. The padding of the oscillator, to make it tune in the same frequencies as does the modulator at the same dial settings, is based on a certain intermediate frequency. But let u see how the independent tuning system widens the range of choice to include any frequency the set can tune in, and how the selection is made.

First, attention is given to the receiver. It is well to work that at the frequency that is most sensitive. You will know from experience whether stations at the low frequency, middle frequency or high frequency end of the dial come in best. You will consider only distant stations, as when locals are used as the test the result may be deceptive, the seemingly greater sensitivity being really the greater input at the antenna caused by the larger field strength.

When the region of greatest sensitivity in the receiver is selected one will choose some frequency therein that does not bring in either a local station or any interference from such local station, or any distant station with much intensity. On almost any set some few semi-distant sets come in "as strong as a local," as the boastful but unscientific phrase has it. If your set is so sensitive it brings in a station at almost any point on the dial, use either extreme, beyond the broadcast band, choosing the more sensitive extreme, usually the high frequency end, if that can be done without uncontrollable oscillation being produced when the intermediate stage is added at that frequency. Tests will show which choice to make.

Coil Selection

If the oscillation is present but can be corrected by adjustment of the set's volume control, which is true in most insances, then there

LIST OF PARTS

For Fig. 1

Coils

Three forms, three windings on each form, as described (L3, L6, L9; L2, L5, L8; L1, L4, L7).
Two shielded intermediate frequency transformers, as described.
One 2.5 volt filament transformer with center tapped secondary.
One 15 henry choke, d-c resistance around 400 ohms.

Condensers

Two 0.0002 mfd. short wave tuning condensers (C1, C2).
Four 20-100 mmfd. equalizing condensers (one used as antenna series condenser at or near maximum capacity).
One 0.0015 mfd. fixed condenser.
One shielded block containing three 0.1 mfd. condensers; black lead common, reds interchangeable.
Two 8 mfd. electrolytic condensers, one with insulating washers and special lug.

Resistors

One 1,200 ohm resistor.
Two 0.02 meg. pigtail resistors.
One 150 ohm pigtail resistor.
One 0.5 meg. (500,000 ohm) pigtail resistor.

Miscellaneous Parts and Accessories

One chassis, with provision for four sockets and two electrolytic condensers mounted invertedly.
Binding posts: antenna, ground, blank for output (Set Ant. post).
One a-c cable and male plug for filament transformer.
One rotary conve selector switch, three points, three throws. shaft insulated from everything (SW-1, 2, 3).
Four UY sockets (two 235, one 224, one 227).
Three grid clips.
Two vernier dials with 2.5 volt pilto lamps.
One double pole single throw switch (SW).
One a-c toggle switch (SW-4).

er's Modulator and Oscillator

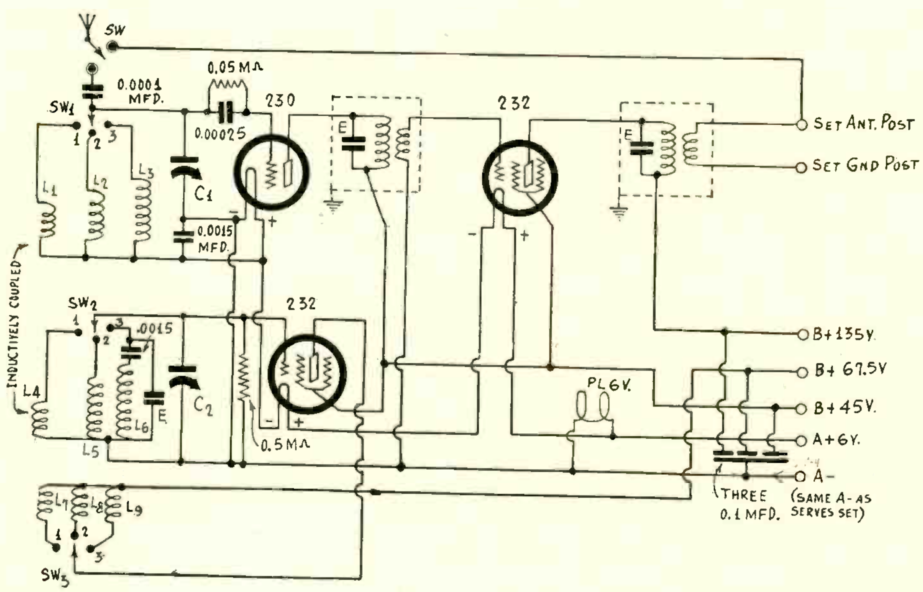
te Frequency Amplification

Battery Models

B. Herman

FIG. 2

The battery equivalent of Fig. 1. The grid leak and condenser modulator is deemed necessary, as the battery operated screen grid tube in the 2-volt series is not a good modulator, while the general purpose tube, 230, is. The biasing is accomplished by capitalizing the voltage drops in the series connected filaments of the 2-volt tubes. The A current drain by the tubes is therefore only 60 ma.



is no objection to using the frequency, even though it produces such oscillation at first.

The selection, therefore, has to be made on the basis of experience, tempered only by the possible necessity of eliminating oscillation, though the low frequency end always can be selected with virtual assurance of absence of oscillation trouble. So we have a wide field and nothing to fear.

The modulator coils are unaffected by the intermediate frequency, so may be wound on the basis of the original frequenceis of the short waves to be tuned in. This can be done experimentally by widening enough wire to bring in 200 meters or a wavelength a little higher. The coil and series condenser may be used as a wave trap on the receiver for that purpose. Count the number of turns, and for the next coil either bringing in at 95 or so on the dial a station that came in at 5 on the previous coil, or by dividing the number of turns on the first coil by 2.5. The third coil can be made by either method, also.

Having selected the intermediate frequency, tune your set to a frequency near that one, bringing in a station, and connect the antenna direct to the modulator grid, not through the series condenser. Use L3 in the modulator grid circuit, with the condenser C1 also not in circuit (stator connection temporarily disestablished) and set the equalizers (E) across the primaries (large windings) of the intermediate couplers so that resonance with the receiver is established. This is easily determined by maximum volume. Notice that the conventional secondaries are the primaries here.

Preliminary Line-up

If the intermediate frequency is high, the equalizers (20-100 mmfd.) will take care of it. The range is from 1,710 kc. to 1,030 kc., or from 172 to about 300 meters. Now, if a lower intermediate frequency is desired, all you need do is put another equalizer across the same two positions, or, for a still lower frequency, still another. As in nearly every instance the frequency selected will be above 1,030 kc., because nearly all sets are more sensitive in that region, only one equalizer is shown for each transformer.

Now you have the intermediate frequency near what it should be but not exactly right. However, you know that for a lower frequency you must use more capacity of E, and for a higher one, less capacity, so turn the equalizing condensers in the proper direction one-half a turn, reset the receiver to the desired intermediate frequency, and you have a preliminary adjustment that will give fair results in bringing in short waves.

When the original carrier frequency is in the band covered by the largest coil the percentage of difference between the modulator and the oscillator frequencies is greatest, and it will always be rathe rlarge. Therefore the capacity of C2 is cut down by a series condenser, 0.0015 mfd. being sufficient. The parallel equalizer E, across the oscillator coil, helps out, and may be set late rto bring the dial settings of modulator and oscillator more nearly together.

Peaking the Intermediate

Having determined on the number of turns for the largest modulator coil, L3, which for a 1-inch diameter would be about 50 turns of No. 28 enamel wire, the oscillator grid coil, L6, may have as many turns, to start with, and then turns taken off to make the dial settings more nearly alike. This is true because the oscillator

(*Continued on next page*)

LIST OF PARTS
For Fig. 2

Coils

Three forms, three windings on each form, as described (L3, L6, L9; L2, L5, L8; L1, L4, L7).

Two shielded intermediate frequency transformers, as described.

Condensers

Two 0.0002 mfd. short wave tuning condensers (C1, C2).

Four 20-100 mmfd. equalizing condensers, marked E (one used as antenna series condenser at or near maximum capacity).

Two 0.0015 mfd. fixed condensers.

One shielded block containing three 0.1 mfd. condensers; black lead common.

One 0.00025 mfd. fixed condenser reds interchangeable with grid leak clips.

Resistors

One 0.05 meg. grid leak (50,000 ohms).

One 0.5 meg. (500,000 ohm) pigtail resistor.

Miscellaneous Parts and Accessories

One chassis, with provision for three sockets for tubes and one for battery connector cable five lead.

Binding posts, antenna, ground, blank for output (Set Ant. post).

One rotary selector switch, three points, three throws; shaft insulated from everything (SW-1, 2, 3).

Three UX sockets (one 230, two 232¾).

Two grid clips.

Two vernier dials with 6 volt pilot lamps.

One double pole single throw switch (SW).

One A battery switch (SW-4).

Batteries: One 6 volt storage battery, three 45 volt B batteries. These may be the same batteries that serve your broadcast receiver.

Battery Model Converter

2 Volt Tubes in a Sensitive Circuit

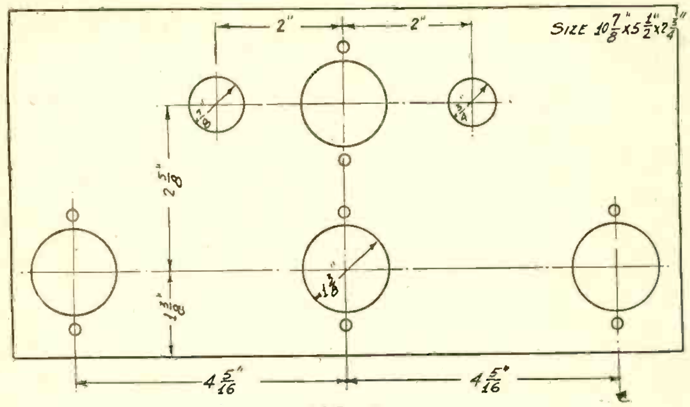


FIG. 3

Suggested layout for the construction of either model, a-c or battery operated, since the connecting cable's plug occupies the fourth socket. However, the holes for the electrolytic condensers would be omitted for battery use.

(*Continued from preceding page*)

tunes to a frequency higher than that of the modulator, and the difference always is the intermediate frequency. So, if the intermediate frequency is high, more turns will have to be removed from L6 than if the intermediate frequency were low.

The determination is made, of course, by tuning in a short wave station, using the band covered by L3, L6, L9. The data for all save L9 have been given, but L9 may be 20 turns of No. 28 enamel wire, separated 1/8-inch from the grid coil, no matter how many turns will be taken off L6.

Now, with a station tuned in, you will first desire to set the intermediate frequency more accurately. This is merely establishing greatest volume of response by resetting the two equalizers in the plate windings of the intermediate transformers. The work should be done with a neutralizing screwdriver, not with a metal tool. These equalizers are across what is usually the primary of a radio frequency transformer, but the tuned circuits are in the plate circuits, so the coils are used in what may be termed inverted fashion. Any t-r-f coils intended for 0.00035 mfd. or 0.00046 mfd. tuning may be used, provided they haven't small primaries. The coils actually used had 25 turn primaries wound over 100 turn secondaries, No. 31 wire, or thereabouts, and 1 1/8-inch diameter tubing. For 1 inch diameter use 127 turn secondaries and 25 turn primaries.

Assurance of Oscillation

The second and third coil systems may consist of secondaries with the same number of turns for each pair, tickler windings one-third the number of secondary windings for the middle band, and one-half the number of secondary turns for the final band. The separation is 1/8-inch in all cases.

A particular frequency is receivable at only one setting of the modulator in all instances, otherwise the coupling between modulator and oscillator is too close. It is recommended the separation be 1 1/2 inches for the largest coils, 1 3/4 inches for the next, 2 1/4 inches for the next. Some stations, because loud enough, come in at two settings of the oscillator. Use the higher frequency oscillator setting (less capacity), unless for reasons of interference removal the lower frequency setting must be used. This option is sometimes valuable, even though the higher frequency oscillator setting usually provides the more sensitivity.

The only thing that will prevent reception, provided the hook-up is followed correctly, and the receiver and all tubes are in good condition, is failure actually to connect the aerial to the intended post, or incorrect wiring of or winding of the oscillator coils. There are two possible ways to connect the oscillator coils correctly, but it is simple to remember that, with windings in the same direction, the ground and B plus connections of the grid and plate windings must face each other. That is, they adjoin, since the windings are side by side.

Voltages Obtained

Although schematic diagrams are not usually to be read literally —that is, as to location of parts or direction of windings—in this case the condition for oscillation is shown on the diagram, because the ground and B plus lines adjoin (lower left).

B plus is obtained from a simple rectifier, wherein a 227 tube furnishes this voltage. The d-c voltage from the output, after the 15 henry choke that has around 400 ohms resistance, will be almost exactly the same as the root mean square a-c input. Thus for a 110-volt line the plate voltage for the three tubes will be 110 volts. The screen voltage will be around 40 volts. The screen voltage, while that, will read a little lower on even a voltmeter of sensitivity of 1,000 ohms per volt. The plate voltage, however, may be read accurately on such a meter.

The antenna switch takes care of elimination of the nuisance of changing the antenna lead from converter to set, the rectifier supplies the B ad C voltages, a filament transformer feeds the heaters, and the unit is therefore autonomous and complete. Moreover, it will prove very sensitive indeed, will work well even on modest t-r-f sets, and also is so good that it will work on all superheterodynes.

Battery Equivalent

Substantially the same circuit and system are adopted to battery operation, as shown in Fig. 2, and the same layout would be followed, the extra socket being used for a battery cable connector, there being five leads. The tubes are of the 2-volt variety, and a 6-volt storage battery is used. Biases are obtained by utilizing the drops in the series connected filaments. The 230 has to be used as modulator, and preferably with grid leak and condenser, since the 232 is not a good modulator. However, the screen grid tube is used as oscillator and as first intermediate amplifier.

