3-TUBE LOOP PORTABLE THAT RUNS A SPEAKER

3-FOOT PEDESTAL TYPE CONE FOR THE PARLOR

MAY 14 *Vol. XI. No. 8* 15 CENTS

RADIO WORLD

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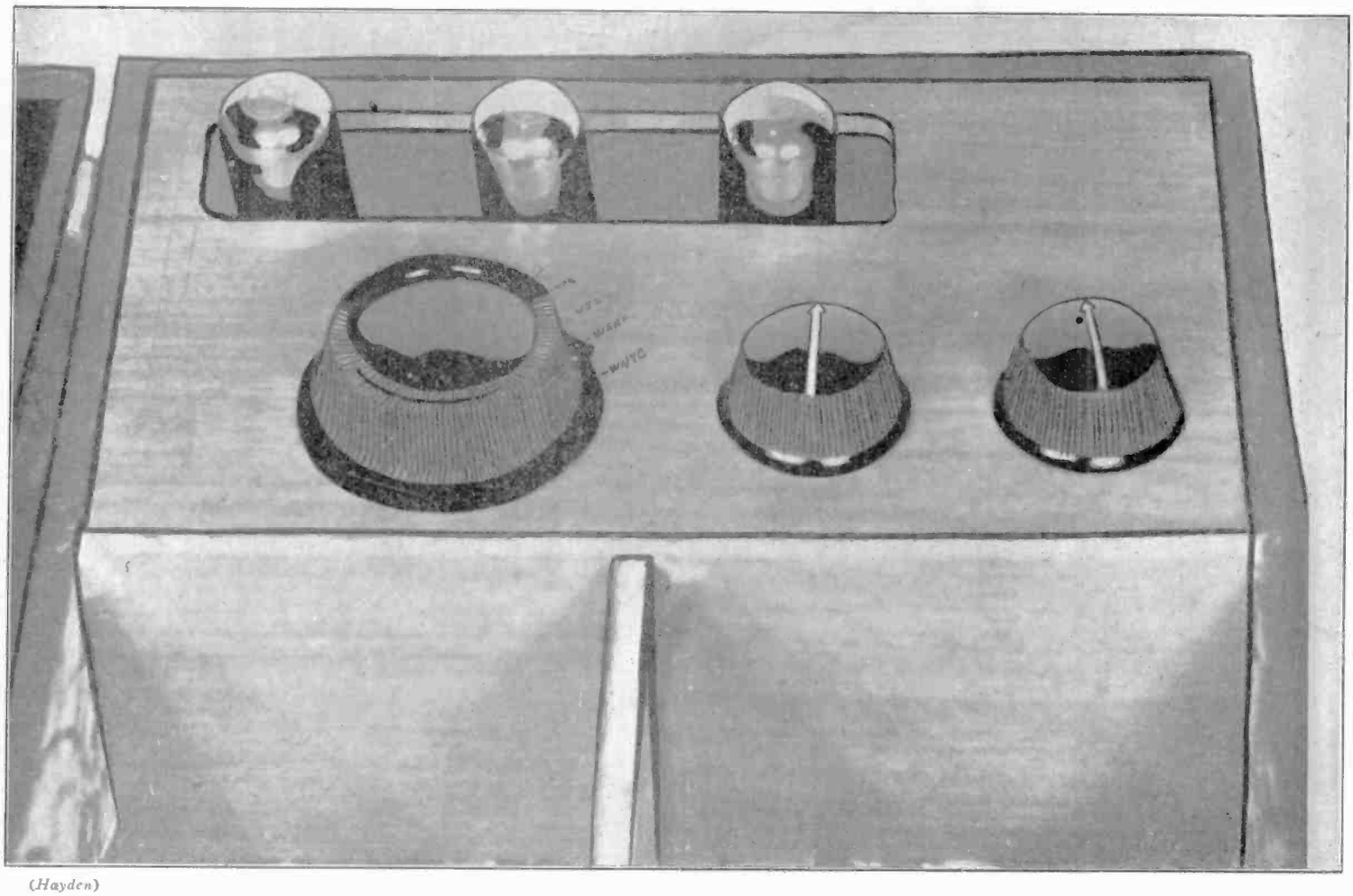

(Hayden)

TOP VIEW of the 3-Tube Portable that operates a speaker. Note how station letters are written in.

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RADIO WORLD
145 W. 45th St. N. Y. City

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

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

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

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

Higher Efficiency

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

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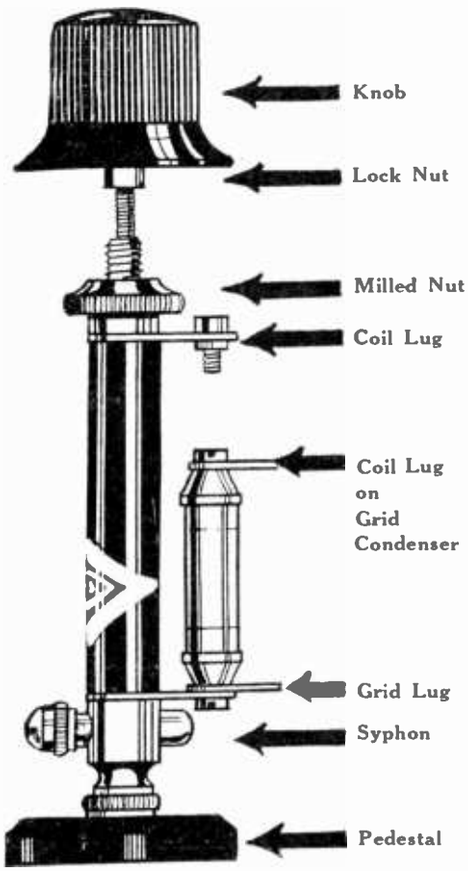

The De Luxe Model Bretwood Variable Grid Leak is shown in actual size. The lock nut secures the knob to the threaded shaft. The milled nut secures the leak to the front panel, if such mounting is desired. The coil lug goes to the outside of the secondary and to the corresponding lug on bullet grid condenser.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

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

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

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

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Good Back Numbers of RADIO WORLD

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

Sept. 4—The Four Rectifier Types, by K. B. Humphrey. A Simple Battery Charger, by J. E. Anderson.

Sept. 11—The Beacon (3-tubes), by James H. Carroll. The 1927 Model Victoreen, by Herman Bernard.

Sept. 18—The 1927 Victorsen, by Arthur H. Lynch. Eliminator in a Cash Box, by Paul R. Fernald.

Sept. 25—The Lynch Lamp Socket Amplifier, by Arthur H. Lynch. Wiring up the Victoreen, by Herman Bernard.

Oct. 2—The Victoreen (Continued), by Herman Bernard. New Equamatic System, by Capt. P. V. O'Rourke.

Oct. 9—A Practical "A" Eliminator, by Arthur H. Lynch. Building the Equamatic, by Capt. P. V. O'Rourke.

Oct. 16—The Bernard, by Herman Bernard. How to Box an "A" Supply, by Herbert E. Hayden.

Oct. 23—The 5-tube P. C. Samson, by Capt. P. V. O'Rourke. Getting DX on the Bernard, by Lewis Winner.

Oct. 30—The Singletrol Receiver, by Herbert E. Hayden. How to Get Rid of Squeals, by Herman Bernard.

Nov. 6—Reduction of Interference, by A. N. Goldsmith. Variations of Impedances, by J. E. Anderson.

Nov. 13—The 4-tube Hi-Power Set, by Herbert E. Hayden. A Study of Eliminators, by Herman Bernard.

Nov. 20—Vital Pointers About Tubes, by Capt. P. V. O'Rourke. The 4-tube Diamond of the air, by Herman Bernard.

Nov. 27—The Antennaless Receiver, by Dr. Louis B. Blan (Part 1). Short Waves Yield Secrets, by M. L. Prescott.

Dec. 4—The Regenerative 5-Tube Set, by Capt. P. V. O'Rourke. The 8-tube Lincoln Super, by Sidney Stack. The Antennaless Receiver, by Dr. Louis B. Blan (Part 2). Winner's DC Eliminator, by Lewis Winner.

Dec. 11—The Universal Victoreen, by Ralph G. Hurd. Some Common Fallacies, by J. E. Anderson.

Dec. 18—Selectivity on One Tube, by Edgar Speare. Eliminating Interference, by J. E. Anderson. The Victoreen Universal, by Ralph G. Hurd (Concluding Part).

Dec. 25—A New Coupling Device, by J. E. Anderson. Functions of Eliminators, by Herman Bernard.

Jan. 1, 1927—The 2 Tube DeLuxe Receiver, by Arthur H. Lynch. The Twin-Choke Amplifier, by Kenneth Harkness.

Jan. 8—Tuning Out Powerful Locals, by J. E. Anderson. A Choice Superheterodyne, by Brunsten Brunn. The 2-Tube De-Lux Receiver, by Arthur H. Lynch (Part 2).

Jan. 15—The DeLuxe Receiver, by Arthur H. Lynch (Part 3). The Simple Meter Test Circuit by Herbert E. Hayden. The Superheterodyne Modulator Analyzed, by J. E. Anderson.

Jan. 22—The Atlantic Radiophone feat, by Lewis Rand. An Insight Into Resistors, by J. E. Anderson. A Circuit for Great Power, by Sidney Stack.

Jan. 29—The Harkness KH-27 Receiver (Part 1) by Kenneth Harkness. Use of Biasing Resistors, by J. E. Anderson.

Feb. 5—5-Tube, 1 Dial Set, by Capt. P. V. O'Rourke. The Harkness KH-27 (Part 2), by Kenneth Harkness. What Produces Tone Quality, by J. E. Anderson.

Feb. 12—Phone Talk Put On Speaker, by Herbert E. Hayden. All Batteries Eliminated by Herman Bernard. The Harkness KH-27 Receiver, by Kenneth Harkness (Part 3) conclusion.

Feb. 19—The 6-Tube Victoreen, by Herman Bernard, (Part 1.) The Big Six Receiver, by Wentworth Wood. "B" Eliminator Problem, by Wm. P. Lear. The Phasatrol Circuit, by Capt. P. V. O'Rourke. The 6-Tube Victoreen, by Herman Bernard (Part 2) conclusion.

Feb. 26—The 5-tube Diamond in a Phonograph, by Hood Astrakan. How To Read Curves, by John F. Rider. Proper Tubes for 5-Valve Receiver, by J. E. Anderson.

Mar. 5—Introduction of 4-tube Universal, by Herman Bernard. Discussion on DX, by Capt. P. V. O'Rourke. Sensible Volume Control, by Chas. Gribben.

Mar. 12—Ten Tell-Tale Points, by J. E. Anderson. How To Figure Resistors, by Frank Logan. The 4-tube Universal, by Herman Bernard. (Part 1.)

Mar. 19—Psycho-Analyzing Circuits, by Thomas L. McKay. The Universal, by Herman Bernard (Part 2). How to Use a Wave Trap, by James H. Carroll.

Mar. 26—The Universal, by Herman Bernard. (Part 3). Flow of Current in a Vacuum Tube, by Radcliffe Parker. Broadcasting Hypnotism.

April 2—Facts Every Experimenter Should Know, by J. E. Anderson. A Ship Model Speaker, by Herbert E. Hayden. The 3-tube Compact, by Jasper Henry. The Nine-in-Line Receiver, by Lewis Rand (Part 1.)

April 9—A 5-tube Shielded Set, by Herbert E. Hayden. The Power Compact, by Lewis Winner. The Nine-in-Line Receiver, by Lewis Rand. (Part 2.)

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A Three-Tube Portable
That Works from a Loop and Runs Speaker

By Herbert E. Hayden

Photographs by the Author

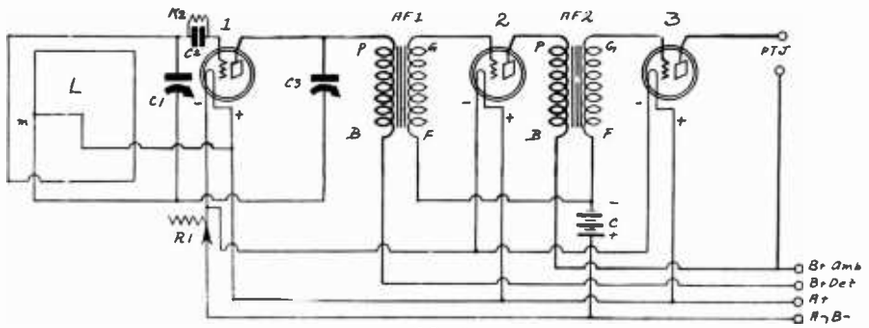


FIG. 1

This three-tube set that is operated from a loop runs a speaker in a satisfactory manner and constitutes one of the most economical speaker portables that one can construct.

THE season of portable sets is with us again, and those enthusiasts who had portable receivers last year are now building better receivers to take along on outings, and countless others are joining the receiver-carrying fraternity. Even many of the gentler sex are equipping themselves with this camping accessory, and thus adding other burdens to those of their willing escorts. And herewith is shown how one of this sorority contrived to install a really presentable receiver in her suitcase.

In Fig. 1 we have the circuit diagram of the receiver that was built in the suitcase. It is of the type which gives the greatest output for the least outlay and space. This means that the circuit must be regenerative in the radio frequency portion and be transformer coupled in the audio. The ratios of the two transformers must also be fairly high so that as great a step-up per stage as possible can be attained.

Loop Location

The set is loop operated to be always ready for use. The question of where to put the loop is important when building a portable set. If the suitcase is built around a wooden frame, this does not present any problem at all because the frame of the suitcase can be used as the loop support. The loop can then be tucked away inside the lid of the case, close to the sides, so that the wiring will not interfere with anything. Small brass brads solve the problem of attaching the wire to the sides while winding. Afterwards cleats can be suitably placed over the completed loop and the brads may be left in or taken out as desired. The loop should be built into the lid of the suitcase, and the suitcase placed in an upright position when the set is operated.

The loop question can also be solved by procuring a folding loop which can be put into the case when traveling and set up outside when the set is in operation.

How to Make the Loop

Those who wish to construct their own loop can use almost any size frame of non-conducting material by winding about 90 feet of flexible wire on it. Stranded wire covered with silk braid is to be preferred, but No. 22 double cotton covered is all right. A tap should be taken out at the middle of the winding.

A single tuning condenser C, is needed for the set, and this should have a capacity of .0005 mfd. for a 90-foot loop, or .00035 for 120 feet. It is connected across the entire loop winding. A small variable condenser C3 is needed to control the regeneration in the loop circuit. This condenser is connected from the plate of the detector tube to the rotor side of the tuning condenser. Its capacity need not be much larger than 50 micro-microfarads, but its physical size is not important. It very largely depends on the distributed capacity of the primary winding of the first audio transformer. If this is very large, the condenser C3 should also be large, or the circuit will not regenerate properly. Hence in selecting C3 it is better to err in the direction of too large capacity than too small.

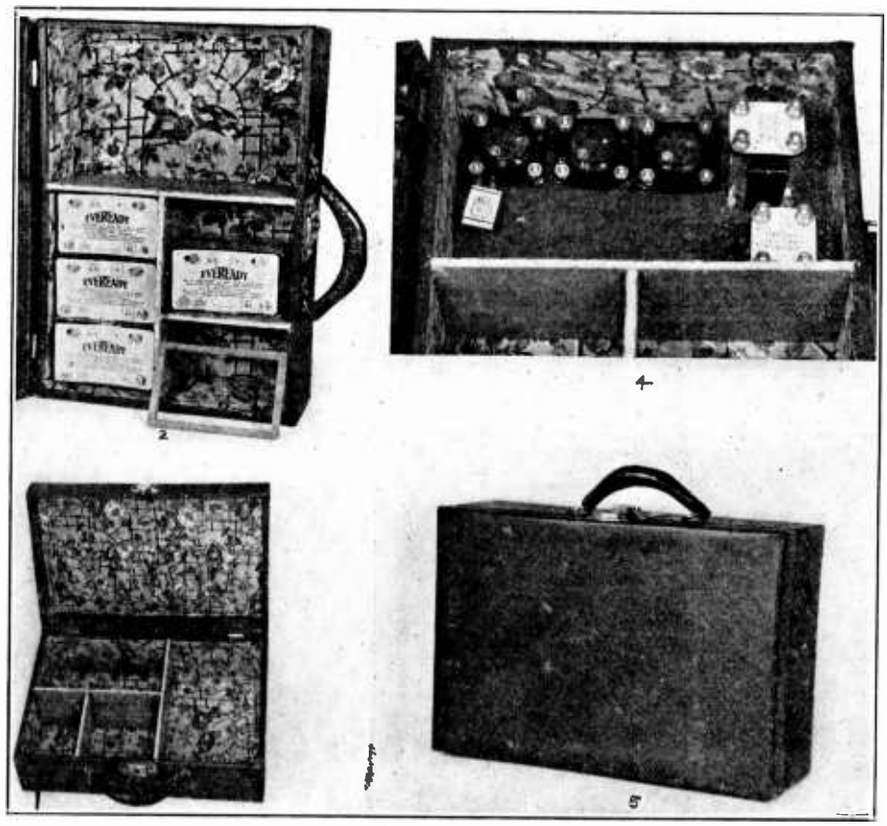
The mid-point of the loop is connected to the positive end of the filament.

