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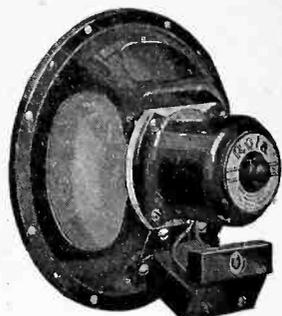
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(Continued from preceding page)

detector. If the screen voltage were less the bias would have to be less.

### Adjusting the Intermediates

The tuning condensers, C1 and C2, are not designated as to capacity, but were 0.00035 mfd., constituting a gang. The padding condenser, the one between oscillator condenser's stator and oscillator grid, was selected at 0.00076 mfd., as that capacity is approximately correct to give the necessary ratio of frequency, the only subsequent requirement being the inductive one to make the oscillator dial settings correspond to the modulator dial settings for the diverse frequencies.

So far the intermediate frequency has not been measured, but the two intermediate couplers were of a commercial type that tunes from 160 to 200 kc. The grid condensers have to be turned down, near maximum capacity, and then the plate condensers adjusted, and as these, too, were at nearly maximum capacity the frequency was lower than 200 kc. However, the frequency will be measured and reported.

Suppose the intermediate frequency is 175 kc. Then, as we desire to use the higher frequency for oscillation, for any given modulation frequency the other will be 175 kc more. So for 570 kc tuned in by the modulator the oscillator would have to be at 745 kc, and for 1,300 kc modulator, at 1,475 kc. If these two points are tied down the tracking will be satisfactory.

It so happens that the coil-condenser combination used in the modulator is the same one used in several midget sets on which the author has worked, and the tuning characteristic is familiar. However, it will be assumed that nothing is known in advance.

### Intermediate Frequency Measurement

By disconnecting the stator of the modulator tuning condenser, and using only the oscillator for tuning in locals, two frequencies may be selected as suggested, or two other frequencies not far removed therefrom. No matter what the intermediate frequency, the intermediate coils can be lined up on the basis of loudest signal response for a given station. Then six or more stations can be tuned in, including semi-distant ones, giving points well distributed as to frequency or dial settings, and a curve run for the oscillator, when the oscillator secondary is just like the modulator secondary.

Some strong stations will come in at three or four points on the dial, others at only two. Two would represent the higher and lower frequency settings of the oscillator in respect to the incoming signal. The third and fourth would be second harmonics of these, much weaker. By noting where these repeat points come in, selecting the two strongest, those closest together on the dial, you can determine the span between the repeats in terms of frequency. You can use the incoming or station frequencies for this observation. This constitutes a measurement of the intermediate frequency, for that frequency is half the frequency difference between the high and low oscillator settings. The curve will disclose the doubled value in terms of dial settings again plotted against frequencies.

### Removal of Oscillator Turns

If the intermediate frequency is too high or too low, particularly if too low, it can be adjusted on the basis of repeat points to make it just 175 kc, or if it is not far off there need be no change, as the intermediate frequency need not be exactly 175 kc. Even commercial receivers sometimes have the intermediate frequency purposely a little different than 175 kc.

The curve just obtained is really the modulator curve, with frequencies raised by the amount of the intermediate frequency, as the modulator secondary is going to stay just as it is, while the oscillator secondary will be subjected to removal of some turns. So you have the dial settings for the modulator to tune in lower signal frequencies. Since the frequencies are displaced to the extent of the intermediate frequency, and you know the intermediate frequency, subtract the intermediate from the signal frequency values, simply by writing on the curve reference used for frequencies, the frequencies the values called for by this reduction.

Therefore you know where 570 and 1,300 kc will come in (or selected frequencies near these), so the corresponding oscillator frequencies (addition of intermediate frequency to the two others) should come in at the same points. Try one first, preferably the higher frequency. Take off turns until the response is just right. This will require the removal of 10 turns.

Now we have established one point, say, 745 kc, and will try the other, say, 1,475 kc. A small variable condenser, a midget, put across modulator at first, then across oscillator, will tell which way, if either, the oscillator is "off." If capacity has to be added to the oscillator then the oscillation frequency at the setting is too high, which may be remedied by turning down the trimmer across this section. If the test condenser proves effective across the modulator, then the oscillator tunes too low, and a turn or two may be removed from the oscillator secondary. Then recheck against the low frequency setting and you will find the response good.

These details are given for the benefit of those who are experimenting with superheterodynes and who run up against the tracking problem. The data are predicated on the use of a padding condenser of 0.00076 mfd. for any type 0.00035 mfd. tuning condenser. For higher capacity tuning condensers the padding capacity could be the same.

However, for the purposes of constructing the receiver at present under experiment, the absolute values of numbers of turns will be given finally, and the special capacity padding condenser will be used.

### Coupling of Mixer Circuit

Nothing has been said so far as to coupling between modulator and oscillator. A condenser C3 is shown connected from grid to grid. This may consist simply of the capacity effect of inter-twisted leads, the twisting begun where the grid leads emerge from the coil shields on their way to the tube caps. This is sufficient capacity. Tests are being made with various values of capacity. At present the experiments involve a 0.6 mmfd. condenser. Anyway, the amount of capacity for adequate coupling is small.

From the operation of the circuit to date, which operation has been merely experimental, it is clear that tuning the modulator is a necessary precaution against picking up squeals when tuning the oscillator, and of course tuned modulator is standard practice. There is no intention to try an autodyne circuit—same tube as modulator and oscillator—because the coupling would be unity or at least very strong, and we have found how slight it should be.

At present it seems that a t-r-f pre-selector is advisable for suppression of image interference. Image interference is due principally to insufficient selectivity at the signal frequency level to exclude signal voltages of transmissions, especially since the oscillator can bring in the same station at two points, or two stations at one point, the interference constituting the image.

The placement of parts was determined by an existing chassis, resulting in some awkward wiring, so that the intermediate amplifier tube oscillated. Therefore in an attempt to get rid of the oscillation all the filtering was done as shown in Fig. 2, but still oscillation persisted, for the feedback obviously was caused by the intermediate frequency coil leads. Finally the condenser across the biasing resistor of the intermediate tube was omitted and the resistance biasing that tube was greatly increased, whereupon oscillation stopped. However, the amplification was not as great from the intermediate stage as it should have been, therefore the set did not come up to sensitivity requirements. It tuned in stations on the speaker within a night radius of about 1,000 miles, with a few instances of about 1,500-mile coverage.

### "Whistling" Reception

Persons who have operated superheterodynes know that some such sets cause a lot of whistling to accompany the tuning. Considerable of that nuisance was present. It may be due to poor tracking or to insufficient selection ahead of the modulator. Here the tracking was excellent.

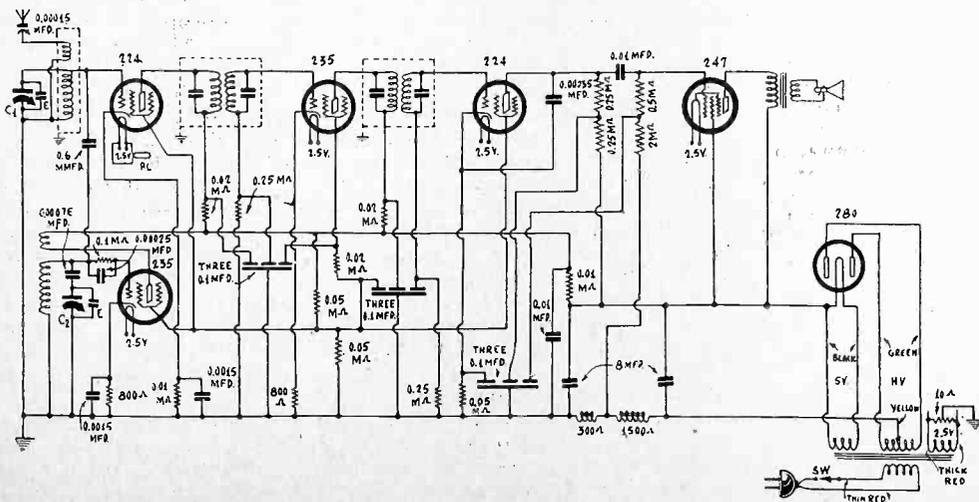


FIG. 2

This crowded pattern was the result of trying to get rid of oscillation due to poor placement of parts.



# An Output Meter Adapter Power Tube Converted

By J. E.

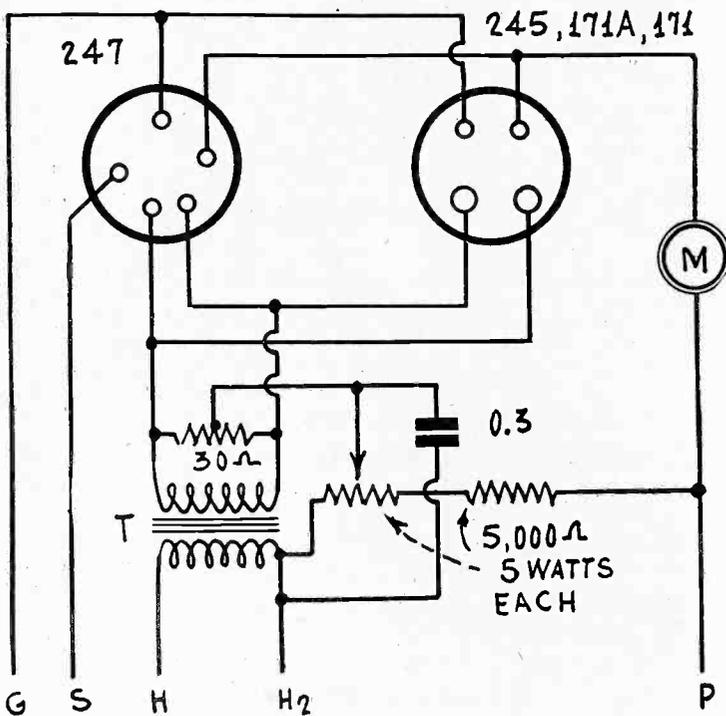


FIG. 1

The circuit diagram of an adapter which converts the power tube to a detector for measurement of output level as an aid in making receiver circuit adjustments.

THE possibility of using the power tube in a receiving set as a rectifier for the purpose of measuring the output with a direct current instrument was suggested last week. The question as to whether it is possible to build an adapter to make the conversion without any wiring changes in the receiver has since arisen. It is not only possible but it is very simple.

In order to provide for three-element power tubes as well as for pentodes it is desirable to incorporate two sockets in the adapter, one UX to accommodate the three-element tubes and the other UY for the pentode. However, to fit the adapter to either type of socket in the set it is necessary to have an adapter at the plug end. Normally the cable may terminate in a UY type plug which fits into a UY socket, which will take care of a 247 tube. When a three-element tube of the filament type is involved an adapter fitting the UY plug is put on the end of the cable, and this adapter in turn is provided with a UX plug. Such adapters are standard equipment on circuit testers.

## Principle of Adapter

The adapter works only on a-c operated sets because a transformer is essential. This transformer is indicated by T in Fig. 1 and it has a one-to-one ratio. When the plug is inserted into the tube socket in the set the primary of this transformer connects with the filament terminals and the input voltage is whatever voltage exists across the terminals. The secondary voltage will be the same since the ratio of turns is unity. The windings in the transformer must be such that both will carry the normal current drawn by the tube.

## LIST OF PARTS

- One UY type socket
- One UX type of socket
- One 30-ohm center-tapped resistance
- One 5,000 ohm, five watt resistor
- One 5,000 ohm, five watt potentiometer
- One 0.3 mfd. by-pass condenser (three 0.1 mfd. in one block, reds interconnected, black to minus)
- One one-to-one filament transformer as described
- One 0-10 milliammeter, or a more sensitive milliammeter
- One five lead cable with UY plug terminal
- One UY to UX adapter

The grid terminal G of the cable connects with the grid prong in the tube socket and is in turn connected to the grid terminal of the sockets in the adapter. Therefore the same signal voltage is impressed on a tube when it is in the adapter socket as when it is in the receiver socket. The plate prong on the adapter plug picks up the plate terminal in the receiver socket, and therefore a high voltage is impressed on the plate of the tube when it is in the adapter socket. A milliammeter M is inserted in the lead between the plate and the plate terminal on the receiver socket. This of course is used to indicate the plate current and the change in the plate current when a signal is impressed on the grid.

## How Bias Is Changed

To change the bias on the tube a resistance is connected between the center point of the secondary of the one-to-one transformer and one side of the primary. The only object of using the one-to-one transformer is to enable change of the bias without rewiring the set. The reason one end of the bias resistance is connected to one side of the primary is that there is no other way of providing a return to B minus automatically. It would be desirable to connect the resistance to the center of the primary as well, but that would require making a connection between the adapter and B minus in the set. There is really no objection to the return to one side of the heater because indications are visual and hum does not matter. The center on the secondary is provided by a 30-ohm center-tapped resistance.

In the drawing a simple grid bias resistance is not indicated but rather a potentiometer. There are several reasons why this arrangement is used. In the first place, if the bias were increased by a high resistance alone, this resistance would have to be of a very high value, since the plate current at correct adjustment will be very small. In the second place, as the current is reduced the voltage on the tube would rise to a high value. This would alter the conditions of the receiver under test. Besides, if the circuit employs electrolytic condensers, as many modern circuits do, the voltage will rise above the breaking down voltage of these condensers and serious damage would result. Hence a potentiometer consisting of two 5,000 ohm resistors is used between the plate terminal on the receiver socket and the side of the heater to which the return is made. The resistance next to the transformer is a potentiometer and the slider of this is connected to the center of the secondary of the one-to-one transformer. The total resistance of the two resistors is such that there is a comparatively small change in the current drawn by the set when the adapter is used, and therefore a small change in the voltage.

## Reason for Potentiometer

In some instances the current will go through half of the filament transformer serving the other tubes in the set, or through the center-tapped resistance for these tubes, but the current is comparatively small so that there is no danger.

If there is no grounded center-tap on the filament transformer serving the set the arrangement will not work because then there will be no return of the plate current in the adapter to B

## Special Connection

Special attention should be paid to the neon lamp connection by television experimenters. No doubt many who have tuned in the picture transmissions aurally have been surprised at the relatively low intensity of visual reception when the changeover is made to picture impulses. Of course some detuning occurs, but it is assumed that has been corrected by retuning. However, the most serious drawback seems to be, under such circumstances, that the output tube is not worked properly.

If the neon tube is the load directly, then the plate voltage may drop to around 50 volts effective, so that it will be as great as the grid bias voltage. Also, of course, the current through the tube is low. The larger plate area neon lamps stand about 15 milliamperes continuously, and a series resistor is recommended to limit the current through the lamp. Since lamp and limiting resistor are in series with the plate circuit, naturally the same current flows in the plate circuit, about 15 milliamperes. Although the efficiency of the tube is increased when such a high load is put on it, the power output is decreased, even though not enormously. What we are interested in is the power output.

The neon tube may have a series circuit in parallel with it, and this series circuit consists of a 4,000 ohm 2 watt resistor

# For Visual Results; Into a Detector by Device

Anderson

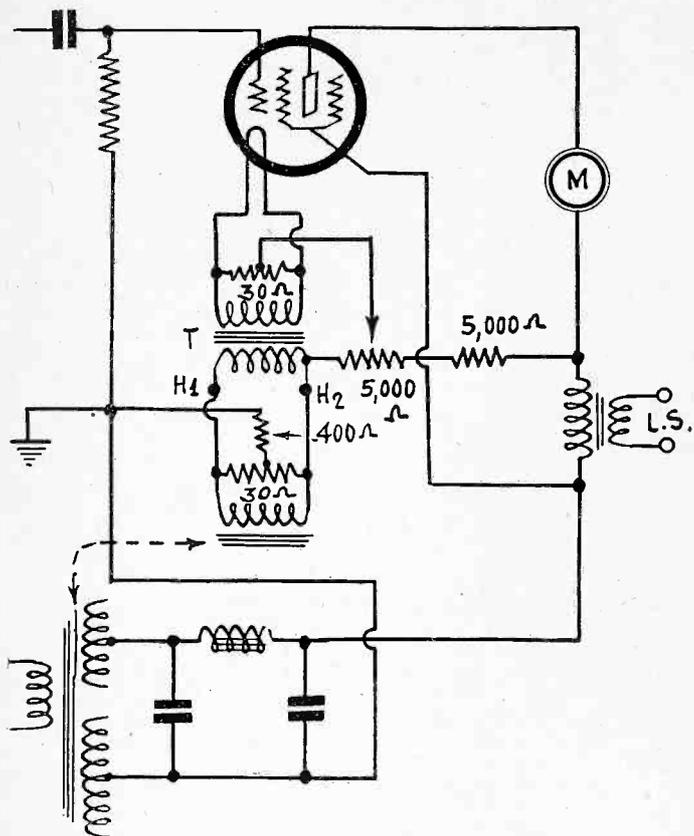


FIG. 2

This diagram shows the complete circuit of a 247 power stage after the adapter has been plugged in and the tube has been transferred. This is for the case when a bias resistance is used and the choke is in the positive side of the supply line.

minus. In such cases it will be necessary to provide an external lead as suggested above.

