

DEC. 11

RADIO

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THE UNIVERSAL
VICTOREEN

TIPS ON USE
RESISTANCE

Reg. U. S. Pat Off.

WHY DEAF HEAR
THROUGH FINGERS

WORLD

LOOP HELD BEST
FOR CITY USE

PEANUT WHISTLES
DUE TO WAVES

America's First and Only National Radio Weekly
Vol. 10 No. 12 *Illustrated*

FIRST INVOCATION
TO RADIO

EXPERT ANNOUNCES CURES FOR HAND CAPACITY



From photo by Hayden.

WHEN you effect tuning by placing your hands near the set, hand capacity is the cause. See page 5.

Best Christmas Gift

This Marvelous B. S. T. 5 at \$40 will bring as much joy and happiness in a home as the most expensive set.

Send your order to-day so as to insure Christmas delivery.

RADIO NEWS RADIO WORLD GIVE BST-5 CERTIFICATE OF MERIT

A \$75 Set Direct from Factory at \$40

I received my B. S. T. radio set two weeks ago and I am very well pleased with it.

I had the set working in fifteen minutes and at the end of two hours and a half I had twenty-nine stations logged. The set brings in new stations almost every night.

The cabinet is very well constructed and the people that have seen it say that it is a very beautiful set.

G. C. PARRISH, Dallas, Oregon.



New model cabinet, Du Pont Duco finish; base 21" long by 8" wide, height 9½", top 21" by 6". Five-ply walnut veneer piano finish.

IMMEDIATE DELIVERY

THIS highly sensitive, powerful and selective BST-5 radio receiver has all up-to-the-minute improvements. Heavy aluminum automobile type chassis, shielded against stray currents and distortion. Flexible grip, Universal type sockets, eliminating microphonic noises. Has provision for battery eliminator and any power tube. Fahnestock clips on sub-panel for adjusting C battery, has voltages for power tube. Efficient on either long or short aerial, including indoor aerial. This BST-5 sets a new standard for true tone values and selectivity. This BST-5 gives greater volume than many six-tube sets and consumes less current.

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New York, N. Y.

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With built-in Utah In Loud Speaker and commodious compartment in which there is ample room for batteries, charger, eliminators, etc.

COMPLETE RECEIVER
BST-5
Loud Speaker and Console

\$57.00

As Illustrated

\$40.

Send Check or P. O. Money Order

Good Back Numbers of RADIO WORLD

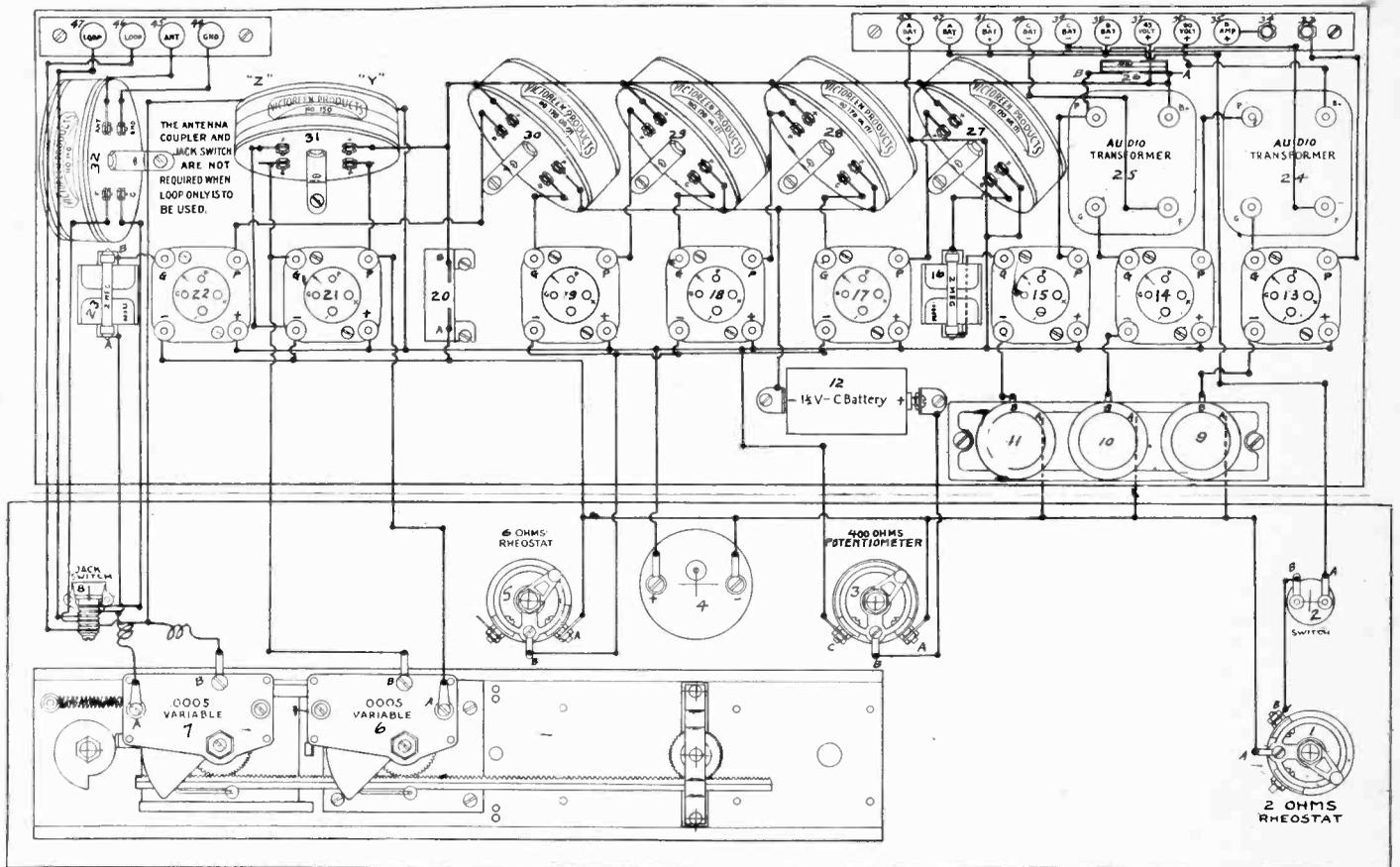
The following illustrated articles have appeared in recent issues of RADIO WORLD:

