MARCH 5
1932

20¢ Price
~~15c~~ Per Copy

RADIO WORLD

REG. U.S. PAT. OFF.

The First and Only National Radio Weekly
519th Consecutive Issue
TENTH YEAR

POLICE CALL LIST

TROUBLE-SHOOTING IN SUPERS

15-550-Meter "Comet"

TWO NEW SCANNING METHODS

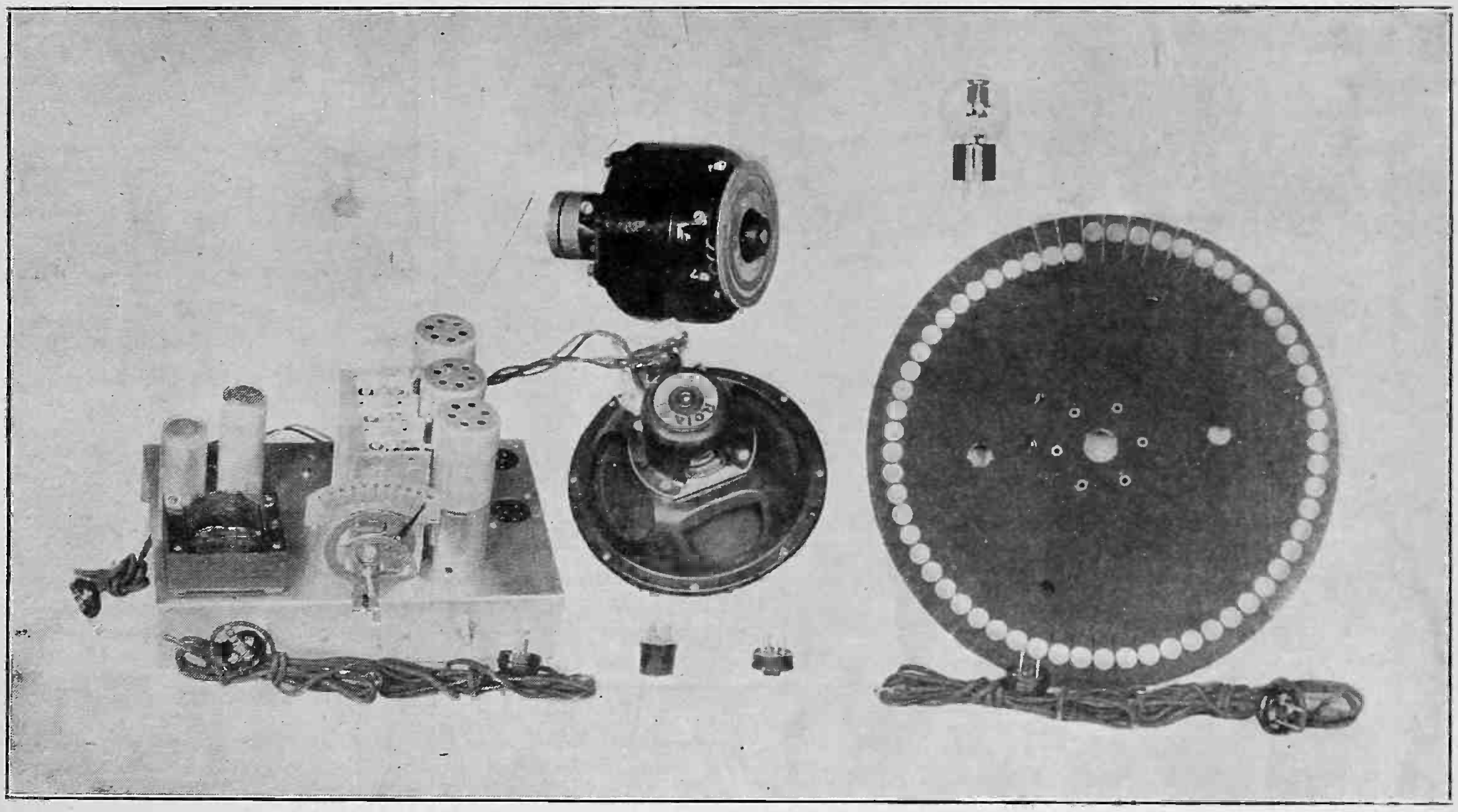


FIG. 1
The essential kit of a television receiver utilizing the new concave mirror disc for scanning. At top are the synchronous motor and the crater lamp; at bottom are the television receiver chassis, the loudspeaker, and the concave mirror scanning disc. This is one of two new systems described on pages 3, 4 and 5.

ONE DIAL TUNES CONVERTER AND SET!

Curves for Computing Inductance

BATTERY-OPERATED SUPER

ROLAND BURKE HENNESSY
Editor

HERMAN BERNARD
Managing Editor

RADIO WORLD

TENTH YEAR

J. E. ANDERSON
Technical Editor

J. MURRAY BARRON
Advertising Manager

Vol. XX MARCH 5th, 1932 No. 25 Whole No. 519

Published weekly by **Hennessy Radio Publications Corporation,** **145 West 45th Street, New York, N. Y.**

Editorial and Executive Offices: 145 West 45th Street, New York
Telephones: BR-yant 9-0558, 9-0559.

OFFICERS: Roland Burke Hennessy, *President and Treasurer;* M. B. Hennessy, *Vice-President;* Herman Bernard, *Secretary.*

Entered as second-class matter March, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. Title registered in U. S. Patent Office. Printed in the United States of America. We do not assume any responsibility for unsolicited manuscripts, photographs, drawings, etc., although we are careful with them.

Price, 15c per Copy; $6.00 per Year by mail. $1.00 extra per year in foreign countries. Subscribers' change of address becomes effective two weeks after receipt of notice.

The Peck Scanner

Compactness, Economy in New System

By J. E. Anderson

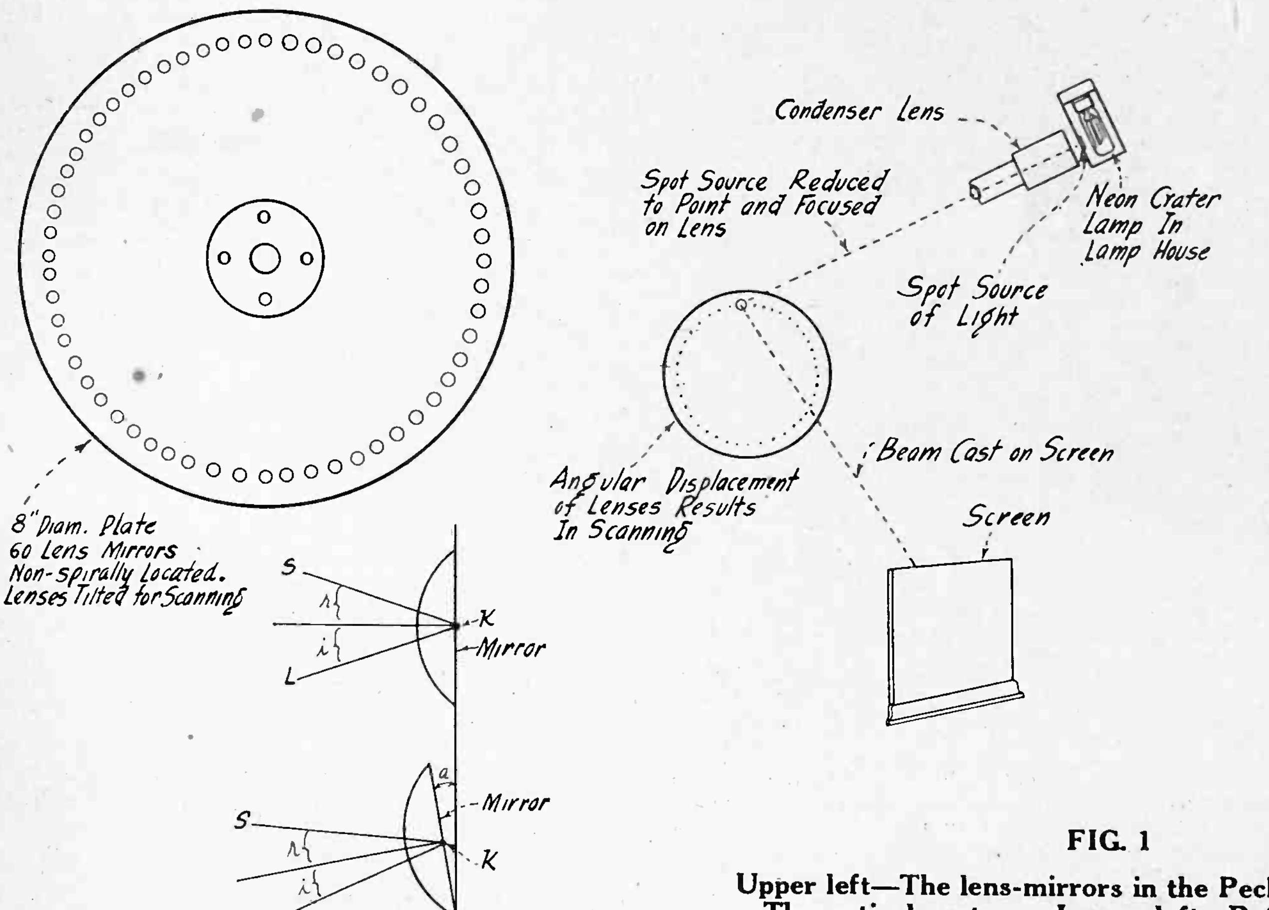


FIG. 1

Upper left—The lens-mirrors in the Peck scanner. Right—The optical system. Lower left—Reflecting surfaces tilted to obtain vertical movement of scanning lines.

A DIFFERENT system of scanning that is characterized by simplicity has been developed and demonstrated by William Hoyt Peck, optical expert. In this system reflecting lenses are used, and all are located at the same distance from the center of the disc. That is, they are not located spirally, as in most scanning devices.

Movement of the scanning beam from top to bottom of the screen is effected by tilting the lenses and the reflecting surfaces at different angles. In Fig. 1, upper left, is shown the arrangement of the lenses in the disc, the overall diameter of which is 8 inches. At right is shown the optical arrangement.

The luminous spot on the crater lamp is brought to a sharp point by means of a condenser lens, or, what amounts to the same thing, a projection lens. The tiny spot is directed to the nodal point on the lens. Back of this there is a reflecting surface which returns the ray of light through the lens and thence to the screen located in front of the disc.

Since reflection is used, both the source of light and the screen must necessarily be on the same side of the disc, but the source of light and the condensing lens are placed at one side, so that they do not interfere with the reflected ray.

As a lens-mirror moves in front of the incident ray, that is, the ray coming from the source of light, the ray is first intercepted by one edge of the lens. It is reflected to the corresponding side of the screen. As the lens moves on different parts of the lens-mirror intercept the beam, changing the direc-

(Continued on next page)

(*Continued from preceding page*)

tion of the reflected ray. As the ray moves across the lens, or rather, as the lens moves past the ray, the reflected ray moves across the screen from one side to the other. As soon as the ray leaves one lens-mirror it is intercepted by the next and a new line is drawn across the screen, a little below the first. This continues until all the lenses have passed in review before the luminous ray. As soon as the last has passed, the first immediately takes hold of the ray and the whole process is repeated, tracing lines from left to right, successive lines proceeding from top to bottom.

The question may arise as to how it is possible to trace lines in different vertical positions when all the lens-mirrors are in the same position with respect to the source of light, that is, when all of them are at the same distance from the center of rotation.

The progressive movement of the lines from top to bottom is effected by the tilting of the lenses and the mirrors. The direction of the reflected ray is determined by the angle of incidence, that is, the angle between the incident ray and the axis of the lens, or of the normal to the reflecting surface. The direction of the incident ray is always the same, but if one lens is tilted more with respect to the incident ray than another, the reflected rays will have different directions. The angle between these two directions will be twice the angle between the two reflecting surfaces.

The Optical Mechanics

As an illustration, consider the lower left drawing in Fig. 1. The long vertical line represents the plane of the disc. The upper lens, which is plano-convex, is placed so that the plane surface coincides with the plane of the disc. The plane surface is the reflector. Let L be the source of light. Then LK is the incident ray, where K is the nodal point of the lens, and i is the angle of incidence. SK is the reflected ray, and the angle of reflection r is equal to the angle of incidence, considering only the reflecting surface now. S is the screen.

The next lens-mirror just below the first is tilted forward by an agle a with respect to the plane of the preceding. The incident and reflected rays, as before, are LK and KS, respectively. Also, the angle of incidence and reflection are equal to each other but they are not equal to the same angles for the preceding lens-mirror. LK has the same direction in both cases, but KS in the second case is tilted downward by an angle $2a$, that is, by an angle twice the angle between the two reflecting surfaces. Therefore the angle between KS in the first lens-mirror and KS in the second is $2a$. Therefore S in the second case will be lower on the screen than S in the first case. The actual distance between the two will depend on the angle a, on the distance between K and the screen, and also on the power of the lens. If the effective distance between the screen and the mirror, including the effect of the lens, is R, the distance between the two lines on the screen will be equal to $2a$R, in which the angle is measured in radians and not in degrees. This will be the separation between two adjacent lines on the screen.

Jumping Angles!

If the third mirror is tilted with respect to the second by an angle a, then the distance between the second and the third lines on the screen will also be $2a$R. If the progressive tilting is the same for all the lens-mirrors, the same separation will obtain throughout.

We can define the angle a as the angular pitch of the scanning device. The angular pitch multiplied by the number of lens-mirrors in the circle will give the total angular displacement. When the incident ray jumps from the last to the first reflector, the angle will suddenly jump back, or a new frame will begin.

Although the distance between two adjacent lines is $2a$R, this applies to the arc rather than the distance on the screen. However, the arc is so nearly equal to the chord that the statement is true when the angle is very small, as it is between one line and the next. It cannot be said of holes between the top and the bottom lines. However, if the lenses are of the right shape, the "field" will be flat and there will be no appreciable distortion.

For the sake of determining the angle between two adjacent lenses we may assume that the same rule holds for the whole as for a small part.

Formula for Square Picture

With this assumption, if there are N lenses in the disc, the vertical distance between the first and the last lines will be $2a$NR. If there are N lenses the angle between any two adjacent lenses will be 360/N degrees, or 2π/N radians. Hence the length of each line on the screen, measured from left to right, will be 2πR/N. If the picture on the screen is to be essentially square, this should equal $2a$NR. Hence for a square picture we have $2\pi R/N = 2aNR$.

It will be noticed that R cancels out so that the relative dimensions of the picture on the screen do not depend on the distance between the mirrors and the screen. If we solve the equation for a we obtain $a = \pi N^2$, or, using degrees, $a = 180/N^2$. Therefore if $N = 60$, $a = 3$ minutes. This is the pitch used in the Peck 60-line scanner.

If we should double the number of lines on the screen, we would have to use 120 lenses and N would equal 120. In this case the angular pitch of the scanner would be 180/120x120, or a would equal ¾ minute. Four times greater accuracy would be required and the electrical system would be required to handle a frequency band four times wider. Under these conditions the detail in the picture would be four times better. But it would be difficult to meet the conditions in practice.

In making the distance R between the reflecting surfaces and the screen greater or less, it is not necessary to reset the focus of the condenser lenses, because the divergence of the light is proportional to the distance. The definition at any distance would be the same, provided that we viewed the screen from a proportional distance. This would not actually change the size of the image on the retina.

The reason a larger picture appears to be less detailed is that we view the screen from about the same distance all the time, regardless of the size. If we do not change the distance between the eye and the screen, and if we double the size of the picture on the screen, the detail is only one-fourth as good.

The main object of the lenses is to get a large image in a small space between the reflecting surface and the screen. The lenses increase the effective distance. The mirrors do the actual scanning.

The Peck system is an improvement in that lenses are combined with mirrors, that crater lamp and a condenser lens are used, and in that it is relatively simple and inexpensive to put into practice.

Audio Amplification for Television

By George E. Fleming

Engineering Staff, Electrad, Inc.

Of the varied problems that have presented themselves to the television engineer, none perhaps has been as clearly defined nor as difficult of solution as the design of proper amplifiers.

Fortunately for the radio art, the human ear is extremely tolerant of distortion. As a matter of fact, some types of distortion are even desirable in an amplifier intended for audio use.

Just a reverse condition obtains when an amplifier is to operate a device for visual purposes. The human eye is not only extremely fast but highly discriminating. The slightest deviation from pure wave form amplification will be immediately noticeable.

The extreme limit of necessity for audio amplification is usually considered to be around ten kilocycles, but to give a scanned picture any detail frequencies in the order of sixty to seventy kilocycles must be handled with the same facility as the frequencies below 100 cycles. In other words, a departure from straight line characteristics below 100 cycles or above six to seven kilocycles in an audio amplifier is unimportant whereas in a television amplifier the limits must be carried to an absolute extreme.

Another form of distortion, one we seldom hear mentioned in connection with audio amplifiers, is amplitude distortion. For instance, in an audio amplifier it is relatively unimportant whether the output linearly follows the input to a close degree. If one volt of signal is applied to the grid of the first amplifier tube a definite voltage value will be available for loudspeaker operation at the plate of the output tube. If, however, two volts should be applied to the grid of the input tube we may or may not have twice the signal value at the plate of the output tube. As mentioned, this is relatively unimportant where an amplifier is intended purely for audio amplification but it becomes extremely important with television work.

So we see that three forms of distortion must be carefully guarded against if we intend to obtain anything like perfect pictures: (1) wave form distortion; (2) frequency discrimination, and (3) amplitude distortion.

A little reasoning will immediately tell us that if we are to meet these extreme conditions we must immediately eliminate transformer coupling as a possibility, or resistance coupling in the form that it is generally known.

It is a belief of the writer that some form of direct coupling will ultimately be the answer to these problems. Much development work, however, must be done to eliminate or neutralize tube capacities, stray capacities, and degeneration in direct coupled circuits. Also by-pass condensers of practically infinite value must be used or circuits so designed that absolute push-pull conditions are obtained, and thus eliminate the necessity of by-passing.

It is undoubtedly, however, in this field that the solution will be found.

A Concave Mirror Scanner

Simplicity in Manufacture One Feature

By Clyde Fitch

A SCANNING method developed by Hutton Television-Radio Corp., Ypsilanti, Mich., makes use of concave mirrors instead of lenses, prisms, or peep-holes. Each concave reflector is pressed into a single piece of metal, which to start with is a flat polished plate. After the concave spaces have been pressed all the rest of the metal surface is covered with a non-reflecting and light-absorbing coating so that only the concave depressions reflect any light.

If the curvature of the depressions is right, each depression will act just like a lens. Moreover, if the reflecting surface is highly polished and is made of a material having a high reflection coefficient, the efficiency will be greater than that of lenses.

From a manufacturing point of view, the pressed concave mirror scanner is superior to all others, because once the die has been made, any number of duplicates can be punched. All the concave mirrors required in a scanning disc are made in one operation.

A Unique Feature

A unique feature of the pressed reflector disc is that radial slots are punched between the reflectors so that each reflector is on a tongue. This tongue may be bent forward or backward so as to tilt the plane of the reflector, and it may also be twisted a little in case that is necessary.

After a disc has been punched and the non-reflecting surface has been treated with a light-absorbing coating, the disc is mounted on an axis and a fine ray of light is directed at the mirrors. This ray is then reflected to a screen which has previously been ruled off in parallel lines. The disc is then rotated slowly by hand and the path of the reflected spot is observed for each mirror. If the path is that predetermined by the ruling, the lens is in the proper alignment. But if the path deviates from the desired line, the tongue which carries the out-of-line reflector, is bent by hand until the spot from that mirror traces the desired line. This adjustment must be made for all the mirrors.

Parts Shown

On the front cover are shown the various parts necessary for receiving the television signals. At the right is the concave mirror disc and above the disc is the crater lamp which is the source of light. In the middle is the loudspeaker which is used to pick up the sound accompaniment of the television signals and also as an aid in tuning in the visual signals. Above the speaker is the synchronous motor for driving the disc, and at the left is the short wave receiver with which to bring in the signals. A suitable stand, of course, is needed for holding the motor and the crater lamp.

In Fig. 1 is a grandfather type console with a complete television receiver built in. There are two independent receivers, each with a dial and three knobs. One of the receivers is for broadcast reception and the sound accompaniment of the visual signals and the other is for the visual signals alone. The three knobs just under the picture are for framing, synchronization, and the control of the motor. The picture appears on a screen located where the customary clock dial is placed.

The 60-line scanner illustrated on the front cover is capable of throwing 5 x 6 inch picture of good detail and brilliance. A larger image can be obtained by increasing the distance between the reflectors and the lenses, but the detail becomes less as the picture becomes greater, and the brilliance also decrases. A 5 x 6 inch picture, when on a screen, is large enough for several members of the family to view it simultaneously.