In selecting the grid leak R2 and the grid condenser C2 it is well to remember that the set will need a great deal of sensitivity at times and that great volume is not a requirement. Hence the grid resistance should be larger than usual and the condenser should be smaller. Suitable values are 5 megohms for the leak and about .00015 mfd. for the condenser.

One Master Rheostat

As space is limited and weight must be kept down to a minimum, a single rheo-

(*Concluded on next page*)



FIGS. 2, 3, 4, and 5.
Stages of the construction, as explained in the accompanying text, are illustrated by the above photographs.

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The 3-Tube Portable

(*Concluded from preceding page*)

stat R1 is used for all the tubes in the receiver. Since there are three tubes of the 99 variety the rheostat will be called on to carry only .18 ampere. The rheostat need not be greater than about 10 ohms, though 20 ohms may be used.

The audio frequency transformer should be selected largely for their voltage step-up. While it is desirable to keep the total weight of the receiver down to a minimum, high ratio transformers don't prevent that.

The plate voltage is supplied by a block of four 22½-volt midget-sized B batteries. How these are installed in the suitcase can be seen from Fig. 2. On top of one of these blocks is also room for three 4½-volt C batteries, for use as the A battery. Another such battery goes in the open space at right and is used for C bias.

In Fig. 2 is also shown a small compartment for a small loud speaker. A wooden frame fitting over this compartment can be covered with thin silk or other fabric, and then it can be used not only for concealing the speaker but also for holding it in its place.

Condensers Must Turn Freely

The assembly of the circuit proper is shown in Fig. 4. Clearly visible are the three UX sockets, the two audio frequency transformers, the grid condenser and the baseboard upon which some of the parts are mounted. The panel has been removed to show the interior, but otherwise the panel holding the two variable condensers and the rheostat covers the transformers and sockets. The manner in which to mount the condensers so that they will not interfere with the tubes and transformers is clearly indicated.

Fig. 3 shows how the suitcase is divided into compartments for holding the various components of the receiver. The largest compartment to the right is for the circuit proper while the smaller are for the various batteries and the speaker.

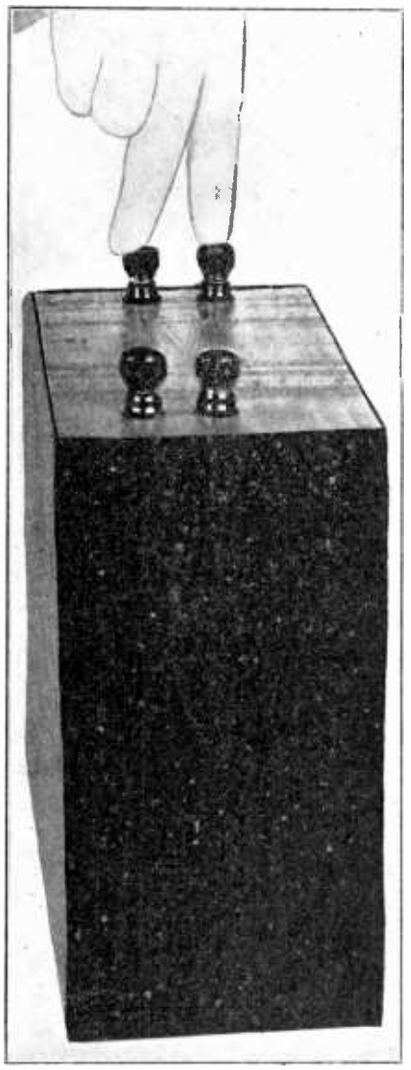
Fig. 6 shows the outside of the suitcase with the receiver installed. There is no suspicion that there is a self-contained receiver with all accessories in that case.

For the tuning control one may use a pointer knob and mark the station letters directly on the panel board at the place where the dial points to bring in any given station. How this is done can be seen from the view of the portable published on the front cover. This view also shows the regeneration condenser next to the tuning knob, and the rheostat knob at right.

LIST OF PARTS

One small suitcase.
L—One loop.
C1—One .0005 mfd. variable condenser.
C2—One .00015 mfd. or .0001 mfd. grid condenser.
C3—One small variable condenser, about 50 mmfd.
R1—One 10 or one 20-ohm rheostat.
R2—One 5 megohm grid leak.
Two audio frequency transformers, ratio four to one.
One pointer knob.
Two smaller knobs, one for C3, one for R1. Usually supplied with the instruments.
Three X sockets.
Three 99 tubes.
Four 4½-volt C batteries.
Four 22½-volt midget B batteries.
Two binding posts for speaker.
A small loudspeaker (Alden Cone or Tower Midget).
Wooden boards for partitions.

A SERVICE BOX



(Hayden)

A WOODEN BOX may be made for containing the A battery, and leads brought out from the minus post to two B minus binding posts on the box, (where fingers point). The object is to facilitate connections to B minus and A minus leads, using one post for each. Also, a wire soldered to the 4½-volt battery post, and brought to one of the foreground binding posts, adapts the battery to —99 tubes, the fourth post being 6 volts.

Franklin Ford Loses Appeal to Be a Juror

The application of Franklin Ford, director of WHAP, New York City, for an order compelling Commissioner of Jurors O'Byrne to reinstate him on the jury lists to make him available for jury duty, was denied by Supreme Court Justice Ford. Franklin Ford's name had been removed from the jury list by Commissioner O'Byrne at the request of General Sessions Judge Rosalsky, in whose court Franklin Ford had been deemed by the Judge to have disqualified himself from jury service by confessing prejudice against Roman Catholics and Hebrews.

Justice Ford said: "It seems to me that the Presiding Judge could do no less, and the Commissioner of Jurors in the exercise of his official functions struck the name from the list of jurors."

Referring to Franklin Ford the Justice said: "He has no right to sit where he may thwart justice under the impulse of his silly obsession that citizens of the Catholic faith are less worthy of belief than others."

Franklin Ford announced he would appeal.

Incoming Traffic

EDITOR RADIO WORLD:

The use of wire rosin core solder is not the only method of producing a satisfactory joint, a fact not all experimenters realize, hence I would like to state why I prefer the alcohol-rosin solution.

First: It is easily prepared at no extra expense. I take about two ounces of alcohol and pulverize a lump of rosin about the size of a pigeon's egg, added to the alcohol, and shake well. It is ready to use, although all of the lumps may not yet have been dissolved. This solution can be bottled and kept a long time without deterioration.

Second: In soldering in a close place the soldering iron needs all the space it can have for the proper manipulation. Also more solder will be melted off the wire than is needed. A bus wire dipped into the solution will carry enough flux for the job, and a drop of solder on the point of the iron will be enough to fasten the joint.

Third: A soldering iron will not carry the solder from the cored wire because the heat of the iron causes more flux to run out of the wire than is needed, making the point of the iron slick with rosin.

Fourth: If the cored wire is placed next to the joint more flux will be placed in the joint than is needed and the risk of a rosin joint is greater.

Fifth: The heat of the soldering iron necessary for soldering will more readily vaporize the solution than that of the solid.

Sixth: What little rosin there is in the drop of the solution will be pushed out as the solder flows properly into the joint, which is very little in quantity.

Seventh: The solution will solder tin, galvanized iron and steel and zinc.

The writer has used both the solution and the cored solder, acid and rosin, and from his experience prefers the solution.

S. HETHERINGTON,
721 N. Madison Ave., Dallas, Texas.

Holland Station Heard In Dutch East Indies

The American Consul at Rotterdam, A. M. Doyle, has reported that radiophone messages have been transmitted successfully from the Netherlands to the Dutch East Indies. His report, made public by the Department of Commerce, states:

"Speeches delivered at the Phillips' factory at Eindhofen, the Netherlands, and transmitted by radio telephone have been distinctly heard at various places in the Dutch East Indies. Telegraphic information received from Medan and Tandjong, in the Dutch East Indies, report that the reception of the addresses by the medium of the wireless telephone was excellent. Although communication by this method has been achieved only in one direction, the results are considered as promising greater ease of communications between the Netherlands and her colonial possessions."

SNAPPY SNATCHES

The Radio Commission makes two stations share time on the air on the same wave. Stations not so particular about the programs they give become mighty particular about the company they keep.

* * *

The goal of engineers is to design a vest pocket portable that works a loudspeaker at least on paper. That requires more than merely a paper diaphragm for a tiny cone.

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A Pedestal 3-Foot Cone

Reproducer Gives Each Note Full Play

By J. C. Spreckles

WHEN an orchestra broadcasts, the bass notes of the bass viol, the piano, drum and the bassoon go out as well as the notes in the middle register. But few persons who listen to orchestral broadcasts hear these low notes. If their amplifiers are able to bring them out the speaker may not do so; if the speaker is all right in this respect, possibly the amplifier is a bit weak on the basses. Most radio receivers of modern design are now able to bring out the low notes, but not if they are saddled with speakers tuned to the piccolo. To bring out all the full richness of the music it is essential to have a speaker not partial to any range of the scale, but which gives every note a chance to sound off. A large cone will do this.

A three-foot cone of the pedestal model, capable of bringing out all the frequencies, can easily be constructed at home. The parts needed can be purchased in any good radio store.

LIST OF PARTS

A large sheet of Alhambra Phonotex paper.
One Ensco phone unit.
One wooden block for mounting unit.
One wooden tripod.
One wooden crossarm for mounting the cone.
A small quantity of glue.

The first step in making the cone is shown in Fig. 1. The large sheet of paper is laid flat on the table and a large circle is drawn on it with chalk. A sector of about 30° is also drawn on one side as shown. Note that on one side of this sector there are two parallel lines about two inches apart, one of which extends to the center of the circuit and one only meeting the line on the opposite side of the sector. Trim the paper along the circular line with a pair of shears. Also cut along single radial line all the way to the center of the circle. Cut also along the short one of the two parallel lines.

Cut to the Center

When this has been done the cutout sector should appear somewhat like Fig. 2, except that cutting should extend to the center of the circle. The shaded portion of the complete sector is to be used for gluing the cone together. This portion is covered with glue as is also the corresponding portion on the other side. The two sides are then matched together so that the cut edge of the sector coincides with the white line. Secure and leave to dry. As soon as the glue is dry the cone is completed.

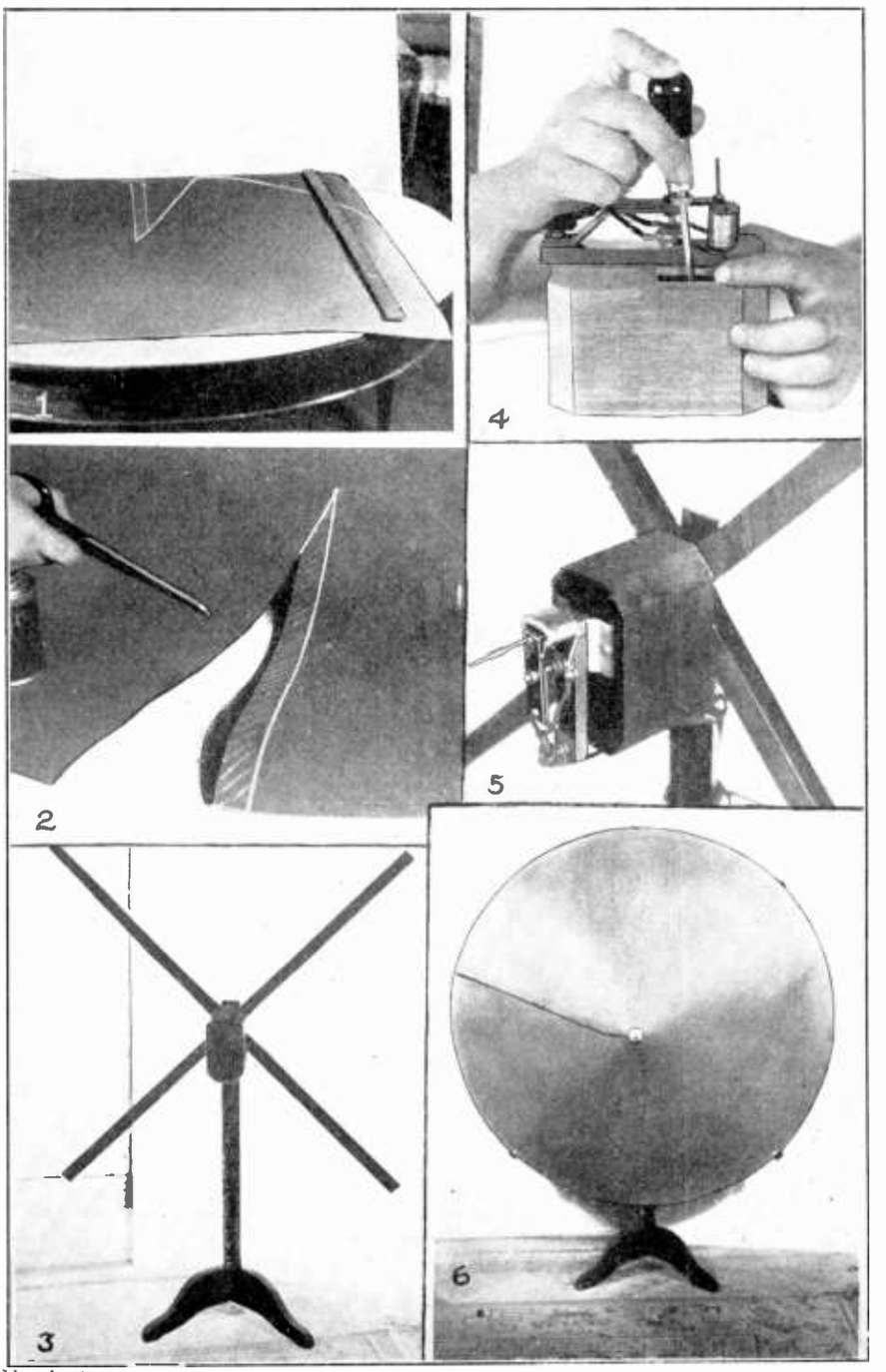
Fig. 3 illustrates how the crossarm, the wooden block and the tripod are assembled. Fig. 4 shows how the phone unit is mounted on the wooden block. It is simply screwed down with a number of wood screws. The solidity of the assembly and the weight of the block are two important features in getting sensitivity and effectiveness of the speaker.

Fig. 5 shows how the phone unit and the block assembly are mounted on the crossarms and the tripod. Note that the center of the crossarms is opposite the coupling pin extending from the unit.

Tone Is Excellent

As soon as the glue has dried on the cone the center tip of this is reinforced with a couple of cone-shaped metal washers, one on each side of the paper. Then the cone is mounted on the crossarms, as is shown in Fig. 6. Then the coupling pin from the phone unit is put through the metal washers and a special sleeve attached thereto and secured by means of a small machine screw provided with a knurled head. This completes the speaker. When it is connected to a first-class radio receiver it will give a tone which will well repay for all the work. It will be rich in the bass notes, it will contain the middle registers as well, and it will not subdue the higher frequencies.

Note that the cone has been mounted with the glued joint pointing northwestward. It will give the cone a better appearance if the joint is pointing downward. Of course, that detail does not change the tone of the speaker.



(Hayden)

SIX stages in the construction of a pedestal model three-foot cone speaker.

SUPER STATION FOR MOTALA

Equipment for the super-broadcasting station at Motala, Sweden, has arrived and is being mounted. Masts have been erected and it is predicted that the station will be ready to begin operation by the end of May, this year. The equipment for this station was furnished by Marconi, Ltd. of England.

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Why Have An Amplifier More Faithful Than the Human Ear?

By E. J. C. Waite

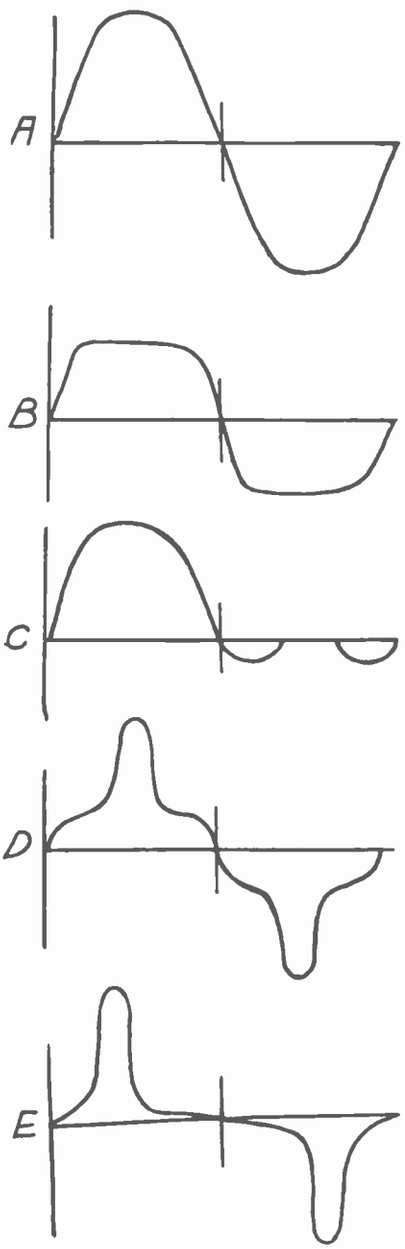


FIG. 1

A—A pure simple harmonic wave without higher harmonics. An air wave of a pure tone has this shape.