The potentiometer is used rather than a fixed voltage divider so as to provide an adjustment of the bias for different tubes. A 247 pentode requires a relatively low bias for good detection. Hence the slider on the potentiometer is set close to H2. The 245 requires a much higher bias, and then the slider is moved toward the plate. The 171A is between the two.

In Fig. 2 is shown the complete circuit of a 247 tube after the adapter has been plugged into the socket in the set and the tube transferred to the adapter. This shows clearly how the

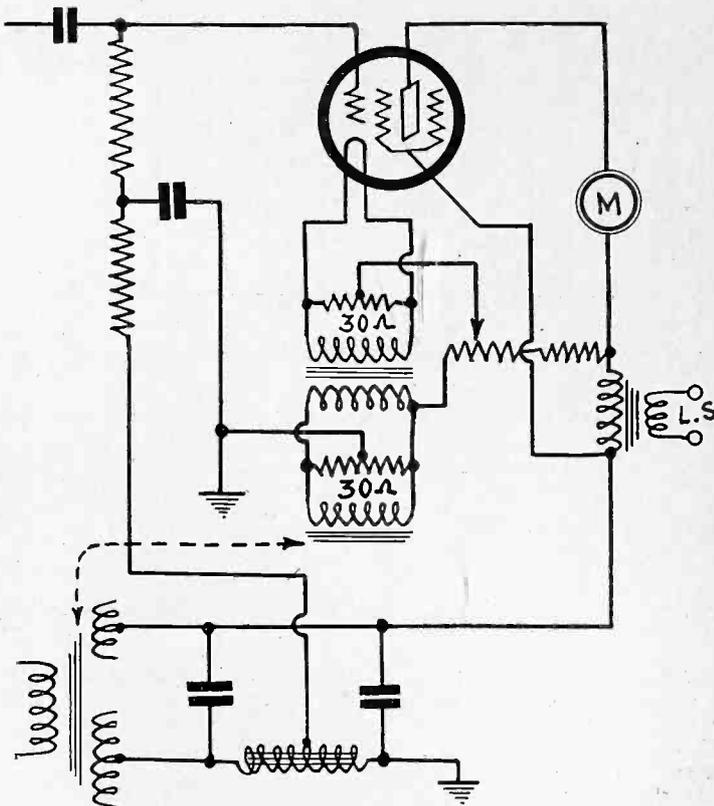


FIG. 3

This diagram shows the complete circuit of the power stage and the adapter for the case when the choke is in the negative side of the supply line and when the bias is obtained from a drop in the choke coil. Dotted line means common core.

bias on the tube is obtained. First there is a portion of the resistance of the 5,000 ohm potentiometer between the filament of the tube and B minus. Then there is the effective resistance of the 30-ohm resistance and the transformer winding, and then the 400 ohm bias resistance which served to bias the tube before the adapter was plugged in. In this case the potentiometer must be set nearer H2 than if the 400 ohm resistance were not there because the total current through the 400 ohm resistance is not much different from the normal plate current of the tube. In Fig. 3 is shown the case where the choke of the filter is put in the negative side of the voltage supply and the bias is obtained from a drop in a portion of the choke. In most cases the choke is the field coil of the dynamic speaker.

The corresponding circuits for the three element tubes are the same except that the connection between the screen and B plus is dropped out, which occurs in the plug adapter.

It should be noted that the circuit will not work if the adapter is plugged into the socket for a 227 tube because the grid would receive a high positive voltage instead of a signal voltage. Neither will it work in conjunction with a 238 type tube because in such cases the cathode would receive the high positive voltage, the grid would get no signal voltage, but the screen would. Similar circuits, of course, may be arranged for these tubes also.

## The One-to-One Transformer

The one-to-one transformer is not standard equipment and some may find difficulty in obtaining one. But it can be constructed very easily. Take the core of an audio transformer or of any small transformer. Put on it two equal windings of about 50 turns each, using heavy wire such as No. 18 double cotton covered. Insulate both windings from the core and from each other. These windings may be put on without the trouble of taking the core down simply by threading the wire through the window. First compute the length of wire required and cut this length off the spool.

## For Neon Lamp

and a 30 henry audio choke coil, the d-c resistance of which may be neglected. The object of the parallel circuit is to take up the excess current, so the neon tube will get no more than its prescribed share. If only a parallel resistor were used, then the signal current would be divided, about twice as much flowing through the resistor as through the lamp, and yet we are interested in getting all possible signal current through the lamp. Therefore if we add the choke to the parallel circuit the signal current will flow through the lamp exclusively, as the coil will choke it out of the shunt circuit.

The switch is so arranged that either the primary of the output transformer or the lamp is shorted out. A single pole double throw switch will do this.

The effective load on the plate circuits of the detector and first audio tubes may be 0.2 meg., the sum of two series resistors in each of those circuits, for the middle and low notes, since the capacities to ground (0.1 mfd.) have virtually no effect on middle and low notes. However, the filter circuits, consisting of the resistors and capacities in all audio plate and grid circuits, are great hum reducers, and likewise minimize other forms of feedback. They are stabilizing agencies as well as hum killers.

# An Eight Tube Super for D-C Heaters Connected in Series for Economy

By Einar Andrews

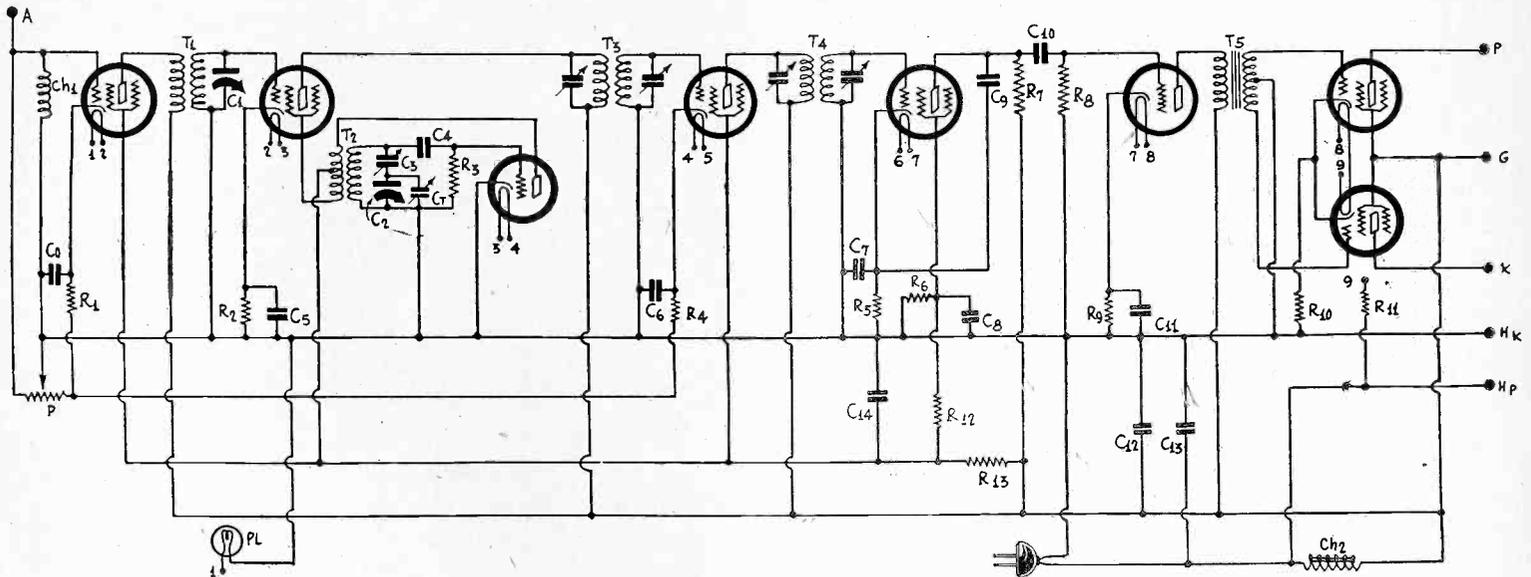


FIG. 1

The circuit of a nine tube superheterodyne for operation on a 110-volt d-c line

IN THE January 16th and 23rd issues was described an eight-tube automobile superheterodyne. Since then there have been requests for a similar circuit diagram for use on a 110 volt d-c line, with the heaters of the tubes connected in series. This diagram is given in Fig. 1.

As the heater current will not be pure d-c it is necessary to make certain changes. For example, it is not advisable to use the heater current for bias or for the screens without first filtering the current. For this reason a grid bias resistance is used for each tube. The first tube in this circuit is operated under the same conditions so that the bias resistance should remain at 600 ohms. The bias resistance for the modulator also may remain at 30,000 ohms, although it may be increased to 50,000 ohms if desired. There is very little difference between the two, and both have advantages.

The oscillator need not be changed except that a lower plate voltage will be used on account of the lower voltage at the source. The bias resistance for the intermediate frequency amplifier is also the same, namely, 600 ohms. Likewise, the grid bias resistance of the detector may remain at 30,000 ohms, although, as in the case of the modulator, it may be raised to 50,000 ohms.

### Change in Audio Amplifier

The screen of the detector is not returned to the positive end of the heater circuit but rather to a suitable point on the voltage divider. The screen voltage may have any value from 6 to 45 volts, although it is better to remain below 25 volts.

There are two changes in the first audio amplifier tube. A grid bias resistance of 1,500 ohms is used in the cathode lead, and a by-pass condenser of 0.1 mfd. or more is put across it.

There has also been a similar change in the push-pull output stage. Instead of using a 300 ohm resistance between the cathodes and the positive side of the heater, a 600 ohm resistance is used between the cathodes and ground, the grids being returned to ground.

In the first detector the screen voltage has been increased from 6 to the same voltage that is used on the plate of the oscillator, or on the screens of the radio frequency amplifier tubes. This change was made necessary by the fact that the heater current was not filtered so that the heater voltage could not be used for the screen.

### The Heater Circuit

All the heaters are connected in series, and the pilot light is also on the series. If we allow a voltage of 7 volts across each heater, which is quite safe, and 2.5 volts for the pilot light, the total voltage drop in the series will be 63.5 volts. If the line voltage is 115 volts, the excess that must be dropped in the ballast resistance is 51.5 volts. Since the current will be 0.3 ampere, the required ballast resistance is 171 ohms. This is the resistance between (9) and the positive side of the supply line.

The heater circuit has not been completed on the drawing but the numbers indicate the connections to be made. The pilot

light picks up the chassis and the negative side of the line. The other side of the light terminates in (1), which is to be connected to (1) on the first tube. After that all heater terminals equally numbered are to be connected until we finally reach (9) and the ballast resistance.

The dynamic speaker is supposed to be connected across the Hk and Hp terminals at the right across which there is 115 volts. A speaker designed for this voltage should be used. However, if a speaker having a field resistance of 171 ohms, or about that, drawing a current of 0.3 ampere, is available this may be used in place of the ballast resistance. In that case the Hk and Hp terminals at the right should be disregarded and the field should be connected in place of the ballast resistor.

### Filtering B Supply

The plate supply voltage is filtered by means of a 30 henry choke in the positive voltage supply lead, and with by-pass condensers across the line. It is recommended that dry paper condensers be used in preference to electrolytics because these will not be damaged if the line plug should be inserted in the wrong way. Very little filtering is needed so that the choke and two 4 mfd. condensers will suffice. One of these fours is connected across the line at each side of the filter. The by-pass condensers from the taps on the voltage divider to ground need not be larger than one microfarad each.

The voltage divider may first consist of one 1,000 ohm resistance between the chassis and the screen for the detector and then two 5,000 ohm resistances.

While reference has frequently been made to the chassis as ground, it should not actually be grounded, for this would short-circuit the line in most cases. No ground connection need be made, but if it is, it should be made through a condenser of about 0.001 mfd. It is also a good idea to put a condenser of this value in series with the antenna for if the antenna should happen to touch any grounded object the line will also be short-circuited. It must be remembered that the chassis is alive and it should so be treated. Suitable precautions must be taken in case there are children around who might become inquisitive about the set.

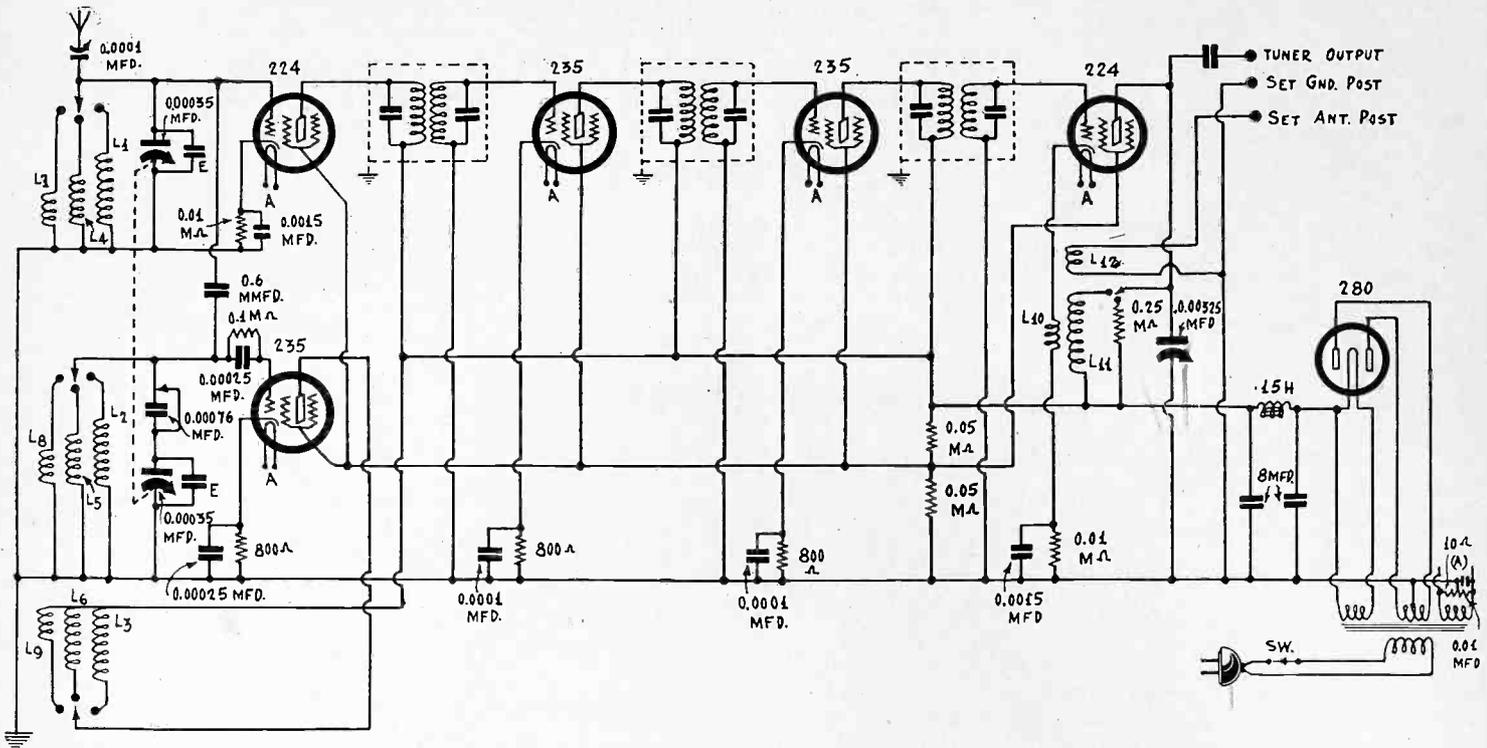
### Placing Pilot Light

The pilot light is placed next to the chassis because in many instances the lamp is mounted on the dial pointer and moves with it, flexible leads connecting it with the heater circuit. This is a danger point because the insulation of the leads might become defective during use. If the lamp were placed on the other side of the circuit there would be a short-circuit. When it is placed on the negative side as shown in the drawing the worst that can happen is a short circuit of the light. The lamp would not burn out, it would simply go out until the short was remedied.

The shaft of the volume control is also at live potential. For this reason the set screw on the knob should be covered with an insulator, such as wax.

# The Duo Converter

## Covers Short and Broadcast Waves—Tuner, Too



THE first facts about a new converter invention were disclosed in last week's issue, dated January 23rd. The invention consisted of a converter with built-in intermediate frequency amplification, the final output being tuned to a frequency of oscillation that would permit further amplification in a receiver at any frequency to which the receiver was capable of tuning. That is, there were two mixers, the first to change the incoming waves to an intermediate frequency, the second to change the intermediate frequency to a frequency to which the receiver would respond. In reality the invention concerned the changing of frequencies in any direction, but the application is being confined for the moment to all-wave converter use.