The pilot lamps may be of the 6-volt type, put in series, as the power expended then is less, and the brilliancy, while reduced, is quite enough for legibility. At full 6 volts, the 6-volt lamps light too brightly for comfort, anyway.

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Short Wave Editor, RADIO WORLD, 145 *West 45th St., New York.*

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The Monitor Receiver

It Needs Smaller Primaries and Vernier Dials

By Roland Tookle

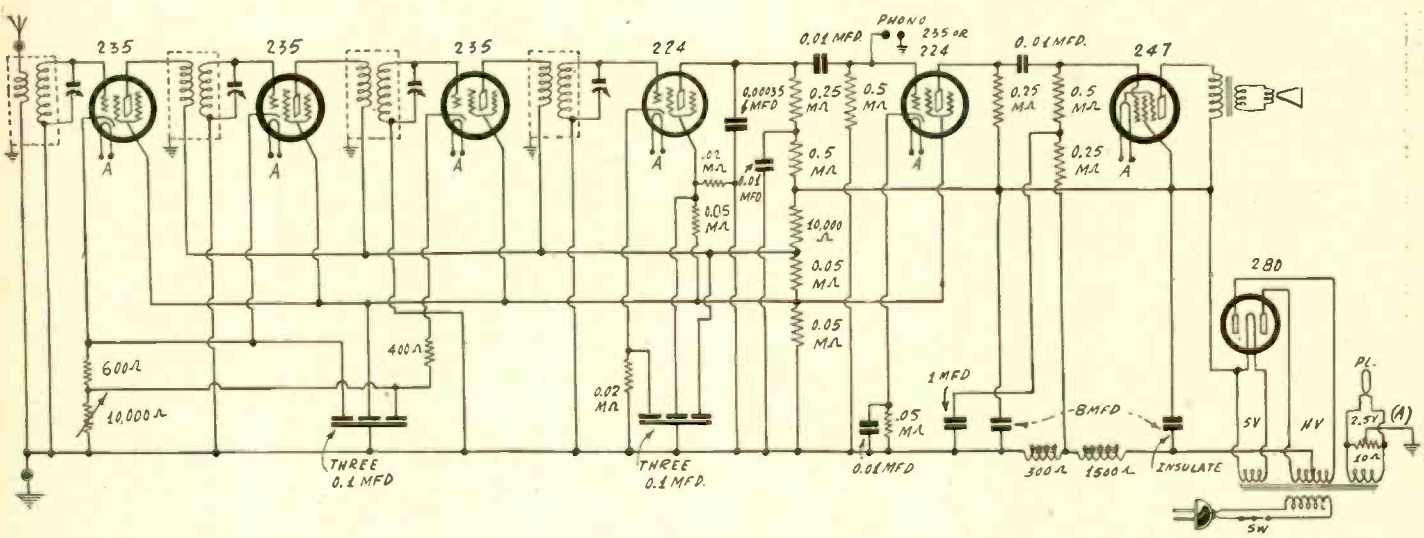

FIG. 1

The Monitor Receiver, incorporating a few slight changes in constants. The set is being tested on the 40 *and* 80 *meter amateur bands.*

THE Monitor receiver, concerning which there was preliminary discussion in the October 31st and November 14th issues, consists of three stages of tuned radio frequency amplification, tuned detector, two stages of resistance audio, with pentode output, and a B supply, using a 280. Plug in coils are used and the intention is to cover from 15 to 2,000 meters. In the November 14th issue a report was given on the broadcast band coverage, which performance was good. However, there was a lapse of two weeks between the time of the publication of the broadcast report, and the preparation of this one, due to trouble encountered on the first and second short wave bands.

This trouble consisted mainly of oscillation. The familiar double plop was present from a mid position of the dial to minimum capacity, and reception was very faint at the high capacity settings. This showed that the primaries were too large, and have to be cut down, and also that the tuning condenser as used on the broadcast band, 0.000325 mfd., has to be reduced for the first short wave band, to build up the inductance to capacity ratio, so signals will be loud at or near maximum capacity setting of the condensers.

Got Amateurs Loud and Clear

It will be remembered by those who read the previous discussion that the intention was to use 0.000325 mfd. also for the first short wave band, but experience now teaches the inadvisability of that. Series condensers that were to be cut in for the second short wave band must be cut in for the first, or a smaller condenser used throughout, and either requires an alteration of the coil windings. Since the primaries must be changed, too, new coils will be tried out, and a report rendered. It is confidently expected that this report will be favorable, because, after much manipulation with a squealing receiver, at a point just below oscillation it was possible to bring in the amateurs from all over the country on both the 40 meter and 80 meter bands. As there isn't anything else obtainable on these bands no real test for DX could be made, particularly since the author does not read code, and might be tuning in a foreign station and not know it. No foreign phone was heard on the amateur band.

It was also brought out that vernier dials are essentials. On the broadcast band this was not so, but the frequency change is much more rapid even on the first short wave band for a given capacity change, so it is no surprise that vernier dials are needed. Some were on at first, but they were of the insecure or shaky kind, whereupon plain dials were used, but it is next to impossible to get satisfactory short wave reception with these, and vernier dials will be used.

Some Circuit Changes

There have been a few slight changes in the circuit. These are included in the diagram published herewith. The volume control is made to govern three tubes, instead of only two, the voltage on the detector is reduced by a slightly different method, whereby the voltage is made more stable, and more or less independent of the signal, while the detector has been changed to a 224, with a load resistor of 0.25, meg., not counting the resistance of the unit in the filter circuit associated with the detector plate.

It is agreeable to report that, despite oscillation, there was no trouble from hum. so the filtration is all that it should be. Great help is afforded, of course, by the capacity-resistor filter in the pentode grid circuit, with the 1 mfd. condenser doing yeoman's service.

Since the publication of the previous articles many have written in about this receiver, showing that great interest attaches to it. The idea of getting it up was prompted by the fact that the Department of Commerce's Radio Division has a monitor receiver at the station at Grand Island, Neb., that has three stages of t-r-f, tuned detector, two stages of audio and separately tuned circuits, with plug in coils. They use a regenerated detector, probably for hearing interrupted continuous waves, but so far all tubes have been oscillating very nicely, thank you, and i-c-w comes in fine, after critical adjustment. These critical features will be eliminated.

Single Shield Per Stage

The question is asked whether single control will not work out satisfactorily, but it is obvious from the difference in dial settings that considerable sensitivity would be lost if single control prevailed.

On account of the large number of plug in coils that would be necessary the option obtains of using one shield for each stage, removing the shield and plugging in the coil. Thus there would not be more than four shields, instead of a shield for each separate coil, possibly 32 shields. This method of single shield per stage is being used and seems to be all right, the only objection being that if one removes the coils with moist hands when the set is turned on, he feels the plate and grid windings, and when I say he feels them you know what I mean—some 200 volts. This can be overcome by turning off the set when coils are to be changed.

It was stated originally that the set had not been built, when the first theoretical article was written. Since then it has been built and tested on the broadcast band, with a report rendered. Now it is in the throes of perfection for short wave work and soon it is expected an article will be published giving coil data and other constructional information for short waves. It is a laboratory set, one designed for performance, and should appeal to experimenters.

Those interested in the set are asked kindly to wait a little while until the wrinkles have been removed. Some have written in abjuring haste, but what we want is performance, and haste does not produce that very handily.

Tabulated Data on Receiving Tubes

Characteristics Listed for All Types—Amateur Transmitting Valves Included

FROM time to time tabulated data on receiving tubes, and a few transmitter tubes for amateur and experimental use, as well as on three regulator tubes, are published, and these are the most important tabulations for the radio worker, as everything he does concerns tubes. Particularly is the list important right now, since it includes information on some new tubes, and indeed some of this information on new tubes has been rather elusive. Now all is grouped under one heading.

It will be found from the characteristics chart that the tubes are placed in five distinctive functional groups: (1), detectors and amplifiers; (2), power amplifiers; (3), rectifiers; (4), regulators, and (5), oscillators and rectifier for amateur and experimental use.

Twenty-four Different Tubes Listed

Among detectors and amplifiers there are 16 tubes listed, among power amplifiers, 10; rectifiers, 2; regulators, 3; amateur, 3. The total, 34, is the most imposing array of tubes so far presented in a single characteristics chart for commercial receiver and amateur receiver and transmitter use. The chart is brand new, and moreover the information it contains is authoritative.

We find that in every case a detector type tube is also useful as an amplifier, with the exception of the 200-A detector, which is not called for much nowadays, as it is a gassy tube, and its performance may become hissy. There is no denying its high sensitivity, however.

The amplifier tubes are not always useful as detectors. The 222, a battery operated screen grid tube, is given no detector rating at all, nor is the 226, 235 or 236.

Getting the 222 to provide adequate detection has been an experimental difficulty that has baffled many home constructors, so one of the general purpose tubes should be used as detector, which may be of the 2 volt series, or a 201A, with proper filament application, or even an automotive tube, if a 6 volt storage battery is available.

Lower Screen Voltage on Audio

The 222 is listed as an audio frequency amplifier as well as a radio frequency amplifier, the negative bias being the same, but the plate voltage applied for audio frequency being higher. The value of coupling resistance to use with screen grid tubes is given in the references.

The 226 is ruled out because it is an a-c filament heated tube, and the hum would be intolerable.

The 235 is a variable mu tube, and its virtue as an amplifier lies in its almost uncanny ability to get rid of crosstalk and cross interference, due to its small detection in comparison to amplification. However

Information on Tubes—A Valuable List, Well Worth Keeping

RCA RADIOTRON CHARACTERISTICS CHART

DETECTORS AND AMPLIFIERS

TYPE	PURPOSE	BASE	DIMENSIONS MAX OVERALL LENGTH	DIAM.	CATHODE TYPE	RATING FILAMENT (OR HEATER) VOLTS	AMPERES	SUPPLY	PLATE MAX. VOLTS	SCREEN MAX. VOLTS	PLATE SUPPLY VOLTS	NEGATIVE GRID BIAS VOLTS D C ON FIL.	A C ON FIL.	SCREEN VOLTS	PLATE CURRENT MILLI-AMP.	A C PLATE RESISTANCE OHMS	MUTUAL CONDUCTANCE MICRO-MHOS	VOLTAGE AMPLIFICATION FACTOR	OHMS LOAD FOR STATED POWER OUTPUT	POWER OUTPUT MILLI-WATTS
WD-11	DETECTOR * or AMPLIFIER	WD-11	4⅛"	1 3/16"	FILAMENT	1.1	0.25	D C	135	—	90 135	4.5 10.5	—	—	2.5 3.0	15500 15000	425 440	6.6 6.6	15500 18000	7 35
WX-12	DETECTOR * or AMPLIFIER	UX	4 11/16"	1 7/16"	FILAMENT	1.1	0.25	D C	135	—	90 135	4.5 10.5	—	—	2.5 3.0	15500 15000	425 440	6.6 6.6	15500 18000	7 35
UX-112-A	DETECTOR * or AMPLIFIER	UX	4 11/16"	1 13/16"	FILAMENT	5.0	0.25	D C	180	—	90 135	4.5 9.0	—	—	5.2 6.2	5600 5300	1500 1600	8.5 8.5	5600 8700	30 115
UV-199	DETECTOR * or AMPLIFIER	UV-199	3½"	1 1/16"	FILAMENT	3.3	0.063	D C	90	—	90	4.5	—	—	2.5	15500	425	6.6	15500	7
UX-199	DETECTOR * or AMPLIFIER	UX	4⅛"	1 3/16"	FILAMENT	3.3	0.06	D C	90	—	90	4.5	—	—	2.5	15500	425	6.6	15500	7
UX-200-A	DETECTOR	UX	4 11/16"	1 13/16"	FILAMENT	5.0	0.25	D C	45	—	45	Grid Return to (—) Filament		—	1.5	30000	666	20	—	—
UX-201-A	DETECTOR * or AMPLIFIER	UX	4 11/16"	1 13/16"	FILAMENT	5.0	0.25	D C	135	—	90 135	4.5 9.0	—	—	2.5 3.0	11000 10000	725 800	8.0 8.0	11000 20000	15 55
UX-222	RADIO FREQ. AMPLIFIER	UX	5¼"	1 13/16"	FILAMENT	3.3	0.132	D C	135	67.5	135 135	1.5 1.5	—	45 67.5	1.5 3.3	850000 600000	350 480	300 290	—	—
UX-222	AUDIO FREQ. AMPLIFIER	UX	5¼"	1 13/16"	FILAMENT	3.3	0.132	D C	135	67.5	180†	1.5	—	22.5	0.3	2000000	175	350	—	—
UY-224	RADIO FREQ. AMPLIFIER	UY	5¼"	1 13/16"	HEATER	2.5	1.75	A C or D C	275	90	180 180 250	1.5 3.0 3.0	1.5 3.0 3.0	75 90 90	4.0 4.0 4.0	400000 400000 600000	1050 1000 1025	420 400 615	—	—
UY-224	BIASED DETECTOR	UY	5¼"	1 13/16"	HEATER	2.5	1.75	A C or D C	275	90	275‡	5 approx.	5 approx.	20 to 45	Plate Current to be adjusted to 0.1 ma. with no Input Signal			—	—	—
UY-224	AUDIO FREQ. AMPLIFIER	UY	5¼"	1 13/16"	HEATER	2.5	1.75	A C or D C	275	90	250*	1.0	1.0	25	0.5	2000000	500	1000	—	—
UX-226	AMPLIFIER	UX	4 11/16"	1 13/16"	FILAMENT	1.5	1.05	A C or D C	180	—	90 135 180	5.0 8.0 12.5	6.0 9.0 13.5	—	3.8 6.3 7.4	8600 7200 7000	955 1135 1170	8.2 8.2 8.2	9800 8800 10500	30 80 180
UY-227	DETECTOR * or AMPLIFIER	UY	4 11/16"	1 13/16"	HEATER	2.5	1.75	A C or D C	275	—	90 135 180 250	6.0 9.0 13.5 21.0	6.0 9.0 13.5 21.0	—	2.7 4.5 5.0 5.2	11000 9000 9000 9250	820 1000 1000 975	9.0 9.0 9.0 9.0	14000 13000 18700 34000	30 80 165 300
UY-227	BIASED DETECTOR	UY	4 11/16"	1 13/16"	HEATER	2.5	1.75	A C or D C	275§	—	275	30.0 approx.	30.0 approx.	—	Plate Current to be adjusted to 0.2 ma. with no Input Signal			—	—	—
RCA-230	DETECTOR * or AMPLIFIER	UX	4¼"	1 9/16"	FILAMENT	2.0	0.06	D C	90	—	90	4.5	—	—	1.8	13000	700	9.3	15000	16
RCA-232	RADIO FREQ. AMPLIFIER	UX	5¼"	1 13/16"	FILAMENT	2.0	0.06	D C	150	67.5	135	3.0	—	67.5	1.4	1150000	505	580	—	—
RCA-232	BIASED DETECTOR	UX	5¼"	1 13/16"	FILAMENT	2.0	0.06	D C	150	67.5	174*	6 approx.	—	67.5	Plate Current to be adjusted to 0.2 ma. with no Input Signal			—	—	—
RCA-232	AUDIO FREQ. AMPLIFIER	UX	5¼"	1 13/16"	FILAMENT	2.0	0.06	D C	150	67.5	180†	1.0	—	22.5	0.25	—	—	—	—	—
RCA-235	RADIO FREQ. AMPLIFIER	UY	5¼"	1 13/16"	HEATER	2.5	1.75	A C or D C	275	90	180 250	1.5 3.0	1.5 3.0	75 90	5.8 6.5	350000 350000	1100 1050	385 370	—	—
RCA-236	RADIO FREQ. AMPLIFIER	UY	4 11/16"	1 9/16"	HEATER	6.3	0.3	D C	180	90	90 135 180	1.5 1.5 2.5	—	55 67.5 90	1.8 2.8 3.5	450000 450000 450000	825 1025 1075	370 460 485	—	—
RCA-237	DETECTOR * and AMPLIFIER	UY	4¼"	1 9/16"	HEATER	6.3	0.3	D C	180	—	90 135 180	6 9 13.5	—	—	2.6 4.3 4.7	11500 10000 10000	780 900 900	9.0 9.0 9.0	17500 14000 20000	30 80 175
UX-240	VOLTAGE	UX	4 11/16"	1 13/16"	FILAMENT	5.0	0.25	D C	180	—	135†	1.5	—	—	0.2	150000	200	30	—	—