B—The form of the wave after it has passed through an overworked vacuum tube with correct grid bias. Tops are flattened, indicating that harmonics have been introduced into the output.

C—The shape of the wave after it has passed through a tube worked with a much too great negative bias. The positive half of the wave is undistorted while the negative is nearly blotted out. Note the two small loops on the negative side. These would have been absent had the negative bias been increased just a little.

D—Form of the wave after it has passed through an iron core transformer. The sharp peaks indicate where the permeability of the iron core is greatest. The low portions of the curve indicate where the core is nearly magnetically saturated.

E—Another wave form showing how a transformer of small core distorts the signal and introduces harmonics. The sharper the peaks are the greater are the harmonic amplitudes.

THERE are two types of distortion introduced into the signal in a radio receiver. One is called frequency distortion and the other amplitude distortion.

Frequency distortion is the introduction of harmonic frequencies into the signal. For example, if the signal is a pure tone of frequency or pitch A, then if there is frequency distortion in the circuit, the output will contain frequencies 2A, 3A, 4A, etc. The first of these overtones, or 2A, is usually much smaller than the fundamental and much greater than the higher overtones. It is easy to design an amplifier so that the second harmonic, or 2A, is only 5 per cent as strong as the fundamental A. The third harmonic would then be much less than 5 per cent. as strong as the fundamental, and the total frequency distortion would be negligible and imperceptible.

The frequency distortion arises from the fact that the output is not proportional to the input, but depends on the amplitude of the input voltage. More particularly it is caused by the fact that the grid voltage-plate current characteristic of a vacuum tube is not a straight line, and in the case of transformer and choke coil coupled circuits that the magnetization of the iron cores is not proportional to the current in the winding.

Flattened Peaks

Both in the tube and in the iron cores the peaks of the signal are flattened out. If the signal goes in as a pure harmonic wave it comes out with a similar wave but more obtuse. This flattening indicates the presence of harmonics, because a curve of that type can be recreated out of a pure harmonic curve, and many of its overtones, provided that the amplitudes of the overtone curves are chosen properly.

Frequency distortion is equivalent to wave form distortion, as can be gathered from the preceding. A pure harmonic wave goes into the amplifier and a badly twisted and misshaped wave comes out. If this distortion is not severe it is not objectionable because the various overtones introduced are harmonic and therefore do not produce discord. In a receiver the overtones are in exact harmony with the fundamental, which is not true of the over tones in stringed instruments.

The effect of the introduction of harmonics into the signal is to change the timbre of the music. If the distortion is not severe it may merely change the tone so that it sounds as if coming from an instrument of the same kind but having slightly different tonal quality.

For Better or Worse

It may improve the tone or make it worse. When the distortion is severe it invariably makes the tone greatly inferior or even unrecognizable. This takes place when the tubes are overworked and underloaded, and when the grid bias is either too much negative or too much positive. It also takes place when transformers and choke coils are overworked, that is, when the core area is insufficient for the work they are called on to do. In the above the term "overworked" is used when the input voltage to tube or primary current to transformer is too great for the size of the instrument. The term "underloaded" is used to express the fact that the load impedance is less than that of the tube.

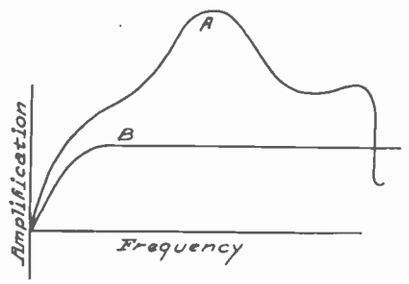
Very bad frequency distortion can be noted when the grids of the amplifier tubes are made too much negative. One-half of the wave can be cut off completely by making the bias such that the tube operates at the point where the plate current is zero. Increasing the bias still more will also cut off some or all of the remaining half of the wave. An experiment of this kind is interesting and instructive in that it tells the experimenter what is wrong with the set when the sound is not just natural, or when there is a queer buzz in it. It may be caused by a too greatly negative grid.

Reactances Affect Amplitude

Amplitude distortion is caused by reactances in the amplifier. Some of these reactances are those of the stopping condensers in the grid circuit or other series condensers, the shunt condensers used to separate radio frequencies from audio, series choke coils used for the same purpose, and shunt choke coils used for supplying the plate current when these coils are parallel to the line or to the speaker. A shunt coil of low inductance and a series condenser of low capacity will suppress the amplification of low notes, and consequently will make the final amplitude of these small. A shunt condenser of large capacity and a series coil of large inductance will suppress the amplification of the high notes and make the final amplitude of these low.

The mechanical properties of the loud speaker also will affect the amplification. In this case stiffness is equivalent to capacity, and mass of the moving parts to inductance. Thus, if the speaker structure is too stiff, low notes will not be brought out with full amplitude and if

(*Concluded on page 20*)



Curves showing the amplitude distortion in two types of amplifiers. Curve A represents the amplification in a transformer coupled amplifier of very poor quality. In the middle frequencies the amplitude amplification is very great. At the low frequencies it is relatively poor. At the upper ones it holds up well until a certain frequency, when it drops to practically nothing. If this cutoff is below 10,000 cycles, many characteristic sounds will not come through at all. Curve B shows the characteristic of a good amplifier. It drops off at the low frequencies but remains constant over the greater part of the audible scale. The decrease in the low frequencies is not nearly so serious as the corresponding decrease in the upper curve. These curves show how the amplified amplitude depends on frequency, when equal amplitudes are put into the amplifier.

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The Distinction
Between Voltage and Power Amplification

By Spaulding Spencer

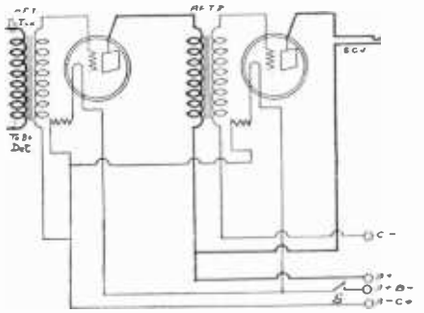


FIG. 1

TWO TUBES in a transformer coupled audio circuit that represent power amplification. Transformer coupling increases the product of voltage and amperage more per stage than other methods, hence this is called power amplification

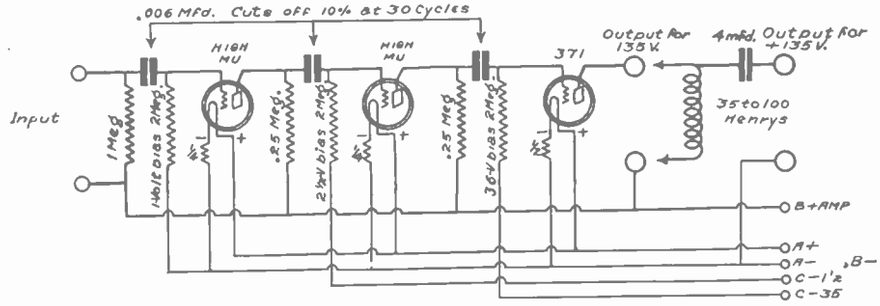


FIG. 2

A three-stage resistance coupled audio amplifier, using high mu tubes, except in the last stage. This exemplifies voltage amplification. The power is increased less per stage than by the transformer method, hence resistance coupling is called voltage amplification, as distinguished from power amplification.

THE term emf will be used in the following and it is well to tell what it means. If an electric current is to flow around a circuit there must be some force driving it. This force is called the electromotive force, and this term is abbreviated emf. It is measured in volts. The emf is also the total voltage drop in the circuit when current is flowing, and is numerically equal to the product of the current in amperes and the total resistance in the circuit measured in ohms. If the total impedance in the circuit differs from the resistance, the emf is equal to the current times the total impedance.

A vacuum tube is a voltage amplifier and nothing else. Current and power amplification are incidental. When a certain AC voltage is impressed on the grid of the tube, this is multiplied by the amplification constant of the tube, and the product becomes the effective emf in the plate circuit. It is this which drives current around the plate circuit whenever it is closed in series with plate battery. For example, let the grid AC voltage be ½ volt and the amplification constant of the tube 30. The effective emf in the plate circuit is then 15 volts. Let the internal plate resistance of the tube be 150,000 ohms and the external or load resistance 300,000 ohms. The total resistance in the plate circuit is then 450,000 omhs. The AC flowing in the plate circuit will be 15/450,000 ampere, or one-thirtieth of a milliampere. The total voltage drop is, of course, 15 volts, but this is divided in the ratio of 5 and 10 between the internal and the external resistances.

While the total voltage amplification of the tube was 30, the available voltage is only the drop in the external resistance, which is 10 volts in this case. Since the input voltage was ½ volt, the effective voltage amplification of the tube and the coupling resistance is only 20. This is only two-thirds of the maximum, and it bears the same relation to the external resistance that the amplification constant of the tube bears to the total resistance.

The total power expended in the plate circuit is the product of the emf and the current, or in the case assumed 15 x 15-450 milliwatt, which equals one-half milliwatt. This power is divided between the internal and external resistances in proportion to their values. The power expended in the internal is wasted, and is equal to 1/6 milliwatt. The power expended in the external is useful in maintaining a voltage difference across the load. This power is 1/3 milliwatt in the case assumed. The efficiency of the device is the ratio of the useful wattage to the total, or 2/3.

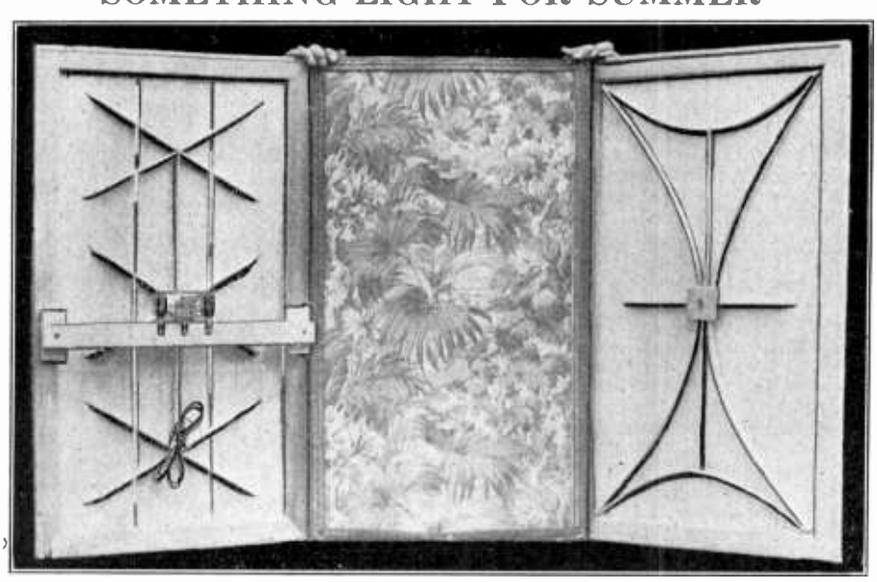
So far we have not had any true current or power amplification because we started with voltage. Now suppose that we have another tube and that we couple it to the first by means of the external resistance. The voltage drop across this resistance then becomes the grid input voltage to the second tube. This we saw was 10 volts. If the amplification constant of the second tube is 3, the effective emf in the plate circuit of the second tube is 30 volts. Then suppose that the internal plate resistance of that tube is 2,000 ohms and that the load resistance is 4,000 ohms. The total resistance is then 6,000 ohms. The 30-volt emf will drive a current of 5 milliamperes through this resistance.

Now we can speak of current amplification by comparing the current in the plate circuit of the second tube with that in the first. The ratio of these currents is 5 milliamperes to one-thirtieth, or 150. This is the current amplification in the last stage. It has no particular significance by itself unless both of the tubes are exactly alike.

We can now also speak of power amplification if we compare the powers expended in the external resistance of the two tubes. The power expended in the first circuit was 1/3 milliwatt. The power expended in the second is the product of the current and the voltage drop in the 4,000-ohm resistance, or it is the product of the square of the current and the resistance. The current is 5 milliamperes and the resistance is 4,000 ohms, which makes the power expended 5x5x4, or 100 milliwatt. The power amplification is therefore 300. It is the 100 milliwatt power which is useful in driving a loudspeaker.

In designing a receiver we should always strive to get the maximum voltage amplification without introducing distortion, until we get to the last tube, and then we should strive to get the most undistorted power. All the amplifier tubes n the set are voltage amplifiers.

SOMETHING LIGHT FOR SUMMER



(Underwood & Underwood)

A SPEAKER of the tapestry ornamentation type is shown at center. Front and rear of similar speakers are at right and left. Balsa wood from the jungles of South America, and seven times lighter than cork, constitutes the diaphragm.

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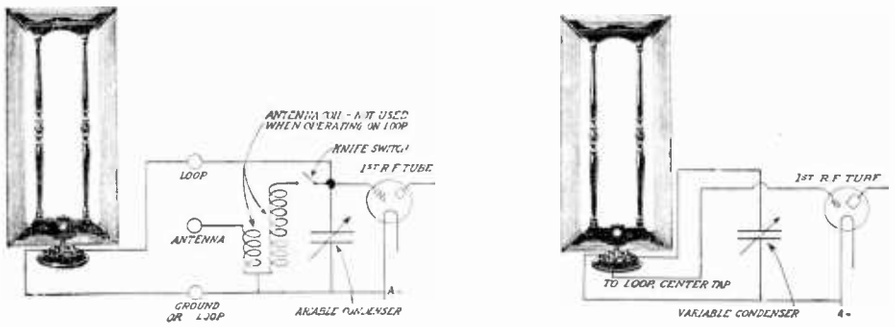
"My Kingdom for a Loop"
And Here Is How to Realize the Wish

By George W. Hoehn



HOW the antenna coil is disconnected in a tuned RF set and a Bodine loop connected in its place is shown at left. A knife switch may be used so that the antenna coil may be cut in at will, but the loop should then be disconnected. At right is a method of using a midtap loop with Neutrodynes particularly. This method affords greater stability but lesser volume.

A PROPERLY installed loop will be crease selectivity and anord portability and ease of operation. In some congested radio districts it is almost impossible to get satisfactory performance from any set without a loop.

In the past, one objection to loops has been their unsightly appearance, due to size, shape and design. Now, however, due to modern engineering skill, handsome, highly efficient loops have been developed.

One need only look through the latest catalogues of set manufacturers to realize that loop-operated sets are becoming more popular every day.

Many manufacturers also have recognized the insistent demand for loop-operated receivers by equipping their sets with connections so that either aerial or loop can be used. Of course low-powered sets with loops will not have the distance range obtained with a long aerial, but the better selectivity and quieter operation offset the sacrifice of distance. By using a special detector tube in these sets, the reduction in distance is very slight, if any. High-powered sets, such as Super-Heterodynes and multi-stage tuned radio frequency receivers, usually perform best with a loop. A large proportion of manufactured sets, using five, six or seven tubes, is of the tuned radio frequency type. It is not generally known that sets of this type, designed only for use with aerial and ground, can be changed easily to operate on a loop.

The Better Way

Any set will operate, after a fashion, if the loop is simply connected to the aerial and ground binding posts of the receiver. In this way, the loop acts as a very small aerial and the full advantage of the loop is not realized. However, if the loop is connected so the first (or antenna) condenser tunes the loop, in place of tuning the antenna coupler coil, you will have a real loop receiver. This method is applicable to all TRF receivers except single control sets not provided with a separate adjustment for the antenna condenser.

To adopt a set to loop operation locate the antenna coil. This is the coil that has a connection running directly to the binding post of the set marked "aerial" or "antenna." Sometimes it is necessary to remove the set from the cabinet to locate the wiring.

Trace the Grid Wire

Locate the grid wire on antenna coil. Upon examining the antenna coil you will note that other wires are connected to it. Find the wire that runs from the antenna coil to an adjacent tube socket and also to the stationary plates of the nearest variable condenser. This is the grid wire and it is connected to the G post of the first socket.

Details of Changes

Disconnect the grid wire from the antenna coil, leaving the other connections of the grid wire to the tube socket and condenser undisturbed. It is convenient to insert a small knife switch at this point, so that the disconnection can be made by opening the knife switch and if it is desired to use the outside aerial again, the switch may be closed and the set will be just as it was originally.

Connect one terminal of the loop to the grid wire and the other terminal of the loop to the ground binding post of the set. For convenience in connecting the loop, an extra binding post may be mounted within or on the back of the set. Use separate lead wires to connect the loop to the set, because if the wires are twisted or braided into a single cord the capacity between them interferes with the proper tuning of the loop. Your set is now ready to operate on the loop. Greater distance and louder signals may be secured by connecting a ground wire to one of the terminals of the loop, which terminal can best be determined by trying first one and then the other, or you can leave the ground wire connected to the ground binding post of your set.

Operation With Loop

With the loop connected as described above, turn on the set and turn the dials to the same setting as when you used the outside aerial for some nearby station. Swing the loop so that the cross bars of the frame point approximately in the direction of the station and retune the antenna dial until the station comes in. Turn the loop until the station comes in clearly. The directional feature of the loop is a great aid in tuning out interfering stations. You will find that the antenna dial readings will vary somewhat from those previously obtained with the antenna coil, but the other dials will log about the same as when you used the outside aerial.