- 1926:
- Mar. 6—The 1-Tube Set, by Capt. O'Rourke. The Chemistry of Batteries, by A. R. Reid.
 - Mar. 13—The Non-Regenerative Browning-Drake Set (Part 1), by M. B. Sleeper. The Tectron Eliminator, by Lewis Winner.
 - Mar. 20—The Super-Heterodyne, by J. E. Anderson. A 2-Tube Speaker Set, by Percy Warren. The Browning-Drake Set (Part 2), by M. B. Sleeper.
 - Mar. 27—An Economical 4-Tube Set, by Edgar T. Collins. A Practical B Battery, by Capt. P. V. O'Rourke. Tectron Trouble Shooting, by Lewis Winner.
 - April 3—How to Get DX, by Capt. P. V. O'Rourke. A Compact B Supply, by Lewis Winner.
 - April 17—The New 1-Dial Powertone, by Capt. P. V. O'Rourke. The Action of Transformers, by Lewis Winner.
 - May 1—New Multiple Tube, by Herman Bernard. The Aero All-Wave Set, by Capt. O'Rourke. Kilocycle-Meter Chart. An Analysis of Detection, by J. E. Anderson (Part 1).
 - May 8—A Study of Detection, by J. E. Anderson (Part 2). To Wind a Loop on a Card-board Frame. How to Reflex Resistance AF, by Theo. Kerr.
 - May 15—Super-Heterodyne Results Brought Up to Maximum, by Herman Bernard. The Truth About Coil Fields, by J. E. Anderson.
 - May 22—A Built-in Speaker Set, by Herbert E. Hayden. The Powertone in Operation, by Capt. P. V. O'Rourke.
 - May 29—Aerials in Ground and water, by Lewis Winner. Economized Filaments, by J. E. Anderson. How to Get DX, by John F. Rider.
 - June 5—Five-Tube Compact Receiver, by J. E. Anderson. A Tester for Tube Circuits, by Spencer Hood. Problems of Portables, by Hugo Gernsback.
 - June 19—Selectivity's Amazing Toll, by J. E. Anderson. The Light 5-Tube Portable Set, by Herman Bernard (Part 2). The 4-Tube Rogers-Schudt, by Wm. A. Schudt, Jr. (Part 2).
 - July 3—Set with a 1-Turn Primary, by Herman Bernard. Part 2 of the Victoreen Portable, by H. Bernard. Trouble Shooting Article for The Light 5-Tube Portable.
 - July 10—A Rub in Single Control, by Herman Bernard. A DX Double Regenerator, by Capt. P. V. O'Rourke. A 2-Tube Dry Cell Receiver, by Samuel Schmalz.
 - July 17—A Double Duty Loop Aerial, by J. E. Anderson. How to Measure Coupling, by John Rider. A 1-Control Crystal Set, by Smedly Lyons.
 - July 24—Why the Super-Heterodyne is the Best Set, by Herman Bernard. A 1-Tube Reflex Receiver, by H. A. Reed.
 - July 31—What's Best in an AF Amplifier, by Herman Bernard. A 6-Tube Reversed Feedback Set, by K. B. Humphrey.
 - Aug. 7—The 5-Tube Tabloid, by A. Irving Witz. The Wiring of Double Jack, by Samuel Lager.
 - Aug. 14—The Improved Browning-Drake, by Herman Bernard (Part 1). Storage Batteries, by John A. White.
 - Aug. 21—A New Stabilized Circuit, by E. H. Loftin and S. Y. White (Part 1). The Browning-Drake, by Herman Bernard (Part 2).
 - Aug. 28—The Constant Coupling, by E. H. Loftin and S. Y. White (Part 2). The Browning-Drake, by Herman Bernard (Part 3).
 - 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 Victoreen, 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.

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The Universal Victoreen The Set With the Powerful Kick



Picture diagram of the wiring of the Universal Victoreen. Note an original twist to the filament wiring. The master control unit is at lower left.

Master Control Unit Gives Single Dial Advantage for Locals, While Adjustable Knob Brings in the Distant Stations, and Then Some—Air Core Transformers Sharply Peaked for Intermediates—Fan Relates His Experiences With the Circuit—Reports Mexico Reception at Bridgeport in Late July.

By Ralph G. Hurd
Radio Editor, Bridgeport (Conn.)
Times-Star

AS far back as a year ago, folks came to me and asked—"What about the Victoreen Super-Heterodyne?" And, being unacquainted with the proposition I was forced to inform my radio friends that I knew nothing of it. I had just blossomed out with another good Super-Heterodyne and it made me hot around the collar to think that I was talking the merits of what I had presumed was a very clever super and here were folk who wanted entirely foreign information. I didn't know whether it was a good Super-Heterodyne—whether it was "fair to middlin'"—or—whether it was just an ordinary garden variety of affair.

About six months ago so many wanted to gain the full particulars and so many good reports came to the writer that there was nothing left to do but investigate. So I investigated I did. I wrote for information—I checked over the blue print, as though it meant anything!—I read the literature and here was where wonderful friendship developed. In the literature mention was made that the Victoreen was at least one set with matched intermediate frequency transformers.

Matched Intermediates

I do not know what you have experienced in erecting a Super-Heterodyne or whether you've even taken the effort to construct one. But—for one—I've built all manner of hook-ups and I've experienced all manner of results. I've had 'em where they wouldn't work at all—I've had

'em where they brought in a few New York stations—and I've had 'em where they brought in Europe—but the latter were so far in the minority that they are as rare as hen's teeth.

And, you or I can absolutely trace the goodness of any one of those supers to one cause—the matching of the intermediates. Intermediate frequency transformers on a super must be matched perfectly. If you don't believe it—build one with transformers that are unmatched and you'll tear out the hair on your head by the handful.

But—as I have said—it was the matched transformers on the Victoreen which impressed me more than anything else—so I ordered a kit from headquarters for the sole purpose of trying the set for my own satisfaction and if it failed to operate as

What One Fan Brought In Without Aerial, Ground or Loop

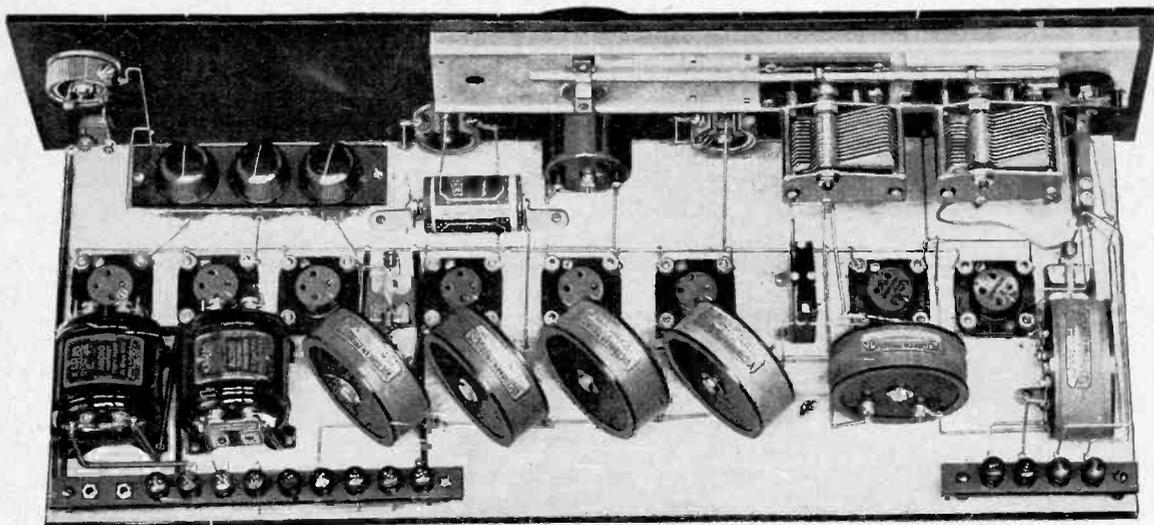


FIG. 2
The top view of the Universal Victoreen.

expected I'd just forget about it and no one would be the wiser.

Astounding Results

I did exactly this. And when the set was finished the results that were totaled up the first night on a piece of paper in the form of a makeshift station log were astounding. Now, let me tell you, this all happened when I was still playing with a super that had three European stations tucked under its belt and the Victoreen would, as you can imagine, have to be a smart set to measure up to the other one.

Still, that first night showed such good results that I quite agreed with myself that there was another good set. As you will recall—radio reception this past Spring was horrible. In fact, with the starting of the last International Test started terrible receiving conditions. The weather and other conditions were indeed unkind to us.

The Victoreen was finished in June, the latter part. We managed to get in one week in that month and a week in July. One hundred different stations were logged. These included broadcasters from coast to coast. Then I took off the Victoreen and on my filament and plate battery switches I slipped in the wires for the other super. There was a difference. The one I'd been so cheery about must have had a sudden attack of fear or jealousy—because it acted in a very "ornery" manner. I gave it all the chance in the world—but it would not, regardless of what I did, snap out of its dilemma. So back went the Victoreen—and back came all the old favorites with a few strangers to boot.