It is clear that this concave mirror scanner can be adapted to more lines by simply pressing more concavities in the spiral. Thus if it is desired to have 120 lines instead of 60 it is only necessary to make 120 depressions with a spacing of three degrees instead of six degrees, with a radial slit between the adjacent mirrors. If the scanning disc is to be made in large quantities it is only necessary to make an accurate die and then to run the stock through a punch press. This could be made so accurately that it would not be necessary to any manual adjustment of the individual discs.

An Advantage

This concave mirror scanner is a variation of the lens scanner for a concave reflecting surface will do about the same thing as a lens having similar refracting surfaces. It is well known that large telescopes are made both with lenses and mirrors, and that the larger and more powerful ones are made with mirrors. Even when lenses are used in some scanning devices, mirrors are placed back of them so that in effect they are reflecting mirror lenses.

One advantage of a scanning device like this one is the high economy of light. With the peep-hole scanning disc only a very small portion of the available light is seen at a time, an almost infinitesimal portion. With this device all the available light is seen at every instant because all the light in the source of illumination is focused to a point and this point is then distributed over the viewing screen. The increase in luminous efficiency is proportional to the area of the picture. Suppose we have a luminous surface one inch square with unit illumination. If we condense this light into a spot 1/60 by 1/60 inch, the illumination will have 3,600 units, and therefore 3,600 to 1 is the increase. This is for a 60 line picture. If we have a 120 line picture, of the square type, the increase will be 14,400 times.

Modulation Problem

The importance of this is obvious when we consider the difficulty of modulating the available light. With a given current in the neon lamp there is a certain amount of luminous flux.

To modulate this 100 per cent. requires a power tube of a given size. If we were to get the same intensity of illumination with the peep-hole scanner we would need a lamp capable of 14,400 greater flux and a power tube capable of 14,400 times greater output current, assuming a 120 line scanner. Considered in this light the advantage of the flying spot receiving scanner over the peep-hole scanner becomes obvious.

SIGHT WITH SOUND

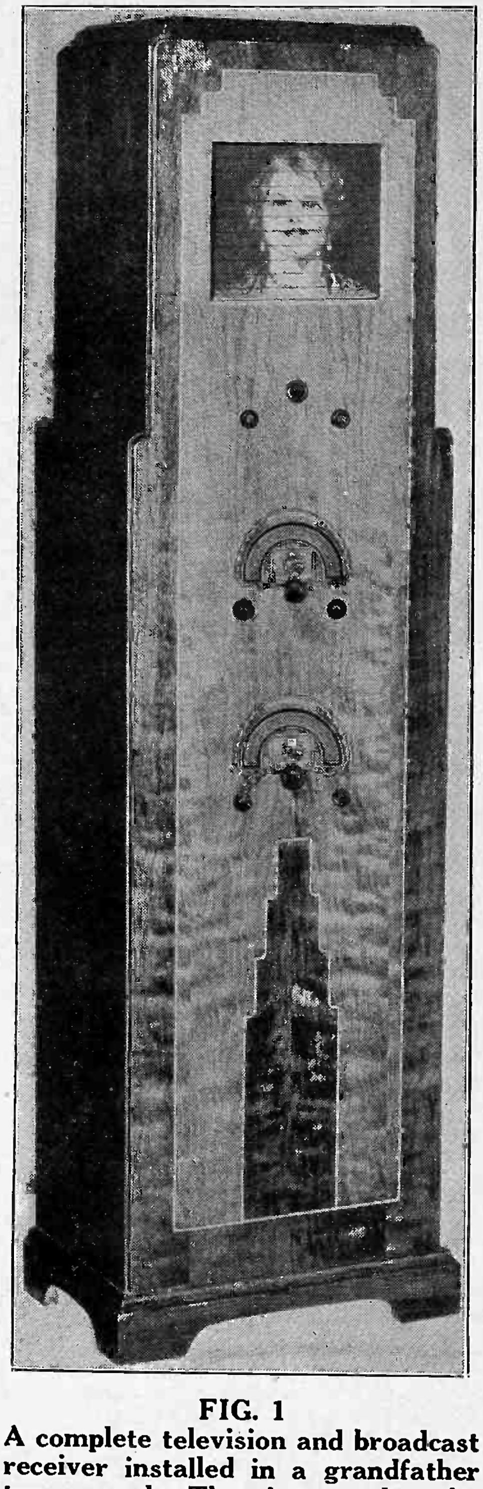


FIG. 1
A complete television and broadcast receiver installed in a grandfather type console. The picture takes the place of the clock dial.

Two Chains Sold $35,791,999 Time

The combined gross income of the NBC and CBS networks for time sold during 1931 reached $35,791,999, which is an increase of 33.6 per cent. over the 1930 figure. The two networks serve about 175 of the 600 stations in the United States. Although the NBC system did a greater gross business, the CBS had a greater percentage increase. The NBC share of the gross was $25,607,041, an increase of 27.5 per cent over 1930. The CBS gross was $10,184,958, an increase of 51.4 per cent. over the preceding year's business.

An Eight-Tube Battery-Operated 2-Volt Tubes Prevail,

By Brunsten

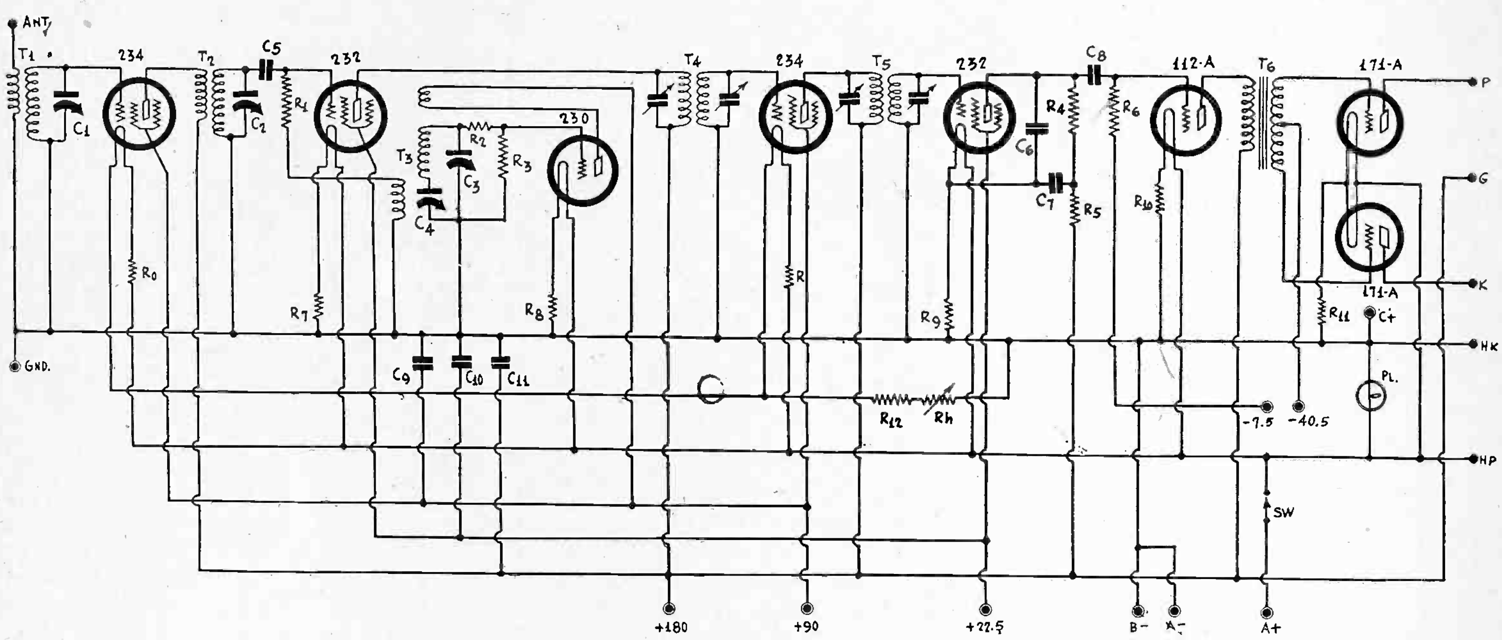


FIG. 1

This eight tube superheterodyne has been designed for battery operation in such a manner that advantage is taken of the economy and advanced features of the two volt tubes in conjunction with the large output of 171A tubes.

IN THIS eight-tube battery-operated superheterodyne, two volt and five volt tubes are mixed. There are several reasons why the same type of tubes is not used throughout. First, there are no screen grid tubes or variable mu r-f pentodes in the 5-volt series of tubes. Hence if we want to take advantage of the latest improvements and developments in tubes we must resort to the small tubes. Second, the 5-volt tubes are not good amplifiers when compared with screen grid tubes. Third, the 2-volt tubes are more economical to operate for the filament current of any one of the 2-volt tubes in the circuit is less than one-fourth the current required by a 5-volt tube.

Five-volt tubes are used only to get a greater output than the 2-volt tubes would give. For this reason the first stage audio is a 112A and the output stage contains two 171A tubes in push-pull. A 112A is used between the detector and the output stage because of the low amplification in the 171A tubes. The output of the 112A is greater than would be that of a 230 in the same position.

R-F and I-F Amplifiers

The first and the fourth tubes in the circuit are of the 234 type for these are operated as amplifiers in which the amplification is varied for controlling the volume. The volume control is placed so that the bias on the grids of these two tubes is increased at the same time as the filament current is reduced. The control, of course, is Rh, a 50-ohm rheostat. The normal grid bias on the tubes is nearly 2.5 volts, which is obtained from the drop in R12, a 20 ohm ballast, when Rh is set at zero. In each positive leg of these tubes there is a 30 ohm resistance to prevent the bias from being excessive at maximum sensitivity. These two 30 ohm resistances are marked Ro and R. These and R12 prevent the filament current from exceeding the maximum safe value. The ballast resistance is split up, part in the positive and part in the negative, in order to give the tubes the proper starting bias at maximum volume.

The Modulator

The modulator is a 232 tube. Although it appears to operate on the principle of grid condenser and leak it is actually operating on grid bias. Condenser C5 has the comparatively large value of 0.001 mfd. and the grid leak R1 has a value of one megohm. The bias on the tube, which is determined by the drop in R7, is about 4 volts, which is correct for good detection provided that the screen voltage is not too high. This, as will be noticed, is 22.5 volt. The value of R7 is 75 ohms.

The only reason for using C5 and R1 is to provide a means of impressing the voltage from the oscillator on the mixer tube. The pick-up coil is connected in series with the grid leak. If the pick-up coil is connected in series with the screen lead, it is necessary to use neither C5 nor R1. However, if the pick-up coil is put in the screen lead it should contain at least twice the

List of Parts

Coils

T1, T2—Two shielded r-f transformers for 350 mmfd. condensers.
T3—One shielded oscillator coil for 350 mmfd. tuning condenser and 400 kc i-f as described.
T4, T5—Two 400 kc intermediate frequency transformers.
T6—One push-pull input transformer.

Condensers.

C1, C2, C3—One gang of three 350 mmfd. tuning condensers.
C4—One 350-450 mmfd. trimmer condenser (set at about 430 mmfd.)
C5—One 0.001 mfd. fixed condenser.
C6—One 0.00025 mfd. fixed condenser.
C7, C9, C10—Three 0.1 mfd. by-pass condenser in one case.
C8—One 0.1 mfd. fixed condenser.
C11—One 1 mfd. by-pass condenser.

Resistances.

Ro, R—Two 30 ohm ballast resistors.
R1, R6—Two one megohm resistors.
R2—One 5,000 ohm resistor.
R3, R5—Two 100,000 ohm resistors.
R4—One 250,000 ohm resistor.
R7, R8, R9—Three 75 ohm ballast resistors.
R10—One 4 ohm ballast resistor.
R11—One 2 ohm ballast resistor.
R12—One 20 ohm ballast resistor.
Rh—One 50 ohm rheostat.

Other requirements.

Sw—One filament switch.
Eleven binding posts.
Four grid clips.
Eight UX, four prong, sockets.
One UY, five prong, socket for loudspeaker.
One six volt pilot light.
One six volt storage battery.
One 180 volt B battery.
One 40.5 volt grid battery.
One metal chassis.
One vernier dial.
One dynamic speaker with 6 volt field and push-pull transformer built in.

uper, but 171 A's Are Used in Output

runn

number of turns. The design of the oscillator coil will be given later.

The Oscillator

The oscillator uses a 230 tube. Its grid is also biased with a 75 ohm resistor R8. Since the 230 is a medium mu tube a bias of four volts is not excessive.

A voltage divider consisting of a 5,000 ohm resistor R2 and a 100,000 ohm grid leak R3 is used to prevent excessive oscillation and also to isolate, in part, the tuned circuit from the tube. C3 is a 350 mmfd. section of the gang tuning condenser and C4 is a series condenser for padding. Note that one side of this condenser is grounded. This is done to facilitate adjustment as well as mounting. The shunt condenser used for adjusting the oscillator at the high frequency end is supposed to be connected across C3 alone. It is the trimmer built into the gang section. The value of C4 depends on the intermediate frequency used. If this is 175 kc C4 is approximately 760 mmfd. Oscillator coils and padding condensers for 175 kc are standard and can be obtained easily. In this case, however, the intermediate frequency is 400 kc and that requires a special oscillator coil and series condenser.

For the case when the intermediate frequency is 400 kc, C4 should be about 430 mmfd. and should be variable from 350 to 450 mmfd. The inductance of the tuned winding of T3 should be 145 microhenries. If the coil is wound on a one inch form with No. 32 enameled wire it should contain 85 turns. This winding is slightly too large when the coil is outside the shield, but the shield reduces the inductance by approximately the right moment.

The tickler should consist of 25 turns of very fine wire wound over the low potential end of the tuned winding, that is, over the end which is next to C4, and it should be separated from it by several layers of insulating paper or some other suitable insulator. The pick-up winding is wound over the tickler in a similar manner, and it should consist of not less than 6 turns nor more than 15. The larger the number of turns in the pick-up the greater the sensitivity, but if too many are used the mixer tube will be overloaded. In case the pick-up winding is connected in the screen circuit it is safe to use up to 25 turns.

R-F Coils

The two r-f transformer T1 and T2 are identical and the tuned winding in each has an inductance of 245 microhenries. It is not asy to wind these coils and get the inductances equal, but the secondaries may consist of 127 turns of No. 32 enameled wire, if they are placed in metal shields 2.125 inches in diameter and about 2.5 inches high. The primaries should be wound in the same manner as the tickler on the oscillator coil. The larger the number of primary turns the more sensitive will the receiver be. If selectivity is of first importance 25 turns will do, but if sensitivity is more important than selectivity as many as 90 turns may be used.

The two intermediate frequency transformers T4 and T5 are tuned to 400 kc, each having both windings tuned with trimmer condensers. These coils are in shields of the same type as the radio frequency coils and the oscillator.

The Detector

The detector is a 232 tube and it operates on grid bias principle. The bias is provided by the drop in R9, a 75 ohm ballast resistor. Therefore the operating bias on this tube is the same as that of the modulator tube. The screen voltage is also the same, namely, 22.5 volts.

In the plate circuit is a 0.00025 mfd. by-pass condenser C6 to direct the high frequency components of the output of the tube to ground by the shortest route. This condenser is large enough to make the detecting efficiency high but it does not completely eliminate the high frequencies from the output. Therefore a filter consisting of C7, a 0.1 mfd. by-pass condenser, and a resistance R5 of 100,000 ohms are connected in the plate circuit below the coupling resistance R4. The object of this filter is to prevent the 400 cycle intermediate frequency or any of its harmonics from entering the B supply. If any considerable current of the intermediate frequency or any of its harmonics should enter the B supply there would be modulation and squealing at certain settings of the oscillator condenser. This effect would be entirely negligible as long as the battery is in good condition but it would be considerable after a period of use when the internal resistance of the battery would be high.

R4, C8, and R6 have the usual values of 250,000 ohms, 0.1 mfd., and one megohm, respectively.

The first audio amplifier tube is 112A and this feeds into a push-pull transformer T6, which in turn actuates the grids of two 171A tubes. The bias on the 112A is 8.5 volts, one volt of which is obtained from the voltage drop in the 4 ohm ballast R10. The rest is obtained from the grid battery by returning the grid leak R6 to a suitable tap. In view of the fact that the plate voltage is 180 volts, it is permissible to make the bias even higher than 8.5 volts, say, 13.5 volts.

The bias on the two output tubes is 41.5 volts, one volt being supplied by the drop in the 2 ohm ballast resistance R11.

The loudspeaker to be used is supposed to contain an output push-pull transformer. There are now suitable dynamic loudspeakers requiring a field voltage of 6 volts. If such is used the terminals at the right marked P, G, K, Hk, and Hp should be the springs of a UY socket. P and K go to the primary of the output transformer, G goes to the center tap on the primary, and Hk and Hp go to the field. If a magnetic or inductor speaker is used, the two field terminals may be left blank and the remaining terminals may be connected to the output transformer or to the speaker winding directly, provided that the winding is center tapped.

Power Supply

The five 2-volt tubes require only a total of 0.3 ampere to heat the filament. Each of the other tubes requires 0.25 ampere. Hence the total filament current is 1.05 amperes. This does not include the pilot light PL. This takes an additional current of about 0.25 ampere so that the drain on the storage battery will be 1.3 amperes. This is very low for a storage battery. Yet the output of this circuit will be just as great as that of any other receiver in which the output tubes are two 171A. To get the most out of the circuit it is important that the speaker be matched to the tubes used.

Polo Startles Public With "Europe Guaranteed" on Short-Wave Converter

Little having been heard from Polo Engineering Laboratories in the way of a new announcement of products for a few months, and as it was known that the engineering staff and factory had been extremely busy, an extraordinary announcement of some sort was expected, and it came the other day. The Laboratories disclosed that it had made up a very large quantity of short-wave converters, 15 to 200 meters, to be offered direct to the public with a postive five-day money-back guarantee that the converter would get Europe, when worked with any broadcast set, including a superheterodyne.

The startling part of the announcement was "Europe guaranteed," as quite a few manufacturers of short-wave converters have not only omitted any such guarantee, but have contented themselves with saying that stations all over the world could be brought in, not saying that such gleeful results actually would positively accrue.

The announcement by Polo Engineering Laboratories, from its New York sales office, at 125 West Forty-fifth Street, set forth:

"We have ready for the public a new short-wave converter so remarkable and dependable in results that we do not hesitate to guarantee that it will bring in European stations, and we back up this with a five-day money-back guarantee. We have been experimenting with converter design for two and a half years and have perfected a circuit that is so far and away beyond the usual that we feel no hesitancy about taking the present step.

"The new short-wave converter we have called the Europe-Getter, and we make no bones about the fact that it does and will get Europe, or money back in five days, also that all of our staff have been working stock models of the converter in their homes, and all of them have gotten European stations repeatedly, and with great volume. There is a secret in the circuit and we are glad we were the ones to find the key to the world.

"The converter bears the catalogue number DX-3W, for the wired model, and DX-3K for the kit. We were never more enthusiastic about anything than we are about this converter and we are glad to add it to our line of midget receivers for broadcast reception. This line of midgets is well-known to the trade and to consumers to be unparalled in performance, tube for tube. And moreover we find business is excellent, which proves that with the right product there is plenty of room for activity even under present market conditions."

Cures for the Main Troubles in Su
How to Pad Tuner, Bo

By E. Bun
Designer of the Day-Lite-R Serie

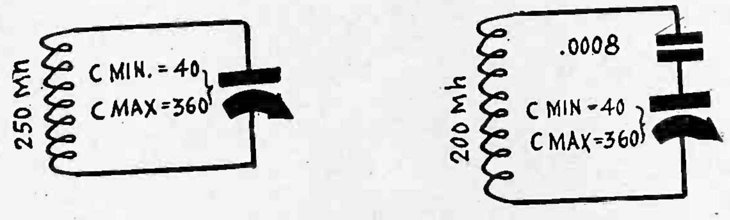


FIG. 1
The oscillator's tuned circuit is shown at left before padding. At right the padding is accomplished. Note the inductance is less, also a series condenser is inserted. This is usually 700-1,000 mmfd., adjustable.

In the course of this highly interesting article the author incidentally mentions the desirability of band pass filter tuning between antenna and first tube of a superheterodyne. Consistently with this recommendation he has designed a 6-tube a-c tuner—requiring external audio amplifier—that has been a sensation among those to whom he has demonstrated it privately. The tuner brings in KFI, KGO and other Pacific Coast stations, from New York City, on a few feet of aerial, almost nightly. The usual performance is 90-channel reception in daylight—thus a station on every channel except six channels—while some have tuned in the entire 96 channels day and night. It is expected this circuit can be revealed soon to our readers.—Editor.