The inductance necessary on the loop depends on the capacity of the antenna condenser in your set, and should be so proportioned that the highest wavelength station will tune in somewhere near the upper end of the dial scale. Different sets have condensers of different capacities, although most TRF sets use condensers having a capacity of about .00035 mfd. The smaller the condenser, the more turns are necessary on the winding of the loop. If there are not enough turns on the loop you will not be able to get the highest wavelength stations with the condenser set at 100, and if there are too many turns on the loop the stations will be crowded at the lower end of the dial and you may not be able to reach the lowest wavelength stations. Some condensers have such a high minimum capacity that the low wave stations will not come in, even with the condenser set at zero, and it is then necessary to use fewer turns on the loop for the low wavelengths.

Short Waves to Be Tested in Two 24-hour Programs

32.77 and 26.8 Meters to be Used by General Electric the First Day and 32.77 and 22.02 on Second Day, a Week Later

Two 24-hour transmission tests will be made by radio engineers of the General Electrical Company on short-wave transmitters. Observers, located throughout the world, will co-operate in making reports on signal strength and clarity in daylight and dark of the various transmitters. The tests will be held on Saturday, May 28, noon, until noon the following day, and Saturday, June 4, noon, until noon next day.

The transmission of music and speech will be on station 2XAF, 32.77 meters, and station 2XAD, 26.8 meters, on May 28. On the following Saturday 22.02 and 32.77 meters will be used simultaneously.

It is possible that both transmitters will not be heard at the same time. For example, 2XAF has been most effective in broadcasting during darkness and the greatest distances have been obtained over areas entirely in the dark zone. The recent successful rebroadcasting of 2XAF'S signals by Australian stations occurred at about 6 p. m., Australia time, of a program which originated at the studio of WGY at 5:30 a. m. Station 2XAD, operating on 22 meters, has proved a more reliable station for European rebroadcasting when part of the intervening territory was in the daylight zone. These tests are conducted for the purpose of getting fairly reliable data on the comparative value of the various transmitters in daylight and darkness.

Observers will make reports from six points in the United States, from Berlin, London, five cities in South America, North Palmerston, New Zealand, Melbourne and Perth, Australia; Shanghai, Tokio, Johannesburg, Manila and one station in Hawaii.

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How to Operate
The Adams-Griffin Shielded Receiver

By Dana Adams-Griffin

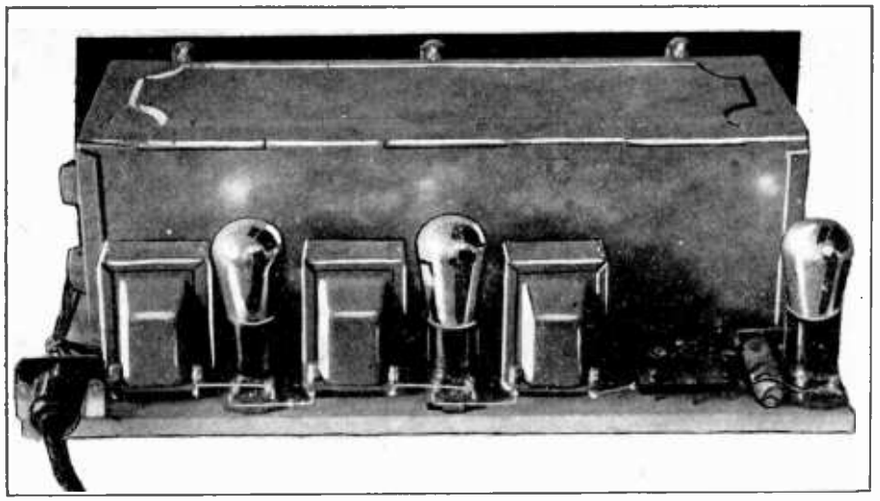

FIG. 3

The cable connector, the two audio transformers, the output transformer, three sockets and the RF choke coil are placed to the rear of the shielding compartment. On the left side of this shield are two rheostats. The speaker output is taken from the left-hand binding posts on the insulated square. The other posts are for antenna and ground.

[*Part I, dealing with the construction of the Adams-Griffin receiver, was published last week. Part II, which discusses operation and also audio channel and eliminators, follows.*]

TURN both rheostats on about seven-eights of the way for the first trial. The proper position of the rheostats, which is always near this point, will be found by experiment. They will not have to be touched again unless the A battery is practically discharged, in which case recharge. The effect of the first rotor coil is merely that of antenna coupling variation. For trial it should be set at a 45-degree angle. Its final setting depends on the length of antenna and local interference. Antennas up to 150 feet will be found to be satisfactory even in the worst "interference locations." The second rotor varies the coupling between the second and third stages. It should be set at 45 degrees for the trial. It will be found that when you turn the rotor one way the oscillation will be severe with little amplification. A reversal of 90 degrees will give good amplification with little tendency to oscillation.

The rotor in the detector should be set at 90 degrees to the stator winding. The effect of "negative regeneration" will be noted in turning this rotor into the stator in one position, while the other gives the desired regeneration on the detector. Now set the neutralizing condenser not quite half way in and forget it. With these adjustments we are now ready to tune in the reciver.

Experiments at Night

Turn up the volume control to the half-way mark and tune in some station around 40 on the dials. Oscillation will probably be encountered along with the signal and the volume control should be turned back until oscillation ceases. Now retune carefully and adjust the first rotor until the first dial tunes sharply. Then advance the rotor in the detector coil and an increase in signal strength will be noted until the oscillation point is reached. With the detector just below oscillation the receiver is of course wonderfully sensitive at this particular wavelength.

As higher waves are tuned in, perhaps the gain of the radio stages falls off more rapidly then in the detector. In that case when the volume control is turned up the detector is at the oscillating point while the radio stages are not yet at the peak. A slight readjustment of the second and detector rotors will clear this up. Several nights of interesting experiment will be necessary before all wavelengths are tuned in at the maximum efficiency. Of course with the receiver operating at its best the selectivity is sharp and it is well to caution against undue condemnation if DX does not come in through the locals immediately.

The distance is there for those who tune carefully, even with the locals pounding away at full blast, and once a station is logged usually it may be returned to night after night.

A discussion of the audio amplifier and current supply apparatus of the receiver is indeed an important one. Good quality is of course the most necessary feature in any broadcast receiver. A good cone speaker is one of the things required to attain this end. Having such a speaker it is of course necessary to supply it with the different frequencies as they come from the transmitter. With transformers having a large core and proper windings relatively equal amplification may be obtained over the entire audible scale. If we eliminate distortion from such a combination of speaker and amplifier the quality should be nearly perfect. Such a result is easily obtained by taking care to use the proper tubes and current supply.

Use of Power Tubes

The importance of the relation of power tubes and quality can not be too strongly emphasized. It can easily be imagined that distortion of the output of a 100-watt station would be terrible if WJZ's 20 kilowatt speech amplifier were put into it. To a lesser but just as important degree the same thing happens in any receiver with a an—01A in the last stage. The plate current simply is not large enough to carry the load nor is the grid biased enough to prevent the grid from going positive when loud portions of a selection are received. A —12 tube will do in the output stage, but with this receiver a —71 tube is much preferable, and even a —10 tube will serve to better advantage, so great is the power.

While the equipment to run the —71 or —10 is a trifle more expensive than necessary for the smaller tubes, it is well to remember the old adage about "something for nothing," which is as true about radio as about anything else. A number of very good eliminators for the —71 tube is available today. Among them the Silver Marshall and Thordarson kits which not only supply the —71, but also the B and C supply for the entire receiver.

[Trouble-shooting next week]

LIST OF PARTS

C1, C2, C3—Three Amsco .00035 S. L. T. condensers.
C4—One Precise 3-plate condenser.
C5—One Tiny Tobe .00025 condenser.
C6—One Tiny Tobe .001 condenser.
C7—One Tobe 1 mfd. condenser.
C8—One Tobe .1 mfd condenser.
R1, R2—Two Yaxley 6-ohm rheostats (16K).
R3—One Carter 200,000-ohm variable resistor and filament switch.
Two Silver-Marshall 110-A Coils.
One Silver-Marshall 111-A Coil.
Three Mar-co illuminated controls.
Three Silver-Marshall Coil Bases No. 515.
One Westinghouse Micarta panel, 7x21 x3/16 inches.
One Westinghouse Micarta binding post strip 2½x2½x⅛ inches.
One Graymore RF choke coil.
One Graymore 2-A shield.
Six Pacent sockets No. 83.
Two Pacent Superaudioformers No. 27-A.
One Pacent Superaudioformer No. 27-B.
One Yaxley Cable No. 660.
One Yaxley Switch No. 763.
Four Eby binding posts Ant., Gnd. and two loudspeakers.
One Amsco 5-megohm Grid Gate and mounting.
Three screweyes with ½ inch eye.
One baseboard 10x20x½ inches (plywood).
Thirty feet Acme flexible Celatsite wire in five colors.
Two lengths of bus bar.
Assorted screws, bolts, etc.

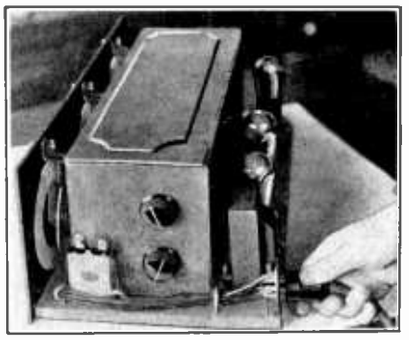

FIG. 4

The cable connector leads are distributed by the shortest routes outside the shield to the multiple switch and to points inside the can. Note the placement of the rheostats and the bypass condenser.

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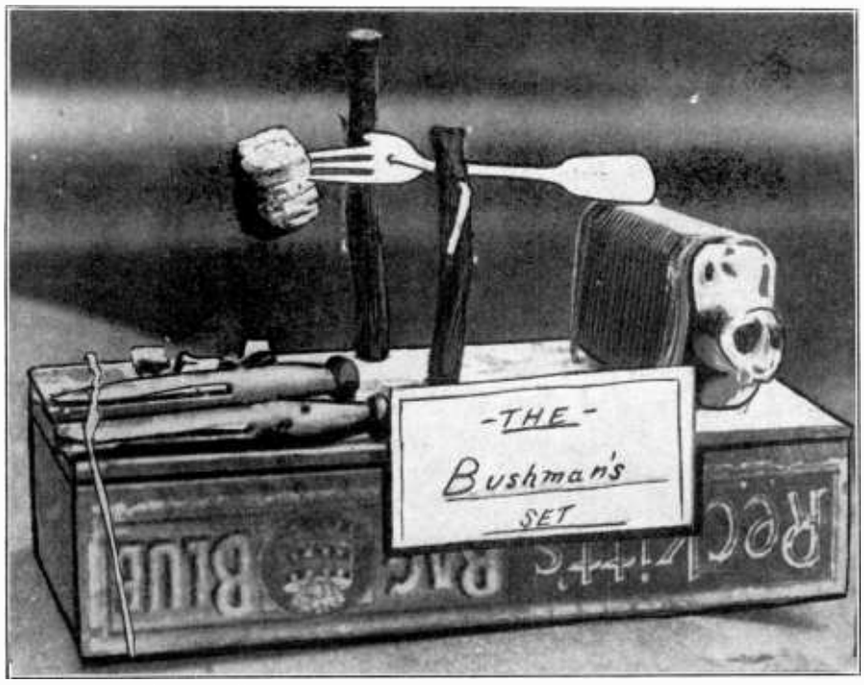
CRUDE SET DRAWS CROWD



(International Newsreel)

A CRYSTAL SET, called "the Bushman's set," was exhibited at a radio show in Sydney, Australia. The set consisted of an old flask, a broken fork, two clothes pins, an inductance around the flask and two output clips. Not exactly the thing for Windsor Castle, one might say, but crowds viewed the crude set.

Steady Filament Voltage Called a Quality Asset

By the Engineering Staff

Radiall Company.

To understand the why and wherefore of true tone control, let's peep into the workings of a tube. To insure the discussion from going dry, we will work by analogy. Set up a still and connect the goose-neck to a vacuum pump by a rubber tube. Half fill the still with water and put a gas flame underneath. The water starts to warm and a little water vapor or steam rises from the surface. Naturally, as the water gets hotter, more and more steam rises. Then again, suppose we start the vacuum pump going. This will suck the steam away from the surface and give some more steam a chance to rise. The faster we pump, the more suction and the more steam we pull over. The bigger you make the gas flame, the faster the steam will flow. In other words, we have two ways of increasing the flow of steam, first, by increasing the heat, and secondly, by increasing the amount of suction.

Now the vacuum tube operates along the same lines. The filament is heated by passing a current through it. The heat causes minute quantities of electricity to bubble off. These are called electrons, which are attracted by positive bodies. So, if we place a plate in the tube near the filament and connect it to the positive terminal of a battery, the electrons bubbling off the filament will be attracted by the plate, just as in the still the vapor is attracted by the suction pump. An increase in the filament temperature will cause an increase in the quantity of electrons buhbling off the filament, just as more vapor is created when the temperature of the boiling water in the still is increased. The heated filament corresponds thus to the boiling water, and the plate attraction to the pump suction.

Suppose we now put a damper in our suction pipe, of the kind used in pipes which lead to chimneys of coal stoves. As we close the damper, the flow of steam will be decreased and vice versa. We now have three elements which affect the flow of steam, first, the temperature of the water; secondly, the suction of the pump; thirdly, the position of the damper. The latter acts like a valve.

In our tube we have negative electrons bubbling off the heated filament, which are attracted to the positive plate. Let us put a wire mesh in the path of the electrons between filament and plate. The negative electrons are extremely small in size and, therefore, will pass through the mesh to the plate. Let us assume a strong negative charge placed on this mesh or grid. The negative electrons will be repelled by another negative pole. We can decrease this repelling action of the grid by decreasing its negative potential. The more we decrease it, the more current will flow. If the grid has a negative potential of 4 volts, there will be no flow of current. As the grid potential is made less negative, or made more positive, the plate current rises until all of the electrons go to the plate, when it is said that the saturation current has been reached. This corresponds to the open position of our damper in the still pipe line.

The grid, therefore, acts like a shutter By increasing or decreasing its potential the amount of current passing through to the plate circuit can be varied proportionately. Suppose we now vary the grid potential by means of currents received from an antenna. The plate current, will, of course, vary in the same order.

The amount of current allowed to pass by the shutter or grid depends upon the construction of the tube. Some tubes might allow an increase in plate current of .1 milliampere, when the grid potential goes up to 1 volt, while others might allow an increase of say .9 or 1.05 milliamperes under the same circumstances.

The grid voltage-plate current curve is called the characteristic curve of a tube. Various types of tubes have different characteristic curves, depending upon their design. All tubes of the same type, as for example all UX-201-A tubes, have approximately the same curve. If the grid in a tube is placed nearer the filament, it will have greater influence on the electrons bubbling from the hot filament. In this way the characteristic curve is changed. Another way to produce the same effect is to increase the fineness of the mesh.

In order that a tube function properly, it must be operated under the conditions for which it is designed. This implies that, when the tube is used as an amplifier, a negative or a positive change in grid potential must cause an equal decrease or increase in plate current. The grid potential, therefore, should at all times be so adjusted that the normal plate current is at its midway value.

Changes the Plate Current

The plate circuit current changes with various filament temperatures. As the filament current is increased, the plate current increases This will explain a condition which no doubt has perplexed many who have operated radio receivers. In most of the sets today a rheostat is used for two reasons. One, to regulate the temperature of the filament as the battery voltage changes, and secondly, as a volume control. Operating a rheostat in this way you no doubt have noticed that the volume decreases when the rheostat is turned down, but you also have noticed that the quality is much poorer and thinner. The reason is that by turning down the rheostat you decrease the plate current and what really happens is that the volume is decreased by cutting off the top of the curve. This naturally introduces distortion.

Thus a rheostat is not a good volume control, so far as distortionless operation is concerned. Its only function is to give the tubes their proper current. As already explained, a tube is designed to operate under exacting conditions. For maximum efficiency and life, the filament must be operated within very narrow limits. This can be done with the rheostat, providing the operator is careful, experienced, and has the use of an accurate voltmeter. In the average home, however, a set is operated by various members of the family. Some are more careful than others.

It Makes a Difference

In many cases the rheostat is turned on full, because to the operator this does not seem to make much difference. In truth, it does not make much difference in volume after the current is increased to a certain point, but it makes a vast difference in the life of the tubes.

Maximum efficiency, together with long life for the tubes, demands constant and accurate regulation of the filament current, and a simple solution is offered by using Amperites, or self-adjusting rheostats. These devices actually compensate for any variation in the battery voltage, automatically and accurately, and are not simply ballasts, which are fixed resistors to reduce battery voltage to safe limits.

ROBYN BACK TO "FAMILY"

William Robyn, known to radio fans as "Wee Willie," lyric tenor of the Capital Theatre Family, who made a concert tour of the Middle West, recently returned to the "family," which broadcasts through WEAF and other stations.

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Storage Battery Care Pays Big Dividends

Simple Attention May Result in Life of Five Years or More—Expert Tells How to Use Battery in the Home

By Paul M. Marko, Jr.