So, with this system, and suitable choice of tuning constants, the situation developed may be as follows: By switching from one inductance to another the band of original frequency response and accompanying oscillator may include the broadcast band as well as short wave bands. If the ratio frequency of 3-to-1 prevailed throughout, then the tuning condensers (0.00035 mfd.) would permit coverage from 550 to 14,850 kc, using three coils, whereby the ratio would be 3 cubed, or 27-to-1. Therefore if the converter is worked with a broadcast receiver, all tuning may be done on the converter, broadcast band included, and the set is relied on only for some extra amplification and detection and for power output.

### Large Frequency Difference

The intermediate frequency selection may be 175 kc, as that frequency is popular now. Then the intermediate amplification would be at a frequency always greatly differing both from the incoming frequency and the frequency of the first local oscillator. There would be no direct reception of broadcast stations because the intermediate frequency is so far removed from any of them, and as the original carrier frequencies increase, the extent of the frequency difference increases. Broadcasting and other stations would be received only by virtue of the superheterodyne action. Ordinarily when converters are connected to sets some strong locals will come through directly, as the intermediate frequency is one chosen in the receiver, and it is not far removed in frequency from the interfering carrier.

The diagram this week shows the new converter completely. The volume control is an antenna series condenser, with some small tuning effects, helpful because of the ganging of the two main tuning condensers. The inductances of the grid windings for modulator and oscillator, in the first mixer, are chosen on the basis of the volume control being set at less than maximum capacity, so that the frequency may be lowered by increasing the capacity. Therefore the second and third grid windings, for short waves, may be of the same number of turns, particularly as the frequency difference need be only 175 kc, from 12 per cent difference down to about 1 per cent finally, the settings of trimmers built into the tuning condensers being adjusted for best response at the lowest frequency setting (second coil).

However, for the broadcast band padding of the oscillator

circuit is necessary, therefore a condenser of about the value of 0.00076 mfd., now a standard value, is used, and the inductance of the oscillator grid winding is less than that of the modulator grid windings. The number of turns used for the broadcast band, on 1-inch diameter tubing, No. 30 wire or thereabouts, was 127 for the modulator and 117 for the oscillator grid windings. The oscillator plate winding consisted of 20 turns wound directly over the secondary, any kind of wire, with insulating fabric between. The coupling is tight enough and the plate voltage high enough to assure oscillation, despite the comparatively few turns on the plate coil. The rest of the grid windings are respectively one-third as many turns as the preceding coil, except that the plate winding for the two smaller coils has one-half the number of grid windings.

### The Heart of the Invention

L11, for 0.000325 mfd., consists of 127 turns; L10, of 20 turns wound over secondary, and L12 of 50 turns wound beside the secondary,  $\frac{1}{8}$  inch space between.

The grid leak and condenser in the oscillator constitute a frequency stabilizing agency. It is well known that the oscillator frequency tends to drift. This would be due to voltage changes, including those arising from grid current flow. Here the leak and condenser do not make for rectification of any substantial order, since the bias is highly negative, but if any grid current flows the voltage drop in the grid resistor tends to keep the bias constant. The situation is like that of a resistor in the plate circuit. As the current increases through this resistor the voltage drop across the resistor increases, and the effective plate voltage is less. So in the grid circuit the resistor opposes negative bias voltage increases that grid current might occasion.

The intermediate amplifier consists of two stages, requiring three transformers, since one transformer couples to the second detector or output tube. The cathode of this tube has a coil in series with the biasing resistor, this coil coupled to a tuned plate circuit. Therefore the tube may be made to oscillate at the frequencies determined by the condenser and coil it tunes. If a physically small sized condenser is used it may be placed on the front panel and be knob-actuated. Then any second frequency of amplification—really a supermediate frequency—may be chosen and the receiver worked at a frequency where it is most sensitive. Even a frequency on which there is a broadcast station may be used.

If the capacities were the same the secondaries for tuning of both oscillators to cover frequencies required for broadcast response would be the same, since the difference, 175 kc, is the same. In the first instance the frequency was lowered from signal frequency to 175 kc by oscillation frequencies 175 kc higher than modulation frequencies. Now the modulation frequency is increased instead of being lowered, the oscillator being 725 to 1,675 kc higher. Subtract 175 kc from the two extreme frequencies and you get 550 and 1,500 kc.—H.B.

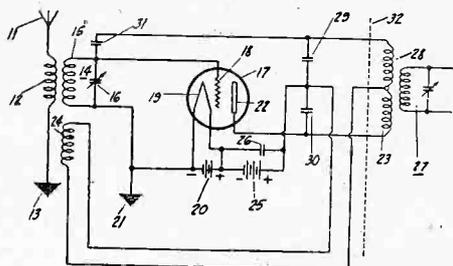


# Patents Newly Issued

## Illustrated Reports from Federal Office

[Newly issued or reissued radio patents are recorded in this department. The number of the patent itself is given first. Usually only one claim is selected and the claim number also is cited. The code at the end of the title description (Cl., etc.) refers to the classification, the next number being the sub-division, which data define the nature of the patent. All inquiries regarding patents should be addressed to Ray Belmont Whitman, Patent Editor, RADIO WORLD, 145 West 45th Street, New York, N. Y.]

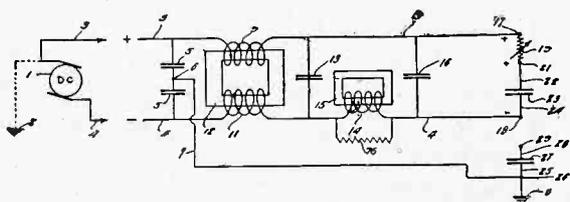
1,841,281. STABILIZED RADIO CIRCUITS. Harold F. Elliott, Palo Alto, Calif., assignor, by mesne assignments, to Radio Corporation of America, New York, N. Y., a Corporation of Delaware. Filed March 15, 1927. Serial No. 175,500. 25 Claims. (Cl. 179-171.)



1. In an amplifying system, an electronic emission device, having a plurality of electrodes, an input circuit for said device, an output circuit for said device, means associated with at least one of said two circuits to oppose the effect of capacitive coupling between the electrodes, and means forming with said associated means, a parallel resonant circuit the resonance period of which is below the range of operation of the system.

\* \* \*

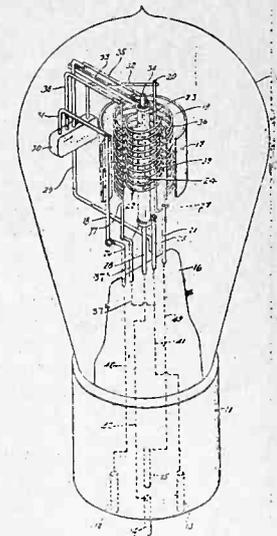
1,840,776. FILTERING ARRANGEMENT FOR DIRECT CURRENT. Harry W. Houck, East Orange, N. J., assignor, by mesne assignments, to Dubilier Condenser Corporation, New York, N. Y., a Corporation of Delaware. Filed Oct. 24, 1924. Serial No. 745,659. 2 Claims. (Cl. 250-27.)



1. In combination with a radio receiving set, a source of unidirectional power supply having one side normally grounded, a filter connected between said source and the receiving set to smooth out fluctuations in the power supplied to the set, a ground connection for the filter and a terminal connected to the receiving set to provide a ground therefor, and a condenser connected between said terminal and ground connection to prevent a conductive connection between the receiving set and ground.

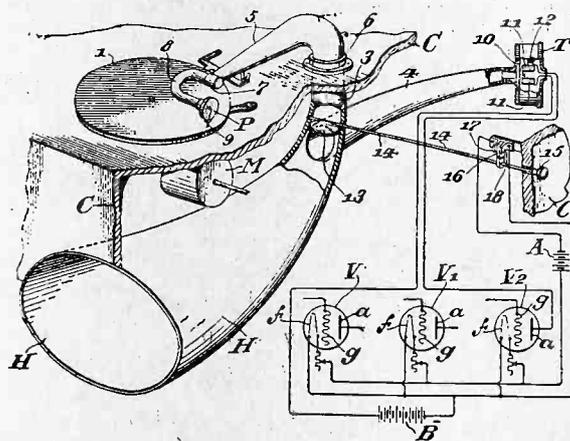
1,840,365. SHIELDED GRID TUBE. Walter Louis Krahl, Montclair, N. J., assignor to Arc-turus Radio Tube Company, Newark, N. J., a Corporation of Delaware. Filed Nov. 2, 1927. Serial No. 230,449. 6 Claims. (Cl. 250-27.5.)

1. A thermionic tube comprising an anode, a grid, a cathode, a heater for said cathode, an auxiliary grid between said grid and anode, supporting conductors attached to said anode, grid, cathode, heater and auxiliary grid respectively, a supporting bead, means connected to the upper end of said cathode and heater for maintaining the same in spaced relation, said means being in the form of a conductor extending through said bead to support the same and being connected to the supporting conductor attached to said cathode, and means each supported by said bead secured to the upper end of said anode, grid and auxiliary grid respectively for maintaining these respective elements in spaced position with respect to each other.



\* \* \*

1,840,772. RADIO PHONOGRAPHIC APPARATUS. Cornelius D. Ehret, Philadelphia, Pa. Filed Nov. 10, 1924. Serial No. 748,850. 14 Claims. (Cl. 179-100.12.)



1. Radio phonographic apparatus comprising telephonic and phonographic reproducers, a horn, means for interchanging communication between said reproducers and said horn, a switch controlling operation of said telephonic reproducer, means for actuating said means and said switch in unison, and a second switch controlling operation of said telephonic reproducer and controlled by movement of a part of the phonographic apparatus.

### QUESTIONS AND ANSWERS

[Readers may avail themselves of this free service for advice on patents, trademarks, designs and copyrights. If a personal answer is desired a stamp should be enclosed with question. Address all questions to Patent Editor. Write on one side of the paper only, giving full name and address. Only initials will be published.]

IS it possible for a poor man to make money out of a patent?—L. O., Philadelphia, Pa.

It certainly is. Some of the greatest fortunes have been built up by men who were originally poor and who made valuable inventions and obtained strong patents on them. Large corporations fear to be drawn into infringement suits over patents and will do all they can to avoid infringing. Where, however, there is an infringe-

ment and the owner of the patent has no funds to sue the infringer, he can often make an arrangement with the patent attorney to conduct the litigation on a contingent fee basis.

\* \* \*

WHAT countries grant the strongest patents?—F. K., Buffalo, N. Y.

The United States and Germany, since both these countries make rigid priority searches and the patents are therefore in a sense semi-adjudicated when issued. Canada, Great Britain, France and most of the other countries grant patents which are largely in the nature of registrations because the searches are not so thorough.

# Simple Methods of Measurement Useful in Designing Coils and Selecting

By Bru

IT OFTEN happens that it is necessary to measure the minimum capacity in a circuit and the effective inductance. This happens during the process of designing oscillators for superheterodynes because, as a rule, the minimum capacity in an oscillator, especially when there is a series padding condenser on the high potential side of the tuning condenser, is higher than the minimum in the r-f tuner. The inductance needed in the oscillator is largely determined with the minimum capacity in the circuit and the inductance cannot be determined accurately until the minimum capacity is known.

There is a very simple way of determining the minimum capacity provided that an external calibrated condenser and a calibrated oscillator are available. The circuit may be already hooked up so that the minimum capacity will be measured in position. Start the calibrated oscillator and also the oscillator in the receiver and couple the two so that squeals will be heard in the loudspeaker as either oscillator condenser is turned. Turn the condenser in the oscillator under test to its minimum setting. Next connect the calibrated condenser across the oscillator condenser, taking care that the leads are short and that the circuit is grounded. If the calibrated condenser has a metal shield around it this will be connected to the rotor side, which should be connected to the grounded side of the circuit under test.

## Measuring Frequency

When this has been set up turn the calibrated condenser to any convenient value, preferably either near maximum or minimum. Now with the calibrated oscillator measure the frequency of the oscillator under test. This is done by turning the calibrated oscillator until it zero-beats with the oscillator under test. Be sure that the squeals between the fundamentals are used. Read the frequency involved on the calibration curve and note it down. Now set the calibrated condenser at some other convenient value, preferably at the extreme previously not used. Again measure the frequency of the oscillator under test and record the frequency. Of course, the two capacity values of the calibrated condenser must also be set down. Now we have enough data for the determination of both the minimum capacity in the oscillator circuit under test and the effective inductance in the circuit. The minimum capacity is computed first. This is done with the aid of formula (4). This gives the minimum capacity in terms of the two frequencies and the corresponding capacity values of the calibrated condenser.

$$F_1 = \frac{1}{2\pi \sqrt{L(C_1 + C_0)}} \quad \text{---(1)}$$

$$F_2 = \frac{1}{2\pi \sqrt{L(C_2 + C_0)}} \quad \text{---(2)}$$

$$\left(\frac{F_1}{F_2}\right)^2 = \frac{C_2 + C_0}{C_1 + C_0} \quad \text{---(3)}$$

$$C_0 = \frac{C_1 F_1^2 - C_2 F_2^2}{F_2^2 - F_1^2} \quad \text{---(4)}$$

$$L = \frac{1}{4\pi^2 F_1^2 (C_1 + C_0)} \quad \text{---(5)}$$

$$C_0 = \frac{C_2 - 4C_1}{3} \quad \text{---(6)}$$

With the aid of these formulas and the data taken by the methods in Figs. 1 and 2 the minimum capacity and the effective inductance can be determined. The first three formulas show the derivation of the others.

Let us assume, for the sake of illustration of the use of the formula, the following values:  $C_1$ , 100 mmfd.;  $C_2$ , 500 mmfd.;  $F_1$ , 1,400 kc., and  $F_2$ , 755 kc. Substituting these values in formula (4) we obtain  $C_0 = 46.5$  mmfd.

If the leads to the calibrated condenser the minimum capacity obtained in this way includes the capacity of the leads, but this capacity should not be more than a fraction of a micromicrofarad, unless they are long and twisted together. The leads should be

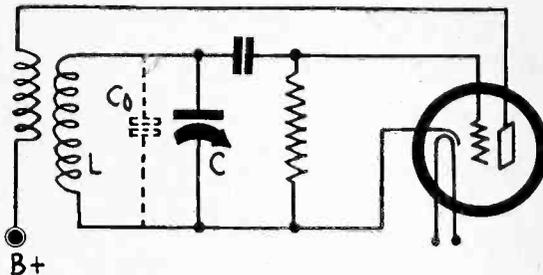


FIG. 1

The minimum capacity of an oscillator circuit can be measured with the aid of a calibrated oscillator and a calibrated condenser while the oscillator is in position.

made as short as possible and the two should be kept apart so that their capacity may be neglected.

## Simplifying the Formula

When this method is used there is a simple way of arriving at the result that is more accurate, provided that the calibrated condenser can vary the frequency of the test oscillator under test one octave. For example, if one squeal point is first found with the calibrated condenser is set near maximum by varying the calibrated condenser, then without touching the calibrated oscillator the calibrated condenser is turned until the squeal is heard again this time the second harmonic of the test oscillator beating against the fundamental of the known frequency. In this case the frequency at one setting of the oscillator under test is just twice that at the other setting. Suppose, that  $F_1$  is twice as large as  $F_2$ . Then we set  $2F_2$  for  $F_1$  in the formula (4) and cancel out  $F_2$ , we obtain formula (6). This method is more accurate because we do not

# Yale Station B

World-wide contacts are established by the Yale Radio Club, at New Haven, Conn., WIYU. Similar stations in other colleges in the country, and with some other college, however, sir, in terms of conformity to the good old irreducible minimum as to that correspondence.

Aside from this aspect, the messages received are a source of much delight to the station.

## Pipes A

Since there are many at Yale who are interested in radio, it is regarded as one of the fine gestures of the station. It is referred to humorously as the "Yale Radio Club" and are worked at forced draught.

The practical side of radio transmission is handled in the most delightful manner, and the station is as easy as the exchange of messages. For example, were, since they get the inside track on the station, are bravely trying to master, and thus are non-participants in the radio doings.

## They Go

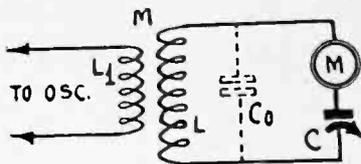
The club members are keenly devoted to the station. Their motto is "The shorter the better." The station is rigged up for short-wave transmission. The station is a sprinkling of apparatus made by National Radio Company, all other executives of that firm. The station is on one of the condensers attests to the fact that they have learned to tune, it being well known that a thousand on the scale may bring in the station instead of for a

# Measuring Capacity and Inductance Padding Condensers for Superheterodynes

Ben Brunn

FIG. 2

The minimum capacity can also be measured with a thermo-couple meter connected as in this figure.



have to know the frequency but only the ratio of the two frequencies, which is exactly two to one, provided that we use the second harmonic. This would be the method to use when our oscillator is not calibrated. Thus we need only a calibrated condenser.