THE current popularity of the superheterodyne circuit has brought the development of this highly efficient circuit to a point far beyond its condition of a year ago, both among manufacturers and personal builders.

It is the purpose of this article to endeavor to present solutions to some of the superheterodyne problems, together with an analysis in simple, non-technical language, of their causes and means of correcting them.

Probably the greatest trouble to the average builder is the tracking of the oscillator and the tuning condensers. Assuming the frequency of the intermediate amplifier to be 175 kc, it is necessary for the oscillator circuit to be at all times tuned to a frequency 175 kilocycles higher than the r-f circuits. (175 kc lower would be all right, but using the higher frequency is simpler constructionally.)

Frequency Examples

To illustrate, the relation at six points on the broadcast band is as follows:

r-f	*Oscillator*
1,500 kc	1,675 kc
1,250 kc	1,425 kc
1,000 kc	1,175 kc
750 kc	925 kc
550 kc	725 kc
500 kc	675 kc

The frequency at which a tuned circuit resonates is a function of the inductance times the capacity, or wave constant LC. That is, if a circuit with a 0.0005 tuning condenser with plates all the way in, and a coil of 200 microhenries is used, the "LC" is equal to 0.0005 times 200, or 0.1, and the circuit will tune to 600 meters. The relative values of the coil or condenser may be different than stated, provided one is changed oppositely to the other, so that the LC remains 0.1. A 0.00025 condenser with a 400 microhenry coil, or a 0.001 condenser with a 100 microhenry coil would either of them tune to 600 meters.

Diverse Capacity Ratios

The LC varies inversely as the *square* of the frequency. That is, for double the frequency, the LC drops to one-quarter its former value. For three times the frequency the LC is one-ninth. Illustrating, if the LC for 600 meters, or 500 kc, is 0.1, the LC for 1,000 kc is 0.025, one-quarter as much, and for 1,500 kc, it is 0.0111, or one-ninth as much.

With a single coil, then, to cover the band from 1,500 to 500 kc, requires a condenser which, including all stray capacities in the set, has nine times as much maximum capacity as its minimum.

At the same time the oscillator, covering the band from 1,675 to 675 kc, which is a tuning range of 2½-to-1, requires a maximum capacity of the square of 2½, or 6¼ times its minimum. The reduction of the maximum capacity of one section of the variable condenser can be easily accomplished by inserting in series with this section a fixed condenser of the proper value to reduce the effective capacity to 6¼ times the minimum. Since the minimum varies considerably, this condenser is usually made so that it is adjustable with a screwdriver.

Since the highest frequency of the oscillator is 1,675 kc, for mixing with a 1,500 kc signal, and the minimum capacity of the condenser is about the same in both instances, the series condenser being virtually ineffective here, the oscillator coil has to be enough smaller than the r-f coils to make this difference at the zero setting of the dial. Figuring it again by the same data (with the same capacity, inductance changes inversely as the square of the frequency) it appears that the oscillator coil should be a little more than 80 per cent of the inductance of the r-f coils.

Alignment of Tuning Controls

Now we come to the actual process of aligning the tuning controls. To do this properly requires an oscillator. A suitable one is shown in Fig. 2. C-1 and C-2 can be 1 or 2 mfd. bypass condensers. C-3 can be any 0.00035 or 0.0005 variable condenser. L-1 is any filter choke, audio choke, or even the primary of an old audio transformer. L-2 is an r-f coil.

A modulated oscillator calibrated to 175 kc, or a range including 175 kc, is also an absolute necessity. Since this calibration must be very exact, it is highly advisable for the experimenter who makes such an oscillator to get it calibrated by a laboratory, or to buy one of the many which are available for service work at a comparatively low cost, or to have the intermediate amplifier adjusted for him. It cannot be emphasized too strongly how important is the exact adjustment of the intermediates to 175 kc. The entire success or failure of the receiver may depend on this one point.

Now set the trimmer on the tuning condensers about in the center of their range. Now tune in a local station as nearly as possible to 1,500 kc. Adjust the trimmers for maximum volume in exactly the same way as a t-r-f receiver. If some of them go too high or too low, change the oscillator trimmer up or down enough so that the r-f tuning condensers will line up with it properly.

Use of External Oscillator

Now tune in a station as near as possible to 550 kc. When it is brought in properly, take a small piece of wire and short-circuit the oscillator section of the tuning condenser. If the oscillator is a screen grid tube, the short should be from grid cap to ground. Remember the series condenser goes to grid, not tuning condenser stator. When this short-circuit is made, the station of course will disappear. Now take the oscillator already described, loosely wrap one turn of insulated wire around the coil in the oscillator, and connect the other end to the grid cap of the first detector. Do not make a physical connection between the wire and the oscillator coil, just wrap the wire once around the coil.

Rotate the external oscillator dial until the station is again heard. Now, leaving the oscillator condenser in the set shorted, retune the set until the station is heard at maximum volume. Then take off the wire leading to the external oscillator and turn the latter off. Do not touch the tuning dial on the set. Take the short off the oscillator condenser and readjust the padding condenser until the station again comes in at maximum volume.

Now, retune the set to a 1,500 kc station, or any station as near to that frequency as possible. Readjust the trimmers on the r-f condensers. *Do not touch* the trimmer on the oscillator condenser. Only very slight adjustments of the r-f trimmers should be necessary here.

Tied Down at Extreme Points

If the above instructions have been carried out properly, the set should now be in alignment, having been tied down precisely at two virtually extreme points on the dial, and any change in the trimmers at any point on the dial should not be necessary further.

Poor sensitivity on one end of the band, as compared to the other end, or on both ends as compared to the middle, is almost in-

perheterodynes; ost Gain and Eliminate "Birdies"

ng Moore

Receivers for Personal Construction

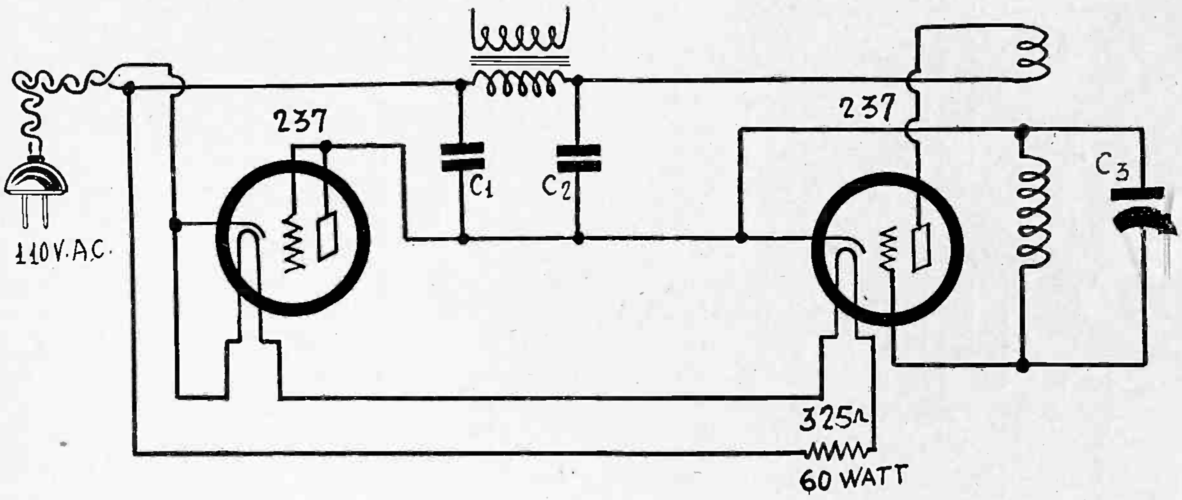


FIG. 3 (below) A band pass filter circuit may be used in this manner. Standard parts serve the purpose.

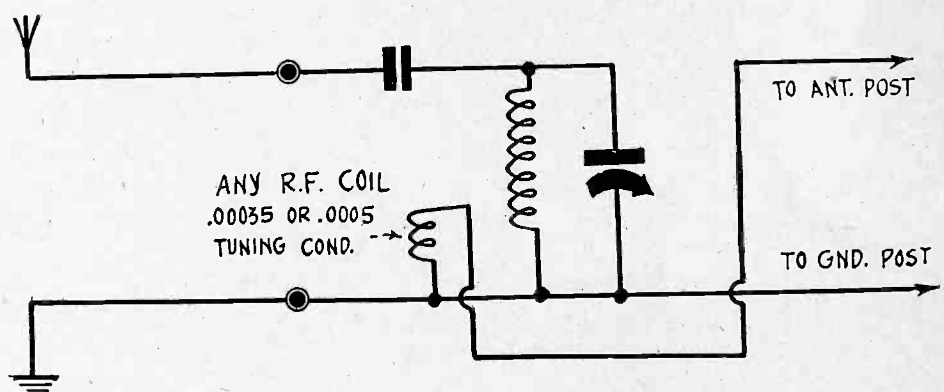


FIG. 2 (above) An oscillator that has its own voltage supply. Superheterodyne construction can not well be successful these days without an oscillator.

variably a sign of improper tracking, and can be corrected in service work by making the adjustments already described. Lack of sensitivity all over the band, provided all other things are correct, is usually an indication that the intermediate transformers are not tuned accurately. As already stated, the adjustment of the intermediates to *exactly* 175 kc is of extreme importance.

"Birdies"—sounds like a regenerative receiver passing stations at various points on the band—are caused by the intermediates being tuned to some other frequency than 175 kc, or by insufficient selectivity in the r-f tuning circuits.

Short the oscillator tuning condenser and then rotate the dial with the volume control turned pretty well up. Under these conditions no stations should be heard, in fact, the receiver should be absolutely silent. If stations are heard at some points without the oscillator tube operating, it is a certainty that the intermediates are not tuned properly. If the set is silent without the oscillator tube working, but whistling "birdies" are heard when it is working, the selectivity of the r-f stages is insufficient. The simplest way of correcting this is to use a much shorter antenna, or to remove turns from the primary of the antenna coil. A very small condenser, of the order of 0.00005 mfd., or thereabouts (a midget variable will do), inserted in the antenna lead, often will eliminate the whistles without appreciably cutting down the sensitivity of the set.

Repeat Point Squeals

Occasionally on some supers there will be found repeat points about 350 kc off the proper place for a station. There are two remedies for this—either those already described for "birdies" (usually heard on the set having the repeat points) or improving the shielding of the set from direct pickup, such as mounting on a metal plate a set which has the chassis unshielded on the bottom so that the bottom will be shielded. Covering the top of the chassis with a grounded metal plate, so as to shield the variable condenser sections and grid caps is often very helpful.

Microphonic audio howls will be found troublesome in some imperfect supers, and the builder, naturally attributing it to a bad tube, will hunt in vain for the tube that is making the trouble. The howl probably is caused by vibration in the plates of the variable condensers. It usually can be cured by mounting the entire chassis on a couple of pieces of sponge rubber, allowing the entire chassis to vibrate instead of just the condenser plates.

Some sets will have ample selectivity as far as music is concerned, but on a station right next to a powerful local, the loud notes of the local will carry over with a kind of scratching blast. This is a sign that the local is modulating a band of more than 10 kc width, and as the trouble originates in the air it cannot be completely eliminated. It can be considerably ameliorated by the addition of a band pass stage (Fig. 3) ahead of the tuner. This reduces appreciably the amount of signal from the local which reaches the grid of the first r-f amplifier tube, but will not seriously affect the amount of signal from the station to which the set is tuned.

When Less Volume Reduces Quality

Some sets will be found which work very nicely over a portion of the band, usually the high frequency end, but which stop working entirely on other portions. This is caused by the oscillator tube having incorrect voltages, so that it stops oscillating in spots. A check-up of the voltages supplied to the oscillator tube, and the correction of these voltages, usually will fix the trouble. Sets using dynatron oscillators are particularly subject to this trouble. In this case, trying out several tubes will result in one being found which will work properly over the whole band. Many —24 tubes will not oscillate at all as dynatrons, although they will function perfectly as detectors, and almost all tubes for use as dynatrons require very accurate settings of the screen and plate voltages to oscillate over the entire band.

Occasionally a set will be found that has perfect quality when turned full up, but when turned down at all loses its quality. If this is the case, examination of the tubes will probably disclose a —24 used in a socket where a —35 or —51 should be. Proper placement of the tubes will make this right. This trouble applies to t-r-f sets also, the use of a —24 in an amplifier socket on a set built for the multi-mu tubes will invariably produce this phenomenon.

Broadcast Set with Built-in Conve for Tuning in Everything from

By Herman

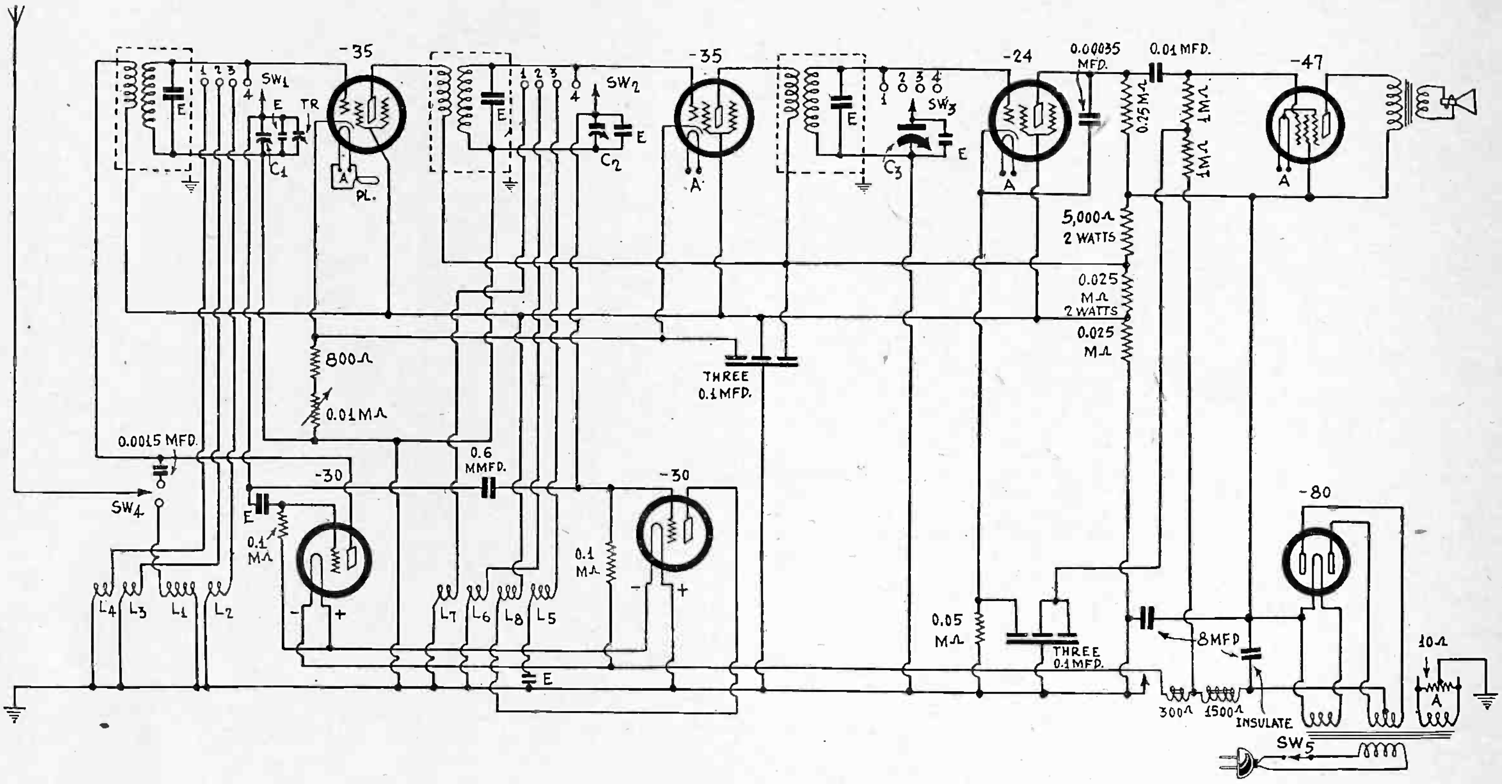


FIG. 1

By following the method shown, the same condenser and dial are used for short-wave tuning as well as for broadcast reception. This is a refinement of a similar method disclosed by the author some months ago.

THE general run of tuned radio frequency receivers with converter built in consists of two tuning dials, one for short waves, the other for the broadcast band, but by a special arrangement, the same condensers can be used for tuning in either short or broadcast waves, that is, one dial used. See Fig. 1.

To work this method it is necessary to put a small trimming condenser across the secondary of the t-r-f coils, to establish an intermediate frequency, which may be 1,600 kc. The broadcast tuning is accomplished by connecting the tuning condenser as usual across these secondaries, and as that condenser will have its own built-in trimmers, the circuit again can be trimmed, say, at 1,000 kc. Hence there is no sacrifice of sensitivity and selectivity.

But the trimmers must be small, not more than 35 mmfd., maximum, otherwise the dual use of trimmers might defeat full wave band coverage for broadcast reception.

5-Tube T-A-F or 7-Tube SW Super

When a three-deck, two-point low-capacity switch is thrown to one position a five-tube tuned radio frequency set is in use for broadcast reception. When the switch is thrown to the other position a seven-tube short-wave superheterodyne is in use. The same switch may have a shorting contact to be used for cutting out the two extra tubes when broadcasts are to be received.

To avoid extra switching, the tuning condensers are so connected that the stators of the first and second sections are left at grids of the 230 tubes. A small condenser, 0.6 mmfd., establishes the coupling for the mixer. As this condenser remains in position for broadcasts, squealing might result, in which case the primary or secondary connections of the first interstage transformer are reversed, that is, the lead used for grid return goes to grid instead, or that used for plate return goes to plate instead, and the remaining leads go to their proper destinations. Then the small condenser acts in a neutralizing manner.

The two extra tubes do not put any extra drain on the set, except as to plate current, which is only a few milliamperes. It is fortunate that the total plate current in the five-tube set is under 60 milliamperes, and as the rating of the 230 tube is just 60 milliamperes filament current, the plate current of the rest of the set is passed through the filaments, and the 2-volt voltage drop across each filament results. Therefore, also 4 volts are added to the negative bias on the pentode, but this is immaterial.

To work the tubes in this manner it is necessary to have the B supply choke in the negative leg of the rectifier. This choke is the field coil of the dynamic speaker. Instead of returning the negative lead of the rectifier directly to ground the connection is completed through the two series-connected filaments. By shorting out these filaments the two 230 tubes are made inoperative. Ground is positive in respect to B minus of the power transformer and thus may be regarded as A plus.

For the modulator tube no bias is needed, especially as grid-leak and condenser modulation is used, and the plate voltage is relatively low, equal to the screen voltage on the —35 tubes in the set proper. For the oscillator some bias negative is advisable, and it may be established at 2 volts, as shown in Fig. 1, by utilizing the voltage drop in the filament of the modulator. This requires that the B current from the set be led through the series-connected filaments in the particular manner shown.

It will be noted that the intermediate frequency is outside the broadcast band, hence there is no danger of picking up broadcasting stations direct, when using the converter, an assurance that might not apply if any frequency in the broadcast band were used. It is not adamant that the intermediate frequency be just 1,600 kc. It may be any frequency in that region. There is a manual trimming condenser across the modulator that

Short Wave Club

ARE you interested in short waves? Receivers, transmitters, converters, station lists, trouble shooting, logging, circuits, calibration, coil winding—what not? If so become a member of Radio World's Short Wave Club, which you can do simply by filling in and mailing attached coupon. Or, if you prefer,, send in your enrolment on a separate sheet or postal card. As many names and addresses as practical will be published in this department, so that short wave fans can correspond with one another. Also letters of general interest on short wave work will be published. Besides, manufacturers of short wave apparatus will let you know the latest commercial developments. Included under the scope of this department is television, which is spurting forward nicely.

The following is a list of new members of the Short-Wave Club:

rter Uses One Dial 15 to 550 Meters by Switching

Bernard

enables some latitude in the choice of the intermediate frequency. Normally the frequency might be a little lower than 1,600 kc.

Some difficulty might arise in establishing the intermediate frequency, unless directions were given. There are several methods. One is to tune in a broadcasting station on the t-r-f set at or near 1,500 kc, thus being sure that such a station is receivable, turn switch for short waves but short the 230 filaments, connect aerial to the plate of the non-functioning modulator, and tune the two equalizers across only the secondaries to bring in 1,500 kc. You will know of course that the equalizers must be turned out, less capacity used, to get above 1,500 kc in frequency, so turn both trimmers half a turn. Then when the receiver is worked for short waves these trimmers may be reset to make the reception of a short-wave station as loud as possible.