Vice-President Marko Storage Battery Co., Inc.

WITH radio becoming more and more a part of our daily existence, it is necessary for the owner of a receiving set to learn more about the parts that make it possible for his set to function and give him the right kind of reception.

The storage battery, while respresenting only a small part of the entire cost of the complete outfit, is without doubt one of the most important factors in making provision for clear tone and uninterrupted service. Yet there are a great many who give it very little, if any, care in the home, and, sadder still, some who never even give the battery a thought until that wonderful concert to which they have looked forward to so long, suddenly fades out, or the voice of the referee tolling off the fatal count in the big bout dies away in the unreachable distance. Then, and then only, do they think of the storage battery, and it usually does not take them very long to let the manufacturer know what they think of it.

The battery should not be too hastily blamed, for if, at the outset, the user has purchased one of a standard and known make—and there are many on the market—he can rest assured that it will repay him many times over in the proper kind of service, provided he gives it fair treatment.

Necessity for Good Condition

In the operation of a radio receiving set, the vacuum tubes might be termed the heart of the set. Two sets of batteries are required to operate these tubes, one to heat the filament, this one known as the A battery, and one to supply the plate voltage, this one known as the B battery.

It is the power from the B battery, flowing through the tubes and then to the loudspeaker, that sends forth the songs, music or whatever entertainment you select from the various programs on the air.

So that the current from the B battery may flow through the vacuum tube, the filament of the tube must be heated to the proper point or the B current will not carry across the space between the plate and the filament.

Therefore, it is necessary that your A battery be in condition at all times to supply the proper amount of energy to the filament and maintain this flow steady and constant throughout your reception.

The drain from the A battery is many times greater than that from the B battery, in some radio receiving sets being as much as 2½ or more amperes, while the drain from the B battery is measured in millamperes (1,000 millamperes equal 1 ampere). From this you will see the necessity for obtaining an A storage battery sufficiently large and sturdy to meet the heavy drain to which it is subjected, otherwise you will be bothered with having to recharge the battery frequently.

Meaning of Battery Rating

The standard practice today among reputable storage battery manufacturers is to rate their batteries of various sizes at the 1 ampere-discharge-rate. In other words, if a battery is rated at 100 ampere hours, this means that if discharged at 1 ampere, it should last 100 hours before becoming fully discharged.

In selecting a storage A battery for your set, you must take into consideration the number and kind of tubes in the set; that is, what will be the total draw of these tubes in amperes. For instance, a set using five one-quarter ampere tubes will draw 1¼amperes an hour; consequently, a 100-ampere hour battery (the most widely used size) will give approximately 80 hours' service on a charge.

It is not advisable, however, to drain a storage battery to the last drop of energy and expect efficient service and satisfactory reception throughout the entire period of discharge. It is generally recommended that a radio storage battery be recharged when the hydrometer reading shows 1.150 specific gravity.

The solution in a storage battery of the lead-acid type most generally used consists of sulphuric acid and distilled water, this combination being known as electrolyte.

What Happens During Discharge

In a storage battery which is being discharged, the action taking place causes the acid in the solution to pass into the plates, thus reducing the density of the electrolyte and giving you the varying hydrometer reading by which you determine the condition of charge in the battery.

When the battery is recharged, the acid is again driven back into the solution, increasing its density and consequently giving you a higher gravity reading.

A fully-charged storage battery, when it leaves the manufacturer's hands, usually reads from 1.275 to 1.300 specific gravity, and it should be borne in mind at all times that the solution contains all the sulphuric acid that is good for the battery. The question, "When should acid be added to my battery?" comes up very frequently, however. The answer is: "Never add acid to the battery unless, through accident or excessive spraying while on charge, some of it may be lost. In this event, let a qualified battery man replace and adjust the acid."

Ordinary evaporation should be taken care of by adding distilled water only. Replace this evaporated water about once a month, or as often as necessary to keep the level of the solution above the top of the separators. The separators are the wood spacers between the lead plates.

Reason for Distilled Water

It is advisable to use distilled water for this purpose at all times, because ordinary water, while it may not be harmful to the human system, may contain mineral matter, such as iron, in quantity sufficient to be detrimental to the plates in a storage battery and considerably shorten its useful life.

If your home is not supplied with electricity, or if it is not your intention to care for the battery yourself, we recommend that you select a battery station in your community which displays the authorized sign of some reputable storage battery manufacturer and let that station service the battery. You will be assured of first-class attention at such stations—more so than at the little store that does battery charging as a side line. Let the grocer supply your wants in the way of food, but let a batteryman take care of your battery.

If you do intend to take care of the battery in your own home, be sure to select a charger suitable to your needs. Some homes are supplied with direct current (DC), but the majority have alternating current (AC). Chargers can be obtained for use with either, and it is advisable to select a 2-ampere or a 5-ampere type, depending upon the capacity of the battery. The maximum charging rate is usually shown on the battery.

Procure a reliable hydrometer, for incorrect readings are often taken due to the hydrometer being inaccurately calibrated, or because the float, not being properly balanced, sticks to the side of the barrel. These instruments do not cost very much and it will pay you to obtain a good one.

Reversed Connections Disastrous

Before putting the battery on charge, make sure that in connecting your charger to the battery, the positive lead of the charger is connected to the positive terminal post of the battery and likewise the negative lead is connected to the negative terminal post. If these connections are reversed the battery may be ruined. Apply to the battery terminals a thin coating of vaseline to prevent corrosion.

In maintaining the proper acid level in the cells of a battery, remove each vent cap and then add distilled water only to each cell until the electrolyte level rises to the proper point. Do not attempt completely to fill the cells or they will overflow on subsequent charging, but fill to the point designated by the battery manufacturer. After adding the water, replace the vent caps and put the battery on charge. Sometimes at the end of charge it will be found that the acid level in one or more cells is low. If this condition is found, add distilled water to the right level and then put on charge again for about three hours. Always add the distilled water before starting the charge, never at the end of the charge, otherwise you will be unable to get a proper hydrometer reading, the water not having had an opportunity properly to mix with the solution. When you obtain a hydrometer reading from 1.275 to 1.300 and the battery is gassing freely, it is fully charged.

Procedure to Get Readings

To take hydrometer readings, both in ascertaining the state of discharge and of charge, remove the vent caps and draw sufficient electrolyte into the hydrometer syringe to float the hydrometer. See that the hydrometer floats free from the barrel and allow it to come to rest in the liquid before taking a reading. After taking a hydrometer reading in one cell, force the acid back into that cell and then go to the next cell. After reading all cells, replace the vent caps and rinse out the hydrometer set with clean water.

If, when taking the hydrometer readings, you find a variation of ten to twenty points between cells, pay no attention to this, as it does not indicate any trouble. If, however, the difference is much greater, it is time to consult a reliable batteryman, as there is undoubtedly something wrong in the cell which shows the very low reading.

Any acid that may be spilled or creeps on the outside of the battery should be washed off with clean water and the battery then wiped dry with a clean rag.

Never permit your battery to stand idle for any great length of time, for it will lose about 1% of its capacity each day. After it has become completely discharged, a hard coating known as sulphate of lead forms on the surface of the plates, and it is very hard, even impossible at times, to remove this sulphate when the battery is again put on charge. Treatment of this kind will take many months of useful service from the life of the battery.

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Uncanny Precision Marks Chain Broadcast Feature

Even a Fraction of a Minute is Respected As Scientific and Artistic Workers Combine to Keep Schedule Exactly Right

By J. T. W. Martin

The production and presentation of network radio programs involve a method of "stage" production operating in split minutes, an infinitely more exacting schedule than that required in any other entertainment medium. Delaying the rise of the curtain in a theatre for five minutes because of the lateness of a star performer means little in the life of a stage manager, and in the production of motion pictures, the time element is of distinctly minor importance. But when out-of-town radio stations have been linked with the studios of WEAF or WJZ for simultaneous broadcasting of a program, timing arrangements must be most rigidly observed and every detail of the transmission must adhere strictly to schedule.

Every other phase of the production finds its parallel in the theatre. The microphone serves as the open front of the stage, allowing the audience to "see" what is going on in the studio. Listeners to a network broadcast may be scattered over an area thousands of miles square, but they constitute a real audience. Incidental music or the announcer's remarks set the stage, and the invisible curtain is rolled up by a system of buttons operated in the studio.

The announcer in charge of the program is the stage manager. When the special circuits which will carry the program to the stations of the National Broadcasting Company's Red or Blue Networks have been tested and the studio is ready to go on the air, he takes charge of the control box in the studio. Buttons mounted on the front panel of this box control various combinations of stations, and by pushing the proper buttons, the announcer connects the studio with the proper special circuits to transmit the music and speech to the broadcasters who have signified their intention of broadcasting the feature.

Keeps Watch in Hand

In an adjoining studio, radio performers are finishing another program, which may have a different audience from the one which is about to go on the air, for it is highly probable that it is being broadcast through a different combination of network stations.

The announcer marshals the artists about the microphone. He stands, watch in hand, close by the control box. The hour arrives, a light flashes on the panel of the box, indicating that the program in the adjoining studio is finished and that this studio is on the air. The announcer throws a switch and speaks into his microphone to the assembled listeners of the network stations. He remarks that WEAF and associated stations of the National Broadcasting Company's Red Network are about to broadcast a feature from New York.

In the studio of every network station connected with WEAF, an announcer, headphones on ears, is listening to the words from New York. The announcer at 195 Broadway completes his introduction and throws another switch, releasing the out-of-town stations, and without perceptible pause, the various announcers in different parts of the country speak into their own microphones, stating their own call letters.

Must Keep to Schedule

Fifteen seconds later, the WEAF announcer has finished his local announcement. He throws his switch again, once more linking up the network. If the out-of-town announcers have not finished their remarks, their words are lost. Time is the all-important element, and chain broadcasting must go forward on schedule.

The announcer at New York opens the program, introducing the performers and stating the first number to be heard. He throws another switch, cutting out his microphone and throwing in the studio microphones. The program is on the air. It is being heard by WEAF's listeners and in addition, special circuits are carrying it to the transmitters of other stations of the National Broadcasting Company's Red Network which are broadcasting it simultaneously to their audiences.

Every fifteen minutes during the course of the program, the same general routine as that which opened the program allows each of the out-of-town announcers to state the call letters of his station to his listeners, while the WEAF announcer is giving his particular audience similar information.

Between selections, the announcer in WEAF's studio talks to the combined audience of the network. The program has been carefully timed in rehearsal so that it will exactly fill the time allotted to it. The last five minutes of the program are planned to allow considerable flexibility. Seconds of delay may pile up during the course of an hour so that their sum will amount to minutes, and a minute's leeway in a network broadcasting schedule is a serious matter.

In the meantime, another studio is being "set up" for the program feature which is to follow, and perhaps a dress rehearsal of still a third program is going on in another studio. Program features must march before the microphone on time. The audience can not be kept waiting, and the announcer who is handling the feature on the air must make sure that his program finishes on the dot.

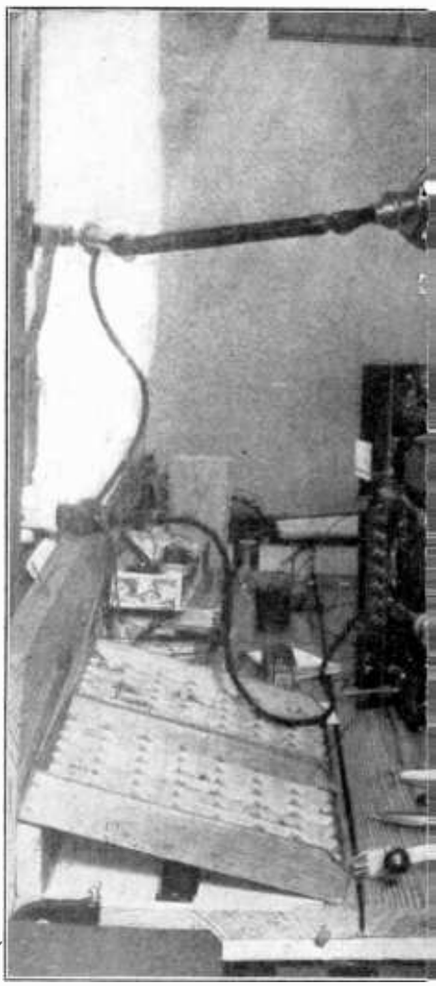
The Off-Schedule Difficulty

As the end of his period approaches, he watches the typewritten detailed program closely. He consults his watch every few seconds to determine the best manner of finishing on time. If the program is ahead of schedule, a short encore number will serve to fill out the allotted period. Such encore selections are always rehearsed, but they are seldom needed.

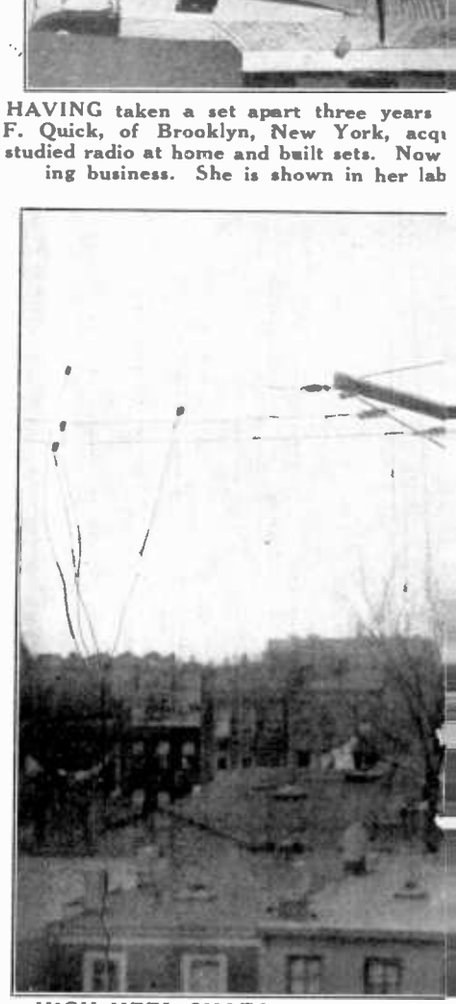
When a program fails to run exactly on schedule, it is usually slow rather than fast. But this is easily overcome. The announcer informs the conductor of the period of the time which is left, and the elimination of one or two "repeat" passages enables the feature to finish on time.

The music stops. The announcer throws a switch and punctuality is achieved.

GIRL BUILDS FLOU



HAVING taken a set apart three years F. Quick, of Brooklyn, New York, acqu studied radio at home and built sets. Now ing business. She is shown in her lab



HIGH HEEL SHOES or not, Harriett

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RISHING BUSINESS

ago "to see what made it tick," Harriette
ired a thirst for radio knowledge. She
she builds 'em for profit and has a flourish-
oratory. (Herbert Photos)

e F. Quick goes right up on anyone's roof

International Programs Now a Fact, Says Rice

General Electric Tests Successfully Carry Music to London, Paris, Australia and South Africa, and Enlarged Scope is Prophesied

By Martin P. Rice

Manager of Broadcasting, General Electric Co., known as "The Father of Broadcasting."

Inter-continental rebroadcasting of radio programs is possible. Tests conducted by General Electric Company engineers at Schenectady have demonstrated that by the use of short waves, signals may be flashed across the Atlantic or the Pacific with sufficient volume and quality to permit rebroadcasting by distant receiving stations.

Vagaries of weather may interfere, and transmitting sets near the receiving point may smear the received signals, but under average conditions our engineers can predict results. On several occasions it has been possible to announce in advance a rebroadcast program and carry through that program successfully.

Just at present American listeners must be content with programs originating for the most part in the 700 or more broadcasting stations in the United States, but it is quite reasonable to expect that when engineers in other countries have developed short-wave transmitters on a par with the transmitters used at the General Electric developmental station. American stations will be able to pick up and rebroadcast programs from other continents.

Schenectady's Work

During the past two years Schenectady programs have been rebroadcast by stations in Johannesburg and Durban, South Africa; Perth, Australia; Keston, England; Paris, France, and Tuinucu, Cuba. In that period our radio engineers have been making thorough and comprehensive propagation tests, at all periods of the year, in darkness and light, with different power volumes, and on a variety of wavelengths. This work has recently been in charge of M. L. Prescott, and a great mass of data has been accumulated.

Recently we received a letter from A. G. D. West, Assistant Chief Engineer of the British Broadcasting Company, informing us that signals of 2 XAF, our 32.77 meter transmitter, had been rebroadcast by all the stations of the B. B. C. chain in the British Isles, seven successive Tuesday evenings. These programs have been included as a regular feature of the B. B. C. programs. They have not always been of high quality, but always of interest to the British listener. Reception is sometimes marred by fading, and at other times the chatter of ship transmitters, particularly those of the spark type, has prevented reception.

Foggy in London; Paris Clear

Of particular interest is Captain West's statement that while the B. B. C. found 2 XAF's signals fading somwhat during the transmission on March 8, Le Petit Parisien station in Paris picked up 2 XAF, and these rebroadcast signals were clearly received in England. P. Gendron, engineer in charge of the Le Petit Parisien station, has been cooperating with the engineers of WGY, and he is very anxious to begin broadcasting on short waves, in addition to his present wavelength of 340.9 meters, in the hope that the French signals will be heard and rebroadcast in the United States.