as a grid leak detector it can be truly said to work, and it also performs as a negative bias detector, though in neither case as well as the 224, so the 235 is well ruled out as a favorite for detection.

The 236 is the screen grid amplifier tube of the automotive series and is of the heater type. Its filament voltage requirement is 6.3 volts, so a storage battery may be connected directly to filament, for the battery when fully charged will register 6.3 volts. The detector for this series is the 237.

Grid Leak Detection

Notice that grid leak detection is specified, with different constants, for some tubes, with negative bias detection optional, but for other tubes negative bias detection alone prevails. The negative bias is high and detection of this type is called power detection.

In connection with screen grid tubes, notice that the screen voltage may be lower for audio frequencies than for radio frequencies.

For instance, take the 222. The rating of maximum plate volts and maximum screen volts calls for 135 and 67 volts, respectively, for r-f and a-f, but in the next columns to the right the 180 volt recommendation is made, a notation calling for a resistor of 250,000 ohms in the plate circuit, while the screen voltage is 22.5 volts. Thus, too, the 224 takes a maximum of 90 volts on the screen with 275 volts applied to the plate, but at 250 volts applied through a 200,000 ohm resistor the screen voltage is 25 volts.

Static curves taken of screen grid tubes in RADIO WORLD's laboratories show that excellent detection results are obtained on some types with very low screen voltage, and the static curves may be used because no dynamic conditions prevail, as to the audio aspects of the tube's function in a resistance coupled amplifier. The radio frequencies of course are bypassed, anyway. So, too, in audio amplification, low screen voltages work well. Experimental results have been good at screen voltages as low as 1.5 volts for detection.

Where is the 51 Vari-Mu Tube?

From the list of detectors and amplifiers it will be noticed that the 51 tube is missing. This seems to indicate the withdrawal of this tube, with concentration on the 235, which performs substantially the same purpose.

Under power amplifiers the voltage amplification factor of the 247 pentode is given as 90, the plate resistance as 35,000 ohms, the maximum undistorted power output at 2,500 milliwatts (2.5 watts). These data compare to the following for the 245: voltage amplification factor, 3.5; plate resistance, 1670 (under stated maximum conditions); power output, 2,000 milliwatts (2 watts). As for the 250 tube, not until the plate voltage exceeds 350 volts, other conditions consistent, does the power output exceed that of the 247 at 250 volts etc.

The data on the 280 rectifier are more detailed than formerly, the voltage per plate being 350, 400 and 550 for d-c current drains of 125, 110 and 135 ma. The seeming contradiction, whereby the voltage rating in the last-named case is greater when the current is larger than in the preceding examples, is due to the special precaution of a choke input, as stated in a notation.

*For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode.
†Applied through plate coupling resistor of 250000 ohms.
*Applied through plate coupling resistor of 200000 ohms.
§Applied through plate coupling resistor of 50000 ohms.
‡Applied through plate coupling resistor of 250000 ohms or 500 henry choke shunted by 0.25 megohm resistor.
¤Applied through plate coupling resistor of 100000 ohms.

POWER AMPLIFIERS

UX-112-A	POWER AMPLIFIER	UX	4 11/16"	1 13/16"	FILAMENT	5.0	0.25	A C or D C	180	—	135 180	9.0 13.5	11.5 16.0	—	6.2 7.6	5300 5000	1600 1700	8.5 8.5	8700 10800	115 260
UX-120	POWER AMPLIFIER	UX	4 1/8"	1 3/16"	FILAMENT	3.3	0.132	D C	135	—	90 135	16.5 22.5	—	—	3.0 6.5	8000 6300	415 525	3.3 3.3	9600 6500	45 110
UX-171-A	POWER AMPLIFIER	UX	4 11/16"	1 13/16"	FILAMENT	5.0	0.25	A C or D C	180	—	90 135 180	16.5 27.0 40.5	19.0 29.5 43.0	—	12.0 17.5 20.0	2250 1960 1850	1330 1520 1620	3.0 3.0 3.0	3200 3500 5350	125 370 700
RCA-210	POWER AMPLIFIER	UX	5 5/8"	2 3/16"	FILAMENT	7.5	1.25	A C or D C	425	—	250 350 425	18.0 27.0 35.0	22.0 31.0 39.0	—	10.0 16.0 18.0	6000 5150 5000	1330 1550 1600	8.0 8.0 8.0	13000 11000 10200	400 900 1600
RCA-231	POWER AMPLIFIER	UX	4 1/4"	1 3/16"	FILAMENT	2.0	0.130	D C	135	—	135	22.5	—	—	6.8	4950	760	3.8	9000	150
RCA-233	POWER AMPLIFIER	UY	4 11/16"	1 13/16"	FILAMENT	2.0	0.26	D C	135	135	135	13.5	—	135‡	14.5	50000	1350	70	7000	650
RCA-238	POWER AMPLIFIER	UY	4 11/16"	1 3/16"	HEATER	6.3	0.3	D C	135	135	135	13.5	—	135‡‡	9.0	102000	975	100	13500	525
UX-245	POWER AMPLIFIER	UX	5 5/8"	2 3/16"	FILAMENT	2.5	1.5	A C or D C	275	—	180 250 275	33.0 48.5 54.5	34.5 50.0 56.0	—	27.0 34.0 36.0	1900 1750 1670	1850 2000 2100	3.5 3.5 3.5	3500 3900 4600	780 1600 2000
RCA-247	POWER AMPLIFIER	UY	5 5/8"	2 3/16"	FILAMENT	2.5	1.75	A C or D C	250	250	250	15.0	16.5	250‡‡‡	32.0	35000	2500	90	7000	2500
UX-250	POWER AMPLIFIER	UX	6 1/4"	2 11/16"	FILAMENT	7.5	1.25	A C or D C	450	—	250 350 400 450	41.0 59.0 66.0 80.0	45.0 63.0 70.0 84.0	—	28.0 45.0 55.0 55.0	2100 1900 1800 1800	1800 2000 2100 2100	3.8 3.8 3.8 3.8	4300 4100 3670 4350	1000 2400 3400 4600

‡Screen Current 3.5 Milliamperes. ‡‡Screen Current 2.5 Milliamperes. ‡‡‡Screen Current 7.5 Milliamperes.

RECTIFIERS

UX-280	FULL-WAVE RECTIFIER	UX	5 5/8"	2 3/16"	FILAMENT	5.0	2.0	A C	1 {A C Voltage per Plate (Volts RMS) 350 D C Output Current (Maximum MA.) 125 2 {A C Voltage per Plate (Maximum Volts RMS) 400 D C Output Current (Maximum MA.) 110 3 {A C Voltage per Plate (Maximum Volts RMS) 550 D C Output Current (Maximum MA.) 135 This rating is permissible only with filter circuits having an input choke of at least 20 henries.	For d-c output voltage delivered to filter of typical rectifier circuit, refer to curves in Technical Bulletin.
UX-281	HALF-WAVE RECTIFIER	UX	6 1/4"	2 7/16"	FILAMENT	7.5	1.25	A C	A C Plate Voltage (Maximum Volts RMS) 700 D C Output Current (Maximum MA.) 85	For d-c output voltage delivered to filter of typical rectifier circuit, refer to curves in Technical Bulletin.

REGULATORS

UX-874	VOLTAGE REGULATOR	UX	5 5/8"	2 3/16"	Designed to keep output voltage of B-Eliminators constant when different values of "B" current are supplied.	Operating Voltage 90 Volts D C Starting Voltage 125 Volts D C Operating Current 10-50 Milliamperes
UV-876	CURRENT REGULATOR (Ballast Tube)	Mogul	8"	2 1/16"	Designed to insure constant input to power operated radio receivers despite fluctuations in line voltage.	Operating Current 1.7 Amperes Voltage Range 40-60 Volts
UV-886	CURRENT REGULATOR (Ballast Tube)	Mogul	8"	2 1/16"	Designed to insure constant input to power operated radio receivers despite fluctuations in line voltage.	Operating Current 2.05 Amperes Voltage Range 40-60 Volts

TYPES FOR AMATEUR AND EXPERIMENTAL RADIO USES

TYPE	PURPOSE	BASE	DIMENSIONS MAXIMUM OVERALL		CATHODE TYPE	FILAMENT			NORMAL PLATE VOLTS	VOLTAGE AMPLIFICATION FACTOR	NEGATIVE GRID BIAS		SCREEN VOLTAGE		PLATE CURRENT		PLATE DISSIPATION		POWER OUTPUT		
											CLASS B	CLASS C	CLASS B	CLASS C	CLASS B	CLASS C	CLASS B	CLASS C	CLASS B		CLASS C
			LENGTH	DIAM.		VOLTS	AMPS.	SUPPLY			APPROXIMATE VOLTS	APPROXIMATE VOLTS	APPROXIMATE VOLTS	APPROXIMATE VOLTS	MAXIMUM MA.	MAXIMUM MA.	MAXIMUM WATTS	MAXIMUM WATTS	PEAK WATTS	CARRIER WATTS	WATTS
RCA-852	OSCILLATOR or R. F. POWER AMPLIFIER	UX	8 3/4"	6 1/8"	FILAMENT	10.0	3.25	A C	2000	12	150	250	—	—	85	100	100	100	120	30	100
RCA-865	OSCILLATOR or R. F. POWER AMPLIFIER	UX	6 1/4"	2 3/16"	FILAMENT	7.5	2.0	A C	500	150	40	75	125	125	30	60	15	15	7.5	1.9	7.5
RCA-866	HALF-WAVE RECTIFIER	UX	6 5/8"	2 7/16"	FILAMENT	2.5	5.0	A C	Maximum Peak Inverse Voltage 7500 Volts Maximum Peak Plate Current 0.6 Ampere Approximate Tube Voltage Drop 15 Volts												

For further information on RCA Radiotron characteristics write to the Commercial Engineering Department, RCA Radiotron Company, Inc., Harrison, N. J.

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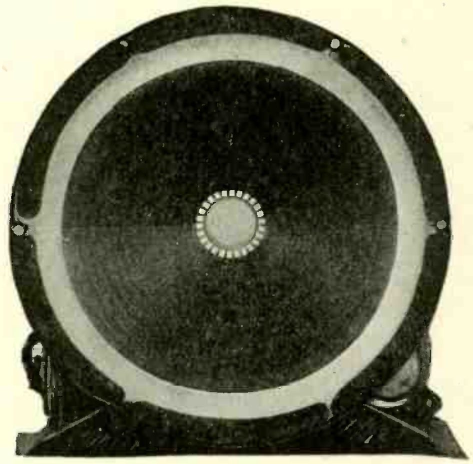
FIG. 971

Front view of a dynamic speaker. The armature or moving element is at center and has the voice coil connected to it at rear (not shown), so that current variations produced in the set's output cause corresponding movement of the armature.