If you have a modulated oscillator that tunes in the broadcast band it likely goes a little higher than 1,500 kc, so select the highest frequency, turn on the modulation, put the modulated carrier in at the plate of the non-functioning modulator, and set the trimmers previously referred to until response is loudest. You will then know that the intermediate channel is lined up and also what is the intermediate frequency.

As stated before, the difference in intermediate frequency in various installations will be taken up by the manual trimmer, which is on the front panel.

Coil Information

Since the intermediate frequency is high, the oscillator has to be padded, at least for the first short-wave band. This can be accomplished by putting 0.0001 mfd. or a slightly higher capacity in series with the oscillator tuning condenser (to reduce the capacity to around 80 mmfd.) and using 30 turns on the oscillator secondary. The equivalent modulator winding has 40 turns. The wire is No. 28 enamel and the diameter is 1 inch.

Two coils are wound, modulator and oscillator, on 1 inch diameter. The antenna winding consists of 15 turns of No. 24 single or double, silk-covered wire. To the right the largest modulator secondary winding is put on, 40 turns as stated. The separation is 1/16 inch. Then on the other side of the antenna winding the second modulator grid coil is put on, consisting of 18 turns, No. 28 enamel, and then the smallest winding, 7 turns of No. 18 enamel, the separation in each case being 1/8 inch. The oscillator coil should be at right angles, or, if parallel, a shield wall should be between the two coils, the wall grounded. The shielding therefore need not be complete.

The plate winding consists of 20 turns of No. 28 enamel wire, the first or largest grid winding of 30 turns of No. 28 enamel, on one side of the plate coil, as in the diagram, the next winding, on the other side of the plate coil, 17 turns of No. 28 enamel, and the last 7 turns of No. 18 enamel, the separation always 1/16 inch. All winding on a given form are in the same direction. The polarities as disclosed in the diagram should be followed strictly for the oscillator. For the modulator it makes small difference if some other method than the one shown is used.

This coil system is a good one, since it results in oscillation at all points of the oscillator tuning, and moreover it is simpler than the six-separate-coil system.

When to Listen In Short Waves

The t-r-f coils may be of the commercial type, but since the primaries may be a little larger than they normally ought to be for 1,600 kc, there might result some oscillation at the intermediate frequency, a trouble cured by increasing the value of the limiting resistor in the volume control circuit (shown as 800 ohms, but may be 1,000 or 1,200 ohms to correct the stated defect.)

The rest of the circuit follows the approved lines for a t-r-f receiver and will give exceptionally good broadcast results. The short-wave reception will be good, also, although it should be borne in mind that not all frequencies can be well received over great distance at any and every hour of the day. Some guidance as to what waves to tune in may be derived from the following indicative table:

Listen in from	*To receive these wavelengths*
6 a. m. to 3 p. m.	14 to 20 meters
11 a. m. to 10 p. m.	20 to 33 meters
8 p. m. to 4 a. m.	33 to 70 meters
Any time	70 meters up*

*Little DX need be expected above 70 meters under any circumstances.

The time is drawing near when European stations will be heard best by those located in the Eastern and Central parts of the United States, and it will become increasingly difficult to pick up South American stations.

The time given refers to local time. Some tables are published that give the hours that short-wave stations are on the air either in Eastern Standard Time only, or in Eastern, Central, Mountain and Pacific Standard Time. Where only EST is given, and if you live in another time zone, convert to local time. Thus for Central time subtract 1 hour, for Mountain time subtract 2 hours, and for Pacific time subtract three hours.

When daylight saving time goes into effect, compensation for that has to be made, and it usually requires that an hour be subtracted.

For television stations, however, the time is usually given in the local standard time of the transmitter, and compensation has to be made to that end, as well as later, in required instances, for daylight saving time.

The wavelength range of the mixer outlined will be from about 15 to about 205 meters, so that the hours for listening are well encompassed by the above table.

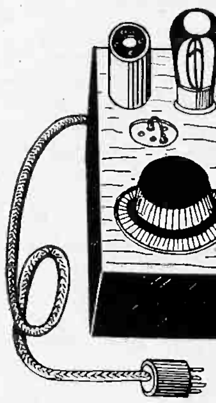
Wesley Greenwood, 133 Queen St., Dover, Delaware.
Dominic Lafiandra, 326 W. 26th St., c/o Paganelli, New York, N. Y.
Joe Shea, Hound No. 72, Atlantic Coast D X Club, 3054 Kingsbridge Ave., New York, N. Y.
Arthur Steinberg, 515 1st Street So., New Ulm, Minn.
Edward Applebaum, 334 Johnson Ave., Newark, N. J.
Harry Gruber, 738 Walsh Ave., St. Paul, Minn.
V. S. Edwards, 37 Lusard St., Painesville, Ohio.
Cedrick D. Justis, Newport, Delaware.
G. H. Schubert, 753 W. 32nd St., Chicago, Ill.
T. J. Smith, Jr., 403 Hartson St., Syracuse, N. Y.
Speros Pechilis, 10 Union St., Ipswich, Mass.
H. F. Bender, 918 Charles St., Louisville, Ky.
Melvin Manley, 214 Collins St., Midland, Mich.
Walter Radetzky, 8833-181st St., Jamaica, L. I., N. Y.
Warren Falls, 22 Munroe St., Lynnfield, Mass.
Ralph E. Puff, 397 Church St., Poughkeepsie, N. Y.
Lester Mathison, Box 11, Hayfield, Minn.
American Radio Service, Box 335, White Plains, N. Y.
V. W. West, Kiowa, Okla.
Harold Howard, 124 W. 117th St., New York, N. Y.
Archie Miller, 496 Maple St., Manchester, N. H.
Peter M. Verbruggen, Jr., 10546 Knodell Ave., Detroit, Mich.
Charles F. Langenhagen (W2BFG), 402 Hughes St., Bellmore, L. I, N. Y.
Carl Tischer, 239 N. Johnson St., Neillsville, Wisc.
Ivan G. Dyer, 4019 Shields Blvd., Oklahoma City, Okla.

Canadian Stations by Call and Frequency

Station	*kc*	*Station*	*kc*	*Station*	*kc*	*Station*	*kc*	*Station*	*kc*
CFAC ...	690	CHCK ...	1010	CJGC ...	910	CKIC ..	1010	CNRE ...	930
CFBO ...	890	CHCS ...	1120	CJGX ..	630	CKLC ..	840	CNRH ..	910
CFCA ..	1120	CHCT ...	840	CJOC ...	1120	CKMC ..	1210	CNRL ..	910
CFCF ...	1030	CHGS ...	1120	CJOR ...	1210	CKMO ..	730	CNRM ...	730
CFCH ...	930	CHLS ...	730	CJRM ..	665	CKNC ..	960	CNRO ...	600
CFCL ...	930	CHMA ..	580	CJRW ..	665	CKOC ..	1010	CNRQ ...	880
CFCN ...	985	CHML ..	880	CJSC ...	690	CKOV ..	1200	CNRR ...	960
CFCO ...	1210	CHNS ...	910	CKAC ...	730	CKOW ..	840	CNRS ...	910
CFCT ...	630	CHRC ...	645	CKCD ..	730	CKPC ..	1210	CNRT ..	840
CFCY ...	580	CHWC ..	960	CKCI ...	640	CKPR ..	890	CNRV ..	1030
CFJC ...	1120	CHWK ..	665	CKCK ..	960	CKUA ..	580	CNRW ..	780
CFLC ...	1010	CHYC ..	730	CKCL ..	580	CKWX ..	730	CNRX ..	960
CFNB ...	1210	CJBC ...	690	CKCO ..	890	CKX	540	CPRY ..	690
CFQC ...	910	CJBR ...	960	CKCR ..	640	CKY	780		
CFRB ...	690	CJCA ...	930	CKCV ..	880	CNRA ...	630		
CFRC ...	930	CJCB ...	880	CKFC ..	730	CNRC ...	690		
CHCA ...	690	CJCJ	690	CKGW ..	840	CNRD ...	840		

A New Converter,

Economical Converter, $7.60



THOSE who desire to enjoy short-wave results from a converter they build themselves may obtain from us for only $7.60 complete parts (less tubes) for a totally a-c powered device, 24-200 meters. The Polo Economical Converter Kit consists of rugged and substantial pa:ts—nothing aesthetic, you know, but something that really does perform.

This converter uses three 237 tubes and has its own power supply with "B" choke, 16 mfd. filter capacity, and husky power transformer. Two independently tuned circuits. High sensitivity. The circuit is expertly designed and received certificate of merit from Radio World Laboratories. No plug-in coils. The complete parts, including cabinet (less tubes) sell for only $7.60. Operating cost, 1/10c per hour. No one has ever reported failure to get real results after building the Polo Economical Converter. This converter has been thoroughly tested and works on all sets, including superheterodynes. Five-day money-back guarantee. For 110v (50-60 cycles a-c.) Sold only as a kit, not in wired form.

Economical Converter Kit and blueprint, less tubes (Cat. ECC) $7.60
Three 237 Tubes (Cat. T-ECC), all three........................ 3.15
Blueprint No. 230 (Cat. BP-230)................................ .25

Testimonials!

Got Foreign Stations on Broadcast Set

We may say in all sincerity that the Polo Midget Radios (Cat. PM) are the finest value for the money we have yet seen in the radio trade.

We were able to receive foreign stations here with your set when not even a trace of the carrier wave could be obtained on one of the latest of superheterodynes costing almost twice as much. All our customers are delighted and you may rest assured we shall stick to Polo midgets.

A. M. PENMAN & COMPANY,
Duckworth Street, St. Johns, Newfoundland.

* * *

Mexico City from Pittsburgh

Doubt if I can pay you a higher compliment to your truly marvelous midget set than to order a second one. We had Mexico City distinctly, then WEAF, WJG, WGY, WENR, all clear, with no fading and without an outside aerial.

F. J. WALZ, M.D.,
Forbes Building, Pittsburgh, Pa.

* * *

Lauds Tone and DX

Your midget, Cat. PM, is a good coast-to-coast receiver. I tuned in many distant stations. I got Cuba and Mexico at 8 p.m. Saturday. Tone excellent. Very well pleased.

JOHN TANNER,
6027 No. Philip Street, Philadelphia, Pa.

* * *

Pennsylvania Gets Pacific Coast

Kindly forward to me another Polo Midget, Cat. PM. Results I am getting from my first set include Chicago in the daytime and KFI and KOA at night, and I am only 60 miles from the Atlantic coast.

CHARLES M. POTTER,
216 George Street, Norristown, Pa.

* * *

Junior Model a Knockout, Too

Received your Cat. PJM. It is hot. Have had KFI on several occasions and XEW, Mexico, several times.

CHARLES STRAYER,
Shepherdstown, West Va.

* * *

Praises Superior Tone

The PJM set is very satisfactory and is far more selective than any other small set of the radio frequency type I have ever seen. With 125-foot aerial I still have plenty of selectivity and on good nights can bring in WTAM, WLW, KDKA, and have several times had WABC with volume enough to be heard clearly. Also the tone is superior to any set anywhere near it in price.

G. M. RAMSEY,
400 Otis Bldg., Santa An,a Cal.

* * *

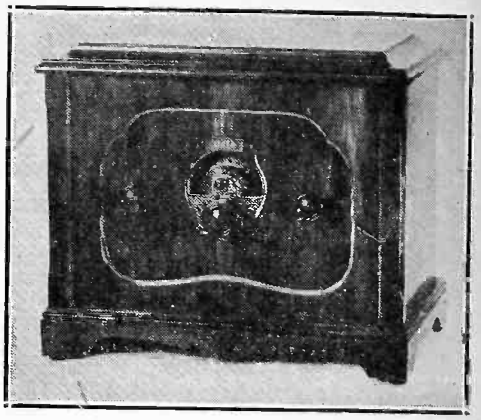
"Marvelous" Junior Midget

I have been using your Junior Midget (PJMT) for about a month and find it marvelous. It is more sensitive than my big set. I have received, all with plenty of volume, five California stations: KNX, Hollywood; KEI, Los Angeles; KGO, San Francisco; KHJ, Los Angeles; KFOX, Long Beach, Cal.; three Mexican stations: XEW, Mexico City; XEB, Mexico City; XED, Reynosa; two Cuban stations: CMCU, Havana; CMCD, Havana; five Texas stations: KFUL, Galveston; WOAL, San Antonio; KPRC, Houston; WBAP, Fort Worth; WFAA, Dallas; one Utah station, KSL, Salt Lake City; two Denver, Colo., stations: KOA, KFEL, besides about 150 stations in the middle and eastern States and Canada. XEW comes in like a local almost any night about 11.30 p.m. Atlantic Standard Time and KNX about 12.30 A. S. T.

DONALD WRIGHT,
1252 Prince St., Truro, Nova Scotia, Can.

GET EUROPE!

But why stop at Europe? Try for Asia, the Antipodes, or any spot on earth that transmits short waves. The Europe-Getter does not necessarily stop at Europe. It is a positively amazing performer—not "one of those things" but a short-wave converter that thrills you with its big doings. And it works on any set, including a superheterodyne. Sold either in wired form or as a kit.



WE are as hard-boiled as any one on short-wave converters. We are testing all makes constantly, and in general the less said the better. Our converters are utterly dependable—Cat. ECC for more modest results at little money, and the Europe-Getter for the world's finest results, with no great fortune at stake, either. This Europe-Getter is by far and away the greatest and best converter we have ever tested, and although we say it who make it, we back up our statement with our 5-day money-back guarantee. The Europe-Getter is our Cat. DX-3W (for the wired with tubes model) and DX-3K for the kit (less tubes).

Everything is of the finest in this converter. In the really beautiful cabinet is the precision chassis. Wave band switching is done from the front panel—15 to 200 meters guaranteed—while the B supply is built in. The tubes are one 224 and two 227. Only two external connections to make. And never any plug-in coil nuisance.

Volume is tremendous, selectivity is razor-like, your broadcast set may be tuned to any frequency in its range, and still the whole world lies before you.

Midgets That Lead the

CAT. PM

The Polo small-sized broadcast receivers are the Polo Midget (Cat. PM at left), the Polo Junior Midget (Cat. PJM), immediately at right, and the Polo Senior Midget (Cat. SM) at extreme right. These wired sets can not be exceeded in performance, tube for tube. Our 5-day money-back guarantee applies, of course.

CAT

Our 5-tube standard of excellence is the vari-mu-pentode wired set for broadcast coverage, Cat. PM (above). See testimonials at left. They tell our story better than we can. Tubes used: two 235, one 224, one 247, one 280. For 110 v., 50-60 cycles a-c. Five-day money-back guarantee. Cat. PM (less tubes) @ $19. Cat. PMT (with tubes) @ $23.00.

Eveready-Raytheon or Arc

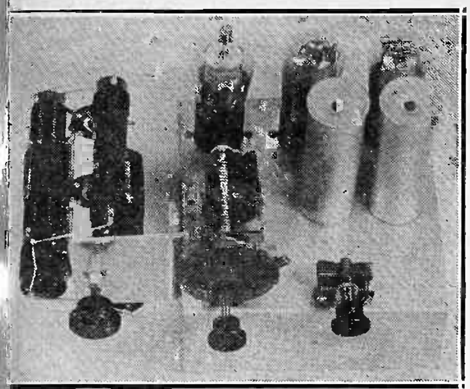
POLO ENGINEE

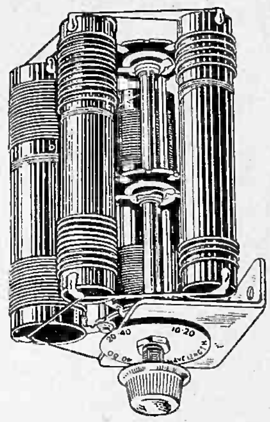
125 WEST 45th STREE

Telepho

[Complete line o

the Europe-Getter!





THE DX-3W chassis is illustrated above. At right is a clear picture of the coil-switch arrangement. The 227 tubes (rectifier and oscillator) are at right rear on the chassis, the modulator tube at left. The left-hand switch controls wave bands. There are four settings: 10 to 20, 20 to 40, 40 to 80 and 80 to 200 meters. The settings are marked. A long switch is used to pick up each of the four coils at a time—and leads are kept extremely short. The main tuning capacities are a two-gang Hammarlund 0.00014 mfd. condenser. At right is a modulator trimming condenser for perfect resonance regardless of the receiver frequency (intermediate frequency) used. The two grey cylinders are 8 mfd. condensers in the rectifier filter.

The coil-switch assembly has a metal bracket whereby we fasten the assembly to the chassis.

The Europe-Getter is a superheterodyne type short-wave converter, works on any set and is sold as kit or wired model on a 5-day money-back guarantee.

"*Europe-Getter*," short-wave converter, wired model, with tubes: one 224, two 227. For 110v., 50-60 cycles a-c. Cat. ADF @ **$32.50**
Kit for above, less tubes, Cat. TGP @ **21.50**
(Battery-operated models available. Write for data.)
Coil-Switch Assembly, 15-200 meters, as used in this converter; bracket included (illustrated). Cat. CSA @ **$7.05**
Above assembly with two-gang 0.00014 mfd. Hammarlund condenser. Cat. CSHC @ **$9.87**

'orld in Performance!

At left is shown our Junior Midget, using the same tubes and circuit as our Cat. PM, but smaller in size and lower in price. Cabinet is 15½" high x 9" deep x 11½" wide. Testimonials prove the unsurpassed performance for a set of this size. In fact, this very small set, in point of performance, exceeds many large superheterodynes and is a most welcome addition to any home. Cat. PJMT (junior midget with two 235, one 224, one 247 and one 280 tubes) @ **$18.00**

CAT. PMST

The Senior Midget, Cat. PMS, is the same as Cat. PM, except for difference in cabinet and the fact that two 247 tubes are used in parallel at the output. A little more volume is developed by the parallel-output-tube method. Th model is sold as Cat. PMST, with tubes, @ **$26.50** The five-day money-back guarantee attaches.

ubes supplied at our discretion.

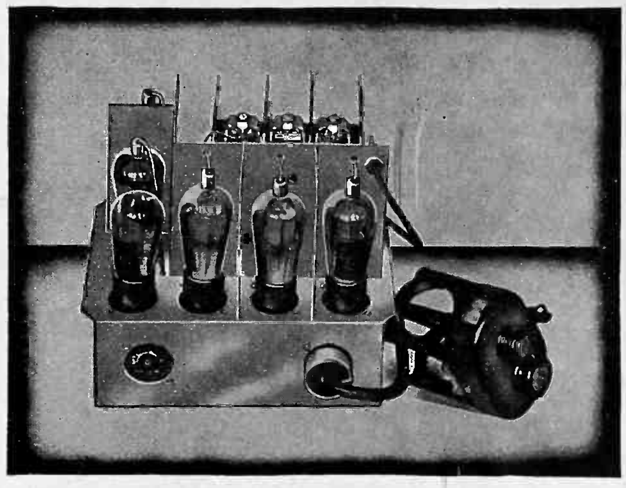
G LABORATORIES

NEW YORK, N. Y.

}yant 9-6516

bition at our office.]

Wired Auto Set, $31.50



A SUPER-SENSITIVE six tube radio frequency set (wired), using the new auto type tubes, two r-f pentode 239's, one 236, one 237 and two 238's. A special tuned r-f circuit in conjunction with push-pull pentode amplification provides marked selectivity and sensitivity with flawless reproduction. The chassis is cadmium plated, mounted in a cadmium plated metal box, rust-proof. Remote control mounted on the steering post directly without any drilling or defacing of the automobile. A full size electro-dynamic speaker, steel battery box for "B" batteries, complete set of suppressors for the spark plugs and a by-pass condenser for the generator complete the equipment.

This auto set is one that, despite low price, gives excellent results. It is on the same high plane of performance as are all our products. Perfection must be achieved at the factory before we even broach the product to our public. Polo products are unexcelled.

The auto set is furnished only in wired form, in two models, one for cars with negative "A" grounded, other for cars with positive "A" grounded, distinguished by "P" and "N."

Cat. AUT-N (less tubes) @.......... **$31.50**

Cat. AUT-P (less tubes) @.......... **$31.50**

Our Guarantee!

WE guarantee all the products advertised on these two pages to be absolutely leaders in their class, with unequalled sensitivity, thrilling tone and real selectivity. Buy anything advertised on these two pages. Try it for five days. If you find as good a device at twice the price, or believe that performance or workmanship are in any way less than claimed, or for any other reason don't desire to retain the product, we will promptly refund the purchase price. No other manufacturer thinks that much of all his merchandise.