CZE In Late July

I call a set that will snap in CZE, the Department of Education's Station at Mexico City, Mexico, on the 20th day of July, a smart affair. I call a set that will bring in the coast during Summer reception one worthy of every kind consideration—

—but—

—that isn't the half of it!

One night in the middle of Summer I was doing a little experimenting with my aerial and ground system. I had been using a loop—then aerial—then loop on the Victoreen, trying out the set from every angle. On this particular night I sudden-

ly quit listening. On the night following I had forgotten where I had left off the previous evening and turning on the set I noticed that there was only a slight oscillation emitting from the speaker. "Must be batteries" I fearfully thought. So dragging out the old hydrometer and voltmeter I tested both. Up to snuff! That was funny. I pushed over the potentiometer a bit and there was, faintly, a station coming in on the speaker. So I pushed up the other rheostats a little and in came the station with all of its previous fullness of audibility. But the outstanding feature was the decided change in sharpness of tuning. I could not account for this. After fussing for about fifteen minutes I brought in a dozen New York stations and decided that nature through one of her vagaries had been kidding me.

No "Nothing"

The thought came that perhaps one of the tubes might be slightly off color because the tuning had certainly tightened up and reaching over in back of the set for a "spare", as I pulled my hand back, a wire caught my arm. I couldn't imagine what this was so I peeked over in back of the set and lo! and behold—the ground wire and the antenna wire were disconnected and the set was operating without any outgoing wires. To make doubly sure that this was not an hallucination I disengaged the loop and still, as usual, came in the station on the loud speaker with plenty of volume. Not so bad, I thought.

Well, do you know, before the evening was over, I had logged practically every Eastern station of importance and also WLS, WBBM and WOK, Chicago. Imagine this without antenna, ground or loop. I call this the exceptional. Especially, in the face of the fact that this was all accomplished right in the middle of Summer. At first I thought that it was a freak set and later on an opportunity was offered me to build a set for a friend who had purchased the parts—so I willingly consented because I desired to note the difference between the two receivers. When the second set was completed—everything that I was able to do with the first set was duplicated with the second. Victoreen owners in Bridgeport and vicinity tell me that they do the selfsame things I do.

There are two outstanding examples of

reception which have won me over to the Victoreen. Early last Fall a radio enthusiast came to me and poured out a story. He had spent over \$400 in a year trying to construct for himself a radio set which was apart from the rest. This chap lived down in Jersey City. He didn't want the best set in the world—but if he could only hear something other than New York, New York, New York, his little cup of joy would be filled to overflowing. A friend of his owned a Victoreen and what the ambitious fellow had seen of it and heard about it captivated his fancies. So—I sent him out happy with the information that the Victoreen could prove much to his advantage. But, before he left he told me that where he had recently moved in Jersey City, everyone told him this particular locality was a so-called "dead-spot."

This chap has written me three letters. Each one was to thank me for putting him on the right track. He sent me in log after log that the average radio set owner would call a vote to put him in as president of the Ananias Club. But—owning and operating a Victoreen, I knew better. In one letter he told me about three super power sets that were near him in the apartment building where he lived and he was running rings around them.

Club Uses It

And—here is a wonderful example of the Victoreen at home. For three years the Bridgeport Club on Cannon street has been seeking a radio receiver which would be impervious to the ten thousand interferences that seemed to beset them on all sides. Set after set was installed only to be taken out. And—when the recent baseball series were put on—one ambitious radio expert here in Bridgeport conceived that, as a last stand, the Victoreen on a loop might just fill the bill. It was installed on trial and after the first day it was decided that here, at last, was one set which could cut through anything and bring in the programs which the members most needed for their entertainment. Accordingly the Victoreen is now one of the prized possessions at the Bridgeport Club.

I have seen station loggings made by Victoreen set owners in Bridgeport that

(Continued on page 30)

Voltages in Roaring Clash

Explain the Effect of Hand Capacity

By Franklin Budd

THE peculiar phenomenon in radio known as hand, or body, capacity is a mystery to many fans. It is a much misunderstood effect. For instance, an enthusiast will speak of a certain condenser as being a marvelous piece of apparatus because it is entirely free from hand capacity. According to him, this condenser is entirely devoid of all capacity variations even when it is placed in the most trying positions. Yet the same enthusiast will condemn another condenser of essentially the same construction as the worst piece of apparatus obtainable just because his limited experience with it has not been so favorable as with the first.

He is not aware that hand capacity depends more on the type of circuit in which the condenser is used than on the make of the condenser. Admittedly, some condensers are so constructed that in a given critical circuit they show up better than other condensers of different construction. But the hand capacity nuisance has nothing to do with the name of the manufacturer.

A condenser which has a grounded rotor and whose stator is shielded from the hand as this is brought up to the tuning dial is relatively free from hand capacity provided that the rotor actually is grounded. But a condenser which has a so-called grounded rotor if used in a circuit in which neither side of the condenser can be grounded is just as bad as any condenser.

Groundless Circuits

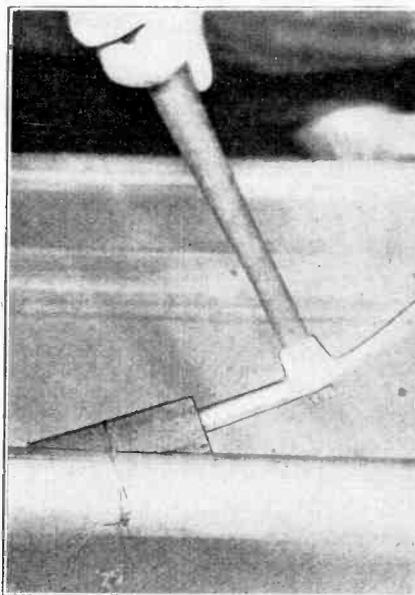
For instance if any condenser is connected into a Hartley oscillator circuit, neither side of the condenser can be grounded, and any condenser will show up badly if the metal shaft of the condenser extends into the tuning dial, as it does in the great majority of the best condensers. The only way to reduce hand capacity in any condenser is to keep the hand away from the high voltage side of the circuit, or circuits, in case neither side is grounded.

What is hand capacity? It is simply capacity between hand and the grid side of the condenser, between the hand and the plate side of the condenser, or between the hand and both the grid and the plate sides of the condenser, depending on the type of circuit in which it is used. The hand is always at ground potential, or, electrically, it is a part of the ground. The capacity of any conductor depends on the distance of that conductor from ground as well as on the size of the conductor. The capacity of the conductor may be increased by decreasing the distance and, conversely, it may be decreased by increasing the distance.

It makes no difference how the distance is varied, whether by moving the conductor or by moving the ground. When the hand is moved up to the condenser it is equivalent to moving the ground up to the condenser, and the capacity is increased.

Ground To and Fro

When moving the hand away from the condenser, ground is moved away from the high potential side and the capacity is decreased. The change in capacity thus introduced is what is known as hand capacity. A similar effect is produced when moving the hand to or from the high potential side of a tuning coil, and



(Hayden)

AN EXCELLENT ground connection can be made in the manner shown, when a ground clamp is not available. Wrap the copper wire around the iron pipe, leaving it rather loose, and place a wooden wedge between the pipe and the wire. Hammer the wedge down, thus jamming the wire in good contact with the scraped pipe.

high potential side ordinarily means the grid side.