Characteristics of the 238 Tube

WHAT are the characteristic data for the 238 tube? I understand this is the pentode of the automotive series, but I have never seen complete data on this valve.—G. E. W.

Please see pages 12 and 13, where data are given for all the receiving tubes.

* * *

Effective Cone Diameter

WHAT is the effective diameter of a cone type speaker? Should the cone itself be measured alone, or may the frame be included?—H. D. A.

The total diameter, including the frame, should be measured, as the frame adds to the radiating surface, and, to the small extent affected, is an extension radiator or baffle. In specifications on lists of parts the extreme diameter, that is, including the rim, is usually designated. See Fig. 971.

* * *

Instability as Hurtful to Gain

IF an intermediate amplifier, or a detector or any other circuit, is oscillating, is that not a sign that by slightly reducing the gain, to stop oscillation, that you will get the most amplification from the tube or circuit? If that is true, why is it that once in a while I encounter oscillation in a circuit I build and I can not get much pep out of the hookup.—I. O.

The oscillating circuit that should be stable is usually one affording the least gain. The instability is such that means must be adopted to produce stability, and these usually take the form of sharp reduction of primary turns below the number that should be present for good gain, or introduction of series or parallel resistance, both loss-provoking. The cure is to use more and better shielding, including tube shields and tuning condenser shield, provide bypassing and otherwise take precautions to produce stability inherently. The progression may be in the direction of more primary turns or otherwise tighter coupling from a stable circuit, rather than from an unstable circuit to one of weak though stable performance.

* * *

Effect of Scanning Disc Size

SCANNING discs of various sizes are offered, some being 24 inches, others 18 inches. Does not the size of the disc have something to do with the size of the picture?—L. K.

Yes, the picture is larger on larger discs. The discs of a few years ago were even larger than 24 inches, but it has been found that the 24 or 18 inch diameter is quite satisfactory. Use either one.

* * *

Short Waves on a 175 kc. Super

WILL it be possible for me to tune in short waves on the superheterodyne I built for broadcast performance? The intermediate frequency is 175 kc, and I understand that is pretty low for short wave work, but do not know why. I am able to wind my own coils and provide the switching method.—H. G. R.

The intermediate frequency is all right for short waves, although a higher one is preferable for highest frequencies, because providing a better percentage of frequency margin between oscillator and modulator. You can provide the usual system for switching, whereby there is a series antenna condenser going to modulator grid, and the switch arm moves this connection to the high side of the coils, the other side of the coils being grounded. Instead of a coil to cover the lowest band in the modulator circuit, a resistor or small r-f choke coil may be used, and while requiring another switch, removes the intermediate frequency as a low wave limit, since oscillator tuning alone would be used for the highest frequency band.

* * *

Coupling From a 227 Tube

BY using a 227 as detector is not a better result attained when audio transformer coupling follows? What is the reason? What should the negative bias be as for power detection? Please state the plate current.—O. R.

The 227 is a relatively low impedance plate tube and therefore is much more suitable for in inductive load than is a high impedance (screen grid) tube. By all means use the 227. The negative bias should be around 30 volts, but is not critical. The plate current may be adjusted to 0.2 milliampere when there is no signal.

* * *

280 Voltage Rating Increase

HOW may the voltage rating of the 280 tube be increased, to capitalize the fact that the current is low? I am drawing about 120 milliamperes, and can stand some extra voltage if the rectifier tube will bear it.—J. McC.

The voltage rating of the tube depends on the current drawn, that is, where the current is less, the voltage may be more, within limits. Therefore the maximum root mean square voltage per plate may be 400 volts a-c at a d-c output current not exceeding 110 ma, but for still higher voltage, even at more current, there must be a choke input. That means that next to the rectifier no condenser must be placed, but B plus is taken off the rectifier through the choke, which should have an inductance of at least 20 henries. Then comes the first filter condenser, followed by the regular B supply choke and the one or two other filter condensers. One fact to remember is that hum is slightly higher when the choke input method is used, and therefore filtration in the succeeding filter must be exceptionally good.

* * *

Code for Resistance Values

WILL you please tell me the resistance values of the following standard coded resistors: main color, brown, dot orange; end black; also main color, red; dot, yellow; end, green. —H. T. D.

The first one is 10,000 ohms and the second one 250,000 ohms. You will find the complete list of resistors, from 500 ohms to 10,000,000 ohms, with color code for each resistor given in body, dot and end designations, on page 15 of the November 28th issue. Such a list every service man should have in his pocket and every experimenter should have at his workbench. Several manufacturers of resistors publish booklets that contain not only this information but also data on the resistors required for replacement in factory-made sets. For information about such a booklet write to Lynch Manufacturing Company, 1775 Broadway, New York, N. Y.

* * *

Use of A-C Set in an Auto

IS it possible to use an a-c set in an automobile? I have heard this has been done, or can be done. Please explain how, because there is only d-c in an automobile.—J. G. D.

Some of the radio set manufacturers have been working on auto sets based on the installation of a power converter in the car, and meanwhile a manufacturer has come out with an instrument listing at $39.50 that is intended to serve the purpose. It is a power converter that furnishes 110 volt, 60 cycle alternating current from the 6 volt storage battery in the automobile. The size is 4x4x10 inches, and it may be mounted forward of the cowl, just behind the ignition, or in any other convenient place. Besides, there are low priced rotary converters, that take up somewhat more room.

* * *

Selection of Simple Built-in Converter

AFTER having read a great deal about short waves, always interested in them, I have at last decided to hear some of them. Can you imagine, I never heard a short wave program yet? Now, I would like to know whether by putting a single extra tube in my set, which is a-c operated, I can bring in short waves, and if so, how should it be done? Can I change the first r-f tube to a modulator-oscillator, and use one less intermediate stage in the converter system, or is a separate oscillator better? I haven't much money to spend.—G. D. F.

By adding an extra tube, and some associated equipment that takes very little room, you can bring in short waves. The results may be classified as fair, but well worth the slight expense involved. It is not a good plan to change the function of the tubes, especially as the coupling becomes so close that a fierce grunting or high pitched squeal results the moment the d-c voltage on the tubes are not exactly right, hence the terrific noise might originate when the volume control is adjusted. By far the better plan is to put in an extra tube, a modulator-oscillator, and preferably extinguish it when short waves are not desired. How to do this was shown on page 5 of the November 21st issue, and a full diagram of a set was published. The B voltage for the oscillator-modulator may be 75 to 100 volts or so. Consult the diagram and if in doubt on any point, write again.

* * *

Two Impossible Formulas Requested

WILL you please state the formulas for broadcast and long wave inductance in shielded state and also for short waves with or without shielding.—H. D. S.

You picked out two good requests. There is no formula for inductance in shields, as the shields increase the capacity and decrease the inductance, compared to no shielding, and these changes depend on many factors, including the size of the shield, thickness of the wall, material of which the shield is made, diameter of the form and length of the coil on the form. Also, for short waves, shielding or none, the minimum capacities of wiring and condensers, the location of parts, particularly inductive ones and other considerations, make it impractical to develop a tenable formula. Both these results must be obtained experimentally. We can, however, give you some experimentally developed data. For 1⅛ inch diameter tubing, 0.00035 mfd. condenser, broadcast coverage, wind 120 turns secondary, for 0.00046 mfd. wind 100 turns secondary, for 0.0005 mfd. wind 90 turns secondary. For 1 inch diameter, 0.00035 mfd., wind 127 turns secondary, for 0.00046 mfd. wind 105 turns, for 0.0005 mfd. wind 95 turns. The shields should be at least 2 inch diameter, preferably around 2½ inches, and should be 2¼ inches high or more, the coil winding centered between top and bottom of shield. The wire is around No. 30 enamel, the size, if in that neighborhood, not being very material. The primary may be wound over the secondary and for screen grid tubes consist of 25 turns of even finer wire. The same coil may be used for antenna coupler. For short waves, using no shielding, 1 inch diameter, 50 turns of No. 28 enamel wire may be used for beginning a little above at 200 meters, with 0.0002 mfd., and the rest of the coils may be apportioned on the frequency ratio basis as determined from the first coil. It will be found, for instance, that for this capacity the maximum frequency will be 2.6 times that of the minimum frequency, therefore divide the number of turns by 2.6 and add about 10 per cent turns for overlap. This is practical because the inductance is approximately proportional to the number of turns. Remember that if the oscillator of a superheterodyne is to be tuned the intermediate frequency should add to the modulator frequency extremes to obtain the band spread desired. Thus, at 175 kc, the first short wave coil for the oscillator would have a little less than 50 turns. If modulator and oscillator are to be ganged for tuning a problem arises that requires an independent local oscillator for solution.

* * *

Screen Coupled Converter

PLEASE show an a-c operated short wave converter diagram, with modulator and oscillator independently tuned, screen coupled, and with the output tuned also, although fixedly. The B voltage will be obtained externally.—U. D. E.

See Fig. 972. The coupling is effectuated from screen of modulator to grid of oscillator. Sensitivity may be varied, hence volume controlled, by a 25,000 ohm potentiometer, P. To limit the screen voltage, so as not to be excessive, a resistor may be placed in series with the screen coil, to the right of X. This may be 0.1 meg. (100,000 ohms). A little regeneration may be present in the modulator circuit, and is helpful, and the value of this series resistor may be so selected as to afford some regeneration without too critical effects. The tubes are heated by a 2.5 volt center tapped filament transformer. If plug-in coils are used the one for the oscillator must be of the six connection type, for which special coil forms and six prong sockets are commercially obtainable. Values of other constants may be: C1, C5, 0.00015 mfd.; C2, C4, C6 and C8, 0.1 mfd. or higher capacity; C7, a 20-100 mfd. equalizer, if the intermediate frequency is to be high (1,000 to 1,600 kc), or, if it is to be low, put a 0.00025 mfd. condenser is parallel with the equalizer. This frequency is to be selected on the basis of the region of utmost sensitivity in your receiver. Notice that a broadcast coil with large primary (of the type described above for H. D. S.) is used "backwards." R1 is 600 to 1,200 ohms for a 224 tube, R2 is 300 ohms. The oscillator tube is a 227. The tickler has one-third as many turns as the secondary for the first two short wave bands, one half as many for the next two, the separation being ⅛ inch for the first two and ¼ inch for the second two.

* * *

Short Wave Super Problems

IN building a small short wave set on the superheterodyne principle, with one stage of intermediate frequency amplification, is it possible that there will be oscillation in the intermediate amplifier or modulator, and if so why? Also, should the primary be tuned or the secondary or both? What is the difference in effect? Can I get good results with only one stage of audio? Had the oscillator and modulator better be separate, or is it practical to use the so-called autodyne system?—K. H.

Oscillation may obtain at the intermediate level, but hardly in the modulator. The reason for oscillation is that there are two tuned coil systems, one feeding the intermediate stage, the other serving as its output, and there may be coupling between the two, if the intermediate frequency is high (say, 1,600 kc), even if the coils are shielded. Besides, stray capacities help build up oscillation. However, the trouble can be eliminated by using grid suppressor in the intermediate stage or by reducing the screen or plate voltage or both, on the intermediate tube, and by reversing connections of one secondary. Either the primary or the secondary may be tuned, or both. The selectivity may be a little better when both are tuned, provided they are tuned accurately, but the adjustment is more simply made if only one is tuned, and this is usually the secondary. You can get good results with a single stage of audio, with pentode output. It is better to have the modulator and the oscillator separate. However, a system of autodyne use, for a five tube set, was described last week, issue of November 28th. Our blueprint No. 628-B covers a six tube set, where modulator and oscillator are separate, and the secondaries of the intermediate coils are tuned. There is one stage of audio.

Converter with Screen Coupling to Oscillator

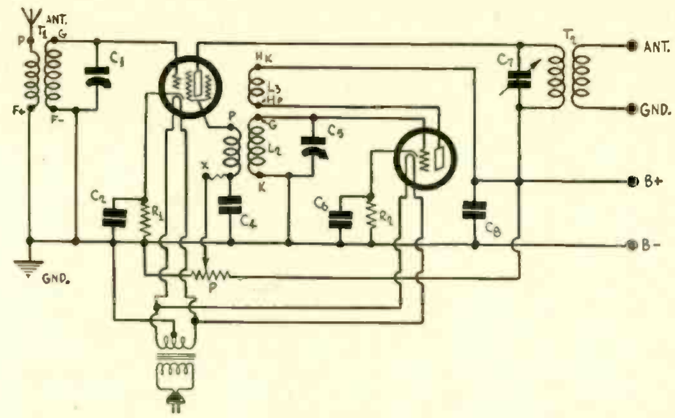


FIG. 972

A short wave converter, with screen of modulator coupled to grid of oscillator.

The November "Proceedings"

Paper on Ultra Short Wave Production by Magnetrons Is One Feature

By Capt. Peter V. O'Rourke

"THE Adjustment of the Multivibrator for Frequency Division" is the title of a paper by Victor J. Andrew, University of Chicago, discussing various applications of the multivibrator of Abraham and Bloch to frequency division. Circuits are shown for getting odd or even frequency division as well as for getting any frequency division. The circuits are useful in calibration work when a standard frequency of high value and high accuracy is available from which lower frequencies are desired.