"Five days" means you have five days after actual receipt of merchandise, not including date of receipt thereof, nor date of return, in which to take us up on any or all parts of our challenge guarantee.

"Play Safe with Polo!"

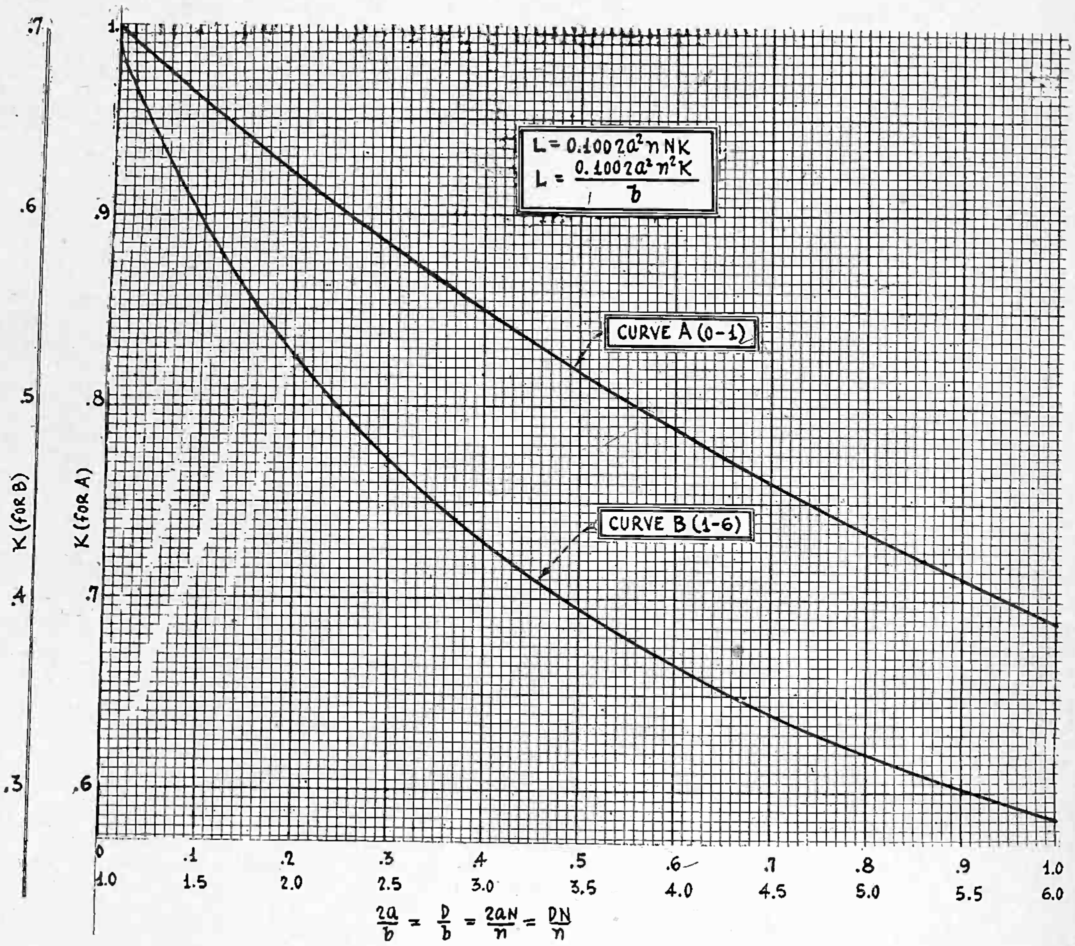
SERVICE SHEET No. 4—

INDUCTANCE COMPUTATION

Curves Giving the Shape Factor K for Single-Layer Solenoids

CALCULATION of the inductance of a single layer solenoid of circular cross section cannot be done without the aid of a table giving the shape factor of the coil, that is, a factor which depends on the ratio of the diameter of the coil to the length of the winding, or in place of a table, curves plotted from such a table. Curves A, B, and C give the shape factor K for various values of the ratio of diameter to the length of the winding from zero to 9.55. Curve A covers the range from zero to 1, Curve B from 1 to 6, and Curve C from 6 to 9.55. The scales are such that the shape factor K can be obtained for any value in the zero to 9.55 range to three decimal places, the last place being estimated on Curves A and B and given directly on Curve C.

The inductance formula is given in two different forms on the sheet containing Curves A and B. In these formulas a is the radius of the coil in inches, n the total number of turns, N the number of turns per inch, and b is the length of the winding in inches. The first formula is suitable for use when the length of the winding is not known, for example, when a coil of given inductance is to be wound on a given form with a given size of wire or a given number of turns per inch. The second formula is suitable for use in computing the inductance of a coil already wound where the length of the winding can be measured.



The curves in this graph give the values of the shape factor K for different values of the ratio of the diameter of the coil to the length of the winding. The form ratio is given along the abscissas and the value of K along the ordinates.

The argument of K, that is, the number on which it depends, is the ratio of the diameter of the coil to the length. It is given in four different forms along the axis of abscissas. The first two of these are identical because twice the radius a is equal to the diameter D. The second two are also identical for the same reason, but in these the length of the winding has been expressed in terms of the total number of turns and the number of turns per inch. It is obvious that if the length of the winding is b inches and if there are N turns per inch, $Nb=n$, or that $1/b=N/n$, whence the equality of the four different expressions. The first two forms are suitable for use when the second formula for inductance is used and the second two forms when the first inductance formula is used.

It is seldom that a coil having a form ratio smaller than 0.2 is used, which means that the winding is five times as great as the diameter. Also, it is seldom that a coil having a form ratio greater than 9 is used, which means a winding so short that the diameter is nine times greater than the length of the winding.

As an illustration of the use of the inductance formulas let us calculate the inductance of a coil 2 inches in diameter containing 50 turns of wire and wound so that the length of the winding is one inch. Here we have $a=1$, $n=50$, and $b=1$. The value of D is 2 and therefore the form ratio $D/b=2$. The value of K for this we find on Curve B and it is 0.526. Now we have all the factors entering into the second formula for L. Putting them in and simplifying we obtain L=132 microhenries.

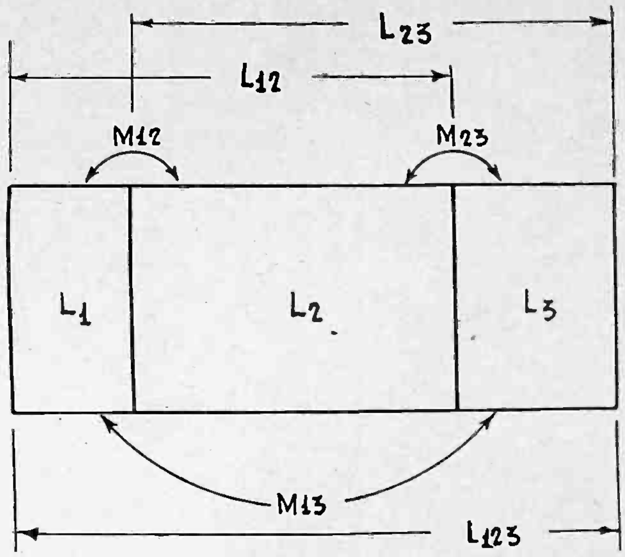
If we know the value of N we can also use the first formula for computing the inductance. For example, what is the inductance of a coil containing 50 turns of No. 26 enameled wire on a form 2.5 inches in diameter, assuming that the wire is wound as closely as possible? In Service Sheet No. 2 we find that No. 26 enameled wire winds 59.1 turns to the inch. Hence we have $a=1.25$, $n=50$, $N=59.1$, and $DN/n=2.955$. The K for this we find on Curve B, and it is 0.732. Putting these values in the first formula for L we obtain L=340 microhenries, very nearly.

When inductance coils of very small value are to be designed the form ratio usually becomes larger than the highest value for which K is given in Curve C. Hence they cannot be designed directly. However, such coils should be wound with spacing between turns to lower as much as possible the capacity. Therefore we can proceed backwards, so to speak, to find the number of turns. We can first assign a form ratio and thereby fix the value of K. After that it is very simple to find the number of turns required. Let us illustrate with a numerical example. Suppose we wish to wind a coil of one microhenry on a form 1.5 inches in diameter. This coil will not have many turns, and even if we use heavy wire, or a small number of turns per inch, the form ratio will be large. Let us assume that it will be 9.5. In Curve C we find that K for this value is 0.2105.

Since $9.5=2aN/n$, $N=9.5n/2a$. If we substitute this value of N in the first formula and simplify we obtain $L=0.476aKn^2$. In this we know all the factors except n. Putting in all the known factors and simplifying we obtain $n=3.64$.

It remains to determine the size of wire to use, or rather the largest size that is physically possible. We have $9.5n=DN$, or $N=23.1$. In Service Sheet No. 2 we find that No. 18 enameled wire winds 23.9 turns to the inch and that heavier wire winds fewer turns than 23.1 to the inch. Hence the largest wire that can be used is No. 18 enameled. Of course we can use any wire that winds more than 23.1 turns to the inch, but whatever wire is used it should be wound so that there are 23.1 turns to the inch. If the turns are crowded more closely the inductance will be greater and if they are spaced more widely the inductance will be less.

Computation of Mutual Inductance



The method of computing the mutual inductance between two single layer solenoids wound on the same form at a distance apart.

SOMETIMES it is necessary to determine a mutual inductance between two coils wound on the same form. When the two coils are wound with the same size wire in the same manner and on the same diameter, the mutual inductance between them can be computed with the formula used for computing the inductance of either.

In order to fix the conditions let us refer to Fig. 1, in which L^1 and L^3 are the two windings the mutual inductance M^{13} between which is to be determined. First imagine that the space between them is also filled with wire of the same size. Let this imagined inductance be L^2. Also, let us call the mutual inductance between L^1 and L^2, M^{12}, and the mutual inductance between L^2 and L^3, M^{23}.

We can compute separately the inductance of the entire coil, that is, of L^1, L^2, and L^3 considered as a single coil. Let us call this inductance L^{123}. We can also compute the inductance of L^1 and L^2 considered as a single coil, and also that of L^2 and L^3 considered as a single coil. Let these inductances be designated by L^{12} and L^{23}, respectively.

We know that $L^{123} = L^1 + L^2 + L^3 + 2(M^{12} + M^{23} + M^{13})$. Of these we know all but the three mutual inductances. Hence in order to find the mutual between L^1 and L^3 we must first find the two mutuals M^{12} and M^{23}. These can be found from the two formulas $L^{12} = L^1 + L^2 + 2M^{12}$ and $L^{23} = L^2 + L^3 + 2M^{23}$. If we solve these two for the mutual inductances and substitute in the equation giving L^{123} we obtain $L^{123} = (L^1 + L^2 + L^3) + L^{12} - (L^1 + L^2) + L^{23} - (L^2 + L^3) + 2M^{13}$. When we simplify this by canceling we obtain $L^{123} = L^{12} + L^{23} - L^2 + 2M^{13}$. Solving this for M^{13} we get $M^{13} = [(L^{123} + L^2) - (L^{12} + L^{23})]/2$.

Therefore we can obtain the mutual between L^1 and L^3 by computing the inductances L^{123}, L^2, L^{12}, and L^{23}.

The formula ordinarily used for computing the inductance of a single layer solenoid is $L = 0.1002a^2nNK(2aN/n)$, in which L is the inductance in microhenries, a is the radius of the coil in inches, n is the total number of turns, N is the number of turns per inch, and K is the shape factor.

In this formula a and N are the same for all the coils involved in the mutual inductance between L^1 and L^3. But n is different and since K depends on n, K is also different. The formula for M^{13} therefore takes the form $M^{13} = 0.0501a^2N[(nK)^{123} + (nK)^2 - (nK)^{12} - (nK)^{23}]$. Hence knowing the diameter of the coil, or radius, and the number of turns N per inch, we count the number of turns, n, for each of the four coils and compute the four values of K.

As an example of the use of the formula let us take a coil having one winding of 50 turns and another of 75 turns of No. 32 enameled wire wound on a diameter of 1.75 inches. Also, let us assume that the space between the coils is one inch. What is the mutual inductance between the two coils?

Here the diameter of the form is 1.75 inches. Hence $a = 0.875$ inch. The wire chosen winds 112 turns to the inch. Therefore $N = 112$. Putting these values into the formula we have $M^{13} = 4.3[(nK)^{123} + (nK)^2 - (nK)^{12} - (nK)^{23}]$. The number of turns in the imaginary coil in the middle is 112 since the space is one inch. Hence the number of turns in the entire coil (123) is 237, the number in L^2 is 112, the number in L^{12} is 162, and the number in L^{23} is 187 turns.

The corresponding arguments of the shape factors, that is, the various values of $2aN/n$, are 0.8275, 1.75, 1.21, and 1.048. Hence if we put these values in the formula we have $M^{13} = 4.3[237K(0.8275) + 112K(1.75) - 162K(1.21) - 187K(1.048)]$. We have to look up the four values of K in a table to proceed. $K(0.8275) = 0.7283$, $K(1.75) = 0.5579$, $K(1.21) = 0.6456$, and $K(1.048) = 0.6781$. Hence $M^{13} = 4.3[172.6 + 62.5 - 104.5 - 126.8] = 16.34$ microhenries.

In view of the fact that by this method the mutual inductance is the difference between two nearly equal numbers, it is necessary to compute each component accurately or there will be a large error in the computed value of the mutual.

If there is no space between the two coils, the mutual inductance between them can be computed by the simpler formula $L^{12} = L^1 + L^2 + 2M^{12}$. That is, the inductance of the two coils considered as one is first computed. Then the inductances of the two coils are computed separately and the sum subtracted from the inductance of the entire winding. The difference is then divided by two to give the mutual inductance. Let us apply this to the case where two equal coils of 50 turns each on a one inch diameter are wound without any separation between them. Assume the wire is such that it winds 112 turns to the inch. The inductance of the two windings considered as one coil is 186.4 microhenries. The inductance of either of the two equal windings is 70 microhenries. Hence the sum of the inductances is 140 microhenries. The difference between 186.4 and 140 is 46.4 and therefore the mutual inductance is 23.2 microhenries.

"Megacycles" Used for Describing Ultra Waves

Television fans will shortly be using the term "megacycles" as generally as radio fans now use the term "kilocycles" according to Joseph D. R. Freed, engineer-chairman of the board of the Freed Television and Radio Corporation.

"The term 'kilocycles' came into general use because it was too clumsy to refer to stations' frequencies in cycles," points out Mr. Freed. "For instance," he states, "it was found easier to remember 710 kilocycles than it was to remember 710,000 cycles and it sounded less technical as well. Likewise television fans will find the term kilocycles unwieldly when the quasi-optical field is used since wave lengths down in the ultra short wave band are designated by millions of cycles. The N.B.C. transmitter atop the Empire State Building, New York, is using frequencies of 44,000,000 cycles for voice and 61,000,000 for pictures. It is unquestionably simpler to refer to these waves as 44 megacycles and 61 megacycles."

The 15-550-Meter "Comet"

Precision Type Receiver for World Range

By Lewis W. Martin

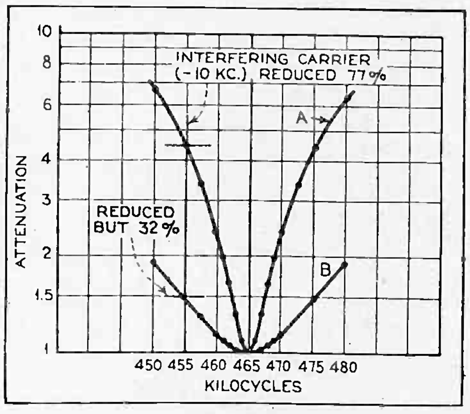


FIG. 2

These curves show the attenuation of two 465 kc circuits for different power factors. Curve A has the lower power factor, or the higher selectivity.

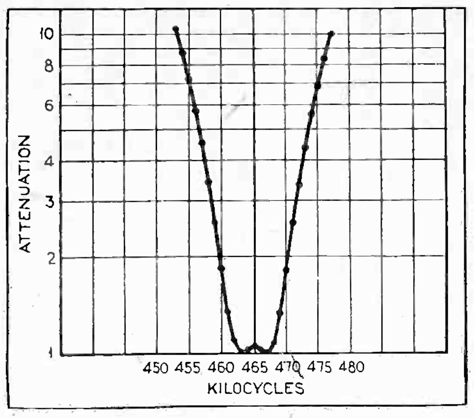


FIG. 3

This is the attenuation curve of a band pass filter having peaks 2 kc off the mean frequency, which is 465 kc. A high order of selectivity is indicated without excessive cutting of essential side frequencies.

The first instalment was published last week. Part III, the conclusion, will be printed next week.

Part II

A MAXIMUM spread between a desired signal and its image interference is important on short waves. On the other hand, modern design necessitates the use of an intermediate frequency materially lower than that of any of the signals to be received. For these reasons 465 kc was chosen as the intermediate frequency for the "Comet."

New Isolantite Coils

The interchangeable plug-in coils are wound on treated Isolantite forms. This material has very low dielectric losses which are very important especially at high frequencies. In addition, its extremely stable physical characteristics insure constant inductance with consequent reliability of dial calibration, which is very important at short waves where the tuning is necessarily quite critical. The wavelength coil for the lower broadcast frequencies has a very high inductance value, and this is secured by a "two bank" winding of the same "Litz" wire used in the intermediate coils. This results in a very low-loss winding with attendant high gain and selectivity.

Fig. 5 shows the tuning ranges of each of the five sets of coils. Ample overlap is provided, insuring complete coverage of the entire range of 14 to 550 meters.

Novel Filter System

A '24-A type screen grid tube is used as a first detector or "mixing" tube. Its high detector sensitivity as well as its high output impedance make it ideal for this purpose as it works into the high impedance tuned plate coil of the first intermediate transformer. A further advantage of this tube is its high input (grid) impedance, with correspondingly low effective input (grid) capacity, which permits a larger wavelength range with a given coil and tuning condenser.

The second detector is also a '24-A type screen grid tube working as a plate circuit rectifier. Its control grid is automatically biased by a cathode resistor resulting in substantially linear power detection. In addition to audio frequencies, there is also a large component of intermediate frequency present in its plate circuit. This i-f component is filtered out by means of a two stage low pass filter consisting of two 85 millihenry r-f chokes and three .00025 by-pass condensers. These two filter stages are separately shielded from each other. This elaborate filtering is extremely important, as otherwise the i-f component would also be amplified by the output pentode and would appear in its output circuit causing overall feed-back to the input of the receiver resulting in great instability and seriously limiting the usable amount of intermediate amplification.

The type '47 pentode is used as the output or last stage audio amplifier. This tube makes an ideal combination with a '24 type screen grid tube operated as a linear power detector. Such a detector, resistance-capacity coupled, easily provides sufficient input voltage to the grid of the pentode, thus obviating the need for a coupling transformer or an intermediate audio stage. The resistance-capacity coupling between the power detector and the output tube preserves the fidelity of the detector output and results in exceptionally clean and faithful reproduction of speech and music. A tone control is provided in the plate circuit of the pentode which enables the listener to modify the response at the higher audio frequencies to suit.

The Station Finder

An important feature of the "Comet" is the "long-wave" oscillater, which can be started and stopped by a switch on the panel. It consists of a '27 type tube and associated circuits, and its output is loosely coupled capacitively to the grid of the second detector. Its circuits are adjusted to oscillate at 465 kc, which is the frequency for which the intermediate amplifier is tuned. Inasmuch as all incoming signals, of whatever frequency, are shifted to 465 kc by the action of the heterodyne oscillator and the first detector (or mixer) it will be evident that starting the 465 kc oscillator will produce an audible beat note (or whistle), since the signal (coming through the intermediate at approximately 465 k.c.) and the output of the beat oscillator are both impressed on the grid of the second detector. Thus the "Comet" is ideal for pure C.W. reception—the pitch of the beat can be adjusted by means of the left hand vernier which controls the heterodyne oscillator. Although this feature is primarily intended for C.W. code reception, it is also extremely useful in searching for all signals. It is quite easy to skip over stations, especially when tuning in the very short waves. However, all chance of missing a station can be avoided by first turning on the long wave oscillator. Then as the main tuning dial is slowly turned a loud whistle will be heard each time a carrier wave is crossed. When such a whistle is heard it is a simple matter to adjust the dial for zero beat (approximately), which makes the whistle low in pitch. This process automatically tunes in the signal very accurately. After turning off the oscillator, speech or music will be heard, provided the carrier is that of a phone or broadcasting station.