Let us examine formula (6) to see under what conditions we may use it. The minimum capacity in a circuit is not likely to be more than 100 mmfd. Let us set this for  $C_0$  in formula (6) to see what the ratio of  $C_2$  and  $C_1$  should be. Let us assume further that the calibrated condenser has a maximum capacity of 550 mmfd. Let this be  $C_2$ . Then  $C_1$  should be 62.5 mmfd. If the minimum capacity of the calibrated condenser is equal to this or less we can use the method. Of course, it is necessary to adjust the frequency of the oscillator so as to bring the fundamental and the harmonic within range.

### Derivation of Formula

Formulas (1), (2), and (3) show the method of arriving at formula (4). First the two frequencies are expressed in terms of the inductance and the minimum and added capacities. Thus we get formulas (1) and (2). Then we divide formula (1) by formula (2) and square both sides and we arrive at formula (3). Then it is only necessary to solve the equation expressed by (3) for  $C_0$  to get formula (4).

The inductance in the oscillator circuit can be obtained as soon

as we have obtained the minimum capacity. All we have to do is to solve either (1) or (2) for the inductance. Formula (5) is derived from (1). We know all the values in (5) except the inductance but all we have to do to get that is to evaluate the expression in (5). For this, however, we must know the actual value of  $F_1$ . A ratio of frequencies will not do.

We assumed that  $F_1$  was 1,400 kc. and that  $C_1$  was 100 mmfd. We also found that  $C_0$  was 46.5 mmfd. Hence in (5) the total capacity is 146.5 mmfd. Putting this and  $F_1 = 1,400$  kc. into (5) and solving we get  $L = 88.1$  microhenries.

Fig. 1 shows the essential circuit of the oscillator in which the minimum capacity  $C_0$  is measured.  $C$  is the calibrated condenser connected across the tuned circuit. Of course, the method applies just as well to other cases than the oscillator in a superheterodyne or some other oscillator. It applies to r-f tuned circuits both in the receiver and outside, or it applies to the case of measuring the distributed capacity of a coil. However, if the circuit on which the measurements are made are not in an oscillator it is necessary to provide some means for indicating resonance. This may be done by connecting a thermogalvanometer in series with the calibrated condenser and coupling the coil to the calibrated oscillator. Or, if the circuit on which the measurement is made is an r-f circuit in a receiver, the tube following the circuit can be used as a vacuum tube voltmeter. Any means for indicating resonance can be used, provided it does not alter the capacity in the circuit appreciably.

### Using Thermo-Galvanometer

In Fig. 2 is a circuit in which a thermo-galvanometer is used for indicating resonance.  $C$  is the calibrated condenser,  $C_0$  the minimum capacity to be measured,  $L$  the inductance which may also be the subject of measurement,  $M$  is mutual inductance between the source of oscillating voltage and the circuit under measurement, and  $L_1$  is a coupling coil. It may be that  $L_1$  is the oscillating coil in the calibrated oscillator.

When using this arrangement it is necessary to use loose coupling. If the coupling is close the constants of the circuit will be different and the frequency of the calibrated oscillator may also be in error. Moreover, if the coupling is close the thermocouple meter may burn out. Just move  $L_1$  close enough to  $L$  to give a definite indication on the meter. A deflection at resonance two or three divisions is enough. In hunting for resonance proceed slowly with the variable condenser, whether that in the calibrated oscillator or the calibrated condenser. If the frequency of the oscillator or the tuning of the circuit under measurement is varied rapidly the resonance point may be passed over without any indication, yet if the coupling is close, the meter may burn out. Turn the condenser very slow and watch the meter. If there is no resonance indication increase the coupling and repeat. If the deflection becomes very large, loosen the coupling.

When using a vacuum tube voltmeter there is not as great a danger of damaging the meter but it is just as important to use loose coupling.

If the circuit under test is a part of a receiver, or if it is a wave trap by which the output of a receiver can be varied, the work may be done with a modulated signal of known carrier frequency. The loudspeaker then becomes the detecting element.

## on to Students

The station of the Yale University Radio also communications are carried on with country. Just before a big athletic game, two are not supposed to be on speaking spirit, communication is reduced to the

most importance that travel back and forth members of this club.

### Worked Hard

For electricity on a grand scale, the club one's pipe in the most adult fashion is recipitation in the radio pastime. The pipe

reception is drummed into the members they never learned anything with half the language students double in brass, as it pronunciation of the foreign tongues they an edge on their fellow students who are

### Short Waves

the mysteries of short waves, and their fine attention to detail the den is all reception, with more than a generous company, as if the president, general members of the club. The real vernier the fineness with which the club members them that a difference of one part in a hemisphere or something, when reach-student's cigarette case.

## Faster Action on

## Patents During '31

Washington.

Those interested in radio and allied patents learned that the Patent Office during 1931 passed on 20,128 more applications of all kinds than during the previous year, equivalent to doing in twelve months the amount of work that previously had been done in fourteen months. Commissioner Thomas E. Robinson explained that a year and a half ago the staff was increased, and also since then improved methods have been instituted. The amount of work per man remained stationary.

The Patent Office has 63 divisions with about 10 or 11 examiners in each. At the beginning of last year only seven of these divisions were less than six months behind in the handling of applications. This number was increased to 48 at the end of the year, while 29 divisions were less than five months behind. All work is now less than seven months in arrears, whereas a year ago it was nearly nine months behind.

**A Question and Answer Department conducted by Radio World's Technical Staff. Only Questions sent in by University Club Members are answered. Answers printed herewith have been mailed to University Members.**

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Annual subscriptions are accepted at \$6 for 52 numbers, with the privilege of obtaining answers to radio questions for the period of the subscription, but not if any other premium is obtained with the subscription.

## Thermo-couple

PLEASE tell how I can make a thermo-couple for measuring alternating current.—W.H.C., Troy, N. Y.

Take a few inches of resistance wire and an equal length of copper. Cross the two and make the junction firm. The four terminals are to be connected to the meter and the source of a-c.

\* \* \*

## Neon Tube Oscillator

WILL you kindly show a circuit containing a radio frequency oscillator modulated by the output of a neon tube oscillator, provided such an arrangement is possible? What precautions are necessary to make a neon tube oscillate? Please explain the principle of the neon tube oscillator.—S. E. G., New York, N. Y.

Such a circuit is given in Fig. 986. The radio frequency oscillator is typical and contains a tickler  $L_1$ , a tuned winding  $L_2$ , and a tuning condenser  $C_3$ .  $R_1$  and  $C_2$  are the usual grid leak and stopping condenser, the value of which should be 100,000 ohms and 500 mmfd., respectively, for the broadcast band. The tuned circuit may be made up of the component of a radio frequency tuner.  $R_2$  is a ballast resistance suitable to the tube used and the voltage  $A$  applied.  $N$  is the neon tube and  $R$  a high resistance rheostat for the purpose of varying the oscillation.  $C$  also determines the audio frequency generated and it may be a variable condenser of about 500 mmfd. Only a comparatively low voltage, from 22.5 to 45 volts, need be applied to the radio frequency oscillator but much more is needed on the neon tube. The voltage on this tube should be adjusted until the glow just appears. If the voltage is too low the glow will not appear and there will be no oscillation. Also, if the voltage is too high the glow will appear but it will not go out, and hence there will be no oscillation. The oscillation is due to the rapid flashing and extinguishing of the neon tube glow, the rate depending on  $R$  and  $C$ .

\* \* \*

## Effect of Grid Current on Sensitivity

TESTS on my short-wave receiver have convinced me that the selectivity decreases very rapidly as I go up in frequency and also that the amplification decreases. I have been wondering if this is not due to the flow of grid current in the amplifier stages. What do you say?—W. H. L., New Bedford, Mass.

Grid current has that effect. Not only does it reduce the selectivity and the amplification but it increases the minimum capacity so that with a given coil you cannot tune to as high a frequency as you could if there were no grid current. But why should there be any grid current? If you bias the amplifier tubes properly and do not overload them, the grids will always be negative and no grid current will flow. If you do not use grid bias at least use a stopping condenser and a grid leak to prevent the current. The only place where grid current might cause much trouble is in an oscillator. Even with negative bias the oscillation might swing so wide that grid current flows.

\* \* \*

## Meaning of Harmonics

WILL you kindly give a simple explanation of harmonics? I know that harmonics are always integral multiples of the fundamental but I don't know why. One thing that puzzles me is that sometimes they call a frequency twice the fundamental the second harmonic and sometimes the first.—B. W. R., Fort Worth, Texas.

There is no universal agreement as to where one should start counting the harmonics. Sometimes the first harmonic is defined as being equal to twice the value of the fundamental, and sometimes the fundamental is called the first. The second way is gaining in favor because it is the only one that is logical from a mathematical view point. When we speak of overtones it is logical to use the first way of counting the harmonics. That is, the first overtone is the second harmonic. Mathematically the fundamental is just as much a harmonic as any of its integral multiples, so it is logical to call it the first. There are other harmonics which do not bear the

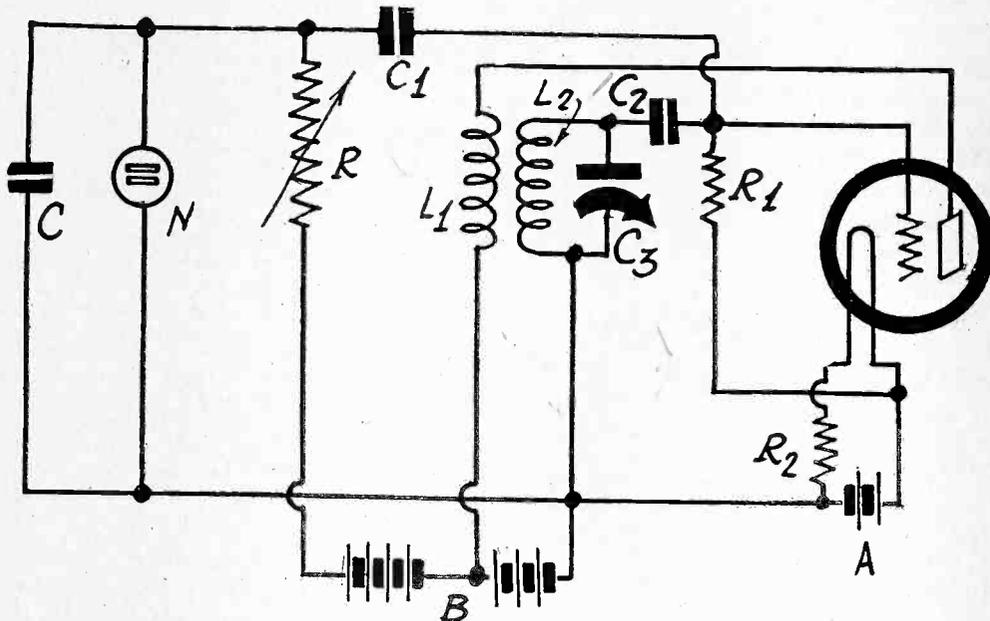


FIG. 986

A radio frequency oscillator modulated by the output of a neon tube oscillator. The audio tone of the neon tube is controlled by the condenser across the tube and by the variable resistance.

integral relationship, but unless specially stated a harmonic means a simple harmonic, such as is represented by an absolutely pure tone. Most tones are not pure but are complex in form, however, they can always be broken up into the sum of many pure tones, provided they bear the integral relationship stated. That is, a complex tone, or any complex wave, can be broken up into its components, each of which is pure, and each such component is a harmonic. The quality of a musical tone depends on the number and relative strength of the harmonics. In a radio set or amplifier no other harmonics must be introduced, and the relative strength of the different harmonics in the original must not be altered, for any change would alter the quality. Waveform distortion introduces harmonics, not of the fundamental alone, but of all the original harmonics, and this leads to very bad quality. Frequency distortion in the amplifier introduces changes in the relative strengths of the original harmonics and thus alters the quality, or the timbre, of the original. This form of distortion is not nearly so bad as wave-form distortion, but when both exist together, and in large measure, the result is reproduction which bears only a crude semblance to the original.

\* \* \*

## Ohmmeter for Low Resistance

MY ohmmeter does not measure resistance accurately below 500 ohms, but often I want to measure resistance down to about 10 ohms. Is it possible to change the ohmmeter so that it will measure these low values or is there any way I can hook up another meter that will measure the low values? I have several milliammeters, one having a range of 0-10 and another range of 0-100 milliamperes. I also have an ammeter going up to 1.5 amperes. Could these instruments be used, or do I require more sensitive meters?—M. L. F., Denver, Colo.

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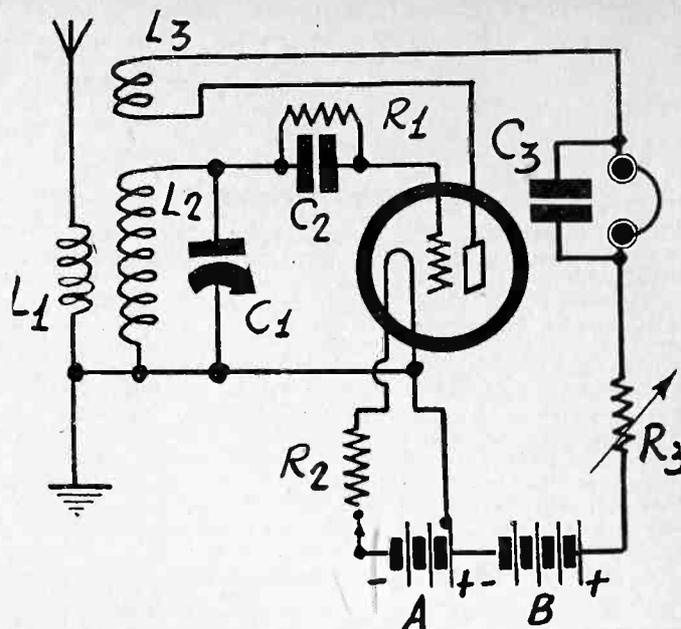


FIG. 987

The circuit of a one-tube receiver that may be used both as a regenerative detector and an oscillator. If the condenser is calibrated in frequency the circuit can be used as a frequency meter as well as a generator of known frequency.

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This can be done, all right. It has one other advantage. The series condenser can take the place of the stopping condenser in the grid lead so that it would be necessary only to use a grid leak. One disadvantage of the arrangement is that the voltage across the tuned circuit is divided before it is put on the grid, only the voltage across the tuning condenser being effective. This might stop oscil-

(Continued on next page)

**A Question and Answer Department conducted by Radio World's Technical Staff. Only Questions sent in by University Club Members are answered. Answers printed herewith have been mailed to University Members.**

# Radio University

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Annual subscriptions are accepted at \$6 for 52 numbers, with the privilege of obtaining answers to radio questions for the period of the subscription, but not if any other premium is obtained with the subscription.

## Thermo-couple

PLEASE tell how I can make a thermo-couple for measuring alternating current.—W.H.C., Troy, N. Y.

Take a few inches of resistance wire and an equal length of copper. Cross the two and make the junction firm. The four terminals are to be connected to the meter and the source of a-c.

\* \* \*

## Neon Tube Oscillator

WILL you kindly show a circuit containing a radio frequency oscillator modulated by the output of a neon tube oscillator, provided such an arrangement is possible? What precautions are necessary to make a neon tube oscillate? Please explain the principle of the neon tube oscillator.—S. E. G., New York, N. Y.

Such a circuit is given in Fig. 986. The radio frequency oscillator is typical and contains a tickler  $L_1$ , a tuned winding  $L_2$ , and a tuning condenser  $C_3$ .  $R_1$  and  $C_2$  are the usual grid leak and stopping condenser, the value of which should be 100,000 ohms and 500 mmfd., respectively, for the broadcast band. The tuned circuit may be made up of the component of a radio frequency tuner.  $R_2$  is a ballast resistance suitable to the tube used and the voltage  $A$  applied.  $N$  is the neon tube and  $R$  a high resistance rheostat for the purpose of varying the oscillation.  $C$  also determines the audio frequency generated and it may be a variable condenser of about 500 mmfd. Only a comparatively low voltage, from 22.5 to 45 volts, need be applied to the radio frequency oscillator but much more is needed on the neon tube. The voltage on this tube should be adjusted until the glow just appears. If the voltage is too low the glow will not appear and there will be no oscillation. Also, if the voltage is too high the glow will appear but it will not go out, and hence there will be no oscillation. The oscillation is due to the rapid flashing and extinguishing of the neon tube glow, the rate depending on  $R$  and  $C$ .