* * *

"New Methods of Frequency Control Employing Long Lines" are described in a paper thus entitled by Messrs. J. W. Conklin, J. L. Finch, and C. W. Hansell, R.C.A. Communications, Inc., New York, N. Y. The methods are applicable to the control of oscillators of the ultra-high frequencies between 35,000 and 100,000 kilocycles per second. Methods for applying the lines to the control of oscillator frequencies by using them as relatively constant low power factor resonant circuits and as aperiodic means for feeding regenerative energy from anode circuits to grid circuits are described. A method is given for obtaining both the advantages of crystal oscillators as frequency standards and the economies and reliability of long line transmitter frequency control. Applications of the methods described to experimental and commercial transmitters are mentioned.

* * *

"Some Observations of the Behavior of Earth Currents and Their Correlation with Magnetic Disturbances and Radio Transmission," by Isabel S. Bemis, American Telephone and Telegraph Company, New York. This paper presents correlation between abnormal earth currents noted during magnetic storms and transoceanic radio transmission on both long and short waves. Th eradio transmissio ndata were collected on the telephone circuits operating between New York and London and between New York and Buenos Aires. The earth current data were collected on two Bell System lines extending approximately a hundred miles north and west from New York. The results of this work establish facts which have been known in a general way from some time. The direction of flow of abnormal earth currents in the neighborhood of New York seems to be along a northwest-southeast line. Coincident with such abnormal currents are periods of poor short-wave radio transmission. However, on long waves, daylight transmission over transatlantic distances is improved. On the short-wave circuit to Buenos Aires, transmission is adversely affected but only to a moderate extent. The paper consists mostly of records obtained automatically.

* * *

Edward N. Dinkley, Jr., Development Laboratory R.C.A. Radiotron Company, Harrison, N. J., contributes a paper on the "Development of a Circuit for Measuring the Negative Resistance of Pliodynatrons." The author gives a test circuit by which the negative resistance of the plate circuit of a dynatron can be measured quickly and accurately. He obtains the condition for balance in the circuit and from this derives a simple expression for obtaining the negative resistance. By a suitable choice of a ratio of two resistances it reduces to $R = 100Rcb + 99$. in which Rcb is the only variable resistance in the circuit, and for which a decade resistance is used.

* * *

Lloyd Espenschied, American Telephone and Telegraph Company describes "Methods for Measuring Interfering Noises," especially as applied to radio telephony. He mentions the "Warbler Method," the use of transmission measuring set for measuring noise, integration method of measuring static, directive noise measurements, noise standard or buzzer method, the circuit noise meter, the threshold of audibility method, and room noise. The paper is short and each method is only mentioned, but references are given to original sources. All the methods mentoined are those that have been found especially useful in the Bell Laboratories.

* * *

The Broadcast Installations in the New "House of Radio" in Berlin are described in detail by Gunther Lubszynski and Kurt Hoffmann. This paper tells how thoroughly the Germans do it, and it is well worth reading for the suggestions it makes.

* * *

"Vacuum Tubes as High-Frequency Oscillators" by E. D. McArthur and E. E. Spitzer, Vacuum Tube Engineering Department, General Electric Co., is a highly interesting and timely paper on the generation of extremely short waves by means of vacuum tubes. The limits of the ordinary triode oscillator are pointed out and suggestions are made for getting down ultimate minimum wave by eliminating the external tank capacity and by using the shortest possible leads for inductors. For waves between 0.75 and 1.5 meters, it is pointed out, the split anode magnetron is the most suitable. This tube is described briefly and its characteristics given, as are oscillatory circuits for it. A valuable bibliography of papers on short wave generation is appended.

* * *

Aijaz Mohammed and S. R. Kantebet, Communication Engineering Laboratories, Indian Institute of Science, Bangalore, India, describe the "Formation of Standing Waves on Lecher Wires." The effect on the wave length of the standing wave of the decrement of the wires is pointed out as are the effects of various terminal conditions.

* * *

From the Electrotechnical Laboratory, Ministry of Communications, Tokyo, Japan, come two papers on the polarization of low and high frequency waves. Shogo Namba contributes "Polarization Phenomena of Low-Frequency Waves." The same author and Eiji Iso and Shigetoshi Ueno contribute "Polarization of High-Frequency Waves and Their Direction Finding." The theory in both cases is worked out and hte experimental technique and apparatus used are fully explained. This paper is especially valuable wherever the direction of a wave is utilized as a part of the signal, such as aviation and ship beacons.

* * *

"The Use of Rochelle Salt Crystals for Electrical Reproducers and Microphones" is the title of a paper contributed by C. Baldwin Sawyer, Brush Laboratories, Cleveland, Ohio. The paper begins with a brief historical resume of the development of piezo activity for acoustic uses and references to original sources given. Methods developed by the author and his associates permit the cheap commercial production of Rochelle salt crystals and sections thereof, but the saturation and variation with temperature of Rochelle salt must be compensated for by special assemblies of the Rochelle salt sections. The underlying principle of the special assemblies is that of mutual opposition with resultant magnification of motion. This principle of opposition may be utilized to produce bending or wtisting elements of Rochelle salt of great simplicity. Such elements may then be combined wtih appropriate acoustic members to operate with great sensitivity and efficiency in either an input or output circuit. Rochelle salt requires no exciting field of any sort, which properly results in the elimination of the necessity for any external excitation. Microphones, pick-ups, and, especially, speakers are described, with some discussion of limiting conditions of load, temperature, and other operating conditions. This, apparently, marks the first advance in the application of piezo electricity to acoustic purposes since the early days of radio when a few dabbled in the subject without much success.

NEW RULES FOR STATIONS GO IN FORCE SHORTLY

In its first official statement concerning the new radio rules and regulations which will be made public about the middle of this month the Federal Radio Commission announced orally through Commissioner Harold A. Lafount that the new regulations would be essentially advantageous to all broadcasting stations as well as to the Commission.

"Broadcasting stations need fear no inconvenience or added expense as a result of the revised radio code," he said. "Existing General Orders undergo no radical change. The only revisions involved will be welcomed by both the Commission and broadcasters."

Describing the publication containing the rules as a "broadcasters' bible," he said it would be a time, labor and worry saver to the Commission and to all broadcasting stations.

Mr. Lafount made available the following information, according to "The United States Daily":

As to the rules themselves, the Commission at this time does not wish to make public any of the revisions. The complete new code will be available to broadcasters and to the public by about the middle of December. The laws will become effective Feb. 1, 1932.

Will Use Loose Leaf System

The revised regulations will be issued in a loose-leaf book, divided into sections covering every field of radio communication. When the Commission amends or changes any regulation, new pages will be sent to broadcasters, who can insert them in the book and remove the discarded rule. In this way it will be possible to avoid the confusion of a code containing a great deal of dead matter, as at present.

In existing regulations there is much confusion. Many rules are not clearly defined because overlapping or confliction with other regulations. In the new legislation, all dead and unnecessary matter has been deleted, and the Commission sets forth its laws and policies clearly and without ambiguity. All the undesirable repetition of the present code has been eliminated.

Adoption of the new regulations amounts to a codification of existing General Orders. Additional rules have been formulated in keeping with advance of the industry. The Commission's experience in enforcing present regulations has served as a guide in deciding what changes were necessary and what matter should be deleted.

Ready Reference

The publication will present to broadcasters a clarification of present rules. Where existing laws have had to be amplified, the Commission has done so; where they required consolidating, they have been made briefer and more to the point. All dead matter has been removed.

Broadcasters will welcome the book as a complete and always up-to-date handbook of the official regulations of the radio industry. It will serve as a ready reference in all problems involving radio legislation. Managing directors and technical operators of broadcasting and communicating stations will find the book of great value as a clear, precise statement of the Commission's policies in questions by which they are so often confronted and about which the radio industry revolves. Experimenters in television will be informed of the Commission's attitude toward development of that branch of radio.

With rules confused, it is often necessary for stations to write to the Commission for information. The Commission has answered hundreds of letters of this type during the last year. With the new book as a reference, much of this correspondence will be unnecessary.

One feature of the publication will be the first completely annotated printing of the Radio Act of 1927. The Commission's annotations will be listed in full to June 30, 1031.

The Commission has been at work on the new rules for nearly a year.

Radio Dollar Rated by Coit

The radio dollar of today has three times the purchasing power of two years ago and nearly ten times as much as five years ago, said J. Clarke Coit, president of the Radio Manufacturers Association.

"This is a conservative estimate," Mr. Coit stated, "when due consideration is given the quality of the modern radio receiver, with all its new features.

"Like every progressive industry, the radio industry has, from its inception, sought ways and means of giving the public more and better quality radio for less money. This is a wise policy, for it means a steadily widening market, making it possible for families in humble circumstances to purchase radios and enjoy radio entertainment, while households more fortunately situated are buying two and three sets."

R. C. A. Outearns Preferred Dividends

Total gross income of $73,638,019 and net income of $3,957,489 for the Radio Corporation of America and its subsidiaries for the first nine months of the year 1931 were announced by David Sarnoff, president of the Corporation.

During the same period last year the gross income was $85,150,256 and the net income $870,753. The statement for the first nine months of the current year shows earnings of $52,980 in excess of dividend requirements on the preferred stocks.

For the third quarter of the year 1931 the gross income of the Corporation and its subsidiaries was $25,664,292 and the net income $1,318,785. The statement shows that earnings for the third quarter of the year 1931 were $17,685 in excess of dividend requirements of the preferred stocks.

Only Three Listed as Not Using Recordings

A recent issue of the theatrical magazine, "Variety," stated that WHAM, WEAF and WJZ are the only broadcasting stations in the United States not using recorded programs, better known as "electrical transcriptions."

WHAM is in Rochester, WEAF and WJZ are National Broadcasting Company key stations in New York.

ON SHORT WAVE AIRPLANE CALL GIVES A THRILL

Less than five years ago radio telephone communication between a plane in the air and a station on the ground was regarded as a remarkable achievement of radio engineering. Now it is accepted as one of the commonplace features of air transport on most well-organized lines.

American Airways, for example, equip all of their planes with two-way radio. Pilots talk back and forth with the ground during flights, periodically reporting their position, altitude, the weather and visibility.

This telephone service is an adjunct to the radio beacon signal, which guides the pilot on his flight between larger airports. The telephone serves as a double check—keeps the ground force informed at all times as to the exact location of ships in the air and keeps the pilot informed as to the weather ahead.

Equipment Weighs 200 Pounds

The apparatus as used on American Airways' planes weighs about 200 pounds, a considerable item in airplane construction, but has come to be regarded as an essential part of the ship. Modern transport planes have built-in radio equipment and antennas.

Radio fans with short wave receiving sets are accustomed to the familiar call-and-answer signals of the sky. Between New York and Boston, for instance, six planes are operated in each direction daily. New England short wave listeners can pick up their receivers at almost any hour of the day and hear at fixed intervals a conversation to the following general effect:

"Boston to 9633. Come in, please."

"9633 to Boston. 125 north 5. Scattered clouds 5,000 feet. Visibility unlimited."

"Boston to 9633. Okay."

Coming out of the still ether, this business-like greeting between land and air has a weird sound. The listener finds it hard to believe that "9633," a mere speck in the sky, is speeding along overhead somewhere at 110 miles an hour.

How Position Is Given

The orthodox position report is given "by the numbers." For this purpose an aviation strip map is used. Strip maps cover territory twenty miles wide on a straight line between two airports. They are divided into ten-mile squares, each numbered. When the pilot reports "125 north 5," he means it is passing over a point 125 east of New York, five miles north of the course. The ground operator can then make allowance for wind direction and figure exactly where the plane will be each minute until the next report comes in.

When there are several planes in the air at once, regular time intervals are assigned to each, but every pilot is constantly listening through his ear phones and can get into communication with the ground or any other ship at a moment's notice.

Power for the Sets

Two fixed antenna systems are supported on and above the wings. One is used for the beacon receiver, so that service need never be interrupted. The other is used for short-wave communication with the ground. A 12-volt storage battery of large capacity supplies all the energy required for transmitter and receivers.

High voltage for the receiver and the transmitter is obtained from separate dynamotors operating from the battery.

A THOUGHT FOR THE WEEK

EDDIE CANTOR is running for president via the ether. He has been singing a song in which he tells about what he'll do when he succeeds President Hoover. He has neglected to add a verse to the effect that if elected he will endeavor to have it made a capital offense for Wall Street brokers to sell stocks to comedians. Ask Mr. Cantor how many hundreds of thousands of dollars he lost in that 1929 crash. He'll probably be too full for utterance.

RADIO WORLD

The First and Only National Radio Weekly
Tenth Year

Owned and published by Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y. Roland Burke Hennessy, president and treasurer, 145 West 45th Street, New York, N. Y.; M. B. Hennessy, vice-president, 145 West 45th Street, New York, N. Y.; Herman Bernard, secretary, 145 West 45th Street, New York, N. Y.

Roland Burke Hennessy, editor, Herman Bernard, managing editor and business manager; J. E. Anderson, technical editor.

Best for Us

IN our possession of radio we have more in this country than we acknowledge. What we complain about is always something of small real importance, for the major problem has been solved, and we relax as the entertained and informed recipients of a large bounty. This we do not realize so much as when we compare our condition with that in other countries.

In the first place, our technical status is second to none; in the second place, we get the kind of programs we want, as a rule, so what is offered is for us, second to none; and in the third place we have most excellent receivers at our command. Other countries import our technical achievements, so to speak, for American radio equipment is found the world over. Where nationalism requires that domestic apparatus be used, it will be found that American developments are present in that apparatus. So our sphere of influence in radio extends, like our short wave transmissions, all over the earth.