Controlling Volume

The use of type '35 variable Mu tubes in the intermediate stages assures extremely smooth control of the amount of intermediate amplification between wide limits. The actual control consists of a tapered wire-wound variable resistance in series with the cathodes of the two intermediate amplifier tubes. By this means the loud speaker output may be adjusted to suit the case, whether the signal be from a powerful near-by station or from a foreign station thousands of miles away.

The receiver is substantially "single control." The left hand vernier provides a very fine adjustment for the oscillator tuning and proves very helpful when receiving the very short waves. The right hand vernier controls the wavelength tuning and is most valuable in receiving the longer waves. Under ordinary operating conditions, most stations can be tuned in with the main control alone irrespective of vernier settings. When a station is heard, it can then be tuned in accurately by means of the verniers. When a signal has been tuned in this manner, other stations a few degrees above or below it may be tuned in solely by the use of the main control.

(*Concluded next week*)

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

To obtain a membership in Radio World's University Club for one year, send $6 for one year's subscription (52 issues of Radio World) and you will get a University number. Put this number at top of letter (not envelope) containing questions. Address, Radio World, 145 West 45th Street, New York, N. Y.

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.

Birdies in Superheterodyne

THERE are many "birdies" in a superheterodyne which I built according to one of your diagrams. The intermediate frequency is 400 kc which I thought was so high that there would be no "birdies." Also, I have two radio frequency tuned circuits so that there is no lack of selection ahead of the first detector. What can you suggest for removing the whistles? I might say that they are not bad but just the same I should like to remove them if possible.—W. A. B., New York, N. Y.

Under the conditions it is possible that the "birdies" are due to harmonics of the intermediate frequency getting back to the first detector and heterodyning with the signal or with the oscillator frequency. Better filtering of the plate supply is a way of getting rid of the squeals. The most effective way is to connect a high resistance of about 100,000 ohms in series with the plate coupling resistance in the second detector and connect a large condenser, not less than 0.1 mfd., between the junction of the two resistors and the cathode of the detector.

* * *

A Correction

IN the superheterodyne circuit by Mr. Endicott in the Feb. 27 issue there appears to be a short circuit between the 135 volt line and ground. There is a mark "C13" at the place and I assume there is supposed to be a condenser there. If that is the case what should the capacity be?—B. W. R., Binghamton, N. Y.

Yes, there should be a condenser in the line which now shorts the B supply. The value should be 1 mfd.

* * *

Biasing of Push-Pull and Parallel Amplifiers

Is it necessary to change the bias resistance when two tubes connected in push-pull are connected in parallel or can the same bias resistance be used? What precautions are necessary in changing from one type of circuit to the other?—N. L. W., Racine, Wis.

The same bias resistance should be used for the same plate current will flow in both cases. In push-pull it is not necessary to put a by-pass condenser across the resistance but in parallel connection it is. The larger the by-pass condenser is the better. When the circuit is to be changed to parallel from push-pull both grids should be connected to the same terminal of the input transformer. The center tap on the transformer may be left unconnected and the entire winding used.

* * *

Cathode Ray Scanning

WHEN a cathode ray scanner is used in a television receiver is it necessary to use the same type of scanner at the transmitter or can a cathode ray scanner be used for scanning a picture sent with a disc scanner?—H. B. C., St. Louis, Mo.

As far as we know it is not possible to scan at the transmitter with a cathode ray. Therefore, some other form of transmitter scanner must be used.

* * *

Oscillator Coils for Superheterodyne

IS there a simple rule for obtaining the inductance of the oscillator coil in a superheterodyne in terms of the inductance of the radio frequency coils when all the tuned circuits are on the same control? If so, please explain?—F. W. R., Newark, N. J.

There is a simple rule which gives the inductance approximately. It is accurate enough for practical purposes and many commercial oscillator coils are based on it. The rule is simply this: If F is the highest frequency to which the r-f circuit tunes, f is the intermediate frequency, and L the inductance of the r-f coil, then $Lo=F^2L/(F+f)^2$, in which Lo is the oscillator inductance. Thus if the intermediate frequency is 175 kc and the highest signal frequency is 1,500 kc, Lo=0.8025L. If L is 245 microhenries, which is the case when the tuning condensers are 350 mmfd., the oscillator inductance should be 196.5 microhenries. Again, if the intermediate frequency is 400 kc, Lo=0.624L. If L is again 245 microhenries, Lo=152.8 microhenries. A more accurate computation will make Lo 145 microhenries, but either will work. On the basis of this simple rule, the value of the series condenser in the oscillator circuit can also be determined. If the r-f inductance is 245 microhenries and it is desired to make the circuit track at 570 kc, the value of the variable condenser at 570 kc is 318 mmfd. But at this setting of the r-f circuit the oscillator must be tuned to a frequency of 745 kc. Hence the capacity in the oscillator circuit must be 232 mmfd. Therefore $1/232=1/318+1/C$, where C is the series capacity. Solving the equation for C we obtain 858 mmfd. If we take the case of 400 kc the total capacity in the circuit at 570 kc should be 176 mmfd. Hence we have $1/176=1/318+1/C$. Solving this equation for C we obtain 395 mmfd. A more accurate computation will give 430 mmfd. but when this is used the inductance should be 145 microhenries. Apparent discrepancies between these two are taken up by the adjustment of the trimmer condenser across the variable tuning condenser.

* * *

Battery Superheterodyne

MOST of your circuits are a-c operated. You seem to forget that some of us are in places where alternating current is not available. We have to use batteries to operate our sets and we should like to have circuits in which we can use the latest tubes. Will you kindly give us some?—W. A. C.

Elsewhere in this issue you will find a description of a battery-operated superheterodyne. We shall try in the future to publish more circuits of this type.

* * *

One Tube Short Wave Set

I WISH to construct a simple one tube short wave receiver using a 230 tube. The circuit, of course, should be regenerative and it should be for earphone reception only. Will you kindly publish such a receiver, giving details?—H. H. J., Fresno, Calif.

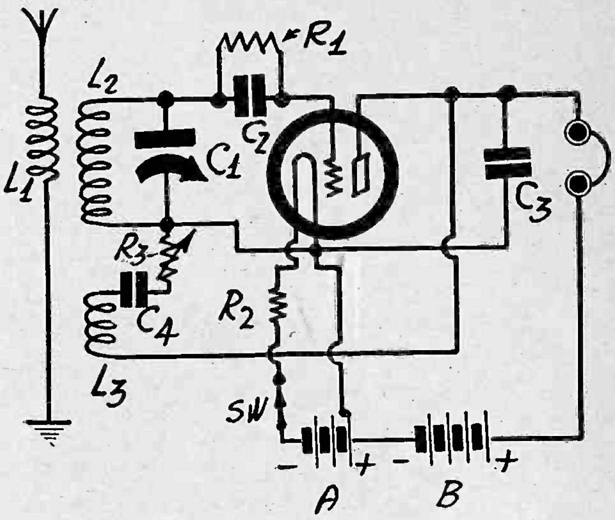


FIG. 993

The circuit of a one tube regenerative short wave receiver for a 230 tube and earphone reception. A small tuning condenser and plug-in coils are preferred.

In Fig. 993 you will find such a circuit. If the A battery is a 3 volt dry cell battery the resistance R2 should be 16 or 17 ohms. To provide an extra volume or regeneration control it may consist of a 15 ohm fixed resistance and a rheostat of an equal ohmage. Omit C3, or else use it across the B battery only, making it 0.001 mfd. The B voltage need not exceed 22.5 volts, although 45 volts may be used. Make C2 0.0001 mfd. and R1 2 megohms. The tuning condenser C1 should not be larger than 200 mmfd. and should preferably be 125 mmfd. The value of C4 should be 0.001 mfd. R3 is the main regeneration control and should have a maximum resistance of 25,000 ohms. The tuning coil should be a three winding type and preferably of the plug-in type. If the form is of the UY type there will be enough prongs for the terminals since ground and A plus may be connected together. The number of turns on the three windings L1, L2, and L3 depends on the range of frequencies to be covered. With a 125 mmfd. condenser it will require about 4 coils to cover the entire short wave range. Using No. 18 enameled wire on a 1.25 inch form the windings may be 5, 15, 20; 3, 7, 10; 2, 4, 6; 1, 2, 3. In each group the first is L1 the second L3 and the third L2.

* * *

Primaries of R-F Transformers

WHAT should be the ratio of the primary to the secondary windings in a radio frequency transformer that is to work between two 235 screen grid tubes? Is there not a definite ratio which gives the best amplification?—N. L. C., Boise, Idaho.

There is no definite ratio that is best. The effectiveness of the transformer depends on the resistance of the tuned circuit, on the frequency, on the degree of coupling, and on the resistance of the tube. The more turns, usually, the greater the amplification.

A THOUGHT FOR THE WEEK

Eddie Cantor, under contract to make some new talkies in Hollywood, was obliged to leave the East for California, thus cheating the Chase & Sanborn hour of his presence. Who would take his place? Who other than Georgie Jessel, who has been cradled in the same nursery of East Side comedy! So, Eddie, after a purification of his smart cracking method—why, he even recited a bit of poetry and spoke some deeply sentimental lines—is followed by Georgie, who, likewise, is given to bursts of pretty things that his family never would have thought possible a year ago. Some dictatorial mind of the National Broadcasting Company—or is it traceable to an advertising agency?—has done his work so well that now you don't have to be wholly sophisticated to know what these comedians are talking about .We'll bet that director could write a book on his special experience in this instance.

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 45tn 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.

120 Lines Needed

It is only a matter of a few months since television for home experimenting reached the projection stage, so that lookers could buy lens discs and get pictures up to 10x12 inches. This was a considerable step forward, and yet it was taken without fanfare. Everyone who has been closely watching television's advance realized that an important move had been made toward the desired goal, the only one that will put television on a commercial basis. And that is clear, projected images.

Just now most stations are sending television on a 60-line basis, which means that each strip is one-sixtieth of the vertical distance. The relationship between this dissection and the final result is that with a given amount of illumination there can be only so much sharpness. With the crater lamps now used, even with the best of optical systems, the 60-line transmission gives a good projected picture up to about 5x6 inches. The smaller the picture, the closer the lines are drawn together, hence the better basis for the optical illusion. The number of pictures sent per second, which is usually 20, is for creating the illusion of motion.

It is time that the television transmitters, because of the growth of their importance, and in the light of the development that has preceded the present results, make another upward climb. At first 15 frames, 45 lines, were used by some, next most went to 20 frames, 60 lines. Now is the time to double the number of lines. The receiving sets and the glow lamps are of sufficient performance, although both will be improved of course, and if only the transmitter would speed up its scanning, the pictures easily could be good enough to intrigue the public. Once the pictures do reach that stage there will be considerably more sound-tracking, whereas now scarcely half a dozen units in the Western Hemisphere give sound-track service. The sound part of the work, of course, presents no problems, as it simply requires an extra receiving set, the track to be tuned in just as you now tune in your favorite local station.

In time no doubt the scanning speed will be greater than 120 lines per frame. Some experts believe that it is unnecessary ever to go beyond 240 lines, as with such fine division one line seems to the eye to merge with its neighboring lines, and the total seems to be one solid, unbroken picture. However, for the present 120 lines offers ample opportunity, and even a 10x12-inch projected image could be supported with enough illumination, especially with 100-milliampere glow lamps now on the market or about to appear, and with improved methods of modulating the lamp with the signal. Scanning systems, all mechanical for the present, likewise are equal to the task, including the lens disc, the most popular, and special systems, such as the Hutton and Peck methods.

Nobody need expect that much of a commercial nature will result so long as adherence to 60 lines persists. At this particular juncture the receiving end is ahead of the sending end, in a sense, and therefore a move toward equalization should be made at once. With 120-line sending, adequate television results could be enjoyed. Then that long-awaited impetus might result in the Grand Rush.

Aid to Calibration

At present less than 45 per cent. of the measured American Broadcast Stations deviate less than 50 cycles from their assigned frequencies, and on June 22d all stations will have to come within this limit, under a new rule of the Federal Radio Commission. This constantly improving stability of broadcast stations will become a boon to our radio structure. There will be no more interference between stations on adjacent channels, nor between stations on one channel and stations having twice the frequency of this channel. Even two stations operating on the same channel at the same time can do so without any appreciable mutual interference, provided that the stations are separated by a reasonable geographical distance. At most, the heterodyne between two such stations will be 100 cycles, and there are not many receivers which are fully efficient on this low frequency.

But the deviation in most instances will not be as much as 100 cycles, for this will only be the case when each station is off its frequency by the maximum allowable amount, and when the two are off in opposite directions. Most likely, the stations will be off considerably less than 50 cycles and there is a fifty-fifty chance that they will be off in the same direction. In such cases the heterodyne will be the numerical difference between the amounts by which they are off. This difference might well be below the audible limit.

Close adherence to the assigned frequencies will not help separating stations on adjacent channels if the receiver is not selective. Nothing can be done at the transmitter to take the place of selectivity in the recevier. Since few receivers are selective enough to separate stations on adjacent channels, there will probably be very little lessening of complaints about the way broadcasting is conducted and the way the radio law is administered, even when all the stations cling within 50 cycles of their assigned frequencies.

One advantage, of interest chiefly to engineers, of close adherence to assigned frequencies will be the easy accessibility of standards of frequency. No longer will it be necessary to purchase costly standards of frequency for measurement purposes and calibration of receivers. They will always be available without cost.

Forum

It is with great interest that I read in RADIO WORLD the news article regarding the Mexican radio racket that Senator Dill alleges exists. It should be apparent to such a well-informed gentleman as Senator Dill that neither Canada nor Mexico has even a look-in on a clear channel, because the United States has more than 2,200 transmitting stations.

We beg that Senator Dill get a little first-hand information on the cat howls and frequency wobbling of some of these American stations at a few hundred miles out. He might change his mind about how other friendly countries should receive this abuse he is handing out.

We do not know just what is the Senator's grievance against Dr. Brinkley, but we say more power be given to this fine station if it will help to make the American Radio Commission make a trip outside of its own country and see how the other fellows like the result of American radio administration. Senator Dill may not know it, but American engineers built this fine station in Mexico and it the last word in design, and furthermore it's on the dotted line.

Take a trip, Senator Dill, outside of U.S.A. You may be able to learn something of value to your country.

H. FERNANDEZ,
Tampico, Mexico.

* * *

Your magazine is the best on the market, regardless of price. It can easily be called a magazine either for the home constructor or the advanced radio fan.

L. J. GOULETTE,
Deep Creek, Wash.

* * *

I am still under the necessity of operating with a storage battery and find very little in Radio World along that line. Most of the articles I see dealing with the new battery tubes are not for the purpose of information but are largely disguised sales ballyhoo.

One of the unsolved mysteries of radio to me is why all the information cannot be given on the diagram. For example, the values of some condensers are not given on a diagram. I found these values in the text, but why not put all on the diagram? In this case you have all the resistors marked. Why is this not done on all diagrams? The same for coils. L1 means nothing to me. In this instance these data are given in the text, but I have seen hundreds of diagrams where the information was not on the diagram or in the text. In some paper hook-ups it would probably be too damaging to do this because the reader would discover that if any definite value was used the thing would not work, except in the writer's imagination.

For some unknown reason most of the articles in which I have been interested have been disappointing. Take the recent articles by Mr. Anderson on coil design. Nothing was said about primaries. Nothing about the impedance they should have for various types of tubes. Nothing about the effect, if any, of the capacity of the primary winding on the distributed capacity of the secondary. At present nearly all coils are shielded, yet not a word was said about this. One could not tell if the coils as described were to be shielded or not.

One good, clear, well-illustrated and complete article is worth a hundred of the average you find in radio magazines.

LOUIS H. KOCH,
New Brunswick, N. J.

STATION SPARKS

By Alice Remsen

A Sylvan Idyll

FOR PASTORALE

(WABC, Sundays, 2:00 p.m.)

Upon a lovely day in Spring,
Two lovers went adventuring.
A yellow primrose peeped at them,
And nodded on its slender stem.
The maid was clad with dainty grace,
In panniered gown of silk and lace;
The lad was tall, and comely, too,
In ruffled coat of brilliant hue.

They wandered through the leafy shade
Of some sequestered forest glade,
And whispered vows of love so true,
The age-old vow that's never new.
The lips of this enchanting miss
Had never known a lover's kiss;
The gallant lad was half afraid
Of shocking such a modest maid.

His fingers touched her lovely hair,
Caressingly they lingered there.
Upon her lips a kiss he prest,
Then drew her gently to his breast.
Though she was timid as a fawn,
The maiden's lips were not withdrawn;
For she had found that love was sweet
And knew that life was oh, so fleet.—A. R.

* * *

Andre Kostelanetz Conducts the Beautiful Pastorale program on WABC over a nation-wide hook-up. A mixed quartet consisting of Helen Board, soprano, Charlotte Harriman, contralto, Charles Carlisle, tenor, and Crane Calder, bass, sing solos, duets and ensemble numbers, in beautifully blended voices. The orchestra, under the able direction of Mr. Kostelanetz, transports the listener to sylvan glades with such pastoral music as Bach's "Awakening of Spring" and Glazounoff's "Autumn and Winter." A very lovely program, not to be missed by music lovers.

* * *

Among the Mementoes of His Past Activities, Dr. Herman N. Bundesen, Health Commissioner of Chicago, has a photograph of himself minus coat and collar, trousers rolled to the knee, bare-headed, and wading through water carrying a medicine kit. The picture was snapped by a newspaper photographer at Miami in 1926. The doctor, whose voice is known to thousands through his two-a-week "Adventures in Health' series over the Columbia network, was one of the first to respond when Miami called for help after a hurricane and tidal wave swept the city. Working forty-eight hours at a stretch, Dr. Bundesen was credited with saving hundreds of lives in the stricken city.

* * *

Revva Reyes, N.B.C. Singer, has been engaged by Flo Ziegfeld and is now rehearsing with the new "Follies," in which she will have a prominent role. Mr. Ziegfeld heard Miss Reyes during her recent engagement at the Roxy Theatre.

* * *

Corse Payton, who presents an oldtime thriller over WOR each Friday night at 8:00 p.m., was born in Centerville, Iowa, on December 18th, 1867. His father was a pony express rider, so Payton had plenty of excitement in his early years. He first appeared on the stage at the age of 16 as Luke Bloomfield, in "Dora," the cast of which was composed entirely of members of his own family.

* * *

The Latest Journalistic Radio Venture is that of "Artists of the Air," presented over WOR every Wednesday evening at 7:00 by The Radio Guide. Merle Johnston and his orchestra supply the musical background and well-known radio artists appear as guest stars.

* * *

Andy Sannella Was All Set at the age of fourteen to become a concert violinist, but the death of his father halted such plans. He joined the navy instead. He didn't touch a violin for many years. When he did it was in the Silver Dollar saloon, a Mexican border resort. He borrowed the orchestra leader's fiddle and won a job. There he saw and purchased his first saxophone, and we all know what he did with that.

* * *

The Camel Quarter Hour, headed by Morton Downey, Tony Wons and Jacques Renard, is on tour. They will stay away twelve weeks, visiting and playing in various mid-western and Eastern cities. The daily programs during that time will be presented over the Columbia network through local stations.

* * *

A New Series for Children, known as Pollyanna, the Glad Girl, and sponsored by the A. S. Kreider Shoe Co., may now be heard every Friday at 5:30 P.M. over WABC and the Columbia network. Pollyanna is played by Gertrude Hardeman, who also writes the scripts, Uncle Jerry is played by Mark Smith, and George Vause furnishes the piano accompaniment for Pollyanna's songs.

* * *

Another New Program to be heard over the Columbia System is the important one sponsored by the Ever-Ready Razor Co., which will feature Belle Baker and Jack Denny with his original Mt. Royal orchestra. Mr. Denny has given up his position in Montreal to work on this program, which will be broadcast each Sunday night from 9:00 to 9:30 p.m., originating in the WABC studios at New York, commencing on March 13th.

* * *

Sidelights

BING CROSBY is making a new series of talking shorts . . . BILL GLENN, the Reveler's basso, can cook omelettes—and how! . . . ANN LEAF wears overalls and shirts when she practices on the organ . . . FRED BERRENS has added two more programs a week to his already staggering list of thirty-five . . . HARRY SALTER, in his earlier days, played a violin in cabarets of the great Southwest, attired in cowboy boots . . . GLADYS RICE walks at least five miles every day to keep herself in trim . . . PETER DIXON, author of the nightly "Raising Junior" program, writes approximately 48,000 words a month for 360 minutes of dialogue—sufficient words to fill a short novel . . . JIMMY MELTON is making shorts for Paramount at their Long Island Studios . . . ERNO RAPEE was born in Budapesth, Hungary . . . COUNTESS OLGA ALBANI is a crack golfer . . . HAROLD VAN EMBURGH, who stepped to stardom as a vocalist on the Club Valspar program, has been a saxophone player with various N.B.C. orchestras. He is 26 and a baritone; tall and good-looking, too, but hands off, girls—Harold's married . . . BUDDY WAGNER, whose continental dance rhythms are heard on late Columbia periods, is another ex-lawyer turned radio artist; Bing Crosby, Milton Rettenberg, Scrappy Lambert and Casey Jones are all one-time lawyers . . . CRANE CALDER, Columbia bass singer, was once the manager of a shoe factory and also at one time an assessor of taxes . . . LEN JOY is unhappy when wearing a new hat.