\* \* \*

## Effect of Grid Current on Sensitivity

TESTS on my short-wave receiver have convinced me that the selectivity decreases very rapidly as I go up in frequency and also that the amplification decreases. I have been wondering if this is not due to the flow of grid current in the amplifier stages. What do you say?—W. H. L., New Bedford, Mass.

Grid current has that effect. Not only does it reduce the selectivity and the amplification but it increases the minimum capacity so that with a given coil you cannot tune to as high a frequency as you could if there were no grid current. But why should there be any grid current? If you bias the amplifier tubes properly and do not overload them, the grids will always be negative and no grid current will flow. If you do not use grid bias at least use a stopping condenser and a grid leak to prevent the current. The only place where grid current might cause much trouble is in an oscillator. Even with negative bias the oscillation might swing so wide that grid current flows.

\* \* \*

## Meaning of Harmonics

WILL you kindly give a simple explanation of harmonics? I know that harmonics are always integral multiples of the fundamental but I don't know why. One thing that puzzles me is that sometimes they call a frequency twice the fundamental the second harmonic and sometimes the first.—B. W. R., Fort Worth, Texas.

There is no universal agreement as to where one should start counting the harmonics. Sometimes the first harmonic is defined as being equal to twice the value of the fundamental, and sometimes the fundamental is called the first. The second way is gaining in favor because it is the only one that is logical from a mathematical view point. When we speak of overtones it is logical to use the first way of counting the harmonics. That is, the first overtone is the second harmonic. Mathematically the fundamental is just as much a harmonic as any of its integral multiples, so it is logical to call it the first. There are other harmonics which do not bear the

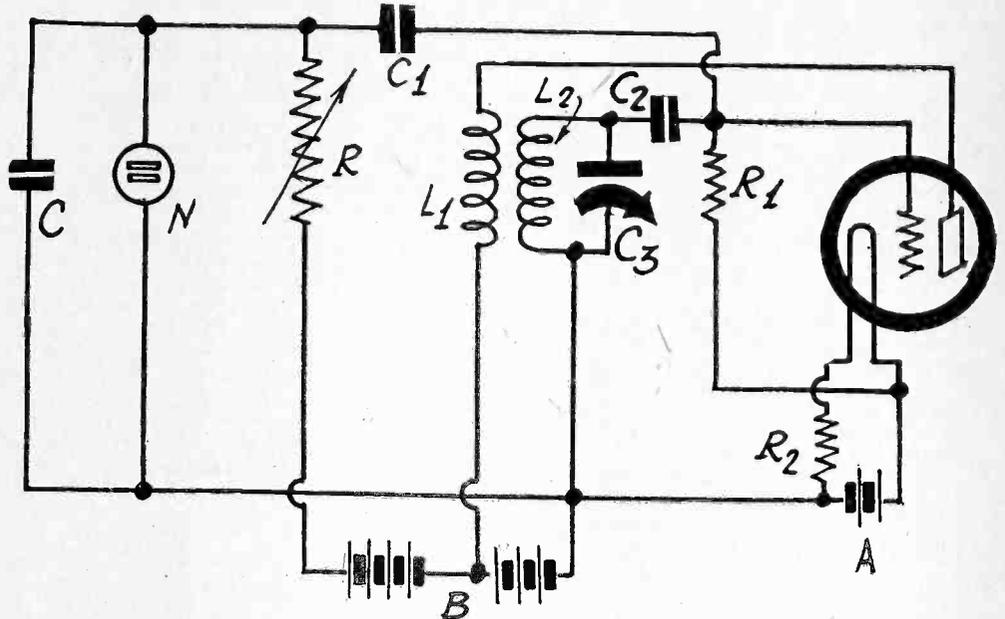


FIG. 986

A radio frequency oscillator modulated by the output of a neon tube oscillator. The audio tone of the neon tube is controlled by the condenser across the tube and by the variable resistance.

integral relationship, but unless specially stated a harmonic means a simple harmonic, such as is represented by an absolutely pure tone. Most tones are not pure but are complex in form, however, they can always be broken up into the sum of many pure tones, provided they bear the integral relationship stated. That is, a complex tone, or any complex wave, can be broken up into its components, each of which is pure, and each such component is a harmonic. The quality of a musical tone depends on the number and relative strength of the harmonics. In a radio set or amplifier no other harmonics must be introduced, and the relative strength of the different harmonics in the original must not be altered, for any change would alter the quality. Waveform distortion introduces harmonics, not of the fundamental alone, but of all the original harmonics, and this leads to very bad quality. Frequency distortion in the amplifier introduces changes in the relative strengths of the original harmonics and thus alters the quality, or the timbre, of the original. This form of distortion is not nearly so bad as wave-form distortion, but when both exist together, and in large measure, the result is reproduction which bears only a crude semblance to the original.

\* \* \*

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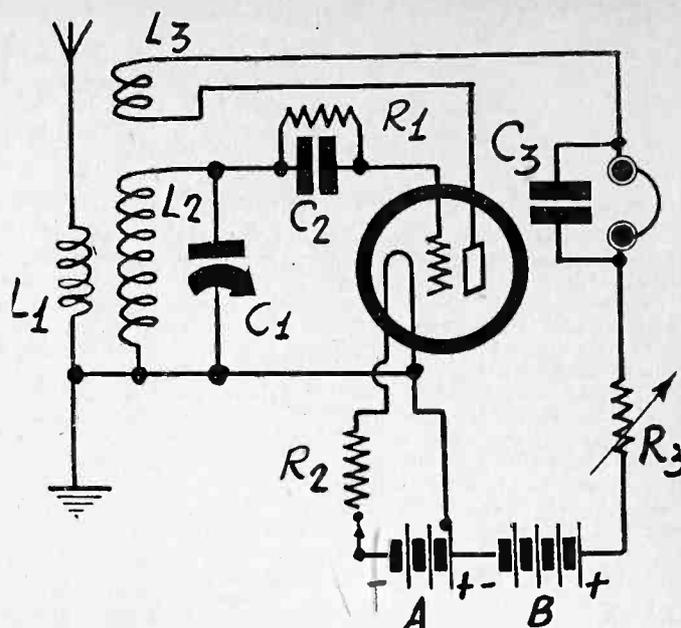


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lation, especially when the full value of the variable condenser is used. Even if the oscillation does not stop, the intensity of oscillation would become less and less the more capacity is put into the circuit by the variable condenser. Therefore the sensitivity of the receiver would reduce toward the lower frequencies. This reduction would be in addition to similar reduction elsewhere in the circuit.

### Squealing Oscillators

THERE is a high-pitched squeal in an oscillator that I built recently for a superheterodyne. Apparently, this squeal cannot be changed with the tuning condenser so it cannot be a beat squeal with some other oscillation. The oscillator does not work in the superheterodyne but the rest of the set does, for when I use an external oscillator I get fine reception. What is the cause of the squeal and how can I remedy it?—C. W. Y., Mt. Vernon, N. Y.

The squeal is only blocking of the grid of the oscillator due to excessive oscillation for the grid leak you have. You can stop it (a) by reducing the value of the grid leak, if any is used, (b) by reducing the number of turns on the plate winding, and (c) by putting a resistance of about 5,000 ohms between the "high" side of the grid winding and the grid, or grid condenser, of grid condenser is used. This is the familiar grid suppression solution.

### Meaning of Inductance

ONE definition states that the inductance of a circuit is the total magnetic flux that threads the circuit per unit of current. According to this definition inductance is magnetic flux. But another definition states that it is a length. But a flux is not a length. Where is the discrepancy?—A. F. A., Los Angeles, Calif.

The discrepancy lies in your conclusion that inductance is magnetic flux. The definition which you quote states that it is flux per unit current. To make the difference clear you might write it flux-per-unit-current. Inductance has the physical dimension of a length only in the electro-magnetic system of measurement. In the electro-static system of measurement it is capacity that has the dimension of length.

### Alternating and Direct Current Resistance

IF THE resistance of a resistor is measured by d-c methods, such as measuring the current through it with a battery in series, will this resistance be the same when alternating current is flowing through the resistor? If not, is the a-c resistance likely to be higher or lower, and how much will it deviate from the d-c resistance?—S. G., Ottawa, Canada

As a general rule, the resistance to alternating current is greater than the resistance to direct current. The amount of difference depends on many factors. The difference is greater the higher the frequency. It is also greater the heavier the

wire, and the better the conductivity of the wire. Again, it is higher the higher the permeability of the wire. This statement applies only to conducting material containing iron, nickel, cobalt, and to certain magnetic alloys. The change in resistance with frequency of resistance alloys, although they contain nickel, as a rule, is not great because of the low conductivity of the material. For audio frequencies the change in resistance may be neglected for resistance alloys. Resistors made of carbon have a low change of resistance with frequency. The apparent resistance also depends on whether or not the resistor is inductive. Good wire wound resistors are wound non-inductively.

### Construction of Galvanometer

OFTEN I have occasion to measure very small currents, smaller than those measurable with 0-1 milliammeters. I cannot afford to purchase a sensitive microammeter, and I have been wondering if it would not be possible to construct a galvanometer out of loudspeaker magnets. I have a machine shop where I can work and the mechanical part of the construction will offer no difficulties. If it is possible will you kindly suggest how it can be done?—L. E. J., Ventura, Calif.

Make a strong permanent magnet out of large loudspeaker magnets. You can place them pole to pole to form a ring or you can place one on top of the other to form a husky U. Place equal poles together in either case so that the magnet is as strong as possible. Attach suitable pole pieces of soft iron or transformer laminations. The form should be that of a magneto. Indeed, a magneto magnet may be used. The space for the rotor should be rounded out. Next make a coil on a very light aluminum frame and make this so that it can swing, when suspended, between the pole pieces with as little clearance as possible. In the center of this coil you can place a round piece of iron, making its dimensions so that there is as little clearance as possible between this center piece and the coil. Fill the coil with fine, insulated copper wire. One hundred turns should suffice if the coil is two inches long and one half inch wide. Mount the magnet on a frame so that the coil can be suspended between the pole pieces. One lead from the coil should be used for suspension and it should consist of a very thin and narrow ribbon of phosphor bronze. It may be six inches long or more if the structure requires it. The other lead should be brought out at the bottom through a very fine wire coiled around a few times so that it will not resist swinging too much. The top of the suspension should be adjustable so that the coil may be turned for zero setting. The structure should also be mounted so that the coil can swing freely without touching anything. It is customary to use three leveling screws. Attach a very light knife-edge pointer to the coil and under its end place a suitable scale.

# Short Wave Club

Each week a new list of names of Short Wave Club members is published. There are no repetitions.

Carl V. Silverspur, 104 No. Main St., Memphis, Tenn.  
 John Delmar, 2848 Broadway, New York, N. Y.  
 William J. Beebe, Pres., Nott Terrace H. S. Radio Club, 7 Cornelius Ave., Schenectady, N. Y.  
 Nott Terrace High School Radio Club, Nott Terrace, Schenectady, N. Y.  
 Earl Robbins, 517 Davisville Rd., Willow Grove, Penn.  
 Kensington Lord, 74 State St., Brewer, Maine.  
 E. D. Cristina, P. O. Box 96, Marina St., Mayaguez, P. R.  
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 C. Lindberg, 608 Scheffer Ave., Kansas City, Mo.  
 Marciano Benedicto, 315 Cataluna, Sampaloc, Manila, Phil. Is.  
 Robert Hanley, 81 S. Stough, Hinsdale, Ill.  
 Celso Infantes, Campo Grande, Yacuiba—Chaco, Bolivia, S. A.  
 A. H. Romag, Box 33, University Sta., Tucson, Ariz.  
 Raymond J. Racine, R. F. No. 1, Box 140, Killingly, Conn.  
 H. Scott Killgore, Damon Rd., Minot, Mass.  
 Anthony Fantauzzo, 3348 Illinois St., Detroit, Mich.  
 F. E. Mahoney, Box 601, Malad, Idaho.  
 Jos. Pouillard, No. 3 Alexandre St., St. Ludger, Riv. du Loup, Temis, Prov. Que., Canada.  
 E. G. Lohman, Jr., 7222 10th Ave., Brooklyn, N. Y.  
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 J. A. Kallus, P. O. Box 521, Lagrange, Texas.  
 Joe Rokan, Jr., Lagrange, Texas.  
 Eddie Supak, Ellinger, Texas.  
 Adolf Vacek, Lagrange, Texas.  
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 Norman Cast, 4520 Clay Ave., Houston, Tex.  
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Short Wave Editor, RADIO WORLD, 145 West 45th St., New York.

Please enroll me as a member of Radio World's Short Wave Club. This does not commit me to any obligation whatever.

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# An Autodyne Circuit

## One Fewer Tube Permitted by This System

By Edgar Harmon Forbes

A SIMPLE and economical method of changing the frequency in a superheterodyne is illustrated in Fig. 1. The same tube is used both as modulator and oscillator, and the circuit therefore is an autodyne. The 224 screen grid tube is used because this is a good detector as well as a good oscillator. The signal voltage is impressed on the tube in the usual way between the control grid and ground.

The oscillator is of the tuned plate type but the grid winding is not connected in the grid circuit in the usual way but in the cathode circuit. L3 is the grid winding, which is connected between ground and the grid bias resistance. In connecting up an oscillator of this kind it must be kept in mind that the grounded end of L3 is the end that ordinarily would be connected to the control grid if the signal input circuit were not interposed. The end of L3 connected to the grid bias resistance is the end that would ordinarily be grounded.

### The Feedback

Since the tube is a detector it must have a load impedance suitable for the detected frequency. This load is the resonant circuit formed of L5, the tuning condenser E, and part of L4. C4, a bypass, condenser, also takes part. This circuit is tuned to the intermediate frequency.

The feedback circuit is E and the lower part of L4. L5 has a high inductance value and therefore it acts as a choke to the frequencies at which the tube oscillates. E is a comparatively large condenser, though small in absolute value, and it offers little impedance to the high frequencies. Hence there is enough oscillating current through it, and hence through the lower part of L4, to maintain oscillation in the tube, provided that the windings and other values have been chosen properly.

There are several reasons why E is connected to a tap on the inductance L4 rather than to the high potential side of the circuit. In the first place it is not desired to have violent oscillation in the tube. Reducing the feedback by means of the tap limits the intensity. In the second place, it is desired that the intermediate frequency tuned circuit be as nearly independent as possible of the oscillation circuit. When E is connected to the tap, varying the tuning condenser C2 has practically no effect on the tuning of the intermediate frequency circuit. If E were connected to the top of the circuit, where C3 connects with the coil, the two circuits would be coupled closely and the intermediate frequency tuning would be affected by the tuning of the oscillator.

### Use of Autodyne

In the third place, it is desired that there should be as little distributed capacity in the oscillator circuit as possible. Tapping it

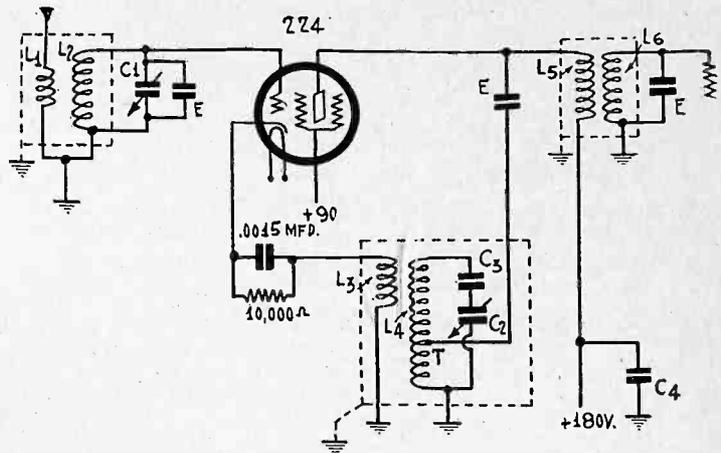


FIG. 1

The circuit of a superheterodyne frequency changer of the autodyne type utilizing a 224 screen grid tube. This is an economical arrangement.

as shown in the figure puts certain stray capacities across only a small part of the oscillator inductance. Hence the effect of the capacities is very small as far as the tuning of the oscillator is concerned.

The autodyne shown in Fig. 1 is used in some late model factory superheterodynes in which conservation of tubes is an important feature. The arrangement permits the elimination of one tube without reducing the sensitivity of the receiver. With an arrangement of this type in conjunction with the latest tubes, it is now possible to make a more sensitive superheterodyne with seven tubes than previously with eight to ten tubes. Indeed, it is possible to make a fair superheterodyne with only five tubes.