Of the various transmitters used on short wavelengths by our engineers the most reliable thus far have been the 32.77 and 22 meter stations, 2 XAF and 2 XAD, respectively. 2 XAD has been found most reliable by the British Broadcasting Company when the transmission from Schenectady has been during daylight. Our engineers are very proud of the reported results of their transmission. The Washington's Birthday address by President Coolidge was sent out on both 32.77 and 22 meter and the B. B. C. successfully rebroadcast twenty minutes of the speech. A change of time, of which the English engineers were not informed, prevented broadcasting of the earlier parts of the address.

A few weeks ago a station at Durban, South Africa, rebroadcast 2 XAF signals and Americans on a world cruise heard greetings from home as they sat in the ship's lounge, in the harbor of Durban.

Fight Results

Several months ago the Dempsey-Tunney fight was rebroadcast by station JB in Johannesburg, South Africa, and a Johannesburg newspaper was able to carry the result of the fight in its mail edition.

The Reuter cable announcing the fight's outcome reached the newspaper editorial rooms twenty minutes after the paper had gone to press.

On November 27, an address by Hiram Percy Maxim, President of the Amateur Radio Relay League, delivered to the league members in South Africa, was relayed by station JB.

What the results of inter-continental rebroadcasting will be none can say, but few would have the courage to scout the wildest prediction. In continental Europe today the listener in one country can hear the programs of a half dozen or more countries. A turn of the dials carries him from Norway to Spain, from Italy to England, and from each he hears a different language. As a result, the radio stations of Italy, for example, are offering language lessons in English.

International Friendship

A station in Norway broadcasts lessons in elementary French. Radio magazines in England, in addition to advertisements for radio sets and parts, now carry several advertisements by language experts. Will radio lead everyone to learn several languages, or will it evolve a world tongue? One tendency already noted is the elimination of dialects, thus resulting in a standardization of the same tongue.

The development of communication has brought about greater understanding between different races widely separated by distance. In radio broadcasting we have an outstanding instance.

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Kent Concerts Go On During Whole Summer

The Atwater Kent Sunday night radio concerts are being continued throughout the Summer. A total of twenty-one concerts will be presented in half-hour programs. One of the features is the American Singers quartet, comprising Charles Harrison, first tenor; Redferne Hollinshead, second tenor; Vernon Archibald, baritone; and Frank Croxton, basso.

ALLEN McQUHAE

Allen McQuhae will give a series of three concerts in response to requests from listeners throughout the country who have come to admire the golden-voiced Irish lyricist through his many appearances on Atwater Kent programs and in stage concerts.

The American Singers will then return for another group of three concerts, the quartet being presented in response to the popular appeal of quartet singing as evidenced in a recent survey made by the sponsor, which showed forty per cent of the listening public like quartet music best, with the tenor soloist second in favor. Announcement with respect to the tenth and succeeding concerts will be made later.

These programs will be broadcast from twelve stations: WEAF, New York City; WEEI, Boston; WRC, Washington; WSAI, Cincinnati; WGN, Chicago; WCAE, Pittsburgh; WGR, Buffalo; WOC Davenport; KSD, St. Louis; WWJ, Detroit; WCCO, Minneapolis-St. Paul; WGY, Schenectady.

The programs will begin each Sunday night at 9:15 P. M., Eastern Daylight Time, or 8:15 Eastern Standard Time.

AN EARLY START

(International Newsreel)

ONLY a month old, Richard Lee Golden was introduced to the microphone by papa himself, who is Ernie Golden, leader of the McAlpin Hotel Orchestra, heard over WMCA, New York City. Dad's favorite phrase is "the next numbah."

Ballots Cast By Listeners Select Songs

BY PHIL FABELLO

(Conductor of the Loew's Kameo Theatre Orchestra, New York)

Mr. and Mrs. DX Fan, sitting at home, must feel that it is a cinch for radio orchestra bands, just to play few tunes and become so popular on the basis of so little work. But heading a broadcasting orchestra is a big job. There is the preparation of the program, so that it will please the majority. You get requests from the fans and also from the music publishers who want their tunes popularized. In compiling my program I try to provide real variety for the listeners.

PHIL FABELLO

While arranging my program I am beseiged with requests to put on this or that song. If I were to adhere to all the requests I would be on the air twenty-four hours a day. Therefore I play only such numbers that are requested most often, as the best suitable material for my orchestra.

We have been on the air over WHN a few weeks, but our broadcasting parties are a big success, due in part to the fact that the theatre audience stays in the theatre until our program is completed, creating a real working atmosphere for my men and myself. Broadcasting is great fun and I shall continue it indefinitely.

Mary Lewis Sails As Bride, Quits Fans

"My engagements will have to cancel themselves," said Mrs. Mary Bohnen (nee Lewis) breathlessly, because of her rush to sail on the S. S. Reliance from New York. "I didn't have time to cancel them. We're too much in love to be separated yet."

And thus explains the reason for the cancellation of her participation in the "all-star" program of the Atwater Kent Radio Hour given as the last of the Winter series through the Red Network of the National Broadcasting Company.

Miss Lewis recently became the bride of Michel Bohnen, bass-baritone of the Metropolitan Opera Company. The bride was supposed to remain in this country because of concert engagements, while her husband was going abroad to answer the demands of his own profession. But love proved stronger than audiences, radio included.

Miss Lewis changed her mind only little more than an hour before the ship sailed.

OCEAN 'PHONE POPULAR

LONDON.

Traffic on the trans-Atlantic telephone system is becoming heavy with the influx of American tourists. From one hotel 26 phone calls were made by American business men to New York in one day. The number increases daily.

Stations' Need of Editors

What is news on the radio? Or, rather, is the radio a news organ?

Has the radio formulated a policy towards the selection of events?

In two respects the radio functions as the press does. It sells time-space for advertising at so much per time unit. And it reports events without cost beyond the possession of a radio, to its listeners.

As a vehicle for advertising, the radio exercises varying degrees of supervision over the air-copy in the ads. If an ice-cream manufacturer chooses to run a male quartet as part of its copy, he is following the same principle that a cigarette manufacturer does who bill-boards a beautiful girl smelling roses, by way of nicotine appeal.

As an editorial force, the radio has not yet fully organized its aims or its functions. That may in part be due to the great difference between the reportorial possibilities of the radio and the press. In the first place, the newspaper can cover a dozen or more events that take place simultaneously. The radio can report only one at a time. The press can publish as first class news, events which have taken place the day before. The radio must report an event at exactly the moment it is taking place. The newspaper has many ways of indicating news importance—headlines, length of article, place in the paper, and other preferential devices. The radio has only exclusivity to indicate preference.

The radio must choose between a presidential message ,and a prize fight, between the Beethoven Ninth Symphony, and the honey words of a new thought healer.

On what basis does the radio make its choice?

This is not always apparent, even when one bears in mind the indeterminate character of the audience.

The radio is assuming a great importance as a moulder of public opinion.

Managing editors of radio stations of broad and constructive imagination are needed.

The New York "Evening Post" printed a fine editorial, which we quote:

"The methods by which the radio and the press handled the Butler-Borah prohibition debate at Boston Friday evening showed the rapidly growing divergence which is defining their respective fields.

"The newspapers regarded this first open political discussion of prohibition from the standpoint of its news importance and gave it the fullest possible coverage. The radio had no sense of the event from this angle and gave it no report whatever in this great metropolitan district or the country at large. Only two small New England stations broadcast the debate, and both of those were inaudible here.

"Various private individuals here who made efforts for arrangements by which the West might 'listen in' on Boston were faced with a charge of thousands of dollars asked for the service. In New York it was found at the last moment that the debate hours on the air had been sold to various clients for advertising purposes and that a purely news service had to be barred."

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Stations Ordered to Keep Within 500 Cycles of Wave

Revocation of Permit or License Threatened for Violation—Bellows Says Board's Insistence Will Reduce Interference

About 650 temporary operating permits having been granted to radio license applicants, the Federal Radio Commission is now proceeding on the assumption that the remainder of the 732 broadcasting stations have discontinued and need not be considered for licenses. This was the substance of an oral statement made by Commissioner Henry A. Bellows, who added that it appears that a larger reduction of stations than was expected has resulted from failures to apply for licenses.

At the same time Commissioner Bellows announced the issuance of a new general order by the Commission directing all stations to remain on their stipulated wavelengths and permitting a deviation of no more than 500 cycles, or one-half kilocycle, from assigned frequencies. Mr. Bellows estimated that perhaps half of the broadcast interference so far has been caused by stations which "wobble" up and down from their normal frequencies.

Conditions Better Already

At present, according to Commissioner Bellows, the Commission is handling the "straggling ends" of the temporary permit issues. As a result of the reallocations ordered under the temporary permit grants, Commissioner Bellows said, numerous advices are being received that broadcasting conditions in general are considerably better. Moreover, he added, there has been "surprisingly little" dissatisfaction among the broadcasters with the rulings of the Commission.

The issuances of licenses, which at first will be granted for 60-day terms only, will follow the granting of the last of the temporary permits, Commissioner Bellows said. No radical changes from present wave and power assignments are contemplated in the licenses. Their stipulations will be kept as near those of the temporary permits as possible, but Commissioner Bellows remarked that the Commission would "promise nothing" to the broadcasters in this respect.

Regarding the order requiring stations to remain on their assigned frequencies, Commissioner Bellows said the Commission was not prescribing the method whereby the stations might do so, but proposes to "deal vigorously and promptly" with those which "wobble" and "wander" and thus prove to be "nuisances" both to other stations and to the listener. He called attention to the fact that the Commission has the power to revoke the licenses of stations violating any of its regulations.

Why .5 kc Was Selected

Crystal controls and mechanical indicators are employed by many stations to maintain a constant frequency, but according to Commissioner Bellows, there are many stations which have no such method of check-up. They will be obliged to equip their apparatus at once with any efficient means they choose.

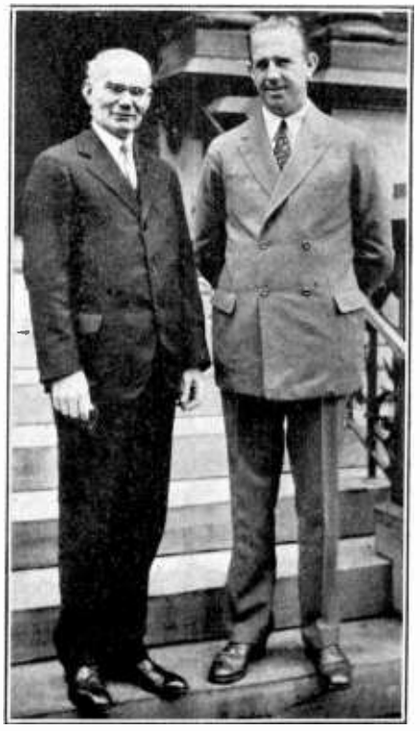
Commissioner Bellows explained that 500 cycles was selected as the maximum deviation after the Commission had carefully advised with radio engineers as to the normal variations. Any properly built and properly operated station can stay within one-half kilocycle of its frequency, he said. This order actually permits a full one-kilocycle deviation, as they can go one-half kilocycle above or below their normal frequency.

"Wobbling on a wave," Mr. Bellows said, "sets up an audible beat note in receiving sets which sounds like static. This has been the cause of much of the interference heretofore."

N. B. C. INSURES EMPLOYES

Life insurance policies totaling more than $500,000 have been distributed to all employes of the National Broadcasting Company, under the group insurance plan entered into by the Broadcasting Company and the Metropolitan Life Insurance Company. Approximately 200 employes have received policies equaling the amount of their annual salaries, with the exception that the largest policy is for $5,000. The entire cost of this insurance is being borne by the National Broadcasting Company, which has also arranged with the insurance company to provide the services of trained visiting nurses for sick and disabled employes.

FAMED PAIR UNITED



DR. LEE DeFOREST, (left) and Powel Crosley, Jr. Mr. Crosley is president of the DeForest Radio Corporation for five years under an agreement. Dr. DeForest, inventor of the vacuum tube is vice-president and consulting engineer. Mr. Crosley plans to produce 10,000 vacuum tubes daily. Mr. Crosley is president of the Crosley Radio Corporation, chairman of the board of the Amrad company, is heavily interested in the DeForest Radio Corporation of Canada and owns WLW.

"Air to Be Clear for DX By Summer"—Caldwell

It will be absolutely necessary to institute a nation-wide reallocation of wavelengths before the listeners in New York City can enjoy the best in radio reception, according to O. H. Caldwell, Radio Commissioner. On his visit to New York to confer with representatives of the broadcasting stations, he said:

"Interference is being experienced on some of the New York station channels from distant stations that are on, or near, the same wave, due to the power of the stations involved.

"This condition will not be noticed so much during the summer, but would constitute an entirely unsatisfactory condition during the season when distant reception is best.

"To make further channel adustments in the New York area at present to escape this condition would only result in an increase in interference caused by the heterodyning of more signals from distant stations if these stations were not reallocated to preserve the desired separation.

"It was easier for me to come to New York and discuss the arrangement for the future with the representatives of the stations rather than have them come to Washington. The suggestions and recommendations will be considered by the commissioners in making plans for the nation-wide reallocation of the wavelength scheme which we expect to become effective some time in the summer. Not until then can the listener-in expect the best in reception. However, the improvement in reception may not become very noticeable until the season of best reception comes around again and fans begin to receive distant broadcast progams again."

Listeners are awaiting results.

Fine New Era Is Impending, Says Bullard

Chairman Promises Clearing Congestion of Stations

Washington.

The dawn of a new era in broadcasting is about to take place, said Rear Admiral W. H. G. Bullard, chairman of the Federal Radio Commission, in an address before the National Press Club, broadcast from 27 stations. Better clarity and satisfaction are inevitable when the wavelength reassignments are completed, he said. Fans who heard his remarks welcomed the promise, as did members of the radio trade, who see in the relief of air congestion a great stimulus to business.

Chairman Bullard, after saying that there is no such thing as a radio Czar in the United States, continued:

"Under the commission's national re-allocation plan," he said, "a separation of forty to fifty kilocycles between local stations would be in order for New York, Chicago and other congested localities. Such a separation should usher in a new era of radio clarity and satisfaction."

He suggested that consolidation of stations by division of time on the same wavelengths would do much to avoid interference.

Admiral Bullard suggested that when the commission could solve the congestion in the New York and Chicago areas a long step toward establishing order in the air would have been taken. He thought the wide separation of wavelengths in the two cities would produce good results.

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A THOUGHT FOR THE WEEK

THE man who, at this stage of the game, refuses to buy a radio set because he thinks something better will come along in the misty future, has about as much sense as the man who refuses to read Shakespeare for the reason that the twenty-first century may produce a better dramatist.

SIXTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

Member, Radio Publishers Association

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

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WISE CRACKS

Franklin Ford, director of WHAP, New York City, ruled off the list of jury eligibles for religious prejudice, tries to compel reinstatement of his name, fails, and announces he will appeal. Something wrong with a man who doesn't try to avoid jury service.

* * *

Something happened to Bob's radio set in the midst of an announcement, so the head of a national daily seemed to be introduced as follows:

"And now, ladies and gentlemen of the radio audience, you will hear the voice of David Lawrence, president of the United States—"

* * *

Woman rises to inquire whether there is any danger of the grid ruining her fine carpet, due to leakage spilling on the floor. All the world laughs and remembers. Transmission of colored pictures by radio is announced. All the world frowns and forgets.

AN ARTIFICIAL SUN

Is Needed for Transmitting Power by Radio, Otherwise Radio Control of Power at a Distance is the Only Possibility

By R. St. John Thwambert

WE hear much about power by radio. Nikola Tesla, the famous electrical engineer and worker with high frequency currents, first suggested the idea some thirty years ago. Since then it has been an intriguing subject. Power by radio!

People who are more interested in the desirability of power by radio than by its practicality dream of the day when a huge broadcasting station will send out power enough to heat and light our homes, drive our factories, run our trains and street cars, propel our ships, and fly our airplanes, when all this power can be had by simply tapping the ether with a suitable tuner.

Of course, power by radio is a natural fact right now. We have the sun, a huge central broadcasting station in the entire solar system, which radiates power in every direction in exactly the same manner that a broadcasting station radiates power. The sun is the ultimate source of nearly all our available power. Coal and oil are only the accummulated sunlight of eons ago. Water power is the sunlight of a season ago. Wood is the accumulated sunlight for a few decades. We have sun engines which convert the sunlight of the moment into the available forms of power, heat and electricity.

Lacks Constancy

The difficulty with the sun is that it does not shine when we need its power to create light and heat. Neither does it shine effectively when the sky is cloudy. But just the same, the sun points the way to power by radio. All we need to do is to create an artificial sun which will shine all the time, or whenever we want it to shine. Thus the solution of power by radio is very simple!

But if the sun be not sufficient to supply all our power needs as we go, where shall we get the power to create the artificial sun? At present we are using up at least a thousand years of continuous sunlight every year in the form of coal, oil, gas, peat and wood. This rate of consumption will necessarily decrease as the accumulated power resources become exhausted. We then have to take recourse to water and wind power. By taking advantage of all available water and wind power it would be possible to approach the point where we use sunlight no faster than we receive it. But would this be sufficient to create an artificial sun for the purpose of broadcasting power by radio waves so that all could have all the power they wanted when they wanted it? Scarcely; it would be just about enough for all if all the available power were used with 100% efficiency, and power transmission by radio is far from 100% efficient. Perhaps it is 1% of 1% efficient.