Our kind of programs strikes home in many countries, and efforts are largely directed toward receiving these programs. This does not smack as a vote of confidence for the type of programs offered in those countries, but perhaps only the minority is looking toward us. At least we may suppose that the other countries, with their tax on radio sets to defray the cost of Government monopoly programs, also get what entertainment and instruction they want. It will be found, however, that in other countries talks assume a much greater part of the burden, and as these are cheaply obtained they may be suspected of being as cheaply valued, particularly as considerable of the talking is done by the political minded who are not entirely removed from Governmental administration, or ambition to participate therein, so it may be a case of the conductor conducting himself. Our receivers are imported by nearly all foreign countries, excepting one country that has banned all foreign made radio sets and another that has placed a 100 per cent. duty. Otherwise, despite high tariff walls our sets sell in foreign countries at prices lower than domestic products and give better satisfaction.

What we complain about largely is the sponsored program overstuffed with advertising talks, particularly the interruption of programs with such talks. It is a tribute to the acceptance of the program itself that strong complaint is made against its interruption. No matter what the cause of the complaint may be, the indirect compliment is there. Such blurbs have been called nauseating, and justly, but any request for action should be made at the right time. Our own position is, as stated editorially before: Postpone the complaint until after the depression, because the sponsors say they sell more goods by the present method, and that means more work for more people.

Our present problem is not esthetic, but vital.

It will be remembered by those who tuned in eight or nine years ago that there were waiting periods between programs, that stations went off the air mysteriously, that promised entertainers (who were not paid then) failed to show up, and that we often wondered whether the set was out of commission, due to absence of reception.

Turn to the situation in Europe, as reported to the Federal Radio Commission by Dr. Willis E. Everette, California radio engineer sent abroad to make clinical observations. He reports that many stations keep a clock close to the microphone, so listeners can hear the tick-tock to assure them the receiver is working properly, for there are lapses of 1 to 10 minutes between different sections of the same program. From that infantile predicament we have been graduated with honors, and should be thankful. Radio reception in Europe, he found, is far beneath that obtaining in the United States, due to amateurish management of stations, poor programs, mumbling announcers, bad sets and interference. Stations clashing on the air are frequent, due to congestion and to the use of high power, the average power of a good station being 53,000 watts.

So we have not done poorly with our own problem, we really have something of which to be proud, and there is no need to heed the advice of the head of the British Broadcasting Company that we adopt the Governmental monopoly system with its tax on sets, or follow the systems and methods of any other country. We have always made best progress when we led.

What obtains in foreign countries may be best for those countries, and we do not advise any of them to imitate us in any way. But we are very well off in radio, and entitled to think patriotically of the gift that is ours, and say that it is just what we wanted for Christmas and all time, wishing the rest of the world peace and good will.

Radio and Weather

IF one could seriously imagine that radio affects the weather perhaps there would be little of real interest in what W. J. Humphreys, of the Weather Bureau, says in an article in "The Monthly Weather Review," reporting that radio has no such effect, but rather is itself affected by the weather.

He really made a serious effort to find out, and the answer is plain. Radio neither induces floods, droughts, rain, clouds nor, we might add, mosquitoes.

However, not a small number of persons was suspicious of radio or outright positive about the now disclaimed effect. The trouble is, however, that those who blamed radio for rain on days off will go right on blaming radio. A scientific finding is to be sniffed at in comparison to a superstition or an ignorant prejudice.

Hail the Amateurs

AMATEURS are more numerous now than ever before, as shown in the report for the last fiscal year, by W. D. Terrell, director of the Radio Division of the Department of Commerce. The increase of nearly 4,000 brings the total to 22,739.

Therefore the amateurs are far and away the largest users of transmitting facilities, although amateurs as listeners do not compare in numbers with broadcast listeners.

Radio communication by amateurs constitutes a most interesting and highly instructive undertaking, and it is well that large numbers realize this and are participating in its benefits. With the world-wide increased interest in short waves, on which the amateurs, among others, work, no doubt the amateurs will increase even more numerously in the years to come. To them radio owes a great deal, for they foresaw what others were blind to, therefore more power to the amateurs, and may they thrive in their glorious and useful pastime.

Literature Wanted

Readers desiring radio literature from manufacturers and jobbers concerning standard parts and accessories, new products and new circuits, should send a request for publication of their name and address. Send request to Literature Editor, RADIO WORLD, *145 West 45th Street, New York, N. Y.*

George W. Howerton, R. F. D. 4, Marion, Ky.
Clayton F. Kitchell, 135 Cook St., Allegan, Mich.
T. Kato, 10½ E. Chestnut St., Yakima, Wash.
Martin Ellis, R. F. D. No. 3, Brunswick, Ohio.
Cecil G. Fry, 5503 Crystal St., Chicago, Ill.
Marvin H. Kirkeby, (technical, relating to circuits, service, etc.), Radio Sales & Service, Kramer, N. Dak.
Kurt R. Zumhagen, 3609A No. 17th St., Milwaukee, Wis.
Chester Pol'itt, Route No. 1, Portsmouth, Ohio.
Joseph Masek, 3466 W. 50th St., Cleveland, Ohio.
C. E. Ogilvie, 416 E. Exposition Ave., Denver, Colo.
Dewey Sutton, Radio, 618 S. Rutan, Wichita, Kans.
N. P. Brewer, c. o. Y. M. C. A., Ottumwa, Iowa.
Claude B. Miller, Walker Bank Bldg., 18th Floor, Salt Lake City, Utah.
F. Smarde, 4226 Ogden Ave., Chicago, Ill.
Hubert F. Lange, R. F. D. No. 1, Fredonia, Pa.
Frank W. Norman, 2604 Wentworth Rd., Hamilton P. O., Baltimore, Md.
P. Gaytan, 332 W. Santa Barbara Ave., Los Angeles, Calif.
Jose Cruz, 1164 Turk St., San Francisco, Calif.
Charles V. Price, Bellefield Dwellings, Pittsburgh, Pa.
W. E. Ferguson, 818 Allis St., Little Rock, Ark.
Robert S. Howard, Howard Radio Service, Box 314, Pocatello, Idaho.
Raymond Engel, 4660 Dewey Ave., St. Louis, Mo.
Geo. Bozsgay, (Superheterodyne sets using pentode and multi mu tubes), 2601 St. Louis Ave., East St. Louis, Ill.
M. J. Scharfer, 514 West 55th St., Los Angeles, Calif.
Don Winget, Jr., Fidelity Engineering Labs., 3353 Wabash Ave., Cincinnati, Ohio.
Eric G. Kutz, Radio Service, 5810 Lexington Ave., Cleveland, Ohio.
F. N. Merralls, 15 Fleming House, Calif. Institute of Technology, 1301 E. California St., Pasadena, Calif.
Solon Person, 6216 Kentucky Ave., Pittsburgh, Pa.
Arthur McQuiller, 1629 Thompson St., Philadelphia, Pa.
Frank Wencel, 2615 Evaline St., Hantramck, Mich.
Joseph Hadda, 4872 E. Davison Ave., Detroit, Mich.
Joe Weismann, Jr., Radiotrician, 503 Lou Ann Ave., Etna, Pa.
Mills Smith, R.F.D. 3, Rochelle, Ill.
Simon H. Sasser, Jr., Route 1, Box 54, Summerfield, Fla.
W. C. Morrison, 3919 - 5th Ave., Sioux City, Iowa.
Everett Shirley, R.F.D. No. 2, Tarentum, Pa.
H. B. Barton, East 4th Battery & Radio Shop, 1131 E. 4th St., Oklahoma City, Okla.
Henry E. Jacob, 1708 Mabert Rd., Portsmouth, Ohio.
Chas. Beggs, (re: remote controls complete with gears for condenser and variable condenser coils), 346 Dexnyth Ave., Cincinnati, Ohio.
Dewey Sutton, 618 S. Roton, Wichita, Kans.
N. P. Brewer, c/o Y.M.C.A., Ottumwa, Iowa.
Claude B. Miller, 10th Floor, Walker Bank Bldg., Salt Lake City, Utah.
B. Whistler, Teepee Music Shop, Box 2007, Norman, Okla.
Wm. Torck, R.F.D., Mauston, Wisc.
J. T. Kelly, 1413 North Trade St., Winston-Salem, N. C.
Chas. W. Turner, 933 N. Sierra Bonita Ave., Hollywood, Calif.
R. D. Smiley, 1711 Richard St., Dayton, Ohio.
C. H. Cor Sette, Sette Radio Service, 1509 Kingston Ave., Kalamazoo, Mich.
Ed. Harrison, 517 W. 3rd St., Lexington, Ky.
J. Feldman, Dealer, Radio & Electrical Supplies, 156 Varet St., Brooklyn, N. Y.
Fred Chadwick, 11 Sayles St., Southbridge, Mass.
Walter Murphy, P. O. Box 83, Laramie, Wyo.
R. W. Billings, Franklin Park, Rosslyn, Va.
Eric G. Kutz Radio Service, 5810 Lexington Ave., Cleveland, Ohio.
C. N. Masterson, 1524 N. W. 45th St., Oklahoma City, Okla.
Ken Long, 608 Mary St., Utica, N. Y.
Clyde Atkins, 520 Spruce St., Charlotte, N. C.

Station Sparks

By Alice Remsen

Kathryn Parsons Is the Girl o' Yesterday. She sings delightful old songs in a very charming manner, accompanying herself on the piano. Miss Parsons has acquired a large following and it seems to me she should be a good bet for a commercial sponsor, especially for a product appealing to the stay-at-home housewife.

* * *

Very Glad to Hear That George Piantadosi is now with Witmark.. He is assistant to Buddy Morris, who is head of the entire musical interests for Warner Bros. George's first act upon entering into his new office was to sell Aunt Jemima the idea of using a Witmark song for the theme of her new radio hour. Aunt Jemima, whose real name is Tess Gardella, is the star of the Jad Salts program on WABC. Her theme song, "Where Were You Last Night?" was written by Al Dubin and Harry Woods for her exclusive use.

* * *

The Latest Six Night a Week Fifteen Minute program is that of the "Voice from The Golden West," Russ Columbo, every Monday, Thursday and Friday over a NBC-WEAF network at 5:45 p.m., and on Tuesdays, Wednesdays and Saturdays, at 10:00 p.m. over a NBC-WJZ hookup. His contract is for fifty-two weeks and will bring the young Californian before the microphone in 156 performances.

* * *

Lottice Howell, belle of the South, is back from a long London engagement. This American lyric soprano is known chiefly for her roles in musical comedies and motion pictures. She was a member of that exclusive radio group, Roxy's Original Gang. You may renew her acquaintance on December 7th over WEAF at 10:45 p.m., when this gifted young lady will sing several songs.

* * *

Andre Kostelanetz, conductor of the Weed Tire Program and of the Snowdrift Southern Melodies, a program originating in New York for Columbia's Dixie network, was for some time conductor of the Petrograd Grand Opera Company, which he joined at the age of seventeen as assistant conductor and concert master, after competing with about two hundred other and older musicians for that position. While he was conducting in Petrograd, Kostelanetz was the first musician to do Rimski-Korsakov's opera, "Le Coq d'Or," in the form in which the composer originally wrote it. A biting satire on the Tsar (written in 1904), the opera had to be radically changed before it was produced. Finally, after the Revolution, with the Bolshevist regime in force, Kostelanetz produced it in its original form.

* * *

The Story of Verna Burke, attractive redheaded young lady who sings both "sweet" and "hot" songs every Sunday night on the Chicago Knights program from Columbia's midwest studios, is one of a fighting spirit that overcame obstacles which threatened to end her career.

At the age of fifteen Miss Burke began her professional work as a dancer in a ballet with Fred Stone and later she performed as half of the vaudeville team of Hughes and Burke. In 1927 an accident ended her dancing activities. Refusing to accept professional defeat, Miss Burke studied voice for three years and made her microphone debut in New York in 1930. As well as her weekly network turn, she is featured on several local programs at WBBM, Columbia station in Chicago.

Although There Are Many Hill-Billy programs on the air, the majority of their performers were born nearer the subways and elevated railroads than the hills of which they sing. But Uncle Olie's Kre-Mel Gang, which entertains children thrice weekly over the Columbia network, is made up of real born-and-bred mountaineers. No entertainment in Smithville, Va., was considered a success unless the four Blue Ridge boys, the home-town vocal and instrumental quartet, were on hand to perform. Passing through Smithville one day, Uncle Olie attended one of the town barn dances, saw, heard and liked the gay rhythms of the Blue Ridge boys. Realizing their value as a radio attraction, he imported them to New York.

* * *

SIDELIGHTS

FRED VETTEL was once an amateur light heavyweight boxing champion . . . WILL OSBORNE is taking up flying lessons at a Long Island airport . . . SINGIN' SAM'S favorite sport is hockey . . . KATE SMITH has a weakness for statuettes . . . NELLIE REVELL calls Lois Bennett's hair Schenectady because it's so near auburn . . . WAYNE KING is a certified public accountant . . . DAD PICKARD once was a grocery drummer in the mountains of Tennessee . . . JOHN WHITE was born in Washington, D. C., and wears spats instead of spurs . . . ART JARRETT is coming to New York . . . BILLY HILLPOT and SCRAPPY LAMBERT are back together again as the famous "Trade and Mark" of Smith Brothers fame . . . MARGARET MATZENAUER was born in Hungary . . . LOUIS KATZMAN has written a new march. It was played for the first time recently on the Liberty program and is called "Aviation March" . . . BILL SCHUDT'S "Going to Press" program celebrated its third anniversary on December 2nd . . . BING CROSBY microphones with his hat on . . . HOWARD LANIN played "traps" in his youth . . . VICTOR ARDEN earned three dollars a week playing piano in a roller skating rink as his first job, in his home town of Wenona, Ill. . . . RUSS COLUMBO once sang behind a plough in the vineyards of California for two dollars a day . . . EDDIE EAST at one time greased and painted locomotives for nine dollars weekly . . . His partner, RALPH DUMKE, wielded a pick and shovel laying gas mains in frozen ground, for twenty cents an hour . . . JOHN TUCKER BATTLE is a ping-pong enthusiast . . . ADELE VASA is the shortest prima-donna in radio circles. She is four feet, eleven inches . . . ANN LEAF, who is exactly the same height, is the shortest radio organist . . . JACQUES RENARD has four children . . . CARL FENTON always has a cigar in his mouth, except when he sleeps and eats . . . TONY WONS plays the harmonica and the violin . . . PETE BONTSEMA likes to play ping-pong . . . JEAN PAUL KING and GEORGE HICKS went to school together.