ANSWERS TO CORRESPONDENTS

MRS. J. TODD, Hornell, N. Y.—Richard Maxwell is an American and was born in Galion, Ohio. Yes, he is a good tenor singer.

JACK WORDEN, Boston, Mass.—I don't understand why Lew Conrad's fine band is not on a wider hook-up. I understand that Mr. Conrad is under the management of N.B.C., which should explain a lot; they hide a great many bright lights under dark bushels, but I guess nothing can be done about it. I'm sorry.

MRS. E. WOLFE, Brooklyn, N. Y.—Carl Fenton's real name is Reuben Greenberg. He is a fine musician and plays the violin. As soon as I know definitely about his new program shall let you know. Glad you like the column. Thanks!

* * *

Biographical Brevities

ABOUT M. PIERRE BRUGNON OF PARIS

You, who have listened in to the delightful Pierre Brugnon, with his charming personality and enchanting accent, as he introduces guest artists on the Evening in Paris program over WABC, have wondered if he really is a Frenchman, or if his accent is assumed. I can assure you that Monsieur Brugnon was born in Paris and is a graduate of the Conservatoire de Musique at Fontainebleau. He has sung in opera in London, Paris, Vienna and Milan and is master of more than thirty operatic roles.

Monsieur Brugnon possesses a sprightly sense of humor, always a decided asset to the role of master of ceremonies. He has acted in this capacity for Bourjois on the Evening in Paris program for more than two years. His debut as a broadcaster was made when the French Consul General invited him to participate in a Bastile Day celebration aboard the S.S. Paris. The Bourjois people heard him and snapped him up for their program.

Pierre Brugnon is very popular with his fellow artists. He is always smiling and invariably has a joke to tell. He is equally at home singing sophisticated songs in the Parisian argot, opera in Italian, or the latest American love song. He is of medium height and weight; has merry dark eyes; is clean shaven; has a high forehead; is rather round-faced; usually wears dark clothes and conservative ties; has very well-kept hands. He sometimes sighs for gay Paree, for a glimpse of the Arch de Triomphe; a stroll down the Champs Elysées; an aperitif at the Cafe de la Paix; but, he loves New York and has made hundreds of friends here, is perfectly at home and would not change his environment for the world. To quote Monsieur Brugnon: "It is your friends that make your home, and I have many very good friends here in America." If you have never listened in on Pierre Brugnon, make his acquaintance next Monday evening at 9:30, over WABC and the Columbia network. You will like him!

* * *

SUNDRY SUGGESTIONS FOR WEEK COMMENCING MARCH 6, 1932

Sunday, March 6.........Footlight Echoes
WOR, 10:30 p. m.
Monday, March 7........Evening in Paris
WABC, 9:30 p. m.
Tuesday, March 8..........Raising Junior
WJZ, 6 p. m.
Wednesday, March 9............Big Time
WEAF, 8 p. m.
Thursday, March 10.................
.................Golden Blossom Honey
WJZ, 8:30 p. m.
Friday, March 11.............Singin' Sam
WABC, 8:15 p. m.
Saturday, March 12......Little Symphony
WOR, 8 p. m.

NEW SCANNING MECHANISM IN COMPACT FORM

By HERMAN BERNARD

A private demonstration was given recently at the Hotel St. Moritz, Sixth Avenue and Fifty-ninth Street, New York City, of a new mechanical method of scanning that provides projected pictures. The system, invented by William Hoyt Peck, a noted expert in the field of optics, but new to television, is characterized by compactness, practicality of production in quantity, good illumination and simplicity.

The method used is as follows:

(1) A crator neon tube is used as the spot source of light, and the television-modulated illumination is condensed to a point through a lens. The lamp is at top front in a console compartment and the condensing lens points downward toward the rear at an angle of about 45 degrees.

(2) An 8-inch scanning wheel is at rear bottom of the compartment, tilted to face the source of light. The point source of light strikes the periphery of the 8-inch diameter scanning wheel. On this periphery are 60 lenses in mirrored beds, 6 degrees apart, non-spirally arranged. The lenses are at an angular displacement of 3 minutes of arc, due to the recessed beds for the lenses being thus displaced in the casting of the wheel.

(3) As the scanning wheel is spun at 1,200 revolutions per minute the lenses pass the fixed point of light and due to the mirrors the beam is reflected. The reflection makes the angular displacement become 6 minutes. As the wheel revolves the picture is scanned, the total displacement vertically being 60x6 minutes, or 6 degrees. Thus the picture is virtually square.

(4) The reflected beam is cast upon a screen and viewed. Instead of a punched or drilled hole disc of about 15 inches, to produce a 10x12-inch picture, therefore, an 8-inch wheel will produce this size or larger, even up to movie theatre size, provided of course the illumination were great enough and the scanning rate were faster. The 60-line pictures can be shown in large sizes, but anything larger than 10x12 inches produces too great diffusion. Pictures 5x6 inches are much more definitive.

Better Light Efficiency

The rate of scanning is determined by the transmitter, the amount of illumination by the neon lamp and the modulation impressed on it by the receiver, so that the limitations set forth have nothing to do with the Peck system.

The screen may be moved back and forth to vary the size without refocusing. With screen one foot away from the lens the picture is one foot wide. As the screen is moved in or out the beam of light increases at the same ratio.

Besides affording compactness, the Peck system is capable of quantity production, which can not be said of the punched hole or drilled hole discs.

The demonstration was given with hand-made apparatus, and yet the results were good, and there were no more dark streaks than in the demonstrations of the more common systems. These streaks were due to mechanical inaccuracy naturally attendant on hand work.

More Useful Light

Robert Louis Eichberg, who arranged the demonstration, said that the system "utilizes 80 per cent. of the available light, instead of 0.02777 of 1 per cent. obtained with the usual punched hole scanning disc."

To obtain sharp scanning the crater lamp's spot of light was focused on the nodal point of mirrored lens, instead of the spot more than covering the lens.

The lenses on the periphery were ground and polished and equal to F/1.6. Finest grade cameras have lenses of F/4.5. Here, of course, the whole lens is used, equivalent to a wide-open diaphragm in a camera, hence the necessity of a lens of short focal length.

The inventor has a regular synchronous motor to go with the scanning mechanism, and estimates of costs indicated that the two together could be listed for $40, and probably a receiver-combination listed at $150 for television and synchronized sound reception, using the Peck scanner and motor.

Asked if the system had been tried out at more rapid scanning rates, Mr. Peck said:

"We have worked up to 10,000 revolutions per minute experimentally. We are soon to go to 240 lines. It would be of no use to go any farther."

He drew two parallel lines in pencil on a sheet of paper, about 1/4 inch apart, and moved the paper six feet from the eye.

"You can see that the two lines eventually look like one," he said, "and at 240-line scanning the lines are so close together that they merge."

Marshall Tells of Set

The actual demonstration of the workings of the Peck system was made by Robert Marshall, of Elmhurst, N. Y., radio consultant, who is working on a new method of modulating the crater lamp so as to get a much higher modulation percentage. It is believed the system is somewhat on the order of the Class B amplifier.

Mr. Marshall has experimented considerably with short-wave sets for television and recounted instances where persons could not pick up any television signals, although only 25 miles or less from the transmitter, using tuned radio frequency sets. He said:

"It seems certain that the desirable receiver for television is a superheterodyne, so that the sensitivity can be developed to a high enough degree to insure adequate reception of signals. With tuned radio frequency sets it is sometimes necessary to put up an extremely high and long aerial to get any signals, but with a properly designed superheterodne the sensitivity could be great enough. I am working now on a super with 50 kc transmission band, using two 245 tubes in the output."

Seeks Square-Spot Lamp

He said that the crater lamp itself had a round spot, and threw the spot on the screen with wheel still, but he has made arrangements for procuring square-spot lamps, to obviating putting a small square screen in front of the round-spot lamp. Also, a lamp of 100 milliampere capacity is to be used, as one has just appeared on the market.

[*A detailed technical discussion of the Peck system will be found on pages 3 and 4.*]

45% of Measured Stations Deviate Less Than 50 Cycles

Washington.

During December the frequency monitoring stations of the Radio Division of the Department of Commerce measured 422 broadcasting stations representing a larger number measured than during any previous month. Of the 422, 190 or 45 per cent deviated less than 50 cycles either way (higher or lower than the assigned frequency), 98 or 23.2 per cent deviated less than 100 cycles, 64 or 15.2 less than 200 and the remaining 70 or 16.6 per cent went over the 200-cycle mark.

In view of the fact that 45 per cent of those measured deviated less than 50 cycles, a greater percentage than shown heretofore, it indicates considerable improvement in the frequency stability.

BOARD ASSERTS BETTER IMAGE IS NECESSARY

Washington.

Clearer and larger pictures constitute a problem in television, it was said at the Federal Radio Commission. The following information was furnished:

One outstanding problem faces engineers experimenting in visual broadcasting—to clarify and increase the scope of pictures. Scores of related problems are involved, but by solving the smaller problems, solution of the major work may be simplified.

Television is in about the same stage of development as broadcasting was when the best receivers were crystal sets. In 1920, when engineers were seeking a method of increasing volume and clarifying tone—parallel problems to those of increasing scope of pictures and giving them sharp detail the audion tube was adapted, solving broadcasting problems. Although the tube had been invented in 1908, its possibilities for use in radio broadcasting were not realized until 1920.

Some Problems Solved

Just such a condition may exist in television. There may be some apparatus now in existence—even in use—which, when perfected and adapted to television needs, may make possible operation of visual broadcasting apparatus.

Problems of interference, and of synchronized transmission of pictures and sound, have been almost eliminated. Major difficulties in these phases of operation no longer exist. Although interference is eliminated and synchronization be perfected, these accomplishments mean little without clear pictures of wide scope.

Engineers have succeeded in transmitting and receiving a fairly clear picture of a person, showing the full length of his body. They can broadcast an image of one man singing, for instance. But they can't transmit a picture of a quartet. They hope, eventually, to bring entire glee clubs and symphony orchestras into every home.

How long it will be before they realize this ambition is a matter for conjecture.

Careful About Licenses

There are 30 experimental broadcasting stations licensed by the Commission. Because in some cases the same company owns two or more stations, those operating total only about 23. It is to these stations that television looks for the knowledge which will raise it above the experimental stage.

The Commission has been careful in awarding licenses, and has investigated every application to make sure that licenses would be issued only to competent engineers whose work will be beneficial to the science.

French Let up a Bit On Import Ruling

Washington.

France has increased the American quota for radio imports from 16.6 to 21 metric tons per month, according to a report to the Department of Commerce from Commercial Attache Fayette W. Allport, Paris, and the American embassy in that city. However, all imports of radio are still suspended because the allotment for the first quarter of the year has been exhausted, it was pointed out.

The advance in the American portion of the radio imports is based on a revised calculation of previous imports during 1930 and 1931. No mention is made of the United States quota of imports of tubes.

NBC AWAITING BETTER RESULT ON TELEVISION

In a report to the advisory council of the National Broadcasting Company, M. H. Aylesworth, president of the company, said television is not yet ready for the public. In view of the relationship between the NBC and RCA, this was taken to suggest RCA would not come out soon with a television receiver. His statement seemed to indicate little expectation of television until after Radio City is occupied next year. Mr. Aylesworth reported:

"Although television is uppermost in the minds of every one when thinking of the future of radio, from the standpoint of the National Broadcasting Company one thing in this regard is certain. Television is not ready for the general public. We do not believe that the time has arrived for visual broadcasting on a regular program basis.

Awaits Better Results

"Our experimentation with television has been directed primarily toward a study of transmission problems, in order that the development of practical television will be on a plane comparable with that of broadcasting. Efforts to determine the effect of steel buildings on propagated waves resulted in the establishment of experimental laboratories and studios in the tower of the Empire State Building.

"In looking to the future, our participation in the Rockefeller City project along with other Radio Corporation associates gives promise of opening up a broader field of broadcasting through the mediums of both sound and sight than was ever dreamed of two years ago.

In Radio City by May, 1933

"In planning for the not far distant day when we shall take our place in this Radio Centre, we are taking into account the fact that radio broadcasting has become the recognized means for the syndication of entertainment, education and information upon not only a nation-wide but upon a world-wide scale.

"It is expected that the building which the National Broadcasting Company is to occupy will be completed in May, 1933. Its twenty-seven studios will bring broadcasting into the very heart of the greatest center of the entertainment and educational arts that the world has ever known."

Business was good with NBC during 1931. Programs sponsored by 231 clients brought in $29,500,000, compared to $22,000,000 in 1930. NBC added 261 employes.

Dill Would Restrict Chain Ownership of the Member Stations

Washington

Senator Dill of Washington has announced that he is considering introducing a bill in the Senate which would limit the ownership of broadcasting stations by chains. The Senator does not object to the programs carried by the chain stations, but objects to chain ownership of stations on the ground that the chains destroy local service.

48 WORDS ARE ON 'TWIST LIST' OF ANNOUNCER

Jack Reid, announcer on the staff of WINS, New York City, says that these tongue-twisters must be readily pronounced by announcers: attache, abdomen, acumen, adamant, Aloha Oe, translucent, perspicuity, transmissibility, pedagological, illustratively, idly, pituitary, xylophone, gubernatorial, physiognomist, facade, column, columnar, cemetery, apparatus, aviator, ignoramus, ensemble, dentifrice, congratulations, going, suggestions, advertisements, discipline, interesting, derivation, salon, musicale, reconciliatory, program, comparable, personable, Gounod, Tschaikowsky, presentation, debutante, vase, serenade, Gretchaninoff, Boston, Houston, adversary, wrestler, Don Quixote, and necessary.

Tradiograms

By J. Murray Barron

Charles H. Lehman, of the Hearing Devices Co., Times Bldg., N. Y. City, has just returned from a three weeks trip and reports good business.

* * *

Blair Radio Labs., 23 Park Place, N. Y. City, are now in production on their new public address system. This is a complete and reasonably-priced unit offere dto the service man and amateur.

* * *

Radio Technical Publishing Co., 22 W. 21st St., N. Y. City, reports a steady increase in sale of both the "Radio Physics Course" and the "Radio Servicing Course." The author, Alfred A. Ghirardi, is well known to radio engineers, experimenters and amateurs.

* * *

A 110-volt d-c midget has been added to its popular line by Polo Engineering Laboratories, 125 West 45th Street, N. Y. City.

TESTS STARTED FOR IMPENDING 50-CYCLE RULE

Washington.

At the request of the Federal Radio Commission the Bureau of Standards has begun the testing of several types of special frequency checking equipment now offered by various manufacturers to broadcast stations. These equipments are intended to fulfill the requirements specified in the commission's Regulation No. 145. Briefly, the regulation requires every broadcast station, on and after June 22 this year, to maintain its frequency within plus or minus 50 cycles of the assigned frequency and to have some form of visual indicating instrument entirely independent of the frequency control equipment to indicate the departure of the station frequency from the assigned frequency. From the results of the tests as reported by the Bureau of Standards to the commission, approval or disapproval of the frequency checking equipment will be determined by the commission.

What Is Checked Up

The manufacturers of such equipment, after making arrangements for test with the commission, forward sample equipment, adjusted for use at 1,500 kc. to the Bureau of Standards for test. The approval of a particular type of equipment will be announced to the broadcast stations by the Federal Radio Commission; the individual frequency checking equipment of that type will not have to be tested by the Bureau of Standards.

The frequency checking equipments thus far offered consist of a temperature-controlled piezo oscillator of great accuracy and stability having either the frequency of the broadcast station or else 500 or 1,000 cycles different, and suitable systems for bringing the frequency of the transmitter and piezo oscillator together, rectfying and amplifying the frequency difference and impressing it upon a direct-reading frequency meter with a scale reading from 0 up to 50 or 100 cycles in both directions. Some of these equipments are made to operate entirely from alternating current supply, while others use alternating current only for the heating units.

Tests Take 5 Weeks

The tests made by the bureau on each equipment, 14 in number, require about 5 weeks to complete. Some of the 14 tests are made 12 times during the month. The tests include such items as accuracy, sensitivity, temperature-control stability, and such miscellaneous tests as the effects of changing tubes, varying voltages, etc. Tests at room temperatures of 15, 25 and 35 degrees C. are included. The tests are intended to show what performance may be expected from the equipment in actual use in a broadcast station.

The Bureau of Standards makes tests of frequency standards for transmitting stations of any frequency only upon request of the Federal Radio Commission.

POLICE RADIO STATIONS

Herewith is a list of stations sending police calls, both municipal and State, as well as a list of applications that have been approved but where licenses have not been granted. This classification is "construction permits." Among the licensees the marine fire stations are included. There are 56 licensed municipal police stations listed, 8 state police stations, and 5 licensed marine fire stations. There are 16 construction permits listed. Totals, 69 licensed stations, 16 construction permits.

EMERGENCY SERVICE

I.—LICENSED MUNICIPAL POLICE STATIONS

(Alphabetically by Cities)

Call Letters	City	Authorized Power, Watts	Frequency in kc	Wavelength in Meters
WPDO	Akron, Ohio	100	2458	122
WPDY	Atlanta, Ga.	150	2414	124.2
WPDN	Auburn, N. Y.	50	2458	122
KGPS	Bakersfield, Calif.	50	2414	124.2
KGPJ	Beaumont, Tex.	50	1712	175.15
KSW	Berkeley, Calif.	400	2422	123.8
WMJ	Buffalo, N. Y.	300	2422	123.8
KGOZ	Cedar Rapids, Iowa	50	2470	121.4
WPDV	Charlotte, N. C.	50	2458	122
WPDC	Chicago, Ill.	500	1712	175.15
WPDD	Chicago, Ill.	500	1712	175.15
WPDB	Chicago, Ill.	500	1712	175.15
WKDU	Cincinnati, O.	500	1712	175.15
WRBH	Cleveland, O.	500	2458	122
KVP	Dallas, Tex.	150	1712	175.15
KGPN	Davenport, Iowa	50	2470	121.4
KGPX	Denver, Colo.	150	2442	122.77
WCK	Detroit, Mich.	500	2414	124.2
WPDX	Detroit, Mich.	500	2414	124.2
WPDF	Flint, Mich.	100	2442	122.77
WPDZ	Fort Wayne, Ind.	100	2470	121.4
WPDI	Columbus, Ohio	200	2430	128.7
WPEB	Grand Rapids, Mich.	100	2442	122.77
WRDR	Grosse Point Village, Village, Mich.	50	2414	122.4
WMO	Highland Park, Mich.	50	2414	122.4
WMDZ	Indianapolis, Ind.	300	2442	122.77
KGPE	Kansas City, Mo.	400	2422	123.8
WPDT	Kokomo, Ind.	50	2470	121.4
WPDL	Lansing, Mich.	50	2442	122.77
KGPL	Los Angeles, Calif.	500	1712	175.15
WPDE	Louisville, Ky.	200	2442	122.77
WPEC	Memphis, Tenn.	150	2470	121.4
WPDK	Milwaukee, Wis.	500	2450	122.4
KGPB	Minneapolis, Minn.	250	*2416	124.1
WPY	New York, N. Y.	500	**438	684.50
			500	599.6
KGPH	Oklahoma City, Okla.	125	2450	122.4
KGPI	Omaha, Nebr.	400	2470	121.4
KGJX	Pasadena, Calif.	100	1712	175.15
WPDP	Philadelphia, Pa.	500	2470	121.4
WPDU	Pittsburgh, Pa.	400	1712	175.15
KGPP	Portland, Ore.	25	2442	122.77
WDDH	Richmond, Ind.	50	2442	122.77
WPDR	Rochester, N. Y.	200	2458	122
KGPC	St. Louis, Mo.	500	1712	175.15
WPDS	St. Paul, Minn.	150	*2416	124.1
KGPD	San Francisco, Calif.	400	2470	121.4
KGPM	San Jose, Calif.	50	2570	121.4
KGPA	Seattle, Wash.	250	2414	124.2
WPEA	Syracuse, N. Y.	400	2458	122
WRDQ	Toledo, Ohio	200	2470	121.4
WPDA	Tulare, Calif.	150	2414	124.2
KGPO	Tulsa, Okla.	100	2450	122.
KGPG	Vallejo, Calif.	7.5	2422	123.8
WPDW	Washington, D. C.	300	2422	123.8
KGPZ	Wichita, Kans.	100	2450	122.4
WPDG	Youngstown, Ohio	150	2458	122.