The Low Efficiency

It is the appallingly low efficiency of radio power transmission which makes the problem so difficult. The greater part of the power that is projected into the ether misses the point. It travels on to the Milky Way and beyond. It is only because of the tremendous amplification possible in a typical radio receiver, and the minute amounts of power required to operate a loud speaker, that radio transmission of speech and music is possible. Of course, radio transmission of intelligence is nothing but power by radio. But the amount receivable is only enough to actuate a head set with the aid of a crystal rectifier. It takes only about one microampere to make an audible sound in a 2,000-ohm headset, which is equivalent to two billionths of a watt. A broadcasting station driving that receiver would have to be increased 25 billion times to be able to light a single 50-watt lamp.

Why, then, do scientists who fully understand the limitation speak of power by radio? Because they think of it as a means of controlling power at a distance. Remote control by radio-transmitted power is the thing, and that subject is due for a great development in the near future. The tuner and the amplifier will play important parts in this development.

Parallels Broadcasting

Much has been done already along this line by many experimenters, and many devices have been radio controlled. There are no new radio principles involved in this. It differs in no essential respect from broadcasting or telegraphy. In broadcasting a loudspeaker is controlled from a distance by radio waves. In telegraphy a headset or a printer is controlled in the same way. Similarly, telephoto and television receivers are controlled from a distance. Technically it is very much simpler to control the operations of an unmanned ocean liner from a station on shore than it is to send a moving picture from one station to another. The operation of a printing telegraph is just as difficult, technically, as would be the steering of an airship from one place to another by radio control.

In the next war it is probable that aerial and submarine torpedoes will be steered to their mark and exploded at the right instant by power transmitted from general headquarters. Tanks may be sent over the enemy terrain to fire machine guns, and throw bombs without manual control but controlled entirely by radio from a safe point behind the lines. A reconnoitering airplane may be sent over the enemy lines to take photographs, print and deliver them ready for use by the time the plane gets back to headquarters. More difficult problems than those involved in these operations already have been solved.

In all of these cases a large source of power must be carried by the moving device, and radio power is merely used to actuate the control levers.

Instrumental Trio To be Heard at WIP

Philadelphia.

The Haenle-Hubbard Instrumental Trio, composed of Florence Haenle, violin; Irene Hubbard, cello, and Blanche Hubbard, harp, will present a program, including some of the compositions of the lighter vein by modern composers, from WIP, Gimbel Brothers, in Philadelphia, on Saturday night, May 21, 8:30 P. M.

Assisting will be May Farley, soprano; Thelma Melrose Davies, contralto.

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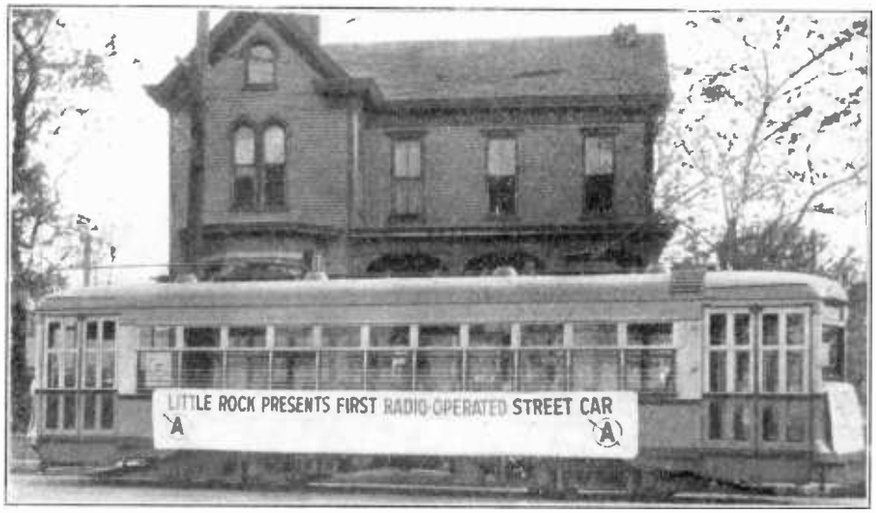

(International Newsreel)

POWER from a small portable transmitter was used for operation of a trolley car in Little Rock, Ark. The transmitter was in an auto beside the trolley, which was operated thus for several blocks. The transmitter weighed five pounds, the trolley 33,000 pounds. Talk about ants!

Time Signals Safeguard Lives of Those at Sea

Radio Proves Boon to Navigators by Enabling Them to Know Exact Position of Ship, Thus Avoiding Accidents

Radio, by making it possible to broadcast the exact time, has proven a great boon to navigators. It provides a means of knowing, to a fraction of a second, the precise time at the zero meridian of Greenwich, a borough of London, thereby reducing to a minimum the possibility of disasters at sea from uncertain knowledge of positions.

So important is the exact time to ships at sea that the error of a single second would cause an error of nearly half a kilometer, at the Equator, while the error of a minute would mean an error of about seventeen miles. Safety in navigation depends almost entirely on the accuracy of a ship's chronometers, and the utmost care is taken with them.

Finding Longitude

The captain of a ship determines his longitude by means of Greenwich time which is indicated by several accurate chronometers. Then with the aid of a sextant he finds the position of the sun or some other heavenly body and calculates his local time. The difference between local time and Greewich or chronometer time gives him his longitude.

Greenwich time is actually determined by telescopic observations of the stars. As a star crosses the meridian of Greenwich the time is noted. In this way the error of a perfect clock is found. Time signals are automatically transmitted by clock to the British Post Office by telegraph and are then broadcast by radio throughout the British Isles.

The French Organized

Beginning Oct. 1, 1926, the French Bureau of Longitudes organized a chain of observatories and signal stations in various parts of the world—at Greenwich, Paris, San Diego, in Algeria, and near Shanghai. At fixed hours during the day these stations send out practically instantaneously, to the world, the information that it is "one hour, zero minute, zero second," or "six hours, zero minute, zero second." The exact local time at each of these stations is also announced. In this way the mariner receiving the radio message knows the exact time at Greenwich without having to refer to a possibly incorrect chronometer, and a glance at the dial of the local time tells him his precise longitude. Thus does radio add to its already long list, a new service to the world.

Map Sending Uses Principle Of Television

Experiments in transmission of weather maps by radio through a "television" process are being conducted at the Naval Air Station at Lakehurst, N. J., with success, the Bureau of Aeronautics of the Department of the Navy announced. The full text of the statement follows:

Tests are being conducted at the Naval Air Station at Lakehurst with a Jenkins apparatus for transmitting the weather map by radio. The apparatus employs a process which is often referred to as "television," but probably is more properly called "radio-sketching." It does not transmit the data by the usual dot and dash code. The receiver sketches the weather map directly on a chart by means of a pen mechanism.

Map is 7x10 Inches

The model which is being tested at Lakehurst receives a map approximately 7 by 10 inches in about 50 minutes. The Bureau of Engineering and the Office of Naval Communications are also much interested in the success of the apparatus and have cooperated with the Bureau in arranging the test.

The Bureau of Aeronautics first became interested in the possibilities of the apparatus as a means of transmitting the weather map expeditiously to aviation units during its exhibition at a radio show about four years ago. Inquiries at that time showed that the apparatus was much too complicated and uncertain for practical use. Since then it has been greatly modified and simplified.

Reduces Errors

When perfected, the apparatus will find wide application to the transmission of all kinds of information and messages. It is expected that the process can be speeded up to several times the present rate. As a weather map transmitter, it eliminates many of the errors arising in transmission of weather data by code and makes it possible for the map to be received directly in the aerological office with less delay in transmission. It is expected that every ship or station having an aerological office will eventually be equipped with an apparatus of this kind.

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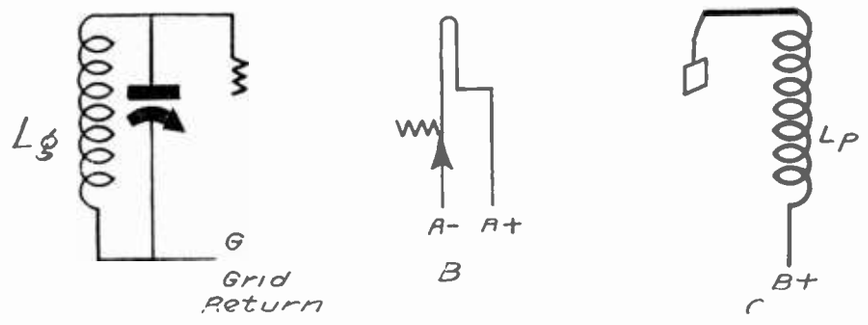

FIG. 532

The terms which Lester Muran queried are here explained diagrammatically. Lg in A is the coil connected in the grid circuit. Lp in C is the plate coil.

I HAVE followed the columns of the Radio University for the past year and obtained some very valuable information. There are, however, several terms, which are used time and time again, which I do not understand.

(1)—What is meant by a positive or negative grid return?

(2)—What is meant by the negative leg of the filament?

(3)—What is the plate coil?—Lester Muran, East Pittsburgh, Pa.

(1)—When one terminal of a winding, say the beginning, is connected to the grid post of the socket, and the opposite terminal or the end is connected to the minus A post, the grid return is said to be negative. Should this latter lead be brought to the plus A, the return would be called positive. The grid return is nothing more than the oppositely connected terminal or portion of a winding one terminal of which has been connected to the grid post of a socket. Whether it is positive or negative, depends upon whether it is brought to the minus or plus post of the A battery, or to the minus post of a C battery, in which case it would be called minus, also. See Fig. 532A, for diagrammatic explanation of grid return.

(2)—This is the minus lead of the filament. In Fig. 532 B the rheostat is connected in the negative leg of the filament, or between the minus post of the filament of the tube and the minus post of the A battery. The other terminal of the filament may be called the positive leg. This applies to any source of power. That is, the negative lead may be referred to as the negative leg.

(3)—This is a coil, one of whose terminals, say the beginning, is connected to the plate, and the end or portion of the winding, is connected to the plus post of the B battery. See Fig. 532 C for diagram.

* * *

IN CONSTRUCTING a five-tube tuned RF receiver, using a double and a single condenser, will I get good results if I place the single condenser in the first radio stage, and the double in the second radio and the detector circuits?

ROGER BERMUM, Atlanta, Ga.

Yes.

* * *

I RECENTLY moved to within one-quarter mile of a powerful broadcasting station and am now greatly bothered with interference from it. My set is a six-tuber, consisting of two stages of tuned radio frequency amplification, a non-regenerative detector and three stages of resistance coupled audio frequency amplification. I would like to use the selector system, described in connection with the one-tube regenerative receiver shown on page 15 of the Jan. 20 issue of RADIO WORLD. Can this be done? The primaries of the RFT in my set consist of ten turns, while the secondaries consist of forty-five turns. Each primary and secondary is wound on a tubing which is three inches in diameter, with No. 22 double cotton covered wire. There is no space between the windings.—W. R. CHARLTON, Newark, N. J.

Yes, this can be used. Procure a three-inch diameter tubing and some No. 22 double cotton covered wire. Wind five turns. Allow one-quarter inch and then wind forty-four turns. The five turns are connected in series with the grid connection of the first radio frequency coil. Across the larger winding shunt a .0005 mfd. variable condenser. This winding is not connected with any other portion of the circuit. You may also gain more selectivity by separating the primaries and the secondaries on the other coils. You may also try connecting the larger winding in series with the antenna, short circuiting the small coil in the grid circuit.

* * *

THERE APPEARED in the March 12 issue of RADIO WORLD on page 10 a hookup of a six-tube receiver, employing three tuned radio frequency stages, a non-regenerative detector and two transformer audio stages. I would like to build this set.

(1)—Can I use a triple condenser to tune the secondary circuits of the second, third and fourth RF coils, and a single condenser for the first RF coil? Standard coils, matched for these condensers, which all have the same capacity, are to be used.

(2)—The primary of one of the coils is variable. I would like to use this coil in the antenna circuit. Is this all right?

(3)—I notice that the end of the primary winding of the first coil is connected to the beginning of the secondary winding. Will I have a more selective set if I break this connection?

(4)—Could I control the filaments of the second and third RF and the detector tubes with a three-quarter ampere ballast resistor, instead of the individual ballasts for each tube?

(5)—What is C6?

(6)—The last audio tube seems to be hooked up for a —71 power tube. Is this correct?

(7)—Could I use —01As throughout?

(8)—What B voltage is used for the RF and first audio tubes?—DAVE KUPPERBERG, Bronx, N. Y. City.

(1, 2, 3 and 4)—Yes.

(5)—A .0005 mfd. fixed condenser.

(6)—Yes.

(7)—Yes. The wiring in the detector circuit will have to be changed around a bit. Instead of running the grid leak across the condenser, connect it from the grid post of the socket to the plus A post. The grid returns are not changed, though.

(8)—90 volts.

* * *

THE RADIO UNIVERSITY columns of the April 2 issue of RADIO WORLD contained a circuit diagram of a four-tube reflex circuit, which attracted my attention. I would like to build this set with some changes, though.

(1)—Could I use regeneration in the detector circuit?

(2)If so, I would like to use a coil consisting of thirty-five turns, wound on a three-inch diameter tubing, with No. 30 enameled wire, shunted by a .0005 mfd. variable condenser, inserted in series with the plate of the detector tube. Is this all right?

(3)—Should I use a bypass condenser? If so, please state the value and how it should be connected.

(4)—Could I use a three-stage resistance coupled amplifier? If so, is the output taken at the end of the primary winding L3?—HERMAN CORDEN, Cincinnati, Ohio.

(1 and 2)—Yes.

(3)—Yes. It should have a capacity of .001 mfd. One terminal of this condenser should be connected to the plate post of the detector tube. The other terminal of this condenser should be brought to the minus A post.

(4)—Yes.

* * *

I HAVE built the one-tube receiver described by Wally Frost in the April 16 issue of RADIO WORLD. The results are great. I would now like to add two stages of transformer coupling. Should I use the same rheostat to control the filaments of all the tubes, they being all of the —01A type, or should I use a separate rheostat for the audio filaments?

(2)—If a separate rheostat is to be used, please state the resistance.

(3)—Could a 500,000-ohm variable resistance connected across the secondary of the first audio transformer control the volume?

(4)—Could a four-and-one-half volt C battery be used, if 90 volts B are used?

(5)—Is it necessary to use an output choke and condenser in this case?—CHARLEY VERDUNN, Poughkeepsie, N. Y.

(1)—Use a separate rheostat for detector and one for the two AF.

(2)—Six ohms.

(3 and 4)—Yes.

(5)—No.

* * *

I AM GOING to build the 1927 model Victoreen. I have some parts lying about the house that I would like to use.

(1)—Could plain four-inch dials be used?

(2)—Will this do away with PL2 and 3?

(3)—I don't wish to use a loop. Could I therefore connect the secondary winding of the antenna coupler right into the grid-filament circuit of the first detector, instead of to the switch?—JONAH K. FELLIPSON, Atlantic City, N. J.

(1, 2 and 3)—Yes.

* * *

I HAVE an old three-tube receiver, consisting of a regenerative detector with a variometer in the plate circuit, and two stages of transformer audio frequency coupling. The filaments of the audio tube are controlled by a one-half ampere ballast resistor, while the filament of the detector tube is controlled by a fifteen-ohm rheostat. When I made this set there were not many stations on the air, and consequently it was selective enough. Now, however, I find it very difficult to tune out some stations. Would the selectivity be increased if I added a stage of radio frequency amplification? The coil now used has a ten-turn primary.

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and a forty-five turn secondary, wound on a three-inch diameter tubing, with No. 22 DCC wire.

(2)—If the RF addition is to be made, should the new coil have the same number of turns on the primary and secondary as the present coil?

(3)—I am now using a .0005 mfd. variable condenser across the secondary winding. Should I use another .0005 mfd. variable condenser across the secondary winding of the new coil?

(4)—Should a separate rheostat be used?

(5)—Using an —01A tube, approximately how many B volts should be applied to the plate?—LESTER KENRONSON, Butte, Mont.

(1, 2 and 3)—Yes.

(4)—Yes. Use a twenty-ohm type.

(5)—About sixty seven and one half volts.

* * *

MY FRIEND recently opened up a radio store. During my evenings I would like to do some service work for him. I would appreciate a few hints on how to get a greater kick out of sets.—HAROLD MEYERS, Columbus, O.

Much of the trouble is due to poor screw joints, such as are made by a nut and a bolt; corroded surfaces of a piece of wire where it makes contact with a terminal; so-called rosin joints, caused by soldering with an iron insufficiently heated and in which a film of rosin remains between the solder and the pieces to be joined.

Occasionally some unskilled set builder runs the grid return lead of a radio frequency stage to the positive, rather than the negative A lead. A set in which this is done will not oscillate and it will not get distance or good volume. Likewise it will distort badly. It is also possible for the pep to be all right until it passes the detector, when it is killed in the audio. This may be caused by high resistance joints as outlined before and by broken secondaries in the transformer.