In the autodyne as depicted in Fig. 1 the coupling between the oscillator and the modulator is naturally very close, unity in fact. When such is the case there is a large harmonic content in the output of the modulator and there may be more interference than in a case where the functions of oscillator and modulator are performed by two different tubes. This is one of the disadvantages of the autodyne. However, by careful design elsewhere in the circuit the effect of the harmonics may be reduced to a negligible quantity.

## Board Called High-Handed; Inquiry Asked

Washington.

Charging that the Federal Radio Commission is guided by political pull, and that its actions and decisions are arbitrary, Representative Horr (Republican), of Seattle, Wash., suggested that a Congressional investigation be made of the activities of the Commission.

In a statement he issued calling upon Congress to make the investigation Representative Horr said:

"In the brief manner I have scanned the subject so far I find the Federal Radio Commission to be one of the most extravagant of the Government agencies.

"Two years ago when the Bureau of the Budget became apprehensive of Federal radio expenditures, it sent three experts from the Efficiency Bureau to make an exhaustive survey of the Federal Radio Commission. These experts worked several months, going into every detail of the Commission's activities, and in their report of Dec. 30, 1929, recommended that the total annual budget for the Commission should be \$284,060. The appropriation then was \$301,920, so the proposed saving was \$17,860.

"In striking contrast to this recommendation Congress, under strong lobby pressure, appropriated \$450,000 for the fiscal year 1931, almost double the amount found necessary. The proposed appropriation this year is \$431,360. In view of the Efficiency Bureau's recommendation this seems to be blatantly overriding the economy program of the Administration.

"This extravagance is overshadowed by other abuses in the Commission. Both in regard to its own personnel and in the allocation of its favors, the Commission has been guilty of high-handedness scarcely precedented. Civil Service rules have been violated with flimsy subterfuge. Instead of promoting its trained personnel, it has asked Congress for permission to hire

experts at large salaries. Often the 'experts' turn out to be inexperienced youngsters, or men who received low salaries elsewhere.

"Favor of monopolistic control is the most vicious tendency of the Commission. This is evidenced by the hold the N. B. C. and R. C. A. have upon the Commission. Incidents of unfairness which almost amount to tyranny are numerous. Stations have been given increased time and power without even formal petition, when smaller stations whose facilities have been attacked have had to spend large sums of money to retain high-priced counsel and prove convenience and necessity at a hearing.

"In some instances where extension in time or increase in power is desired, owners of the petitioning stations have been sent to one or the other of the national chains for approval or disapproval. 'Influence' seems to be the Commission rule, and not convenience and necessity.

"Because their properties are completely at the mercy of the Commission, owners of many stations hesitate to come forward with direct charges against the Commission for fear of reprisal. This is also true of the employees of the Commission. This is only another reason for the necessity of a congressional investigation, and I am sure an executive hearing will bring this complaint out.

"If this monopolistic tendency continues local stations will rapidly become relics of the past. A few large companies will own the air, and uniform entertainment for the country will be sent from one or two centers, thus discouraging general artistic development. If two or three orchestras and attending artists can furnish entertainment for the entire country, it is very apparent that the outlet for musicians and artists will be almost cut off."

### A THOUGHT FOR THE WEEK

**ANOTHER WARNING!**—Radio officials should remember that the way to stave off that un-American bogey, censorship, is to do nothing that calls for it. There is a very small percentage of our broadcasting programs that can be regarded as going over into the morass of bad taste or even bordering on indecency, but once in a while an offender will come along and defile the air. These exceptions should be noted and action taken immediately to prevent a recurrence. Otherwise—trouble is threatened for the whole institution of radio. They shall not pass!

# 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; J. Murray Barron, advertising manager.

## Television Diversity

TELEVISION has reached the stage of development that permits of projected pictures in the home. Projection means that the picture is thrown on a screen, usually a small one. Some systems give 10 inch pictures, almost square, others 6 inch pictures, or of smaller size, but a group of persons can see the images at the same time, and the peep-hole nuisance is therefore absent.

Projected television therefore is of practical interest to the experimenter, and while the pictures now are not all that they will be in the future, those living within receiving range of television transmitters will find pleasure in looking, and some even will want to bring in sound as well for sight-sound synchronization, as a few stations render even this service possible.

While television as a public service is not ready yet, no doubt the economic situation has postponed awhile the eventful day when it can be truthfully said that the lay listener and looker will get his meed of entertainment out of the projections. Meanwhile the experimenters are taking to television, gradually but surely, and with lens discs becoming available in the market their interest will grow. Such discs are necessary for projected pictures, also a special neon lamp, called a crater lamp, must be used, for the greater illumination required.

Besides, experiments are being made with cathode ray tubes for oscillographic scanning. Meanwhile experimenters must work with such tools as they have, and not only does the disc suffice for present needs but probably will endure after tubes are introduced, provided the scanning is slow enough.

The disc has to be driven by a motor, and the speed is therefore limited. At present 1,200 revolutions per minute are popular, for 20 frames per second, 60 lines per frame. W6XAO, Los Angeles, recently went on the air with cathode ray scanning, sending 15 images per second, 80 lines per image. This speed of course is well within the range of a disc, although the transmission is at 44,500 kc (6.75 meters), so a receiver that responds to that frequency is necessary.

It is obvious that there is much diversity. The scanning is not uniform among the various stations now transmitting, the wavelengths are quite diverse, the transmissions are experimental and considered by some of the stations as acts that outside technicians need not be interested in, and so there is a deterrent to wide popularity even among

those experimentally inclined. However, pictures as now received on screen systems are not bad at all, and interest grows despite the limitations. When television interest actually will thrive nobody knows, but there are enough persons saying "any day now" to necessitate attention to the topic.

Accepting the quality of the picture as it is, the response would be greater if one scanning system were used throughout, with regular scheduled transmissions on the continental band. The ultra frequencies offer excellent possibilities, but are still to be conquered, and systems to be improved sufficiently to warrant the use of these waves. High-speed scanning will be necessary, and as yet even the experimenter can not make much individual progress along this line.

Demonstrations of television reception and projection are given by various commercial undertakings in different parts of the country, and all experimenters at least should acquaint themselves with the results attained. Perhaps their interest will be heightened and they will then join the ranks of the happy owners of television receivers.

## Words, Music, Cough

POLITICIANS are generally assumed to be suave individuals, at home under all circumstances, but the national forums conducted on the air by several agencies bring to the microphone men in public office who are palpably embarrassed. It may be that some of them are not in politics, but were appointed only for their surpassing fitness. However, most of them were elected. Where does that leave us?

One of the irritating results of these microphone-shy talkers is their cough of embarrassment. There is hardly anything so uninteresting as a cough. Why should one have a radio in operation to receive these sudden emanations of heterogeneous frequencies?

The cough is proving more bothersome than ever. If it is one caused by embarrassment, what remedy is there, except to acquire microphone presence? If it is just throat-clearing, surely there is no sense in tying stations together by expensive telephone lines for the chain broadcast of the speaker's audible warming-up exercises. Instead there had better be some throat-clearing disciplinary rules in the station, with an attendant physician to examine the throats of all about to sing or talk, to make sure that the clearance was successful and retentive. Fortunately, singers are not offenders. It is the talkers who do the coughing.

Any one appearing before the microphone may have a cold. There is no rule against it yet. But it seems more merciful to the audience that those who would speak or sing be compelled to keep in physical trim. Greater care will mean fewer colds. A physical examination precedes many types of events, and radio artists need feel no offense at having to submit to the doctor's stethoscope, X-ray, microscope and even scalpel. An adenoid soprano who had been molesting listeners should have the impediment taken out then and there.

It is surprising to many how leaders of the stage, screen and the microphone keep so well. The certainty and punctuality of their appearances are the marvel of our less methodical element. But the reason obviously is that their living depends on it. And what one can do when failure to do it means deprivation!

But an audience itself is sometimes an inflicting agency. That is, one audience commits offenses against another. This recently took place when the Philadelphia Orchestra, Leopold Stokowski conducting, broadcast from the Philadelphia Academy. A large audience was in the Academy. Specially sensitive microphones were used for attainment of the most faithful values of pick-up. And of course there was coughing in the audience. And that coughing was heard by the air audience. It is admittedly hard to get the great body of people enthusiastic about concert and operatic music. How much harder the task becomes when

coughs ride the air waves that are supposed to carry only the masterful music!

Mr. Stokowski is strict with his audiences, but the police power of a conductor is rather limited. The unenforceability of his decrees is not his fault.

We should be thankful that nobody who is about to sing or speak ever sneezes. Nature seems to gear the nervous system to such a fine mesh that the coarseness of a sneeze is not possible amid the excitement. And, besides, when one sneezes one shuts one's eyes. And nobody can be thus trustful, even in a studio, in these tempting times.

## The Favorable Side

AMID the offense taken at some of the more brazen forms of advertising "credits" on sponsored programs one should not lose sight of the fact that advertisers enable listeners to hear the greatest artists of our time, and that the stations themselves do very little toward bringing this finest artistry into the home. It is no reflection on the stations to say that, for their economic status is hardly commensurate with paying a performer thousands of dollars for appearance on a single program. Advertisers find they can do it with success, and therefore the listeners are benefited.

A case in point is that of The Voice of Firestone presenting Lily Pons, glorious French artist, the soprano who is the reigning sensation of the Metropolitan Opera this season. Lawrence Tibbett was singing on the stage of the Opera House that night so Miss Pons appeared as the featured singer on the air program. Her voice is of the type that thrills, and all who heard her will carry a cherished memory of her singing.

"The Nightingale and the Rose," the berceuse from "Jocelyn" and "Cara Nome" are familiar enough, but there was too much lofty poetry, sheer artistry and vocal mastery in the way Miss Pons sang them to listeners to constitute a familiarity with the method of rendition. After all, each generation is endowed with only about two handfuls of real sopranos, and Miss Pons is one of the real ones. Therefore on the favorable side of the ledger of radio criticism there should be a bold notation of the high credit that comes to radio as an institution because into the homes of the many are brought many of the glorious voices of the age. The other side of the ledger is bad enough in spots, but the books should be kept straight.

## One of Us

Alice Remsen, contraalto comedienne of WOR Footlight Echoes, and conductor of our own Station Sparks Department, admits that she has crossed the Atlantic Ocean seven times; has never been to the Pacific Coast; has played every "tank" town in the East and Middle West; has been in every branch of show business except the circus; made her debut on the stage of the Folies Bergere, Paris; once made a balloon trip; has never been in an airplane; doesn't like buckwheat cakes but adores French pancakes; likes dogs but barely tolerates cats; would rather ride horseback than drive an automobile; has synchronized sound for pictures many times but has never been screened; likes to sing comedy songs but thinks she does sob-ballads best; has been a comedienne, straight woman, character woman and soubrette; also a librarian, columnist, radio editor, song writer and poetess, playwright, continuity writer and notary public; is also an excellent cook and once ran a boarding-house in Rochester, N. Y.

Miss Remsen's brother, by the way, is one of England's pioneer radio men.

And again by the way: Listen in on the "Evening in Paris" program, from 9:30 to 10 p.m. EST, on February 8. You will hear Miss Remsen render some of the type of numbers that have won her distinction over the air.

# STATION SPARKS

By Alice Remsen

## Songbirds and Roses

For Jessica Dragonette

(WEAF every Friday, 8:00 p.m.)

**T** WAS in the month of roses you came, my dear, to me; You met me in a garden, we sat beneath a tree. The nightingale was singing upon that night in June, You told me that you loved me beneath a silver moon.

Songbirds and roses, a garden in bloom,  
Soft shimmering moonlight, a rosebud's perfume;  
Whispering winds and a star-spangled night,  
These bring me dreams, dear, that fade with the light.

Roses have withered, the songbirds have flown.  
Now in the garden I wander alone;  
But deep in my heart, dear, your love still shall be  
A memory of songbirds and roses to me.  
—A. R.

The Sweet Voice of Jessica Dragonette suggests a nightingale singing in a rose-garden, lovers wandering in the moonlight, and romance in all its aspects. I never tire of listening to her. Rosario Bourdon's orchestra accompanies Miss Dragonette perfectly. The Cities Service hour has always been delightful. It still is one of the most enjoyable periods on the air.

The Jarr Family Is Still Going Strong Over WOR. Many of Roy McCardell's old and well remembered characters are being revived. There are the Cacklebury girls, still trying to get husbands; Policeman Reilly, Gertrude, the maid; Schultz, the janitor, and Doolittle, the politician. All are being introduced, and many who remember the series from the pages of the old New York World will chuckle again over the troubles of Mr. and Mrs. Jarr, as portrayed by Julia Nash and Charles O'Donnell.

If You Listen in On Radio Programs early in the morning, I advise you to tune in on WJZ at 9:15 a.m. every Tuesday, Wednesday, Thursday and Saturday, for at that time those delightful creatures, The Lady Bugs, use their twenty twinkling fingers to charm our ears. The Lady Bugs, you must know, are those clever pianists, Muriel Pollock and Vee Lawnhurst. They are both young, attractive-looking girls and have been soaked in harmony for years. Both write songs and orchestral compositions. Vee sings solos and Muriel sings harmony—altogether an ideal combination from the standpoint of entertainment.

If There Is Anyone Entitled to the term "veteran in radio broadcasting," the patriarchal whiskers should go to Joseph A. Bier, WOR announcer, who was with the old WDY station at Roselle, N. J., which compares with a modern station about the same as Noah's Ark would with a modern marine leviathan. Mr. Bier was then a baritone with the Premier Male Quartet. Years later that quartet sang at WLWL and Joe was invited to become staff soloist and announcer. He stayed there two and a half years, leaving to spend a similar period on the New York Evening Journal programs. In September, 1930, WOR requested him to join its

staff, and one is likely to hear him over that station now at any time between 8:00 a.m. and midnight. Joe's lusty, yet mellow, baritone may be heard in a fifteen-minute solo program every Wednesday morning at 9:45. He has been singing in churches of every denomination since he was six. At present he is the soloist at the Church of Our Lady of Lourdes, in Washington Heights, New York City. When not on the air he can usually be found somewhere in the environs of Wood Haven, L. I., where he makes his home.

Maria Cardinale, the Popular Prima-Donna of "Footlight Echoes," which broadcasts over WOR every Sunday night at 10:30, has signed a contract to appear each Thursday night at 8:30 p.m. over WJZ, for Golden Blossom Honey. The initial broadcast is on January 28th. Maria has a beautiful voice, a soprano of excellent quality and range.

And Now WMCA Has Its Own Building. Donald Flamm has signed a ten-year lease and also taken over another floor in the structure formerly known as the Hammerstein Theatre Building, now called the WMCA Building. Well, this little station has certainly progressed since I first remember it, seven years ago, on the 24th floor of the Hotel McAlpin, when its staff was composed of five people. It now occupies three entire floors, has a little television theatre of its own, an extensive music library—and—(note the difference)—employs eighty people on its staff, besides hundreds of floating artists, musicians, bands, lecturers, etc. Yes, under the capable leadership of Donald Flamm, its President, WMCA has certainly progressed.

Elizabeth Lennox, NBC contralto, has started a series of weekly concerts over an NBC-WJZ network. She will be heard every Monday at 6:15 p.m., supported by an orchestra under the direction of Graham Harris. Her programs will be varied, consisting of concert music, operarias, Broadway melodies and folk songs.

Four Years Ago, Dana Suesse, 16, red-headed and radiant, rushed into Nat Shilkret's office with her first triumph of tempo. Nat, busy as usual, smiled quizzically, examined the piece, missed his lunch and immediately started to make a special arrangement of Dana's first opus, "Syncopated Love Song." On Wednesday, January 20th, Dana had the satisfaction of listening to her initial effort featured by Shilkret in the "Music That Satisfies" program over the Coast-to-Coast network of the Columbia Broadcasting System. It formed the finale of the Chesterfield program.

## Sidelights

ALEX GRAY once vocalized with a deckhands' quartet on a British merchantman... DAVID ROSS recently celebrated his third anniversary as a Columbia announcer... MORTON DOWNEY celebrated his first anniversary as a regular studio broadcaster over Columbia last week... BUDDY ROGERS was born in the small Kansas town of Olathe... BEN BERNIE was born Benjamin Ansel, the son of a blacksmith... CARL FENTON was born Reuben Greenberg... KELVIN KEECH has a ukulele case made entirely of tin cans... "MRS. PENNYFEATHER", who giggles with the Cuckoos over an NBC network, once prepared music-rolls

for player pianos... FRANK SYLVANO, tenor with Abe Lyman's orchestra, was a high school boxing champion in Chicago... LEON BELASCO is a native of Odesa, Russia... VINCENT LOPEZ has broadcast nearly 3,000 programs since 1922... PETER DIXON has again attained recognition in Frank Wilstach's book of similes. This year's Dixon contribution was: "As fleeting as the beauty of cream in iced coffee"... TITO CORAL is 24 years old... PHIL COOK, the Quaker man, runs up and down the stairs of the New York NBC building every day. It is the only exercise he gets.