The hand capacity effect is most noticeable in critical tuned circuits. In moderately selective circuits the effect is negligible unless the hand almost comes in contact with the grid side of the tuned circuit, either the coil or the condenser.

In very selective circuits, and in ultra frequency circuits, the effect is very great. In Super-Heterodynes and oscillators it is still greater. In a regenerative receiver, or a Super-Heterodyne receiver, on the shorter waves, it is possible completely to tune in or out a station merely by moving the hand an inch or two to or from the dial controlling the critical circuit. This trouble may be eliminated in even the most serious cases by proper shielding and grounding.

If the tuned circuit in question is such that it may be grounded on one side, the shaft extending into the control dial should be on the grounded side, and there should be a grounded shield between the hand and the stator plates. This effectively stops all capacity troubles arising from the movement of the hand in the field of the electro-static field of the coil and condenser.

Examples of Difficulty

If the circuit is such that neither side of it can be grounded that is not sufficient to stop hand capacity. Such circuits are those in which one side of the tuned circuit is connected to the grid and the other to the plate, while the middle of the coil is connected to the filament or ground.

The Hartley and the Colpitts circuits with their numerous variations are examples of circuits which cannot be grounded on either side. To eliminate hand capacity from such circuits it is necessary to put a grounded metallic

shield between the hand and the entire circuit. The mechanical coupler between the rotor of the condenser used and the dial must be a non-conductor. It may be a bakelite or wooden rod, or intermediate gears of non-conducting material may be employed in the case a metal shaft is used to connect with the dial.

Hand capacity is not only a nuisance to the operator of the receiver, but it is likely to be nuisance to all broadcast listeners for miles around. If the set is regenerative or oscillative a loud beat covering the entire audible scale will be heard every time the hand is moved to and from the tuning dial, and this can be heard by all the receivers in the neighborhood, provided that these happen to be tuned to approximately the same frequency as the squealing set.

(Illustration on front cover)

Put Broadcasting Pastor Alone With Mike, One Suggests

Broad sympathies and good diction are essentials for the preacher who uses radio broadcasting to broaden his scope of influence.

Such is the opinion of Dr. James L. Gordon, after three years experience preaching over radio from his pulpit in the First Congregational Church, San Francisco.

Dr. Gordon delivered a farewell radio sermon over KGO, when he reviewed for listeners some of the ideas gained from radio preaching experience.

"Responses from my radio preaching, which have come in from a wide area," he said, "have convinced me that a real appeal to the conscience of the mass of the American people is what is needed most of all today. Such an appeal, if made widely enough and to the mass of the people, would, I believe, lessen our crime wave at least eighty per cent."

"Responses to radio preaching are a great aid to a preacher to broaden his mind regarding the intimate affairs of his fellow men and women. And more value in this respect could be gained from careful study of the way to do radio preaching."

"When you preach to those in the church and those on the outside, who are invisible to you, at the same time, it cannot be so effective as if you spoke to either one or the other of the audiences alone."

"You can't jump around and be dramatic when preaching over the radio. You have to consider the microphone—and the invisible crowd outside the church. The best way would be to have a quiet little room, and go in there and preach to the radio listeners only."

Doctor Gordon retires from the pastorate of the First Congregational Church, San Francisco, to establish what he calls "a municipal pulpit."

DUTCH EAST INDIES IS WON OVER TO RADIO

WASHINGTON.

The Dutch East Indies have at last succumbed to the fascination of radio. According to a report to the Department of Commerce, it will be legal to operate a receiving set in that country after Jan. 1, 1927, upon payment of small fee.

Peanut Whistle Rampant Waves Mix With Maddening Results

By Brewster Lee

THE most persistent voice against the failure of Congress to enact laws regulating broadcasting is the peanut whistle which may be heard in all sections of the country, in all regions of the ether and at all times of the day and night. This persistent whistling is caused by clashing of waves from different broadcast stations which are operating too close together in the frequency scale. In the New York area there is hardly a station which is free from this type of interference, and the situation is no better in many other sections of the country.

Two types of interference may be noticed in this interclashing of adjacent waves. The first is the noise produced by the direct interference of the carriers frequencies of the two stations, and the second is the interclashing of the side bands of the same stations. The interference between two carriers is manifest by a musical note of high but relatively stable pitch. The other appears as a mushy noise in which no pure tone can be distinguished at any time and which is always changing its character. It is a sort of background to the station being received.

Stations Desert Wave

For the permanent whistle to appear the two stations must operate on frequencies differing by less than 10,000 cycles. A frequency even a little higher than this is audible to most persons, yet it does not appear as an interference simply because it is not pronounced until it gets below 10,000 cycles. There should be no interference of this type if the stations stayed on their assigned frequencies, because the minimum assigned frequency separation is just 10,000 cycles. The difficulty now is that stations depart from their allotted frequencies, either intentionally or accidentally. Even if two stations are a thousand miles or more apart they are capable of interfering with each other if their frequency interval is less than 10,000 cycles.

A receiver need not be sensitive enough to pick up the signal of a distant receiver to pick up the interference which that station is capable of if the frequency of

that station differs by less than 10,000 cycles from the frequency of a local station. The interference is not only proportional to the strength of the distant carrier but also to the carrier of the local wave. Therefore, the stronger the signal from a local station, the weaker may be the interfering signal, and yet cause annoying noises in the receiver. There are not many stations which interfere in this manner.

Harmonic Trouble

A similar interference may be caused by a station which operates on a harmonic frequency of another station. For instance, a 1,220 kc. station is capable of interfering with a station operating on a frequency 610 kc., and this interference may be quite severe. Not only may it be severe but it may be of frequent occurrence, because there are many stations which operate legally on harmonic waves of other stations.

The interclashing of the side bands of two stations which are operating with carriers which are too close in the frequency scale is particularly annoying. It is also of more frequent occurrence than any other type of interference, because of the widths of the side bands. The audible side band extends 10,000 cycles on either side of the carrier for each carrier. Thus if two stations are operating within twenty kilocycles they are capable of producing this type of interference. WRNY and WLWL operating on 800 and 780 kc. respectively, are capable of interfering with each other by direct interclashing of side bands. Likewise WOR, Newark, N. J., and WLIT, Philadelphia, which are operating on 740 and 760 kc. respectively, are capable of interference. Again, WEBJ, New York, and WCAU, Philadelphia, are within 20 kc. of each other and are likely to cause interference if they are operating at the same time. The fact that they are separated by a few hundred miles does not help much.

Relief by Tuning Is Hard

When the side bands of two carriers interfere there is very little relief to be found in tuning. If the selectivity were increased until one of the stations entirely disappeared, the quality of the desired signal would be so bad that it would not

be worth listening to. In fact the quality would be greatly impaired long before there would be any diminution in the intensity of the interference.

But not all the trouble encountered along this line is due to beats between carriers, their harmonics, or their side bands. Much of it is due to lack of selectivity to separate the signals proper, and this lack of selectivity is often met with in some of the best receivers. The selectivity of the receiver cannot be increased without impairing the quality, that is, without cutting down on the higher notes in the signal.

Five New Stations

WASHINGTON.

Two new 500 watt stations have been licensed by the Department of Commerce. One of them is at Syracuse, N. Y., and will operate on the same wavelength as WWJ, Detroit. The other is at Newark and will operate on 280.2 meters, with five other stations. Two new 100 watt broadcasters and one new fifteen watt station also were licensed, while five stations announced changes of their wavelengths, and two stations reported discontinuance of operation.