* * *

Biographical Brevities

Some Facts About Russ Columbo

Russ Columbo started life as a violinist. Started it, literally; for the dark-haired lad was no more than a child when he first tucked a violin under his chin for a gruff Teutonic teacher. The old man was unsparing, for he believed the boy had real talent, and he dreamed of the day when his pupil would be a celebrated violinist.

That was back in the little town of Calistoga, Calif., where the family moved following the birth of Russ in San Francisco in 1908. By the time he was fourteen he was playing solos in the Imperial Theatre in San Francisco, and when the family moved to Los Angeles he was promptly made first violinist in the Belmont High School orchestra. His father, who had been a musician in his native Naples, was confident that his son was started on a successful career as a violinist, but already the mellow baritone voice of Russ was beginning to attract attention.

Then came the day when George Eckhardt, Jr., heard him sing and engaged him for $75 a week to sing at the newly-opened Mayfair Hotel in Los Angeles. Russ later sang and played in the Roosevelt Hotel and in the Cocoanut Grove at the Ambassador Hotel. Then he had a try at talking pictures, appearing with Betty Compson, Lupe Velez, and Gary Cooper. Finally he opened his own club, the Club Pyramid, in Los Angeles.

The young singer then came East and the rest is radio history. He went on the air over a nation-wide NBC-WJZ network on September 5th, 1931—and the next day the fan mail began to pour in. Columbo's unique style of singing captured the country just as it had the Pacific Coast.

His rise to fame has left him modest. He is tall, dark, handsome—and unmarried; one of radio's best dressed men. His personal interest is in opera and he has a private collection of about every operatic work ever recorded.

* * *

SUNDRY SUGGESTIONS FOR WEEK COMMENCING DECEMBER 6

Sun., Dec. 6: Romance of the Sea .... WABC—9:30 p.m.
Sun., Dec. 6: Footlight Echoes....WOR—10:30 p.m.
Mon., Dec. 7: Hugo Mariani's Orchestra .... WEAF—11:30 a.m.
Mon., Dec. 7: Waves of Melody ..WJZ—7:45 p.m.
Mon., Dec. 7: Street Singer.....WABC—11:15 p.m.
Tues., Dec. 8: Carl Fenton & Bing Crosby .... WABC—7:15 p.m.
Tues., Dec. 8: Alice Joy........WEAF—7:30 p.m.
Tues., Dec. 8: Willard Robison's Orchestra .... WOR—11:30 p.m.
Wed., Dec. 9: Sam Lloyd, Puzzle Man .... WEAF—5:30 p.m.
Wed., Dec. 9: Believe It Or Not....WJZ—7:45 p.m.
Wed., Dec. 9: Singin' Sam ......WABC—8:15 p.m.
Thurs., Dec. 10: L'Heure Exquise .... WEAF—11:00 a.m.
Thurs., Dec. 10: Raising Junior...WJZ—6:00 p.m.
Thurs., Dec. 10: Sherlock Holmes WEAF—9:30 p.m.
Fri., Dec. 11: March of Time ...WABC—8:30 p.m.
Fri., Dec. 11: Armour Program....WJZ—9:30 p.m.
Fri., Dec. 11: Silver Flute .....WEAF—10:00 p.m.
Sat., Dec. 12: Tom Neely's Saxophone Four .... WJZ—6:15 p.m.
Sat., Dec. 12: Little Symphony ..WOR—8:00 p.m.
Sat., Dec. 12: Enric Madriguera WABC—11:00 p.m.
Sat., Dec. 12: Jesse Crawford & Organ .... WEAF—11:15 p.m.

[If you would like to know something of your favorite radio artists or announcers, drop a card to the conductor of this column, Miss Alice Remsen, care RADIO WORLD, *145 West 45th Street, New York, N. Y.]*

Childhood Days

(Girl o' Yesterday. WABC, 3:00 p.m. Wednesday)

THERE'S a doorway framed in lilac,
And a garden path that flanks
A tiny brook, which gurgles
Between two mossy banks.

There's a rosebush in the corner,
And some green ferns at the side,
And a tree stump by the water,
Where I once sat down and cried.

There's a gateway to the meadow,
And beside it is a tree;
And carved upon the tree trunk
Is a heart—for you and me.

How I wish I'd kept your heart—but
I'm afraid it is too late,
For I remember when you carved it,
I was six—and you were eight.

—A. R.

RADIO SALES TAX PROPOSED; TRADE MAY O.K.

Sales promotion plans, television, the patent problem, the proposed sales tax on radio and many other important industry problems were considered by the Radio Manufacturers Association board of directors at a recent meeting in Cleveland, O. Preliminary plans for the eighth annual convention and trade show at Chicago, beginning May 23, 1932, the only official industry show, also were approved. J. Clarke Coit of Chicago, president of the RMA, presided.

Probability of Treasury Department recommendations to Congress of a manufacturers sales tax on radio products was presented to the board by Frank D. Scott, the association's Washington legislative counsel. Action in the sales tax matter was deferred by the Board, to await developments in Washington.

Deplores Television Reports

It is planned to take action with due regard to the Government's revenue needs and conditions of the radio industry, in cooperation with other radio and industry organizations. The legislative committee, of which H. B. Richmond, former association president, is chairman, is in charge of the matter.

President Coit and other chairmen reported progress on the patent problem, in which negotiations and conferences have not been completed.

Deploring man false reports regarding television, and deploring "blue sky" television stock promotions, the board took steps to advise the industry and the public regarding the true progress at present of television. A special statement on the actual status of television will be prepared and issued by the engineering division, of which Dr. C. E. Brigham, of Newark, N. J., is chairman.

Exports Up 50%

The export trade continues to increase, being over 50 per cent up during the current year, according to reports to Arthur Moss, of New York, chairman of the foreign trade committee. For further development of export trade a meeting will be held soon of export representatives of all manufacturers to discuss export trade promotion problems and plans.

No important business failures among radio manufacturers have occurred in recent months, according to reports to the credit committee.

Why "Fairly"?

I AM a fairly constant reader and like your magazine very much because it gets right down to first principles. I especially like the mathematics wherein you show just exactly how to figure out the number of turns for r-f transformers. Such knowledge is invaluable to one who is experimenting with various oscillators for short wave receivers.

I would like to see an article explaining all about mutual inductance, what effect an untuned coil which is coupled to a tuned coil has on the tning of the tuned unit, if any, and how to figure it out.

RALPH MATTHEWS,
2612 St. Charles Ave., Dayton, Ohio.

Booster Station Plea Is Denied

Washington.

The Federal Radio Commission denied the application of the Columbia Broadcasting System to erect a "booster" station at Washington, D. C. Three Commissioners voted for denial, two for issuance.

Such a station would have been experimental and would have reenergized the programs of WABC, New York, the key of the System. With a power of 250 watts, the station would have synchronized for 17 hours daily with the New York station and would have represented the first instance in which a key station of a network would have been linked on its own wave length with a "booster," according to the application.

KALEIDOSCOPE

Everyone is finding out that the ringleader of agreeable broadcasting is diction.

* * *

Have we left behind individual explorers in radio inventions in exchange for mass laboratory efforts? Payroll schedules seem to show it.

* * *

Stations convey millions of dollars of service yearly to a radio set. Adding the value of the broadcasts to the price of a midget makes a millionaire out of the pewee set.

* * *

The commercial television battlefront is raging amicably. On the one hand we have those who don't say much and on the other hand those who haven't much to say, the latter do the talking. What the others are doing you can't imagine.

* * *

Music publishers of sweet compositions are complaining that radio broadcasting tomahawks potential sales of their sheets. Music engineers of the air in their burrowing for additional taxes guarantee the extraction will be painless. A. B.

New Corporations

Jones Research Sound Products, motion pictures—Atty. L. E. Greenberg, 132 Nassau St., New York, N. Y.
Troy Radio Co.—Atty. D. Eberstein, 165 Broadway, New York, N. Y.
Lafrance Television Co., Garrett Park, Md., television radio devices, Capital Trust Co. of Delaware.
Trenton Broadcasting Co., Camden, operate broadcasting stations—New Jersey Corporation Guarantee and Trust Co., Camden, N. J.
Voltarc Tubes, Inc., East Orange, radio tubes—ttys. Wing, Laking, Russell & Whedon, New York, N. Y.
Telephone Koil Co., selling agents—Attys. Kinkelstein & Jacobs, 521 5th Ave., New York, N. Y.
Teleunit Laboratories, radio business—Atty. M. B. Solomon, 200 5th Ave., New York, N. Y.
Hawley Products Co., Wilmington, Del., radio, radio parts—Corp. Trust Co., Dover, Del.
Radio Vision Research Laboratory, radio—Atty. H. G. Kosch, 383 Madison Ave., New York, N. Y.
Servacar, garage, radio business—Atty. L. Pressman, 21 East 40th St., New York, N. Y.
American Radio and Sound Advertisers, Inc., Wilmington, Del.—Atty. Franklin L. Mettler, Wilmington, Del.
Sobel Stores, radios—Attys. Gelfand & Teiman, 16 Court St., Brooklyn, N. Y.
Connie Hubert Refrigerator and Radio Co.—Atty. S. Moanfeldt, 11 West 42nd St., New York, N. Y.
Photo-Electricity and Sound Publishing Co., electrical appliances—Atty. R. J. Joseph, 723 7th Ave., New York, N. Y.
North American Television Corp.—Atty. M. Levy, 55 West 42nd St., New York, N. Y.

N. B. C. HONOLULU LINK

KGU, Honolulu, is the most recent addition to the National Broadcasting Company's works. KGU exchanges programs with the N.B.C. by short wave to San Francisco, a distance of 2,100 miles.

N.B.C. 5 YEARS OLD, NOW HEARD BY 51,000,000

The National Broadcasting Company is five years old.

The company presented its inaugural program on November 15, 1926, heard by an estimated audience of more than 10,000,000 persons. The featured stars included Titta Ruffo and Mary Garden, Weber and Fields, Will Rogers, Walter Damrosch and his New York Symphony Orchestra. The artists were in different parts of the country.

Today each of N.B.C.'s two coast-to-coast networks can reach a potential audience of 51,000,000 persons and it has presented broadcasts from twenty-one foreign countries.

$10,000,000 a Year to Talent

Annually the N.B.C. spends more than $10,000,000 for talent it brings to its microphones. Thirty-seven thousand miles of special telephone lines, for broadcasting and monitoring its programs, link its eighty-two associated stations from coast to coast.

Each month thousands of artists and celebrities appear in its studios. In the New York division alone some 30,000 programs are transmitted in one year.

In one recent month the New York studios originated 1,997 programs, involving 23,657 individual appearances before the "mikes." The New York N.B.C. outlets, WEAF and WJZ, broadcast 2,813 programs, many originating in the N.B.C. studios at Chicago, Washington, San Francisco and in special pick-ups in this country and abroad.

Behind this is an N.B.C. personnel of executives, engineers, program builders and productionists numbering 1,200 persons. Soon this estate will move into the main tower of Radio City, where N.B.C. will operate at least twenty-six studios.

Station Purchases

It also maintains elaborate divisional quarters in Chicago, Washington and San Francisco and brings programs from Europe, South America and the Orient.

N.B.C.'s creative capital was supplied by the Radio Corporation of America, the General Electric Company and the Westinghouse Electric and Manufacturing Company, the latter strong competitors. N.B.C. was designed to be self-sustaining and independent.

N.B.C.'s first step was to purchase WEAF from the R.C.A., which previously had bought the station from the American Telephone and Telegraph Company. The new company later took over WJZ from the R.C.A. and likewise became associated with KDKA, Pittsburgh.

Metallized Resistor Prices Reduced About 40 Per Cent

Prices on metallized resistors have been reduced approximately 40% on all types. One watt resistors, formerly 50c list, are 30c list; 2 watt resistors, formerly 75c list, are 40c and three watt resistors, formerly 80c list, are 50c list. The same dealers' and servicemen's discount of 40% from the list price applies.

EUROPE RISES TO TELEVISION; ZEISS IS A HIT

By ALEXANDER NYMAN

Consulting Engineer, Short Wave and Television Corporation.

Europe is working steadily, if quietly, on television with progress paralleling the work of American research, I found on an engineering trip abroad which took me through Switzerland, Berlin, Finland, London and Paris. Both the mechanical and cathode ray systems have their own advocates as in this country and both methods are making interesting progress.

With cathode ray television in the news, my visit to Berlin brought me to that interesting worker, Baron von Ardenne, who is doing excellent work. His cathode ray pictures show a more brilliant image than any other method I have studied, and also much better modulation. Since the great problem in the cathode ray system is the question of isolating the functions of modulation and scanning effect. I was particularly interested in his scanning success, considering the good light and modulation he had. His picture seemed to bend down a little at one side, indicating some imperfection in scanning, but, nevertheless, the results were generally good. The modulation of light spots seemed to be excellent and using 120 lines the detail was very good.