Don't forget that it is possible for joints in the antenna span or a ground clamp to become corroded or the lead-in wire may break inside of its insulation.

* * *

I HAVE a one-tube reflex receiver employing a regenerative RF and AF tube and a crystal as a detector. The filament of the detector tube, which is a 201A, is controlled by a twenty-ohm rheostat. A three-circuit tuner is used in the input circuit, while a radio frequency transformer matched to the tuner is used in the detector stage. The set is very unstable. I was thinking of removing the crystal and inserting a regenerative detector, at the same time removing the regeneration from the first tube. This would give me a two-tube set with a non-regenerative RF-AF tube and a regenerative detector. Will this give me better results than those obtained with my present set?

(2)—Could I use the tuner in the detector circuit and the RF coil in the input circuit?

(3)—Can I use rheostats in both filament circuits?

(4)—If so, could I use a twenty ohm in the detector circuit, as well as in the RF-AF circuit?

(5)—Should separate B leads be used for each tube?

(6)—Will I get satisfactory results if I use another 01A tube?—LEONARD B. JARDON, San Francisco, Calif.

(1)—Yes. Use a two-megohm grid leak shunted across a .0001 mfd. grid condenser in series with the grid circuit of the detector tube.

(2, 3, 4, 5 and 6)—Yes. Don't forget to bring the grid return of the detector tube to the plus A post.

* * *

I WOULD LIKE to have the circuit diagram of a four-tube receiver containing two-tuned stages of radio frequency amplification, a regenerative detector using a three-circuit tuner and a single stage of transformer coupled audio frequency amplification. I have three .0005 mfd. variable condensers and a fifty-turn coil wound on a three-inch diameter tubing with what appears to me to be No. 22 double cotton covered wire. I also have three twenty-ohm rheostats. Please give constants of the other parts.—F. HARVEY COLEMAN, Los Angeles, Calif.

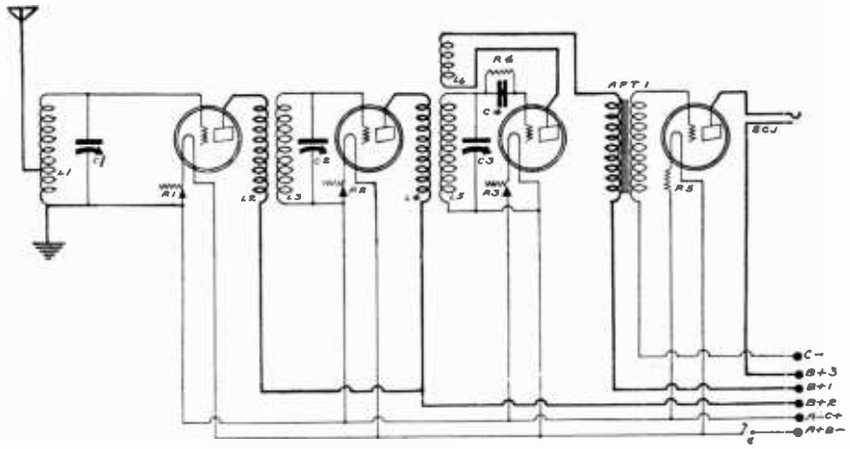

FIG. 533

The circuit diagram of the four-tube regenerative receiver requested by Mr. F. Harvey Coleman, wherein two stages of tuned radio frequency amplification, a regenerative detector and a single stage of transformer audio coupling are used.

The circuit diagram of such a set is shown in Fig. 533. The three variable condensers are used in the radio frequency and detector stages. L1 is the fifty-turn coil. It is tapped at the tenth turn from the beginning of the coil. This tap is brought to the antenna. The beginning of the winding (ten turns from the tap) is brought to the ground. The other terminal of the winding (forty turns from the tap) is brought to the grid post and to the stationary plate post of the variable condenser. The rheostats, R1, R2 and R3, are used to control the filaments of the radio frequency and detector tubes. L2, the primary of the second coil, consists of ten turns. The secondary L3 consists of forty-five turns.

Both these windings are wound on a single three-inch diameter tubing, using No. 22 double cotton covered wire, with a quarter-inch space between the two windings. L4, the primary of the tuner coil, also consists of ten turns. The secondary L5 consists of forty-five turns. Both windings are also placed on a single three-inch diameter tubing, using No. 22 double cotton covered wire, allowing a quarter-inch space between both windings. L6 is the tickler coil, which consists of thirty-six turns of No. 26 single silk covered wire, wound on a one-and-three-quarter-inch diameter tubing. The coil is wound in two eighteen-turn sections, a half-inch separating the halves. This is for the shaft holding this coil, which fits into the tubing containing the L4 and L5 windings. Place the tubing near the grid terminal end of the secondary winding. C4 is a .00025 mfd. fixed condenser, while R4 is a 3-megohm grid leak. AFT1 is a low-ratio audio frequency transformer. R5 is a 1A Amperite. S is the filament switch. The plate of the audio tube receives ninety volts. This is the B plus 3 post. The C bias is four-and-one-half volts. The detector B voltage, B plus 1, is forty-five volts. The radio frequency B voltage, B plus 2, is sixty-seven-and-one-half volts. SCJ is a single circuit jack. These voltages are for the —01A type tubes. Should you find that the radio frequency tubes are oscillating beyond control, even with the filaments turned low, insert a 2,000-ohm variable resistance in series with the B plus 2 lead. That is, break the lead which goes to the battery, connect the resistance wire terminal to the ends of the plate windings and the arm terminal to the battery. A pilot light may be used to indicate when the filament circuit is on or off. The light is inserted across the A battery line, one terminal going to the minus A post and the other to the terminal of the switch, not connected to the battery. If this latter terminal is brought to the battery terminal, the light will burn all the time.

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Uneven Amplification Produces Distortion

(*Concluded from page 6*)

the moving parts of the structure are too heavy, the high notes will be suppressed. A low-pitched speaker is one in which there are little stiffness and much weight; a high-pitched speaker is one in which there are much rigidity and little weight. Thus, generally, a small cone is high-pitched and a large one is low-pitched.

Uneven Amplification

Amplitude distortion simply means that the amplification is not the same for all notes. For example, a 100-cycle note may be amplified 50 times, a 1,000-cycle note 10,000 times, a 5,000-cycle note 500 times. An amplifier of that characteristic would be very bad. Distortion would be serious. In many good amplifiers the distortion from 50 cycles up to 7,000 cycles does not vary by more than 10 per cent. Such distortion is not noticeable.

The ear has no direct basis of comparaing two notes which differ greatly in frequency. It judges intensity mainly by the fatigue the sound produces, and the apparent intensity of a note of any frequency depends on how long it has sounded, growing weaker as time goes on. The ear recuperates from fatigue quickly, so that the basis of comparison is always variable. Hence the ear is not sensitive to amplitude variations between different pitches sounded at different times.

But when the amplitude of one tone is changed suddenly the ear is quite sensitive to the change in the volume. A 25 per cent change is detectable.

If the ear is such an obtuse sluggard why is it necessary to take any precautions in designing an amplifier free from amplitude distortion?

It Does Make a Difference

It would seem from the foregoing statements that it would not make a particle of difference whether the amplifier was capable of high quality or not. If a sudden change of 25 per cent in a given note is just noticeable, and a much greater amplitude difference is not at all noticeable when the frequencies and the times differ, why then is it necessary to hold the amplification down to a 10 per cent. limit over the entire scale?

Here we must bring in the harmonics again. Very few musical tones are pure sound waves. They contain a multiplicity of overtones, and their presence and their relative magnitudes determine the timbre of a certain note. Apparently the ear is very keen on timbre. Even the least musical ear can tell the difference between the same note when sounded on two different instruments. Many ears can even tell the difference between the same note when sounded on two different instruments of the same kind. Suppose, now, that the amplifier is such as to suppress the high notes and bring out the lower notes with full volume. The relative intensities of the overtones then will be changed, and this change may so alter the timbre as to make the sound unrecognizable, not as to pitch but as to origin. An example is the sound of a piano on the radio in the early days. Thump, thump, thump, was the sound, with both the high and the low harmonics missing.

Freedom from Both Sorts

Another example is the way a bass viol sounds in even some of the best receivers. But few have heard how that does sound, and that is just the point it usually does not come through because the low notes are suppressed. Still another is the way that esses and the like will come through. All the characteristic hissing is not there, not unless the receiver amplifies well up to about 10,000 cycles.

An amplifier must be relatively free from frequency and amplitude distortion.

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Public Interest Keeps Air Free, Club Hears

As long as public interest controls the broadcasting program—and upon no other principle can a nation-wide broadcasting service be rendered to the United States—broadcasting will remain the free forum of the air, according to Merlin Hall Aylesworth, President of the National Broadcasting Company, in an address delivered at a meeting of the Civil Liberties Union, held in the Aldine Club, New York City. The real danger to the freedom of broadcasting, he asserted, lies at one extreme, in the demand for unlimited license of speech by radio, and at the other extreme, in the proposals for municipal, state and Federal censorship of programs. Unlimited license would result in chaos, and censorship would be obnoxious to the American spirit.

Mr. Aylesworth put instructive broadcasting ahead of entertainment, and listed religion first, as follows:

"As President of the National Broadcasting company I see two distinct functions of broadcasting. First, religion, education, public affairs and political economy; second, entertainment, whether symphony or popular music, comedy or drama. I am sure that you will agree that we cannot consider these two distinct phases of broadcasting under one heading."

126 Per Cent. Increase In Sets Used on Farms

After making tours of the country, agents of the Radio Service of the Department of Agriculture report that in 1926 there were 1,252,126 farms in the United States equipped with radio receiving sets. This is an increase of more than 126 per cent over the 553,008 sets estimated to have been on the farms July, 1925.

The largest gain in sets was in Utah, which in 1925 had 899 sets, the new figure being 6,061. Iowa leads with 99,990 sets; Indiana is second with 81,144, an increase of over 377 per cent over 1925. Missouri is next with 77,510 sets; Nebraska, 69,784; Illinois, 65,832; Ohio, 63,448, and Kansas, 62,955 sets.

Swedish Authors Ask Pay from Broadcasters

Stockholm, Sweden.

The Government of Sweden has introduced a bill, which will give all authors of poems, short stories, etc., a royalty whenever their material is used either on the radio or in a public recital. The bill was suggested by Ernst Didring, Chairman of the Swedish Authors' Society, who stated that there was more money in reciting poems or stories than there was in writing them. He also stated broadcasting hindered the sale of books.

Message From Alaska Received in Australia

Adelaide, Australia.

For the first time Australia picked up Alaska. Charles Phillips, of Glenelg, picked up a message from Captain Wilkins's expedition, which was 100 miles from Point Barrow, Alaska. The distance between the two points is more than 8,000 miles.

It is understood that the message contained information for Captain Wilkins' mother, informing her of her son's safety.

NEW ANNOUNCER AT WGY

If you happen to hear a southern drawl on WGY's wavelength, don't rush to the conclusion that you have picked an Alabama station. You are listening to WGY's most recent announcer recruit, Louis Edmond Dean. His birthplace was Valley Head, Alabama, along about 1901, and for fifteen years he lived in Charlotte, North Carolina.

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COMPLETED DETAILS on what ohmage resistances may be used with B eliminators to also obtain C bias, was given by Frank Logan in the March 12 issue of RADIO WORLD. Either send 15c for this issue or begin your subscription with this issue. RADIO WORLD, 145 West 45th St., N. Y. City.

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THE RADIO TRADE

R. C. A. Patent Infringed By Neutrodyne, Says Court

A decision rendered by the United States Circuit Court of Appeals holds that the neutralization method employed in Neutrodyne radio receivers infringes the Hartley patent No. 1,183,875, and the Rice patent No. 1,334,118, which are among the numerous radio patents of the Radio Corporation of America. R. N. Hartley and C. W. Rice are well-known engineers of the American Telephone & Telegraph Company, and of the General Electric Company, respectively.

The suit was against the Twentieth Century Radio Corporation, dealers in radio apparatus, and was defended by the Independent Radio Manufacturers, Inc., an association of Neutrodyne manufacturers. This decision reverses a previous decision of the lower court in favor of the defendant.

Silver Marshall Plug-in Inductances are made in many sizes—all uniformly interchangeable for 30 to 3,000 meters. They represent the last word in coil construction—low loss and low distributed capacity. Suitable for all standard circuits wherever the finest is required. Substitute them in your present set for improved results.

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846 West Jackson Blvd., Chicago. Ill.

West Will Descend On Chicago En Masse

A special train will carry delegates from the Denver territory to the Radio Manufacturers Association annual convention and the meeting of the Federated Radio Trade Association to be held in Chicago the week of June 13 in conjunction with the First Annual Radio Trade Show of the Manufacturers Association.

Practically every leading company in the Denver territory will have a representative. Efforts are being made to have other delegates picked up along the road, and also to have the coast delegation join the mountain delegates, bringing the entire western group into Chicago together.

Music Is Broadcast From 3,500-Room Hotel

An hour of dance music from 10 to 11 each night (except Sunday and Monday) will be provided by Jack Chapman and his orchestra from the Stevens Hotel through WQJ, Chicago. The hotel has 3,500 rooms, which is a record.

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Kiley Sees Good Times

Pat Kiley, of 30 Church Street, New York City, who is always busy making "dollars for dealers" with the Frost and Remler lines of quality parts, says that business is good with him. He believes that next year will see the greatest volume of radio sales in history. It is a pleasure to visit his office and look over the fine line which he takes pride in displaying.

The new Frost rheostats are beautiful jobs, also the bakelite air-cooled Frost potentiometers; the Frost super-smooth variable resistances are accurate and noiseless and will ornament any set. The old reliable "Frost fones" are still leaders and there is a full line of Frost jacks for every radio use. Besides the standard line of jacks the new pan-tab are ideal for compact use and may also be used for sub-panel use by merely inverting them; the gem-jacs project only one inch behind the panel and are really gems of construction.

There is also a Frost jac-box for connecting from one to four pairs of phones or speakers, a full line of extension cords and plugs for every need, adapters, ground clamps, cord-top jacks, push-pull battery switch with positive self-cleaning contacts, toggle switches and loop plug and jack. The Frost line is indeed complete. Then there is the Remler line with the famous Twin-Rotor condensers; Remler transformers, which have stood the test of time, and the Remler Infra-dyne Amplifier and the type 50 sockets, not to mention the New Remler drum dial, just out. Pat Kiley is one of the best-liked boys in the radio game and is always full of enthusiasm over his products. He will be glad to send anyone complete descriptive circulars on these lines who writes to him at the above address.—J. H. C.

Electric Manufacturers Name Patent Committee

Gerard Swope, president of National Electrical Manufacturers' Association has appointed a committee of seven executives from prominent electrical concerns to investigate the situation regarding patents in the electrical industry to determine whether some modification of the plan utilized by the National Automobile Chamber of Commerce may be made applicable to the electrical manufacturing industry.

The committee appointed consists of Leonard Kebler, president, Ward Leonard Electric Company, chairman; A. G. Davis, vice-president, General Electric; A. Atwater Kent, president, Atwater Kent Mfg. Co.; M. C. Rypinski, vice-president, Federal Brandes Co.; B. E. Salisbury, president, Pass & Seymour, Inc.; Harold Smith, general solicitor, Westinghouse Electric and Manufacturing Company; Charles H. Strawbridge, president, Goodman Manufacturing Company; Alfred E. Waller, managing director, and Francis E. Neagle, counsel, of the Association, are ex-officio members.

At the Policies Division meeting a resolution was passed authorizing the president to appoint the committee whose report will be presented to the Policies Division for action.

Tyrman Corporation To Offer Parts Line

The Tyrman Electric Corporation, 268 South La Salle Street, Chicago, will soon have on the market a line of highest grade radio parts for set builders. The corporation has taken over the entire engineering and sales staff of the High Frequency Laboratories, which specialized on coils for the Nine-in- Line. Ernst Tyrman is president and A. Hintze, Jr., is vice-president of the Tyrman Electric Corporation. The parts of the Tyrman organization will be exhibited at the Chicago trade show in June.

Roth-Downs Move

St. Paul, Minn.

The Roth-Downes Manufacturing company, a St. Paul concern engaged in the manufacture of radio sets, recently announced its removal from 2360 University avenue to larger quarters in the Como Industrial building at 295 Como avenue.

Organized in 1922 with a small plant, the company has expanded rapidly, and the present move represents the fourth large expansion in its brief existence.

VALLEY TO ENLARGE ON RADIO

Following a meeting of its Board of Directors, at which Herbert Elder was elected president of the company to succeed S. A. Whitten, the Valley Electric Company announced a policy of intensive development of the Radio Division.

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HOFF'S RADIO TROUBLE FINDER, Log and Station Book, Radio Dictionary, profusely illustrated. Now $1.00 per copy. Central Sales Co., 5 Central St., Palmer, Mass.

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

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

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

Blueprints of the Universal, $1.00 each.

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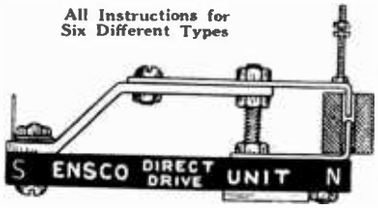

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5th, Helps uphold the listener's rights; and

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