NEW STATIONS

WBKN, Arthur Faske, Brooklyn, N. Y., 291.1m., 1020 kc., 100 watts.
WJBZ, R. G. Palmer, Chicago Heights, Ill., 419.3 m., 715 kc., 100 watts.
WSYR, C. B. Meredith, Syracuse, N. Y., 352.7 m., 850 kc., 500 watts.
WDWM, Radio Industries Bdcst. Co., Newark, N. J., 280.2 m., 1070 kc., 500 watts.
KVI, Puget Sound Radio Broadcast Co., Tacoma, Wash., 242.5 m., 1237 kc., 15 watts.

WAVELENGTH CHANGES

WCBR, Providence, from 209.7 m., 1430 kc., to 234.2 m., 1280 kc.
WSWS, Bridgeport, Conn., from 209.7 m., 1430 kc., to 232.4 m., 1280 kc.
KFDY, Brookings, S. D., from 305.9 m., 980 kc. to 299.8 m., 1000 kc.
KFWM, Oakland, Calif., from 315.6 m., 950 kc., to 325.9 m., 920 kc.
WEDC, Chicago, from 422.3 m., 710 kc., to 249.9 m., 1200 kc.

DISCONTINUED STATIONS

KFJC, Junction City, Kans., 10 watts.
WJBX, Osterville, Mass., 100 watts.

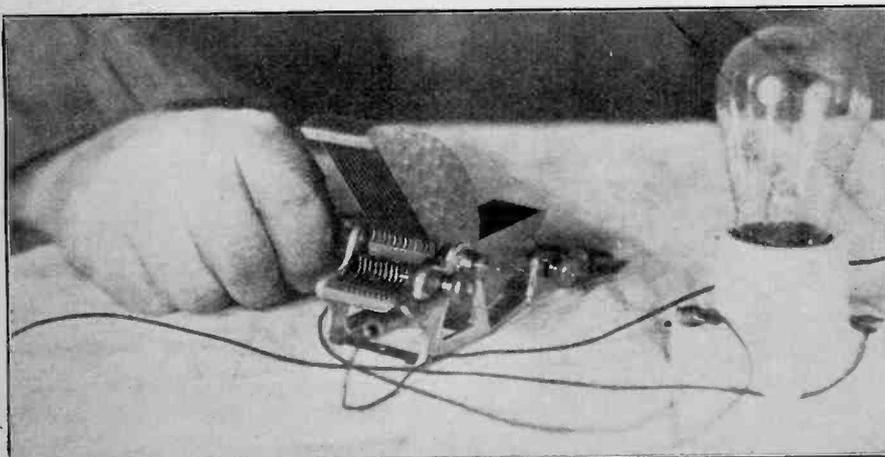
Gets Up at 3 A. M. To Fish For DX

WASHINGTON.

Sitting up late at night trying to get distance may do for some, but not for H. D. Hayes, Supervisor of Radio, who is attached to the office of Chief Inspector W. D. Terrell. When Mr. Hayes wants to get the Pacific Coast, he doesn't sit up late. On the contrary, he goes to bed early and sets an alarm for 3:30 A. M.

Mr. Hayes has been trying to get the stations at Portland, Oregon, and Seattle, Washington. So far he hasn't had any luck this year, although they came in good for him at times last Winter. He says reception is best around 5 o'clock in the morning and that is when he generally gets the greatest distance.

LIGHT REVEALS SHORT CIRCUIT



(Hayden)

A 10-WATT, 110-volt lamp, connected in series with a variable condenser, serves as an excellent means of testing a short circuit, instead of the conventional phones and battery. A light indicates a short.

The Hammarlund-Roberts Hi-Q Receiver Constructional Data

[The theory of the Hi-Q Receiver was explained last week.]

By Leslie G. Biles

IT will be well for the builder to observe closely the system employed in assembling and wiring the Hammarlund-Roberts Hi-Q Receiver. Usually it is the custom to assemble the entire receiver and then do all the wiring. Here the assembly is done jointly with the wiring. This tends toward ease of building because the hand is not hindered by the obstruction of parts not yet in place. The section method of building up the shield makes it possible to wire easily the parts which will later be completely enclosed by the shield.

The first step in the construction of the receiver is to attach the front panel to the baseboard and mount the panel instruments as shown in the picture diagram.

Now mount tuning condenser No. 1 with its small shield. The single hole mounting nuts on this and the other tuning condensers are not used and may be discarded.

Care as to Position

After removing the mounting nuts and the short shafts from the remaining two condensers, mount one of them, first placing shield section No. 1A between the condenser and the panel.

Loosen the screws in the friction brakes of all condensers. Now slide the two aluminum strips of the foundation unit in place, taking care to place them in their correct positions. Then slide shield section 1E on top of these strips and under the lip of the panel shield section so that the holes in the lip of the panel shield, the bottom shield and the shield strips line up.

Socket No. 2 should then be screwed in place and socket No. 1 is fastened to the baseboard in line with socket No. 2.

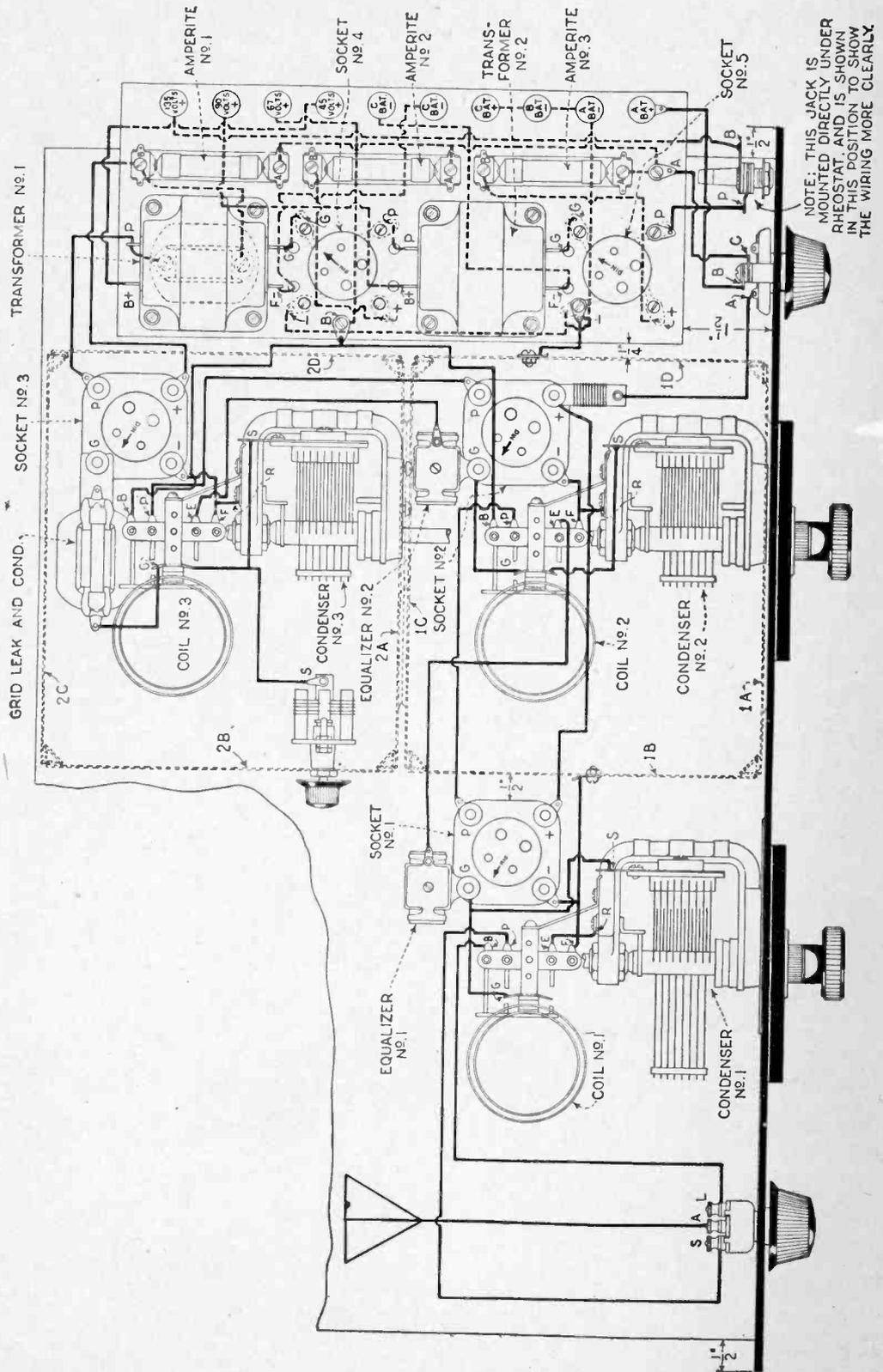
Now loosen the two set screws in the rotor of the first tuning condenser, slide the shaft back so that 3/8" projects beyond the rear bearing and then retighten the rotor set screws. Mount one of the Auto-Couple coil cams on the projecting shaft so that the set screw in the cam is exactly on top (looking down on the set) when the plates of the condensers are all the way in.