Von Ardenne's Plan

Speaking of detail, at the Berlin Radio Show a most interesting arrangement was a room where the same film was passed through five machines, each with some sort of optical scanning device which gave the projected effect. Thus one machine was giving the equivalent of 1,000 points (about 30 lines), the next 5,000 points, the next 10,000 (about the equivalent of 100 line scanning), the next 50,000 points and the fifth and last machine 100,000 points. This gave one an excellent opportunity to compare definition and from 10,000 points upward the pictures were of excellent detail.

Von Ardenne's plans to use 200 lnies which will require a frequency response of around 80,000 cycles. He showed me an amplifier which will handle 1,000,000 cycles and so will be suitable for this advanced detail scanning. The Baron is working on improving the saw tooth oscillator design since this is a somewhat difficult problem when applied to cathode ray scanning. It is a problem which can be met, however.

In France I contacted Dr. Alexandre Dauvillier, who is little known in the United States but is probably the most advanced research worker in cathode ray television at the present time.

Cathode Ray Deemed Essential

The nature of his work cannot be divulged at this time, but it shows a distinct advance in the art. Mr. Clay, of England, has also done some advanced work in cathode ray television. Incidentally, Dr. Dauvillier is a close friend of Boris Rosing, the Russian, who originally conceived of the use of cathode ray tubes in television and had patents granted on this. These patents have since expired, showing that cathode ray television is a pretty old art at that.

As to some specific cathode ray details, I might mention the Wehnelt cathode cylinder, now in general use, since all the European workers seem to agree that this is essential at the present stage of the art. As to the luminous screen of the cathode ray tube, the brilliancy is achieved not by the use of a new substance, since the formula for the coating is old in the art, but by a new method of putting it on. Von Ardenne's screen requires only 2,500 to 3,000 volts and since no serious X rays appear until some 10,000 volts are reached there seems to be no danger from these rays to anyone working with these tubes.

As to mechanical television, the Telehor system of spiral mirrors is most interesting, giving quite a decent picture, but it appears to be much too difficult to build for commercial application.

The best mechanical work I saw was by the house of Zeiss Ikon, a subsidiary of Carl Zeiss, who use a system which paralels our present work here; that is, lens scanning with a glow tube giving a one-foot picture. Their tube gives a yellowish light, different from any light I have seen in America.

Zeiss By Far Most Practical

The Zeiss work is by far the most practical method I saw while abroad since it can be applied immediately to commercial work, based as it is on lense and glow lamp scanning, separating the two functions for scanning and modulation, and thus avoiding the outstanding problem of the cathode ray arrangement. The cathode ray work, so far, while interesting from a laboratory viewpoint, requires considerable development from a commercial viewpoint.

Speaking of the work of Zeiss, in another way they are making a most interesting contribution to television, indirectly, since they have perfected a special crystal for transmitting on ultra-short waves. Engineers are unanimous that these ultra short waves, under seven meters in length, are the proper channels for television signals since these channels demand very wide side band ranges when pictures of 200 lines detail are considered.

One of the great problems at these frequencies has been the keeping of a station on its wavelength, since the ordinary quartz crystal control system required picking up and amplifying a very weak harmonic. Now the Zeiss people have developed Turmalene crystal which will give as steady a frequency as we now get in broadcasting with quartz crystal, but which can be made to oscillate directly over a range from 40 meters down ot 2 meters.

Baird Limited in England

Baird's work in England is unfortunately limited by government regulations to the use of only a 9 kc. band width, which means 30

GERMANS USE KERR CELL FOR CLEAR IMAGE

line pictures and only 12 frames per second. It is therefore hard to judge his work. Considering his limitation, however, he is producing very good pictures using the mechanical method.

An interesting exhibit at the Berlin Radio Show was that of Reichansfalt, the German equivalent of our Bureau of Standards. They had a cathode tube receiver but with coarser definition than Von Ardenne's, only about 40 line picture. The image was, however, clear and practically undistorted. They had also a Kerr cell mechanical scanner device giving about the best picture I saw at the show. The color, the definition, and the brilliancy were all good. They used a rather powerful glow lamp as a source of light.

All the exhibits except that of Zeiss Ikon used transmission from films and they all standarized on two films which permitted a great ease of comparison.

Calls For Steady Work

The Zeiss Ikon had a television projection room and next door a mechanical receiver with a loudspeaker giving complete reproduction of sound and face. The exhibit was good and compared well with similar demonstrations in this country.

All in all, my trip abroad points to steady television progress in both schools of thought, a more promising condition than spectacular announcements which usually peter out to nothing. Television now needs more than anything else, steady intelligent, and patient work.

612 Stations Now, Compared to 733

There are now exactly 612 radio broadcasting stations in the United States, a substantial decrease from the 733 peak point attained just before the Federal Radio Commission took over the regulatory reins in February, 1927. Though it is following a general policy of licensing no more new stations, except in the few remote areas not now receiving good radio service, the Commission has authorized 11 new stations since the first of this year.

On the other hand, 20 stations have gone off the air since last January 1, six representing consolidations with other stations. Applications for new broadcasting stations, nevertheless, continue to pour into headquarters of the Commission at the rate of about one per day.

—From "Radex," November, 1931.

Parker Chief Engineer of Pacent Company

Oliver B. Parker, for the past four and a half years assistant chief engineer of the Pacent Electric Company, Inc., of New York, has been promoted to chief engineer, Louis G. Pacent, president of the company, announced.

Mr. Parker contributed to the development of the Pacent talking motion picture apparatus and is responsible for many individual items of the extensive Pacent line. He is a graduate of Pratt Institute and is a member of the Society of Motion Picture Engineers, the Institute of Electrical Engineers, the Institute of Radio Engineers and the Radio Club of America.

Lynch Manual Aids Replacement Work

The Lynch Mfg. Co., 1775 Broadway, New York, N. Y., has published a resistor replacement manual as shortcut to trouble-finding for the servicemen. The company says:

"Repairs to radio sets ordinarily can be made in one-tenth the time it otherwise would take. The book, pocket size, gives the value and code of each resistor, and its position in the circuit, of nearly every popular make of radio receiver. More than 200 circuits are listed." The book, 60 pages, sells for $1.00.

Forum

Only Three Programs

YOUR "Rapping the Broadcasters' Knuckles," including an editorial reprinted from "The Standard-Star" of New Rochelle, N. Y., in Oct. 24 issue of your magazine, is surely open to criticism and comments.

For seven years and a little more I have been listening to radio broadcasts from all over the good U. S. A., Canada and Mexico.

I always used a good superheterodyne receiver for my home, having started with the late R. E. Lacault's original Ultradyne which I used with his improvements until nearly a year ago.

I am at present using a new superheterodyne circuit of my own design which I will give out for publication to some magazine in the near future. An all-wave receiver of 7 tubes, getting very good distance, volume, tone and selectivity.

Now take the reprint from "The Standard Star.": "The radio listener who claims broadcasting has lost it's lure through chain station hookup is right." I'll say *Absolutely Right. Positively.* Practically all you can get are three programs all the way across the dials. It surely is very disgusting and discouraging.

Again "The Standard-Star.":

"Radio advertising is coming closer and closer to propaganda."

That surely is *Correct!*

"Now they have grown stronger and are demanding perpetual franchises for these wavelengths."

Once more "The Standard-Star" is *right.* And is not the Radio Corporation of America gradually gaining control of the larger and most powerful broadcasting stations in the country?

Why?

So that when an outraged public does wake up and demand its rights that they, the R.C.A., can shove through just any old program they desire.

And I, for one, don't think that the Radio Commission has stood up on its hind legs and protected the rights of the listening public as it should have done. Not by a long shot. How about a little over a year ago when they wanted to shift some half-dozen of the larger stations to give better service with less interference? It was postponed because the station owners threatened to take it to court.

When, oh, when, will the listening public get spunk enough to protest and demand their rights? When it is too late, and nothing much can be done.

Now then, let's turn to RADIO WORLD's side of the question:

Who, oh who, wants all those grand opera singers and stars?

Very few. How many women singers sound really well over the air? Again, *very few.* You know that.

True enough that the so-called jazz music is very monotonous and tiresome. I have not lived here in the backwoods all my life. I am a lover of good music and have heard some of the best bands, orchestras, singers, etc., clear to the East coast.

All of the heavy music doesn't appeal to me either, as some of it is too much like a child practising chords on a piano.

Again, when we finally have tuned in one of the heavy type of programs, we will listen to one or two really good numbers of music and then the announcement that Miss so-and-so will now sing such and such a number. Ye gods and little tadpoles! If they would only *sing* it, instead of trying to show how nice they can imitate a tin whistle from low G to high P.

True enough that the little ten cent station can not afford to pay for such screeching and lucky for us it can't. But it can give us good common everyday talent that surely has a greater appeal to the human heart and fireside any-day-or night in the week. Ask yourself and anyone or two-dozen of your friends just what they actually and really enjoy but over the radio.

Be honest with yourself when you do so. Who, on the other side, enjoys these so-called blues singers? I don't and you don't either, if you really care for music.

I don't say that we have a really spineless radio commission, but even giving credit for what good it has done, there are some conditions in radio broadcasting today that I firmly believe could have been bettered before this.

Again referring to advertised programs on the radio. Isn't there entirely too much chatter about the product they are advertising? I say there is and I think you will agree to that also.

Take the Lucky Strike program. It is really disgusting. Absolutely disgusting. B. A. Rolfe's orchestra sure did give us the popular tunes of the day in a good lively and snappy way so that we enjoyed them, but what a rank and disgusting line of chatter that always goes with a Lucky Strike program!

Again, referring to the public's interest in radio. You come here in the middle part of the country with a good, reasonably powered receiver which has good selectivity and can reach out for fairly good distance also. Then twirl your dial and find out how many stations you can get clearly and without interference from other stations. Just about 25% of the dial is good. The rest is absolutely a bunch of catcalls and squeals. And of the few stations that you can get fairly clear of interference you have to take your choice of just three programs or shut the switch off and go without.

The only thing a large chain hookup is good for is an address of nation-wide interest or importance or the broadcasting of some particularly interesting event.

I know a number of persons who will not buy radio sets on account of too much chatter, absolutely useless chatter on advertising radio programs.

In plain English, there is certainly too much useless material going out over the air and time wasted that could be better given over to really enjoyable programs at half the expense to those paying for them. And they would appeal to and be enjoyed far more by the really home-loving part of the public that can enjoy good programs of any class or style worth hearing. To blazes with the high powered stations and highly paid artists of today, especially the many so-called artists!

H. H. HILL,
34 Winston Ave., Rothschild, Wis.

* * *

10,000 Is a Lot, W. E.

JUST a few lines to let you know how I appreciate your magazine. I have been connected with the radio industry for about fourteen years and have built many sets, mostly supers, and have benefited a great deal from your articles. One particular article, published in October, 1929, I think I have read over about 10,000 times, hi, hi!

I have just finished an 8-tube super, 110 volt d-c, something similar to the one in the November 14th, 1931, issue, by Brunsten Brunn, only I used the vari-mu tubes instead of the 236. I like the 237 type for second detector in preference to 236.

You have given the experimenter some good hook-ups on various types of 110 volt d-c receivers. How about a first class audio amplifier so that one can use a mike or phonograph pickup? It could be semi-portable.

W. E. SMITH,
Oak Forest, Ill.

Van Horn Vice-President of R.C.A. Institutes, Inc.

Announcement of the election of J. C. Van Horn, of Philadelphia, as a vice-president of R. C. A. Institutes, Inc., was made by D. O. Whelan, president of the Institutes, following a meeting of the Institutes' Board. The new vice-president will be in charge of the four resident schools at New York, Chicago, Philadelphia and Boston.

Mr. Van Horn has a service in radio extending over a period of twenty-two years. His connection with instruction activities started in 1911, when the Philadelphia School of Wireless was formed. This school became a unit of the R.C.A. Institutes two years ago. Mr. Van Horn served for four years as chairman of the Philadelphia Chapter of the Institute of Radio Engineers. He is a member of the American Institute of Electrical Engineers.

COLUMBO INVITES PARENTS

Russ Columbo, crooner, is the youngest of twelve children. The California singer hopes that his father and mother, both past seventy, will arrange their affairs in Los Angeles so that they can come East for the rest of their days with him.

NEW BOOKS

Radio and Electronic Dictionary, compiled by Harold P. Manly and published by Frederick J. Drake & Co, $2.50. (Radio World Book Service.) This volume contains the definitions of 3,800 words and terms met with in the science and application of electronic tubes, together with 550 illustrations.

The book covers the fields of radio transmission and reception, aviation, navigation, and industrial control, photocell applications, sound pictures, public address systems. television, telephotography, and electricity and magnetism. The book is invaluable to those who are just beginning to study the various branches of science and technology in which electronic tubes are used, or to those who resume the study after a period of other interests. The definitions are up-to-date in every particular and contains material which was introduced during 1931. The alphabetical arrangement of the terms and the numerous cross-references facilitate the finding of any desired definition.

POLO MIDGET, 80 TO 570 METERS

Polo Engineering Laboratories, 125 West Forty-fifth Street, New York, N. Y., has added to its line of midget receivers the model PM-80, which not only covers the broadcast band but by throwing a switch also permits tuning down to 80 meters, to bring in police calls, television and other interesting material, including amateur transmissions.

The new model follows very closely the exclusively broadcast model, and uses the same tubes and substantially the same circuit. The only difference is that the three coils have tapped secondaries. The switch moves the condenser stator connections to the taps for tuning below 200 meters. This is the circuit on which is based Blueprint No. 627. The tubes are two 235, one 224, one 247 and one 280. The price, less tubes, is $23.25.

The set business has improved wonderfully in the last few weeks, the Laboratories report, and factory production had to be speeded up to fill orders.

SOLDERING IRON FREE!

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