## Biographical Brevities

About Sylvia Froos

There is a youngster now broadcasting over the NBC network who is a radio find, to my mind, and that is Sylvia Froos. Sylvia was born in New York City, and she could sing almost before she could crawl out of the cradle. She started on the stage in Baltimore as member of a "kiddie" act when she was only seven years old. That was back in 1921 and she's been going ever since. For years during that period, Sylvia has had battles with the child labor board. They said she was too young to sing on the stage—but she still went on singing, after theatre managers had paid her fines.

Today Sylvia Froos is eighteen years old, and child labor bodies have stopped camping on her trail. Boy admirers have tried to usurp the place once taken by the "law," but Sylvia declares she is "too busy to date." For ten years she has tramped about the country thrilling an untold number of audiences with a repertoire of sentimental songs, but she says she has never fallen in love—but there's plenty of time for that.

Two great events occurred in Sylvia's career during the last Christmas holidays—first she was booked for the Palace Theatre, New York, the goal of all troupers, with the Four Marx Brothers; second, she signed a contract to sing thrice weekly over NBC networks. She had broadcast before on four successive RKOLians programs.

She sings one or two love ballads during each broadcast, with a combination of songs running from fiddler's breakdowns to "arty" numbers. Her program is greatly enhanced by her accompaniment of two pianos played by those clever artists of rhythm, Muriel Pollock and Vee Lawnhurst.

## SUNDRY SUGGESTION FOR WEEK COMMENCING, JAN. 31st

Sun., Jan. 31: Footlight Echoes... WOR	10:30 p.m.
Mon., Feb. 1: Piccadilly Circus... WJZ	9:30 p.m.
Tues., Feb. 2: The Jarr Family... WOR	7:45 p.m.
Tues., Feb. 2: Eno Crime Club... WABC	9:30 p.m.
Wed., Feb. 3: Golden Gems... WEAF	2:15 p.m.
Wed., Feb. 3: Roth String, Quartet... WOR	8:30 p.m.
Thurs., Feb. 4: Adventures of Sherlock Holmes, WEAF	9:30 p.m.
Thurs., Feb. 4: Weaver of Dreams, Basil Ruysdael... WOR	10:15 p.m.
Fri., Feb. 5: Raising Junior, Peter Dixon... WJZ	6:00 p.m.
Fri., Feb. 5: March of Time... WABC	8:30 p.m.
Sat., Feb. 6: Alice Joy... WEAF	7:30 p.m.
Sat., Feb. 6: Little Symphony, Phillip James... WOR	8:00 p.m.

## ANSWERS TO CORRESPONDENTS

MRS. GEO. E. TUCKER, East Bangor, Pa. (1) Radio Guide lists all programs and stations and comes out weekly. (2) You may obtain pictures of artists by writing to them personally to the stations through which they broadcast.

[If you care to know something of your favorite radio artists and announcers, drop a card to the conductor of this page. Address her, Miss Alice Remsen, c/o RADIO WORLD, 145 West 45th St., New York, N. Y.]

# FRANCE RAISES HIGH BARRIER ON OUR RADIOS

Washington.

France has scaled down the quota on American imports. For the first three months of the year the limitation is 10.8 per cent. of the total importation, whereas during the first ten months of 1931 the radio imports from the United States totalled 15.6 per cent. The reduction is therefore about one-third.

Expressed in metric tons, the United States is limited to 16.6, compared to the following tonnage for other nations: The Netherlands, 79.2; Germany, 50; the United Kingdom, 4.6, and all other countries combined, 3.7.

The Department of Commerce received the report from its commercial attache at Paris, Fayette Allport. The Department, after hurried consultations, announced there was apparently no discrimination against the United States, and therefore no ground for protest. It was admitted that the basis of the new gradation is not known here, but quotas on other commodities always had been predicated on previous imports.

## Department Issues Statement

The French imports of American radio sets were as follows: first ten months of last year, 9,162 radio sets valued at \$310,589; 1930 total, 1,772 sets, valued at \$79,725.

The Department's statement follows in full:

"Import quotas were established for the importation into France of radio equipment by a decree published in the French Journal Officiel for Jan. 16, 1932, according to a radiogram from Commercial Attache Fayette Allport, Paris.

"For January, February and March, 1932, quotas have been fixed for each month as follows:

"Radio sets, accessories and parts (except tubes), a total quota of 154.1 metric tons, divided into individual quotas of 16.6 metric tons from the United States, 50 metric tons from Germany, 79.2 metric tons from the Netherlands, 4.6 metric tons from the United Kingdom, and 3.7 metric tons from all the other countries combined:

"Radio tubes, a total quota of 15 metric tons, divided into individual quotas of 1.7 metric tons from the United States, 2.0 metric tons from Germany, 6.0 metric tons from The Netherlands, 3.4 metric tons from the United Kingdom, and 1.9 metric tons from all other countries combined.

"The decree does not provide for the admission of shipments en route. It is reported that the United States quota for January is probably already exhausted.

## In Dark About Quota Basis

"The exact basis for the above allotments of radio imports is not yet known. On other commodities the importation of which France has restricted by quotas, the quotas have usually been determined by the average imports for a period of years preceding, in total and for individual countries.

"Imports from the principal supplying countries, and total imports of radio sets, accessories and parts (except tubes) into France for the years 1927-1930, inclusive, and for the first nine months of 1931, have been as follows, in metric tons,

# Audience Cough Heard on Chain

Philadelphia.

Although Leopold Stokowski, orchestra conductor, exhorted his auditorium audience to be careful not to make any sound during the program he was about to render, there ensued some coughing that was at first attributed to the musicians by listeners to the chain broadcast of the event, but which proved to come from the audience at the Philadelphia Academy, where the Philadelphia Orchestra, which Stokowski was conducting, was giving a symphonic concert.

The specially sensitive microphones, installed for faithfully catching the musical tone gradations, also caught the colds of the audience, so to speak.

according to French import statistics:

	United States, A;	Germany, B;	The Netherlands, C;	United Kingdom, D;	total, E:
1927	13.8	21.3	*	19.9	59.8
1928	11.3	192.0	168.5	89.1	492.0
1929	72.5	407.6	625.9	72.7	1,229.9
†1930	.....	.....	.....	.....	2,706.2
\$1930	128.8	419.2	1,426.4	.....	2,103.5
\$1931	355.0	957.9	795.9	.....	2,278.1

\*Not segregated.

†Imports by countries not yet available.  
\$10 months.

"The proportion of imports from the United States to total imports into France during the above-mentioned periods has been as follows: 1927, 23.1 per cent; 1928, 2.3 per cent; 1929, 5.9 per cent; 1930, not available; January-October, 1930, 6.1 per cent; January-October, 1931, 15.6 per cent.

"The proportion of the quota now allotted to the United States to the total quota is 10.8 per cent."

\* \* \*

Paris.

Although the news was received here that the Department of Commerce of the United States saw no ground for protest in the new decree reducing the American radio quota of imports here, alleging there was no sign of discrimination, both French dealers in American radio sets and representatives of American radio manufacturers took the opposite view. They pointed out that American sets were becoming more and more popular, that the market for them was therefore expanding, and that the quota permitted the importation of only about half the total value of sets that otherwise would have been imported. Moreover, it was observed that the Holland and German quotas were abnormally large, and this fact was read as an open effort to throw the business to these two countries.

The decree was signed by the previous Laval cabinet, effective January 2nd, which was five days prior to the signature, but the fact was not disclosed until the decree had been in force about two weeks, and then only through publication in the Journal Officiel.

That something was "in the air" was sensed by those interested in importing American sets, because various difficulties had been imposed, such as customs officials claiming great diversity between the value of the sets in the United States and the declared value for importation, and also infringement of patent rights was alleged. Both of these interpositions by customs officials effected long delay in clearing shipments, in fact, caused a great many shipments to be held here in abeyance, and meanwhile the decree went into effect.

The authority of the French Government to issue the decree was not questioned, but the absence of a direct intention to discriminate against the United States was scoffed, particularly because American radio imports could be expected to exceed those of 1931.

# BOARD STARTS AN AIR SURVEY FOR SENATORS

Washington.

The Federal Radio Commission is taking immediate steps to begin the investigation of the uses of the radio facilities by broadcasting stations in conformity with the Senate resolution requesting the Commission to undertake the investigation and report to the Senate.

A questionnaire has been sent to 607 stations and large chain organizations asking for complete financial statements of their transactions during 1931, according to an oral statement issued by Commissioner Harold A. Lafount. It is hoped that the data compiled from the replies to the questionnaire will provide a satisfactory solution of the advertising problem that will be of benefit to both the listening public and the broadcasters.

Among questions sent to broadcasters are those intended to disclose how much broadcasting time is sold, what rates are charged, to what extent stations are dependent for operation on revenue thus derived, and a comparison of the amounts of time sold by stations using power ranging from 100 to 50,000 watts. Similar information will be requested of the large national chains.

Investigation of the educational institutions mainly will be a survey of the records of the Commission, which has kept careful watch over development of radio facilities for educational purposes and has received reports from colleges and universities where broadcasting stations are located. There are now several methods of broadcasting educational matter in use and the Commission will analyze the various methods in its report to Congress.

The Senate resolution also requested the Commission to report on the feasibility of Federal ownership and control of radio, and the Commission will make an investigation. Considerable work along this line has already been done by Federal authorities. A report on the European methods of broadcasting prepared by Dr. William C. Everette, a California radio engineer, was recently made public by the Commission.

## Polo DX-4 Converters in Big Factory Run

Having had two years' experience in the manufacture and sale of short-wave converters, Polo Engineering Laboratories, 125 West 45th Street, New York City, points out that it was one of the first in the field with a converter, and therefore the experience is valuable in making performance certain.

The DX-4 de luxe converter has stood the test of time, as proved by many satisfied users, the Laboratories report, and the only circuit change has been that to accommodate the converter to the use of variable mu tubes. Therefore the DX-4 converter is adapted to use of these tubes, in fact has been for three months. Having caught up on most of the export orders, which came in large quantities, the factory has undertaken a large domestic run.

The converter uses two variable mu tubes, either 235 or 551, one 224 and one 227. The wave band coverage is from 15 to 200 meters. There are a rectifier and filter built into the converter, which is therefore totally self-powered from the a. c. line.

# WIDER USE OF SYNCHRONIZED SENDING LOOMS

Washington.

Interest in the synchronization experiments of WTIC, Hartford, Conn., and WEAF, New York, on the one hand, and WBAL, Baltimore, and WJZ, New York, on the other, has focused attention on the hearings being held by the Federal Radio Commission on the renewal of the synchronization license. The synchronization is being sponsored by the National Broadcasting Company, whose New York outlets are WJZ and WEAF, as an experimental undertaking.

Listeners have noticed that the synchronization has not been completely successful, due to a slight interference heard occasionally, and the Commission engineers have reported from time to time that the experiments are being watched, but that perfection of results has not been noticed.

## Some Doubts By Board

However, the experiment is of vast importance as offering the possibility of operating numerous stations throughout the country on the same wavelength, with resultant economy of distribution of the available channels, hence the Commission is eager to have experiments continued in the public interest. A question now being considered is whether the synchronization should be continued by these stations, or whether some other stations should be tied in instead, so as not to reduce the actual service of the stations, if the present method effectuates such reduction.

Besides the economy consideration, it is urged that by those favoring synchronization that it offers a transmission relatively free from fading and interference. Against that is the statement that there has been some impairment of quality from time to time during the experiments.

It is believed that the Commission will favor the continuation of the experiments as at present conducted, because of the relationship to new broadcasting methods, and also because engineers have testified that they are encouraged by the results already attained, and that improvements are in sight. The four stations strongly desire continuation. The hope expressed by the stations that the future would bring about better conditions of transmission and reception was taken as an admission that perfection has not been reached.

## Crystal Control Used

The synchronization depends for its success on the transmissions from the synchronized stations on exactly the same frequency. Any deviation would result in an audible note in receivers tuned to receive the intended frequency. The synchronization is attained by radio. Matched and protected crystals permit operation on exactly the same frequency, but there is some difficulty in maintaining the utter precision required, because even though crystals are ground for exactly the same frequency, temperature and mechanical differences at the points where the crystals are used would occasion a slight difference in frequency. Thermostat control is used for maintaining constant temperature, while stabilized mounting devices correct for frequency shift caused by vibrations.

WEAF and WJZ are unlimited time stations. For half of their operating hours they are tied in with the two out-of-town stations. WEAF uses 660 kc, 50 kw, while WJZ uses 760 kc, 10 to 30 kw.

## Three New Vision Stations Approved

Washington.

Recommendations have been made by Elmer W. Pratt, chief examiner of the Federal Radio Commission, that a total of three television licenses be granted to the following applicants:

WJR, Pontiac, Mich.

WGAR, Cuyahoga Heights Village, O.

Two television stations would be operated by WJR.

In his report the examiner recommended:

(1) The application of the WGAR Broadcasting Company to erect a new television transmitter be granted, and that a construction permit be issued in accordance therewith.

(2) The application of WJR, the Goodwill Station, Inc., to erect a new television transmitter to operate in the very high frequency band be granted, and that a construction permit be issued in accordance therewith.

(3) The application of WJR, the Goodwill Station, Inc., to erect a new television transmitter to operate in the intermediate band be granted, and that a construction permit be issued in accordance therewith.

## New Incorporations

Malode Radio Service Corp., Yonkers, N. Y. radios—Atty., H. H. Salmstrom, Yonkers, N. Y.

Radio Network Surveys, Inc., New York City, general broadcasting—Atty., Marguerite Digan Hopkins, Wilmington, Del.

Rochester Sunrise Lighting Corp., Rochester, N. Y., electrical appliances—Atty., M. D. A. Cohen, Rochester, N. Y.

Club Auto Radio of Buffalo (N. Y.)—Atty., Palmer, Garono, Houck & Wickser, Buffalo, N. Y.

Improved Pilot Light Corp., Brooklyn, N. Y.—Atty., Geiger & Hirsch, 50 Court St., Brooklyn, N. Y.

Community Refrigerators, Queens—Atty., W. Moser, 305 Broadway (Manhattan), N. Y. City.

Crown Electrical Corp., New York, N. Y., motion picture film—Atty., Tomlinson, Herrick, Hoppin & Coats, 15 William St., N. Y. City.

Household Electrical Appliance Corp., New York, N. Y.—Atty., J. W. Russell, Glens Falls, N. Y. N. Y.

Glens Falls Electric Supply Co., Glens Falls, N. Y.—Atty., J. W. Russell, Glens Falls, N. Y.

Albany (N. Y.) Electrical Corp.—Atty., F. S. Harris, Albany, N. Y.

Refrigeration Corporation of America, Jersey City, N. J., radios, refrigerators—Atty., Ezra L. Noland, Jersey City, N. J.

General Television Manufacturing Corp., Belleville, N. J., patents—Atty., Registrar and Transfer Co.

Electric Eye Corp., Wilmington, Del., patents—Atty., Corporation Trust Co.

Allied Television Industries, Inc., Wilmington, Del., broadcast theatrical plays, dramas, operas—Atty., Delaware Registration Trust Co.

Jean V. Gromach, New York, N. Y., radios—Atty., S. M. Lazarus, 8 West 40th St., N. Y. City.

Rockland Refrigeration Co., Nyack, N. Y.—Atty., B. Haas, Nyack, N. Y.

Service Electric and Maintenance Co., Brooklyn, N. Y.—Atty., S. Edelstein, 11 Park Place, N. Y. City.

Gardner-Nilsen-Graydal, Queens, refrigerators—Atty., Albany Service Co., 299 Broadway, New York City.

Tiger Super Batteries, Inc., Newark, N. J., manufacturer storage batteries—Atty., Rosenbaum & Mintz, Newark, N. J.

Investors Engineering Co., Wilmington, Del., mechanical, electrical engineers—Atty., Colonial Charter Co.

J. & A. Brenneis, Queens, electrical machinery—Atty., C. B. Schwanda, Long Island City.

Automatic Electric, Delaware, name changed to Automatic Electric Co.

Technical Equipment Corp., New York, N. Y., laboratories—Atty., Lee, Donnelly & Curren, 160 Broadway, New York City.

Naybor Electric Corp., Brooklyn, N. Y., Radios—Atty. H. L. Turk, 26 Court St., Brooklyn, N. Y.

Berger Radio Sales Corp., New York, N. Y., realty—Atty., S. M. Hermann, 521 Fifth Ave., New York, N. Y.

## Name Changes

Sentinel Refrigeration Corp., Buffalo, N. Y., to Niagara Electric Refrigeration Corp.

Phylsylvania Corporation to Radio Research Laboratories, New York, N. Y.

Electric Refractories Corp., Delaware, to Electric Refractories and Alloys Corp.