*Temporary.
**Harbor police.

II.—LICENSED STATE POLICE STATIONS

(Alphabetically by States)

Call Letters	City	Authorized Power, Watts	Frequency in kc	Wavelength in Meters
KGPY	Louisiana—Shreveport La.	100	1574	189.5
WBR	Pennsylvania—Butler Pa.	300	257	1182
WMP	Massachusetts—Framingham, Mass.	500	1574	189.5
WBA	Pennsylvania — Harrisburg, Pa.	300	257	1182
WJL	Pennsylvania—Greensburg, Pa.	500	257	1182
WMB	Pennsylvania—W. Reading, Pa.	300	257	1182
WDX	Pennsylvania—Wyoming, Pa.	300	257	1182
WRDS	Michigan—E. Lansing, Mich.	†1,000	1574	189.5
		‡5,000	1574	189.5

†Night. ‡Day.

III.—LICENSED MARINE FIRE STATIONS

(Alphabetically by Cities)

Call Letters	City	Authorized Power, Watts	Frequency in kc	Wavelength in Meters
WEY	Boston, Mass.	50	1558	192.40
WKDT	Detroit, Mich.	500	1596	187.81
WRDU	Brooklyn, N. Y.	125	1596	187.81
WCF	New York, N. Y.	400	1596	187.81
KGPD	San Francisco, Calif.	400	1558	192.40

IV.—CONSTRUCTION PERMITS FOR MUNICIPAL POLICE STATIONS

(Alphabetically by Cities)

Call Letters	City	Authorized Power, Watts	Frequency in kc	Wavelength in Meters
WPED	Arlington, Mass.	50	1712	175.15
WPEJ	Brookline, Mass.	50	1712	175.15
WPDM	Dayton, Ohio	150	2430	123.4
WPEI	Providence, R. I.	50	1712	175.15
KGPR	Ft. Worth, Tex.	100	1712	175.15
KGZA	Fresno, Calif.	100	2416	.....
KGPQ	Honolulu, T. H.	100	2450	122.4
KGZB	Houston, Tex.	150	1712	175.15
WPEE	Brooklyn, N. Y.	400	2450	122.4
WPEF	New York, N. Y.	400	2450	122.4
WPEG	New York, N. Y.	500	2450	122.4
KGPW	Salt Lake City, Utah	100	2470	121.4
KGZD	San Diego, Calif.	100	2430	123.4
WPEH	Somerville, Mass.	100	1712	175.15
KGZC	Topeka, Kans.	50	2422	123.8

V.—CONSTRUCTION PERMITS FOR STATE POLICE STATIONS

Call Letters	City	Authorized Power, Watts	Frequency in kc	Wavelength in Meters
KGPV	Des Moines, Iowa	400	2605	.....

Literature Wanted

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

C. R. Spicer (on amateur short wave transmitting and receiving apparatus) U. S. Navy Receiving Ship, San Francisco, Calif.
J. A. Davis, General Delivery, Zillah, Wash.
A. P. Kite, Box 246, E. Radford, Va.
L. J. Goulette, Deep Creek, Wash.
Bob Delius, 1107 Albert Ave., Knoxville, Tenn.
J. B. Dupuis, c/o Telephone Kamouraska, Riviere du Loup, Co., Temiscouta, P. Q., Canada.
Charles F. Langenhagen, 402 Hughes St., Bellmore, L. I., N. Y.
Harold Howard, 124 W. 117th St., Apt. 1-S, New York, N. Y.
Remington Horlacher, 1715 Sanderson Ave., Scranton, Penna.
Charles Schifflin, 544-13th Street, West New York, N. J.
C. Biddle Atlee, 114 Elm Ave., Riverton, N. J.
Ruel Roy, 3841 So. 47th St., College View Sta., Lincoln, Nebr.
Kurt R. Zumhagen, 3609A No. 17th St., Milwaukee, Wisc.
Sam Hoffman, 412 So. Waco St., Hillsboro, Texas.
Cedrick D. Justis, Newport, Delaware.
Francis J. Duvic, Jr., 435 S. Olympia St., New Orleans, La.
Curtis Duval, 520 Dawson St., San Antonio, Tex.
R. R. Taylor, East Radford, Va.
M. Weiser, Box 57, Uxbridge, Ont., Canada.
F. G. Caswell, Grand Junction, Iowa.
Gilbert Fuller, Box 31, Holcomb, N. Y.
T. R. Dobrydnio, 3 Shawmut Ave., Holyoke, Mass.
Carter Radio Co., C. S. Carter, 706 Banner St., Topeka, Kans.
Eldon W. Payne, P. O. Box 15, Hudson, No. Car.
Kilgore Radio Service Club, Box 137, Braeburn, Penna.

New Incorporations

Jochem's Radio Co., Inc., West New York, N. J.—Atty., Leon F. Kroebel, Hoboken, N. J.
Empire State Television Institute, New York City, conduct schools.—Attys., Fieldman & Paul, 276 Fifth Ave., New York, N. Y.
Ware Radio and Television Corp., Belleville, N. J., broadcast theatrical plays, dramas, operas.—Attys., Registrar and Transfer Co.
Fox Radio and Television Co., New York City.—Atty., B. N. Brody, 261 Broadway, New York, N. Y.
Fifth Avenue Broadcasting Corp., New York, N. Y.—Attys., Guarantee and Trust Co., Philadelphia, Pa.
Radio Productions Corp., New York, N. Y., general broadcasting, recording, transmitting.—Attys., United States Corporation Co., 19 Dover Green, Dover, Del.
Commonwealth Neon Corp., tube display signs.—Atty., R. P. Weil, 36 West 44th St., New York, N. Y.
Silent Salesman Electric Clock Corp., Brooklyn, N. Y.—Atty., M. J. Esposito, 50 Court St., Brooklyn, N. Y.
E. M. Electrical Sales Corp., New York, N. Y.—Attys., Golden & Golden, 225 Broadway, New York, N. Y.
Macy Electrical Products Co., New York, N. Y.—Atty., L. F. Hutton-Locher, 38 Park Row, New York, N. Y.
National Electric and Engineering Co., Philadelphia, Pa., electrical appliances, devices.—Attys., United States Corporation Co., 19 Dover Green, Dover, Del.

List of Mexican Broadcasting Stations

Call signal	Owner	Location	Power (watts)	kilocycles (meters in parentheses)
XEA	Alberto Palos Sauza	Guadalajara, Jal.	100	1,000 (300)
XEB	El Buen Tono, S. A.	Mexico, D. F.	1,000	1,030 (291.2)
XEC	Jesus R. Benavides	Toluca, Mex.	50	1,000 (300)
XED	Cia. Intl. Dif. Reynosa, S. A.	Reynosa, Tams.	10,000	965 (310.8)
XEE	Alfonso Zorrilla B.	Oaxaca, Oax.	105	1,000 (300)
XEG	Miguel Zarza	Mexico, D. F.	100	1,360 (220.5)
XEH	Constantino, Tarnava	Monterrey, N. L.	1,000	1,132 (265)
XEI	Carlos Gutierrez	Morelia, Mich.	100	1,000 (300)
XEJ	Juan G. Buttner	C. Juarez, Chih.	100	1,000 (300)
XEK	Arturo Martinez	Mexico, D. F.	100	990 (303)
XEL	Antonio Garza Castro	Saltillo, Coah.	10	1,000 (300)
XEM	Maria T. de Gutierez	Mexico, D. F.	250	1,300 (230.7)
XEN	Cerveceria Modelo, S. A.	Mexico, D. F.	1,000	711 (421.9)
XEO	Partido Nacional Rev.	Mexico, D. F.	5,000	940 (319.1)
XEP	Asociacion Radiodifusora Latino-Americana, S. A.	N. Laredo, Tams.	200	1,400 (214.2)
XEQ	Feliciano Lopez Islas	C. Juarez, Chih.	5,000	750 (400)
XER	Cia. Radiodif. de Acuna, S. A.	Villa Acuna, Coah.	75,000	735 (408.1)
XES	Emilio Balli	Tampico, Tams.	500	890 (337)
XET	Mexico, Music, Co., S. A.	Monterrey, N. L.	500	690 (434.7)
XEU	Fernando Pazos	Veracruz, Ver.	100	1,000 (300)
XEV	Ciro Molino	Puebla, Pue.	100	1,000 (300)
XEW	Mexico, Music, Co., S. A.	Mexico, D. F.	5,000	910 (329.6)
XEX	Excelsior	Mexico, D. F.	500	1,210 (247.9)
XEY	Partido Socialista S. E.	Merida, Yuc.	105	1,000 (300)
XEY	Partido Socialista S. E.	Mexico, D. F.	500	780 (384.6)
XEZ	Joaquin Capilla	Mexico, D. F.	500	1,140 (263.1)
XETA	Manuel Espinosa Tagle	Veracruz, Ver.	500	630 (475.9)
XETF	Manuel Angel Fernandez	Veracruz, Ver.	500	630 (475.9)
XEFA	Manuel F. Murguia	Mexico, D. F.	250	1,250 (240)
XEFE	Rafael T. Carranza	N. Laredo, Tams.	100	1,000 (300)
XETQ	Carlos G. Caballero	Mexico, D. F.	100	1,230 (243.9)
XEFC	Hugo Molina Font	Merida, Yuc.	10	1,050 (285.7)
XETC	Juventino Canchez	Jalapa, er.	100	1,000 (300)
XETG	Feliciano Lopez Islas	Torreon, Coah.	100	1,000 (300)
XETB	Jose A. Berumen	Torreon, Coah.	125	1,380 (217)
XEFB	Quintanilla y Stevenson	Monterrey, N. L.	50	1,270 (236.1)
XEFS	Salvador Sanchez	Queretaro, Qro.	40	1,000 (300)
XEFI	Feliciano Lopez Islas	Chihuahua, Chih.	100	1,000 (300)
XEFD	Carlos de la Sierra	Tijuana, B. C.	300	1,020 (293.9)
XETZ	Manuel Zetina	Coyoacan, D. F.	100	1,500 (199.9)

Government

Call signal	Owner	Location	Power (watts)	kilocycles (meters in parentheses)
XFC	Gobno. Edo. Aguascalientes	Aguascalientes, Ags.	350	805 (372.6)
XFG	Sria de Guerra y Marina	Mexico, D. F.	2,000	683.3 (470)
XFH	Sria de Guerra y Marina	Mexico, D. F.	250	....
XFI	Sria Ind. Com. y Trabajo	Mexico, D. F.	1,000	818.1 (366.7)
XFX	Sria de Educacion Publica	Mexico, D. F.	500	860 (348.8)

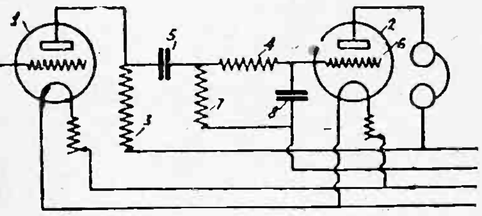
NEW PATENTS

Illustrated Reports on Radio Inventions

[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.]*

Those Listed This Week Issued February 9th, 1932

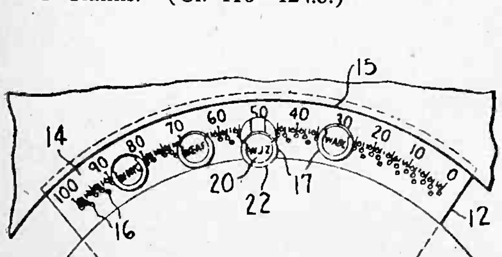
1,844,177. RESISTANCE-COUPLED AMPLIFIER. Klaas Posthumus, Eindhoven, Netherlands, assigned to Radio Corporation of America, a Corporation of Delaware. Filed June 6, 1927, Serial No. 196,725, and in the Netherlands Aug. 16, 1926. 12 Claims. (Cl. 179—171.)



1. A resistance coupled oscillation amplifier comprising a series of triodes, means to lead oscillations from the plate of one triode to the grid of the next succeeding triode comprising two partially separate paths, one of which paths includes a large capacity and offers a high resistance to the oscillations to be amplified but which allows the passage of high frequency oscillations, the other of said paths including a lower capacity and offering a high resistance to high frequency oscillations and a low resistance to low frequency oscillations, a grid leak resistance, the said grid being connected to points of said leak resistance and said low capacity where the potential amplitude of the high frequency oscillations has already been substantially reduced but where the amplitude of the low frequency oscillations is substantially unweakened, said leak resistance being shunted by the large capacity.

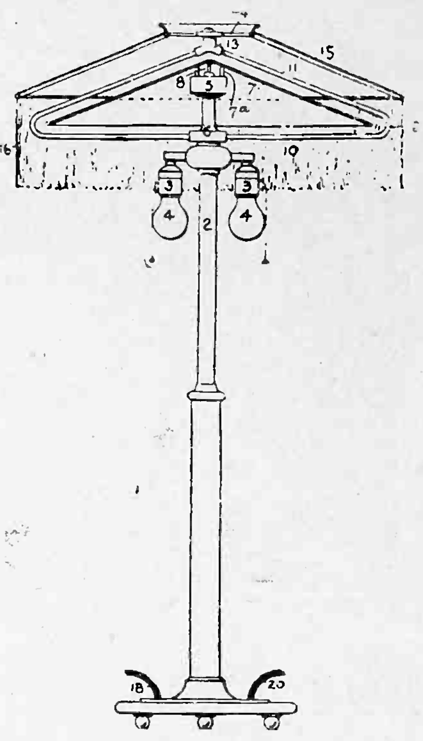
* * *

1,844,441. RADIO APPARATUS. William Scheibel, New York, N. Y., assignor to Bulova Watch Company, Inc., New York, N. Y, a Corporation of New York. Filed Mar. 2, 1931. Serial No. 519,292. 8 Claims. (Cl. 116—124.3.)



1. In a radio dial, the combination of a rotatable dial member provided with a series of closely related openings, and a plurality of station markers having stems insertible in any of said openings.

1,844,680. RADIO LOUDSPEAKER AND LAMP. Otto M. Rau, Philadelphia, Pa. Filed May 17, 1927. Serial No. 191,994. 4 Claims. (Cl. 181—27.)



1. An upright support adapted to stand upon the floor or table provided at its upper portion with a cone-shaped loudspeaker disk in which the largest diameter is arranged in a substantially horizontal plane, the said support extending from a point below and close to the loudspeaker whereat it is provided with electric lighting devices, to a point above the loudspeaker disk for providing a supporting means for attachment of a shade.

* * *

1,844,859. MAGNETIC AND RADIO-ELECTRIC GONIOMETRY. Lucien Levy, Paris, France. Filed Apr. 1, 1927, Serial No. 180,319, and in France Apr. 3, 1926. 4 Claims. (Cl. 250—11.)

1. A magnetic and radioelectric goniometry device comprising a phasemeter, a stator of a multiphase generator creating an auxiliary field, a two-phase tetrapolar induction rotor in this field, an exploring element for the field in observation, said element and said rotor rotating together, and means to compare in said phasemeter the relative phases of the electromotive forces generated respectively in said rotor and in the exploring element.

(Illustrated at right)

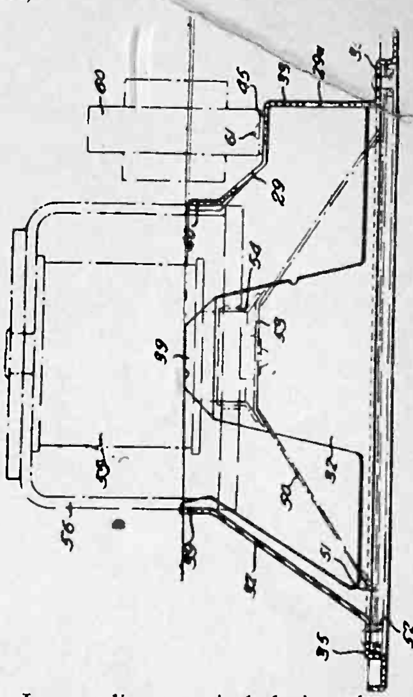
* * *

1,844,519. ELECTRICAL APPARATUS. Edward B. Newill, Dayton, Ohio, assignor to General Motors Radio Corporation, Dayton, Ohio, a Corporation of Ohio. Filed Nov. 14, 1930. Serial No. 495,593. 2 Claims. (Cl. 250—16.)

1. In a control for a radio receiver having a sheet metal frame, the combination including U-shaped straps integral with said frame, and a shaft rotatably supported in said U-shaped straps so that said straps function as bearings for said shaft.

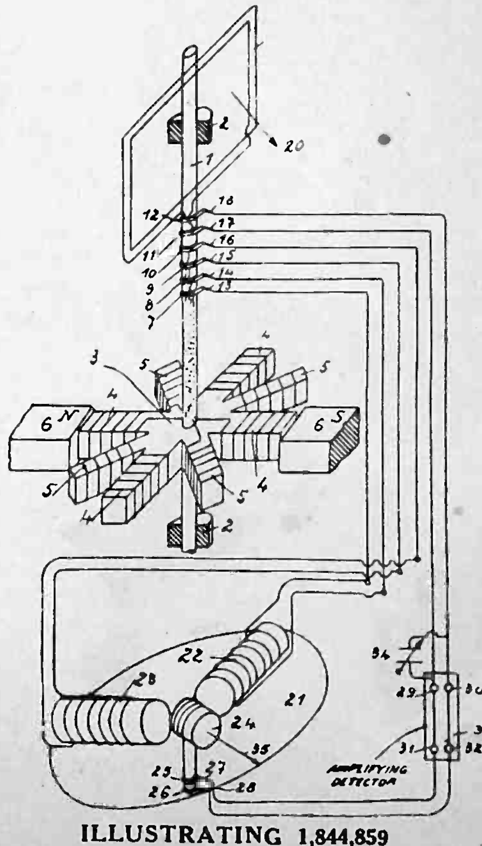
(Above patent not illustrated)

1,844,804. SUPPORT FOR DIAPHRAGM TRANSFORMERS. John D. Seabert, Dayton, Ohio, assignor to General Motors Radio Corporation, Dayton, Ohio, a Corporation of Ohio. Filed June 20, 1931. Serial No. 545,661. 5 Claims. (Cl. 181—31.)



1. In a radio acoustical device, the combination comprising, a diaphragm supporting member of frusto-conical form, said member having a plurality of radially extending arms to support a power plant, one of said arms being deformed to provide a ledge parallel with the base of said cone, said ledge being adapted to support a transformer.

* * *



ILLUSTRATING 1,844,859

NOW! KEEP STEP WITH RADIO SERVICE PROGRESS

ANNOUNCING

A MONTHLY MAGAZINE

Dedicated to and Written Expressly for RADIO SERVICE MEN

Edited by

JOHN F. RIDER

SERVICE, A Monthly Digest of Radio and Allied Maintenance, was born to fill the need for a monthly magazine—written and published expressly for the Radio Service Technician. I personally feel that the radio service man is a sufficiently important individual and part of the radio industry to have a magazine of his own. I hereby go on record as saying that SERVICE shall be for radio service men ONLY.

SERVICE shall be your contact with the entire radio service industry and its various affiliated enterprises. I know that you do not have much time to read lengthy — long-winded articles — that you are busy. Accordingly, you shall have a magazine in keeping with the times—in which you shall find service notes without any superfluous material. Right smack on the button—every time! Brief—but informative and right to the point.

SERVICE will cover radio broadcast receivers—short wave receivers—refrigeration—home talking movies—public address—auto-radio, etc., at all times sticking to service work upon these items. You will be kept informed of the service contents of all other magazines by means of abstracts of service articles which appear in all magazines and engineering bulletins published in the English language. Each month there will appear in SERVICE an Index of articles of interest to service men as published in all other important radio magazines, periodicals, etc. — SERVICE will be modern—educational—breezy and easy to read.

I have given every owner of my books his money's worth, and I promise every subscriber to SERVICE, that he will receive his money's worth.

JOHN F. RIDER

—and the subscription price is LOW! $1.00 per year in the U. S. A.

The magazine is full size—9 x 12 inches. 12 issues per year.

JOHN F. RIDER PUBLICATIONS
1440 Broadway, New York City

......Here is 10 cents in stamps. Send me a sample copy of Rider's NEW magazine SERVICE.

......Here is $1.00. Enroll me as a subscriber for one year to Rider's NEW magazine SERVICE. I will receive 12 issues during the year.

NAME ....

ADDRESS ....

CITY ....STATE ....