First Part of Wiring

Before mounting the coils on their condensers remove the long adjusting screws in the square brass posts at the primary end of the coils because they will be extremely difficult to remove when the assembly is completed.

After removing these screws mount the coils on the two condensers as shown, using the brackets and screws packed with the coils.

The cams on tuning condensers No. 2



and No. 3 are not yet to be mounted but the same mounting instructions given above will later apply to these two condensers.

The assembly is now ready for the first

part of the wiring.

Use the special wire solder in the foundation unit and a light iron which should first be cleaned and properly tinned.

(Concluded on page 28)

Some Common Fallacies

By J. E. Anderson

Consulting Engineer

THERE are a great many erroneous ideas entertained by radio fans concerning certain phases of broadcasting and reception.

One of the most recent of the erroneous ideas is that straight line frequency condensers improve the selectivity of the circuits of which they form a part. The shape of the condenser plates has no more to do with the selectivity of the circuit than the features of a social debutante have to do with the selectivity of her set. The shape of the plates merely determines the rate at which capacity is increased or decreased with uniform rotation of the shaft. This is purely mechanical—nothing electrical about it. The same law of change of the capacity may be obtained by various other schemes which do not involve special shapes of plates.

For instance, there are several dials on the market which may be attached to the shaft of an ordinary semi-circular plate condenser and which will convert the condenser from a straight line capacity to a straight line frequency. This change does not in the least change the electrical characteristics of the tuned circuit.

Merely Spreads Out

The only thing that the straight line frequency condenser, or the converter, does is to spread out the short wave stations on the dial at the expense of the long wave stations. Of course, this change is highly desirable in very selective receivers as it greatly facilitates tuning.

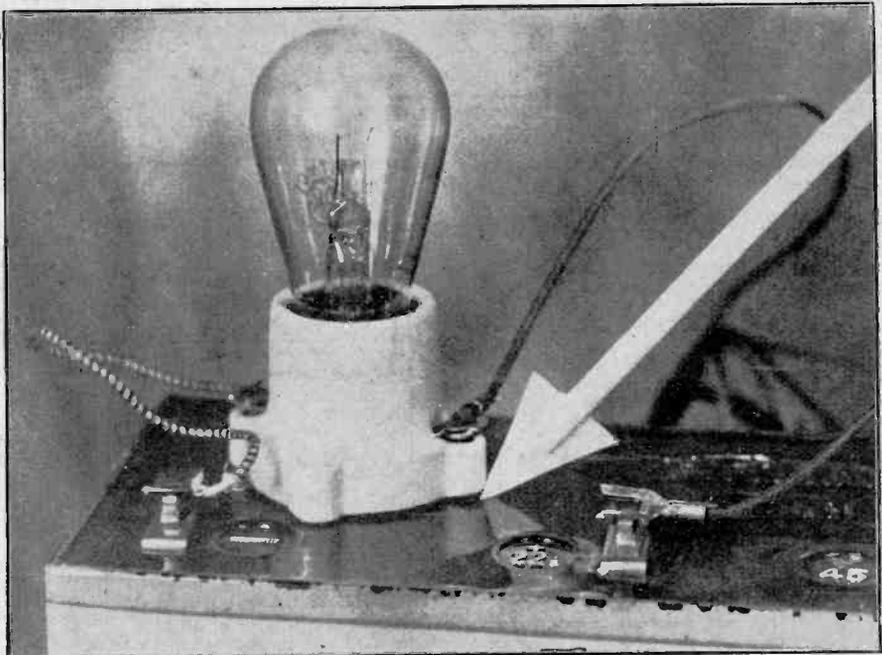
Selectivity depends mainly on the amount of resistance there is in the tuned circuit, particularly in the tuning coil. More accurately selectivity depends on the ratio between the product of the inductance in the coil and the frequency to the resistance in the coil. That is, if L is the inductance, w the frequency in angular measure, and R the resistance in the coil, the selectivity is measured by Lw/R . The larger this ratio is, the more selective is the circuit. The resistance in the majority of condensers now used is negligible in comparison with the high frequency resistance of the coil.

Another fallacy, one of very ancient vintage, is the idea that static can be eliminated. Many a hard-earned dollar has been wasted in buying static eliminators. Static is an electromagnetic phenomenon just the same as the waves used in broadcasting. Furthermore, static contains all the waves of all frequencies, or if it does not contain all the frequencies it is impulsive in nature and will set up waves in any tuned circuit by shock excitation. These shock excited waves will, of course, be of the same frequency as that to which the circuit is tuned.

Static may fortunately be suppressed to a certain extent, that is, the ratio of the static to signal ratio may be reduced. There are several ways in which this may be accomplished with different degrees of success. A very selective circuit will aid a little; but since a selective circuit eliminates solely by virtue of difference in frequency, and since some of the static will be on the same frequency as the desired signal very little relief can be expected from an increase in selectivity.

Directional Elimination

The more successful methods depend on directive selectivity, that is, they depend on the fact that the static usually comes from a direction different from the direction of the desired signal. For this reason a loop picks up less static than an omnidirectional circuit antenna, because a loop picks



(Hayden)

A 10-WATT, 110 volt lamp, connected between the B minus and the A plus or minus post of your set, depending on how you make the common lead, will prevent the filament from burning out, if an error is made in connecting up the B batteries. The lamp will light, but the radio tube filament will not burn out.

up signals from only two directions and suppresses those from the two other directions. Combinations of loops which will eliminate signals from all but one direction are more effective in suppressing static and other forms of interference. Then there is a method which takes advantage of the fact that the intensity of the static is different from that of the desired signal. If the static is the weaker then this may be reduced at the expense of signal intensity in such a manner that the remaining signal is relatively free from all static. But all these balancing arrangements are complicated, and they cannot be bought over the counter.

Many persons think that much of the interference on the lower wavelength end of the broadcast scale is due to harmonics transmitted by the broadcasting stations. Much ill will toward the stations is generated in the minds of the radio fans as a result of such thinking. It is a form of auto-intoxication, however.