E. American Electric Company, Inc., Delaware, to American Electric Co.

Gas Utilities, Inc., to Electric and Gas Utilities Company, New York, N. Y.

# TELEVISION AS TEACHING AID DEEMED SURE

Washington.

Educators within the next five years will have to consider the use of television as an adjunct to classroom and other types of instruction, C. M. Koon, Specialist in Education by Radio at the United States Office of Education, stated orally. As the technical development of this new instrument of communication proceeds, its practical application to education must be studied, he asserted.

At present, however, the problem of applying radio to classroom instruction confronts educators, and it is probable that its more recent extension into the realm of pictures in motion will not receive widespread attention among them until the mechanical aspects have been perfected for adaptability in the schools of the country, he explained.

## Importance Growing

The following additional information was supplied by Dr. Koon according to "The United States Daily":

Recent studies on education by radio include allusions to television because of its growing importance and possibilities. However, it is asserted that the value of television as an educational medium will depend on the detail possible within a picture.

For practical classroom or auditorium instruction, it will be necessary to have more than just a narrow portion confined merely to a specific operation, whether it be in surgery or in connection with some other type of instruction. If the size of the picture can be made large enough to bring out the personality of the speaker, which is important in any course of instruction, the educational possibilities are good. It is assumed that as the experiments advance obstacles of this kind will be eliminated.

## Development of the Art

In the meanwhile, educators can do little other than wait for the mechanical developments which will place the new invention at their disposal. No technique can be developed by them in utilizing it for educational purposes until mechanical achievements make it readily available.

The educational possibilities of television are significant. A precise picture of a scientific operation has many advantages over the actual performance by the person present. Details, obscured from the view of students assembled in a lecture room, can be readily focused before them, and different procedures and manipulations, especially in surgery and laboratory work, can be presented from different perspectives.

The possibilities of television in transmitting current events also looms important in presenting subjects for classes in history, civics, government, and the social sciences,

**TAPPED COILS** for broadcast and short-wave coverage for 0.00035 mfd. condensers. One antenna coil and one interstage coil. Taps permit reception of broadcast range wholly, also 200 to 70 meters for next tap, 70 to 35 meters for next, and 35 to 17 meters for next. Both coils sent on receipt of \$1.59.

**Direct Radio Co., 145 West 45th St., New York, N. Y.** (Adv.)

## Oscillators Next Week

Test oscillators, of plug-in adapter and other types, for building and servicing superheterodynes, will be described next week.

# NEW RACKET IN MEXICO TRAPS U. S. STATIONS

Washington.

The latest racket, according to Senator Dill (Dem.), of the State of Washington, is the Mexican radio racket. It is worked as follows, he says:

Some large United States station is selected as the intended victim. Then a station is put on the air in Mexico on the same frequency used by that large United States station, high power being put into the antenna, so that the interference will be abundant. As there is no treaty or other agreement with Mexico in regard to air channels, the station in Mexico is protected at that end, but the United States station finds its programs ruined, and therefore is decidedly eager to get rid of the interference. Then comes an "approach" from a representative of the offending station, the amount of money desired is stated, negotiations ensue, and the Mexican irritant is bought off as the only way out, under present conditions.

## "Outlaws" Cross Border

Another bad situation, according to the Senator, is that stations ruled off the air in the United States can satisfy their broadcasting desires by erecting a station in Mexico, and under conditions that will permit coverage of a large part of Southern and Southwestern United States. He cited the case of a Kansas station ruled off the air, only to be found soon in operation in Mexico.

The Senator proposes that treaties be negotiated with Canada, Mexico and Cuba, so that air conditions in the three countries will be susceptible to administrative control by each country within its own borders, and without interference with the two other countries concerned. He said that Cuban stations also interfere with reception in the United States, as do legitimate stations now operating in Mexico.

The Mexican station situation has been growing worse, in relationship to conditions in the United States, as more stations with larger power are opened.

## Anticipates Criticism

The Senator said that "lack of action" by the State Department had resulted in the interference conditions imposed by stations in the foreign countries named, hence he asked that negotiations be undertaken.

There is a gentlemen's agreement between the United States and Canada, and this he said has worked out well, as both parties lived up to the agreement fully, but he declared that the situation should be dignified by settlement by treaty, particularly since only a treaty had binding force.

"If we insist that further radio treaties be negotiated I know full well what will be said," commented the Senator. "We shall be told that Canada and Mexico will want more channels than we shall be prepared to give. But as for Mexico, it is taking those channels, anyway, and the broadcasting going on down there is destroying much of the service of our own stations."

# TRADIOGRAMS

By J. Murray Barron

Teleplex Co., 76 Cortlandt St., New York City, is in production on the Teleplex, the master teacher. This device is used by many of the leading schools. There is a descriptive circular.

Hearing Device Co., 2400 Times Building, Broadway and Forty-second St., New York City, has an interesting booklet on De Forest parts, also one showing the new De Forest Audiphone for the deaf.

Alan Radio Corp., 80 Cortlandt St., New York City, reports an improvement in business with an increased interest in television parts.

Dixon Radio & Electric Co., 112 E. 23rd St., New York City, has a new catalog and flier listing radio parts and merchandise and also television supplies.

West Side Y. M. C. A. Radio Institute, 5 West 63rd St., New York City, has a new course in television. Full particulars upon request, or you may call and see the school.

Clarostat Mfg. Co., 285 N. 6th St., Brooklyn, N. Y., has ready for free distribution the new 1932 Clarostat Handbook and catalog.

Blair Laboratories, 25 Park Place, New York City, has some new literature for the "ham," there is also a new catalog.

Electron Radio Co., 31-12 Broadway, Astoria, New York City, has on demonstration the new 1932 Scott All-Wave Superheterodyne Receiver. Mr. Chivily is always glad to talk radio and is very proud of this new model.

Rim Radio Mfg. Co., 691 Grand St., Brooklyn, N. Y., has completed its new 1932 plugless converter for short-wave reception, and has issued a new circular.

Freed Television & Radio Corp., 22 Wilbur Ave., L. I. City, N. Y., is manufacturing a complete short-wave receiver kit for television reception, also a complete Telescanner kit for home assembly.

C. E. Montford, manufacturer of wire-wound resistors, has moved to Dumont, N. J. Here will be installed new and additional equipment.

Roland Radio Co., 35 Hooper Street, Brooklyn, N. Y., has a television receiver, 80-200 meters, a six-tube set with two stages of audio and pentode output. Vari-mu r-f is used. The company is getting ready a seven-tube receiver, principally for broadcasts, but with plug-in option for short waves, introducing for the first time t-r-f on short waves ahead of a modulator. Phonograph, B plus for converters, tone control and television terminals are featured in the 7 tube DX set.

The Pilot Radio & Tube Corporation, Lawrence, Mass., has appointed the Wolfe Radio Company, 71 Fifth Avenue, New York City, as its exclusive Metropolitan New York distributor.

## ANSWERS TO CORRESPONDENTS

MR. AND MRS. OLIVER BENNETT, Washington, D. C.... Presume you mean the New Year's program. Nobody seems to know what happened to Phil Cook. You may hear him, however, every morning except Sunday, over WJZ at 8:15. If I see Mr. Cook in the meantime shall try and find out the "whys and where-fors" and let you know.

M. DUNN, Brooklyn, N. Y.... Jean Sothern was the only non-British person on the Piccadilly Circus program. Ivy Scott, Arthur Sinclair, John Barclay, Alice Remsen, and Gene and Kathleen Lockhart are all British. Yes; the skits and songs were English. Glad you liked it.

—ALICE REMSEN

# BOARD CHECKS SPECIALTIES

Washington.

A letter has been sent by the Federal Radio Commission to all broadcasting stations, limiting special broadcasts. The letter follows:

To All Radio Broadcast Stations: A great many requests are received by the Commission for special authorizations to permit the operation of stations in a manner and to an extent which are at variance with the terms of existing licenses. Because of the increased number of such requests and the consideration that must be given to the need of such extended service and to the question whether the granting thereof might adversely affect the listeners residing in the normal service areas of other stations, the Commission has adopted the following procedure which must be adhered to by all applicants:

1. Application for special authorizations must be made by the licensee.

2. Applications for special authorizations must be received in the offices of the Commission at least three (3) days previous to the date for which the authorization is requested.

3. Applications made by "Limited," "Day," "Part Time," or "Specified Hour" stations must be supported by the consent of the dominant station or stations with which the applicant divides time. Consents must be received by the Commission direct from the stations giving them and must show whether the consent is for simultaneous operation or whether the station giving the consent is giving up the time sought by the applicant.

4. Applicant must show the public need for such authorization.

Approval by the Commission will not be given in cases where another station is licensed to operate in the same locality and during the hours specified in the application.

## Examiner Compares Stations' Programs

Washington.

Where there are applications for license renewals by time-sharing stations, the examiner of the Federal Radio Commission before whom the case comes may inquire into the respective merits of the programs from the stations, and recommend a reallocation of time accordingly. This procedure was followed in the cases of WEOO, Ohio State University, Columbus, O., and WKBN, Youngstown, O. The college station asked for renewal with more hours. The other station asked simply for renewal. But the examiner recommended that the college station's time be reduced and the extra hours allotted to the other.

The examiner, Ralph L. Walker, reported: WEOO has not made full use of the hours assigned it under agreement with WKBN, whereas WKBN has operated during all its authorized hours.

WKBN is the only broadcasting station located in Youngstown, while Columbus is the location of three stations in addition to WEOO.

The service rendered by WKBN is more diversified and of more general interest than are the programs of WEOO.

Authorization to operate from 9 to 11 a. m., 12:30 to 2:30 p. m. and 5 to 7 p. m., will enable WEOO to render any substantial service heretofore rendered by it; and authorization to WKBN to operate the remaining time will result in a better service to the Youngstown area.

Public interest, convenience and necessity will be served by authorizing the division of time between Stations WEOO and WKBN set forth in the preceding paragraph.

## BLUEPRINTS

- 627. Five-tube tuned radio frequency, A-C operated; covers 200 to 550 meters (broadcast band), with optional additional coverage from 80 to 204 meters, for police calls, television, airplane, amateurs, etc. Variable mu and pentode tubes. Order BP-627 @ .....25¢
- 628-B. Six-tube short-wave set, A-C operated; 15 to 200 meters; no plug-in coils. Intermediate frequency, 1,600 kc. Variable mu and pentode tubes. Order BP-628-B @ .....25¢
- 629. Six-tube auto set, using automotive tubes, with pentode push-pull output. Order BP-629 @ .....25¢

### RADIO WORLD

145 WEST 45TH ST., NEW YORK, N. Y.

## RADIO WORLD and "RADIO NEWS"

BOTH FOR ONE YEAR **\$7.00** Canadian and Foreign \$8.50

You can obtain the two leading radio technical magazines that cater to experimenters, service men and students, the first and only national radio weekly and the leading monthly for one year each, at a saving of \$1.50. The regular mail subscription rate for Radio World for one year, a new and fascinating copy each week for 52 weeks is \$6.00. Send in \$1.00 extra, get "Radio News" also for a year—a new issue each month for twelve months. Total, 64 issues for \$7.00.  
RADIO WORLD, 145 West 45th Street, New York, N. Y.

## Quick-Action Classified Advertisements

7c a Word — \$1.00 Minimum  
Cash With Order

BUY 900,000 ARTICLES WHOLESALE. Directory 300 Jobbers, Manufacturers, 25c. Arts, B-1611-DR, Denver, Colo.

MIDGET RECEIVERS, A.C., COMPLETE, \$14.95. Bargain Catalog Free. Imperial Radio Company, 16 East 23rd Street, New York.

BLUEPRINT NO. 627—Five-tube tuned radio frequency, A-C operated; covers 200 to 550 meters (broadcast band), with optional additional coverage from 80 to 204 meters, for police calls, television, airplane, amateurs, etc. Variable mu and pentode tubes. Order BP-627 @ 25c. Radio World, 145 West 45th Street, New York City.

"A B C OF TELEVISION" by Yates—A comprehensive book on the subject that is attracting attention of radioists and scientists all over the world. \$3.00, postpaid. Radio World, 145 West 45th St., N. Y. City.

"THE CHEVROLET SIX CAR AND TRUCK" (Construction—Operation—Repair) by Victor W. Page, author of "Modern Gasoline Automobile," "Ford Model A Car and AA Truck," etc., etc. 450 pages, price \$2.00. Radio World, 145 W. 45th St., N. Y. City.

EBY antenna-ground binding post assembly for all circuits. Ground post automatically grounded on sets using metal chasses. Assemblies, 30c. each. Guaranty Radio Goods Co., 143 West 45th St., New York, N. Y.

25,000 OHM POTENTIOMETER, wire wound, in shield case; takes 1/4" shaft. Will stand 20 ma. easily. Excellent as a volume control. Price, 90c. Direct Radio Co., 143 West 45th Street, New York, N. Y.

THE FORD MODEL—"A" Car and Model "AA" Truck—Construction, Operation and Repair—Revised New Edition. Ford Car authority, Victor W. Page. 703 pages, 318 illustrations. Price \$2.50. Radio World, 145 W. 45th St., New York.

### SITUATIONS WANTED

RADIO MAN, 24 YEARS OF AGE, holding U. S. Commercial Second Class Radio Operators' License, has completed fifty credit hours of college electrical engineering; service with sound-picture equipment manufacturer; also broadcast and marine operating experience. Position desired as radio operator or technician. Will furnish references. Sam Dyer, Lewis, Iowa.

# Special Short-Wave and Television Number

## of Radio World now in preparation!

Dated February 27, 1932.

Last form closes February 16, 1932.

No Increase in Advertising Rates—\$150 a page; \$5 an inch

We take pleasure in announcing one of the most important numbers ever issued by Radio World, containing:

List of Television Stations by frequency, with number of lines per frame and number of frames per second.

List of principal short-wave stations of the world that send programs, arranged by hours, thus constituting the first short-wave time table. Under each of the 24 hours are given the call, location, frequency, wavelength and, in the case of relaying short waves, the broadcast call.

Articles on the following topics: Present Status of Television, Sensitive Television Receiver, Audio Amplification for Television, Diagnosis of Television Transmitting Studios, Cathode Ray versus Mechanical Scanning, Discs by Photographic Process, Leaders in the Television Field, etc.

A great advertising medium for those who make, distribute or sell short-wave and television goods.

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

## RF CHOKES

### VOLUME CONTROL TYPE

Where a receiver is to be built to incorporate automatic volume control, the shielded choke, consisting of two closely coupled separate windings, may be used. Connect one winding (yellow leads) from detector plate to the audio input. Connect the two other leads (red and black) as follows: Black to the slider of a potentiometer (400 ohms up, without limit), red to the joined grid and plate leads of a 227 tube used as automatic volume control. Connect cathode of that tube to ground (B minus), and the grid returns of coils in controlled tube or tubes to arm of the potentiometer. Put 1 mfd. from arm to ground. Order Cat. DW-SHCH (maximum current rating, 25 ma) @ .....

DIRECT RADIO COMPANY  
143 West 45th Street New York City

### — SPECIALS —

Five-lead cable, 2 ft. long, with plug to fit a five-prong (UY) socket. The cable is connected at the factory so that following wires represent the respective prongs of the socket: Blue with white marker—G post of socket; Red—plate of socket; Green—cathode of socket; Yellow—heater adjoining cathode; Black with yellow marker—heater adjoining plate. ....Net 65c  
MARCO black bakelite vernier dials. Read 0-100 with a supplementary scale reading 0-10 between figures on large scale. Takes a 1/4" shaft...Net 50c  
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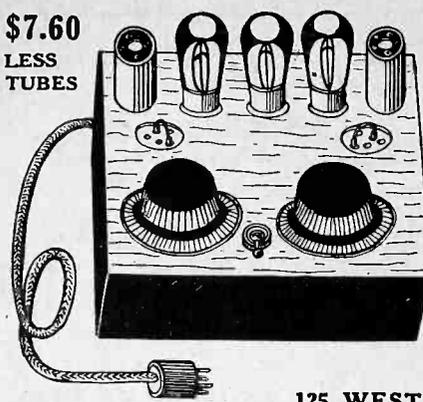
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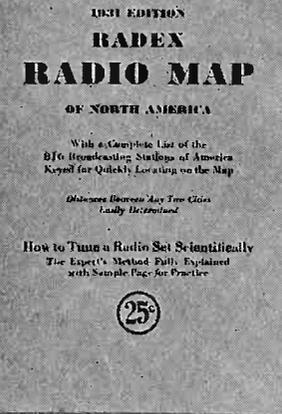
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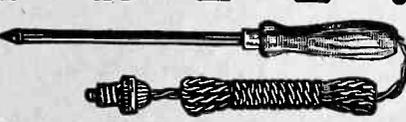
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