Second Harmonic Too Weak

Broadcasters are usually not to blame. Most of the stations have very loose coupling between the antenna and the generator, and the antenna is tuned to the fundamental wavelength. These facts preclude the possibility of very much energy being radiated on harmonic frequencies. Furthermore, an antenna does not radiate much if anything at all on even harmonics, and it is only the even harmonics of the longer wave stations that come within the broadcast range. The lowest wavelength in the broadcast range is 200 meters, hence only stations operating on wavelengths equal to or higher than 400 meters are capable of interfering with any of the short wave stations in the broadcast band, that is, on the second harmonic. The third harmonic may be stronger, since an antenna radiates odd harmonics better than even. But since 200 meters is the third harmonic of 600 meters, and since this is outside of the broadcast band by a wide margin, it is evident that the broadcast stations do not interfere on the third harmonic, or on any of the higher harmonics.

The harmonic interference trouble so

frequently experienced in broadcast reception arises for the most part in the receiver. The main causes of it are overloading of the radio frequency tubes and improper pick-up. And the causes for the overloading are too low filament current, too low plate current, and improper grid bias. The radio frequency tubes are supposed to be amplifier tubes, but very little attention is ordinarily paid to their proper adjustment.

The Crooked Line

It is regarded as of little consequence, since improper adjustment of the various voltages of these tubes produces no serious distortion of the audio output. Then it is so convenient to control oscillations and volume by using low plate supply, very low filament current, and either too high or too low grid bias, and so easy to blame the broadcaster for any interference which may result.

Even if a receiver is not tuned to a high wave, powerful station, small signal voltages will be effective in the various grid circuits. These voltages will ply over a badly curved grid voltage plate current characteristic of a tube, because the atrocious maladjustment of one or more of the three-tube voltages makes every section of the curve very crooked. As a result of working a tube over a crooked portion of its characteristic, harmonics are introduced, harmonics of odd order, of even order, and of many orders. All the harmonics are introduced, and of these the second and the third are quite prominent. The second harmonic of all stations operating on 400 meters or over lies within the broadcast range. When the various tuned circuits in the set are tuned to one of these harmonics, this will of course be selected and amplified in the usual way. If the frequency of this harmonic happens to be the same as the frequency of a desired wave, interference naturally follows.

Wave Trap a Remedy

If trouble of this nature is experienced in a receiver it may be abated by employing a wave trap and tuning out the interfering station. This trap is not tuned to

High Plate Voltages Urged

the harmonic of the interfering wave, and then the desired signal would also be eliminated, but to the wave itself. For instance, suppose it is desired to receive a station whose wave is 263 meters and located in the vicinity of a powerful station operating on 526 meters. The signals from the latter station are so strong as to produce the second harmonic in the receiver. This, of course, will interfere with the desired station since the two frequencies are identical, that is, 1040 kc. The wave trap is then tuned to 526 meters. This will reduce the signals from the powerful station to a point where no harmonics are produced. Then the short wave station may be received without any interference from the long wave station.

This type of interference may also be minimized by limiting the pick-up to the pick-up system proper. That is, shielding or specially wound coils may be employed to limit the pick-up to the loop or to the antenna coil. The best way of eliminating it, however, is to use the tubes properly.

Advice on Voltages

Use high plate voltages and normal filament current so as to make a considerable portion of the grid voltage plate current characteristic straight. Then adjust the grid voltage so that the tube operates over the straight portion—as near the steepest point as possible. The grid voltage adjustment is most important.

To straighten the characteristic a high impedance load might be used in the plate circuit, but this might also lead to troublesome oscillations. A pure resistance in the plate circuit of approximately the same magnitude as the plate resistance of the tube will help a great deal to straighten out the curve and at the same time kill any tendency to oscillate. No by-pass condenser should be put across this resistance, of course, for then none of the desired effects would be obtained, but a few undesired effects introduced with the resistance would be retained.

It is quite generally held that Super-Heterodynes do not radiate. That idea is exactly the same as that of the ostrich hiding his head in the sand to conceal himself from his enemies. Just because the operator himself cannot hear his Super-Heterodyne squeal, he assumes that no one else can. That part is easily tested. Set up a crystal set in the same room as the Super-Heterodyne, and then operate the latter. There will be squeals aplenty in the crystal set. Of course, most supers squeal terrifically, and even then the operator complacently thinks that his set does not radiate. Well, as a matter of fact, all these squeals do not get out in the ether, but there are plenty of them that do. It may not only interfere with broadcast reception, but it may interfere with long wave commercial stations.

Radiation and Reradiation

Every oscillating receiver radiates more or less, unless extreme precautions have been taken to stop it. It is just a question of how much a receiver radiates. Not only does every oscillating receiver radiate, but every receiver in which there is radio frequency amplification reradiates. This latter fact is not generally appreciated, but it must be a fact because energy is continually fed into circuits which are capable of radiation, either electro-statically or electro-magnetically. This reradiation is not such as to produce interference, for it merely strengthens the signals from a given station in the immediate vicinity of the reradiating receiver. Many freak cases of reception by crystal receivers and other insensitive sets are due to this. The only case when this reradiation would give rise to in-



(Hayden)

SEALING WAX, when mixed with denatured alcohol, makes an excellent paint and can be used for making indication points, such as A plus, using red sealing wax, on A battery positive post. Any colored wax can be used.

terference would be when the receiver is capable of affecting the modulation. For instance, it might have inconstant voltage supply or loose contacts, which would interpose noises on the re-radiated energy. Another receiver affected by this energy would, of course, get the noise.

Some persons are of the opinion that radio is different from wireless. Just what the difference is supposed to be is not clear, but it appears that radio is telephony and wireless is telegraphy. Of course, there is no difference between the two. The same principles are used in both. There is just a difference in the form of language that is used in effecting communication. If two persons are traveling on a train and while doing so converse in English their conveyance is a train. If they switch and talk in some other language, say French, their conveyance does not become a ship. Wireless was the first name for the system of communication by means of electromagnetic waves. Later radio came into more general use because the term is shorter, more descriptive, and more appealing to the imagination. In British countries the older term is still used equally as much as the newer, if not more so.

The Effect of the Air

There is quite a widespread belief among radio fans and politicians that radio waves travel through the air, that is, that air is an essential medium of travel. They also believe that sound actually travels through the air between the transmitting station and the receiver and that it is rendered inaudible in some mysterious manner in the intervening space. Obviously, radio waves travel through air or they would not get to us, since we are thoroughly immersed in air. But air is not an essential medium of travel, it is merely an impediment to the travel of the radio waves. The radio waves would travel faster if the air were not present between the transmitter and the receiver. Radio waves also travel through other substances. In some they travel slower than in air. Some substances they cannot penetrate at all. These are opaque to the waves. Radio waves are just long light waves, very long; and if radio waves do not behave quite the same as light waves, it is be-

cause they differ in wavelength and not in character.

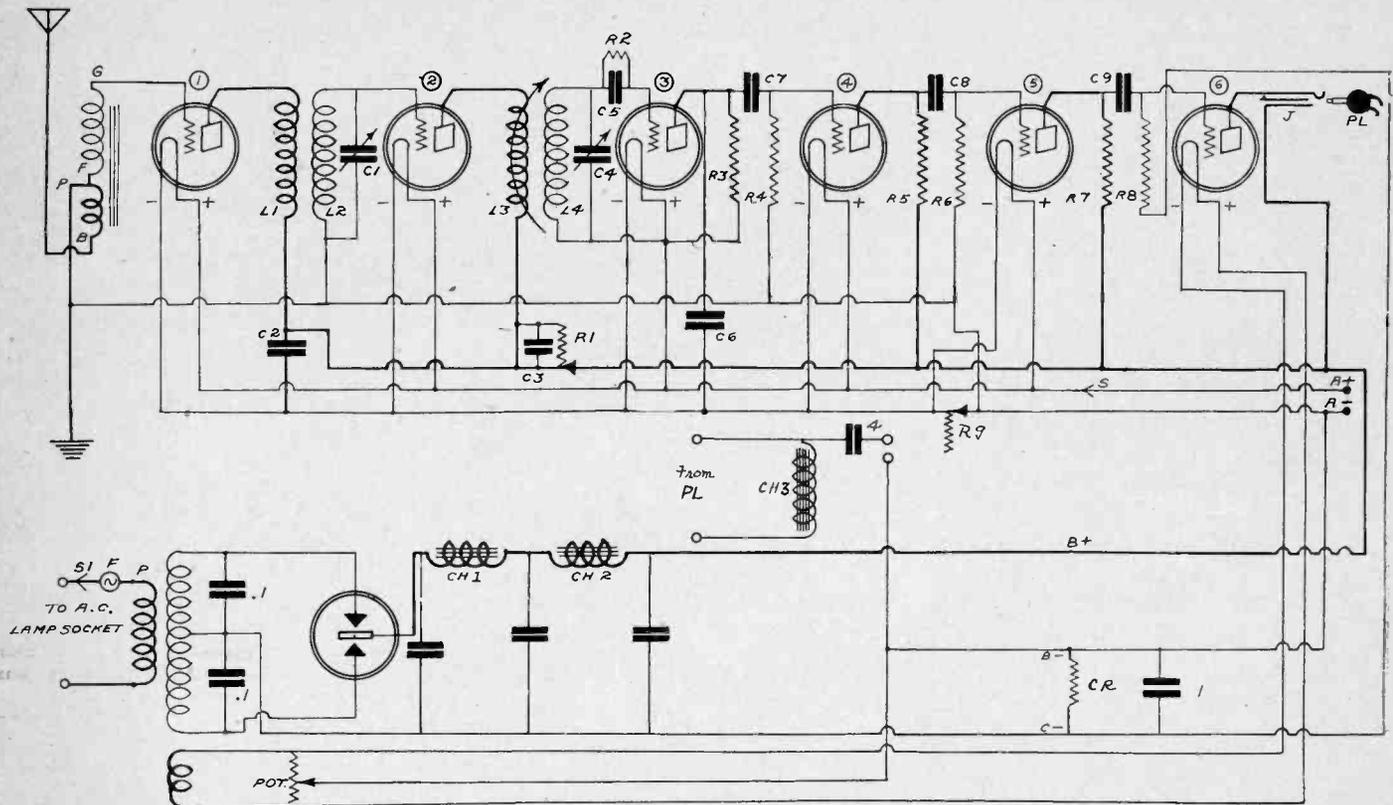
Clear as a bell has long been the standard of clarity. There is only one thing that beats that, and that is clear as a silver bell. Now a bell intended for ringing is nothing more than a tin pan made of a highly elastic metal. The quality of sound emitted by a bell is of the same nature as that emitted by a tin pan. It is a little bit more musical because the metal whereof it is made is more elastic, that is, the tone emitted lasts a little longer and does not change in pitch at a sudden rate. To say that something is as clear as a bell, even a silver bell, is tantamount to saying that it is very bad musically.

One reason for this is that the pitch changes as the tone dies down. This, however, is common to all musical instruments in which the sound is produced by plucking or striking. There are various degrees of change of pitch, like the tin pan and a good bronze bell. But this change of pitch is not the main reason why the bell is unmusical. The main reason is that the overtones of a bell are not simple harmonic overtones, that is, they are not simple multiples of the fundamental or tonic. There are plenty of overtones in the sound of a bell, but they are not consonant with the fundamental. They produce discord.

Some of the more credulous fans are wont to attribute the tonal qualities of a receiver to the tuner or in general to that part of the receiver which precedes the detector. They worry about the tone quality of a tuning condenser, or of a tuning coil, or of a grid leak, or of a socket, etc. They think that they can improve the tone quality of the loud speaker by getting a new set of tuning coils or condensers. These persons are merely victims of propaganda.

It is true that quality is affected to a slight extent by the tuner, but this effect is usually negligibly small in comparison with the effect of the audio amplifier and the loud speaker. The more resistance there is in the tuning condenser and in the coil, the less will be the detrimental effect of the tuner on the quality. In other words, the worse the tuner is from the viewpoint of selectivity, the better the quality is likely to be. But the effect is comparatively small

The Batteryless Bernard for 5-Volt Tubes



THOSE desiring to build the Bernard receiver to operate 5-volt tubes without batteries may follow the above diagram. The unmarked filter condensers are, left to right, 2, 2 and 4 mfd., 600-volt test. Tube 6 is a -71 power bulb. The A eliminator may be a Radi-A or a Davey. The line current must be AC. CR is a 750 ohm Ward Leonard. See December 4 issue for other constants.

PRESENT SEASON HELD BEST IN DX

CHICAGO.

The present radio season promises to be the best from a reception viewpoint of any year since the development of radio.

This prediction is made by Leonard E. Parker, chief radio engineer of the Stewart-Warner Speedometer Corporation, and is based on information compiled by his assistants in the Radio Research laboratory and from reports received from more than sixty-five points in the United States. In addition, information has been collected through WBBM.

"I am basing my prediction on the results that have been apparent already," said Mr. Parker. "In our own laboratory we have observed unusual clarity of reception and have been able to bring in the most distant stations without much trouble.

"I have been particularly surprised at the absence of static, except on occasional nights. Distant stations have been coming through so well that we have had little difficulty in tuning them in through the maze of Chicago stations, which number, I believe, more than forty.

"We have also received reports that confirm our own information from sixty-five distributors who are scattered all over the United States. They report that they have been able to receive distant stations with a minimum of interference or at least with only such interference as can be attributed to natural conditions.

"There is no question of the fact that today there are too many broadcasting stations on the air, but such interference

is man-made and has nothing to do with natural law.

"We have been somewhat amazed at the amount of interest that long distance radio fans maintain in getting distant stations. Within the past ten days we have received distant telephone calls from Nome, Alaska; Tia Juana, Mexico; many points in Canada, and from every border state in the Union.

"In addition, we have received telegrams or letters from every other state including afternoon telegrams from California. Consequently, I believe that I am justified in making the prediction that we are about to experience the best reception year in the history of radio."

Better Music, Plea Of Fans Who Got Opposite Coast

KFI, Los Angeles, is revising its late program schedule due to almost unbelievable clarity of reception.

With all indications tending to prove that the radio audience no longer is prone to write letters, KFI has sensed little difference in its volume of Eastern mail. One change visible in the response, however, is in the type of communication. The bulk of those who at one time were thrilled by the sound of a carrier wave and stuttering call letters of some station hard to get, now demand that their DX

programs bring in something that is pleasing to hear. This stand probably is the result of stations and radio magazines poking fun at those who suffered discomfort in listening to something not half so good as could be heard in the earlier hours from their local stations.

After wading through a group of letters from the Atlantic Coast that spoke of clear reception of KFI, but regretted the use of that station's drive and clarity to "poke a ukulele solo to the Atlantic Coast," Robert Hurd, KFI program manager, has started to revise his late program schedules, given over for years to popular music. It will not be long before a Connecticut listener will be able to listen to a Bruch cello concerto from Los Angeles instead of to "Red Hot Henry Brown."

WITH THE AMATEUR

MARYVILLE, Mo.

When S. F. Martin, a local amateur operating station 9CKS, received a message recently to be relayed through his station he was somewhat disconcerted to note that the address was simply "in the Arctic." Remembering, however, that the Canadian Government steamship Boothic was at that time in Arctic waters, and knowing also that this ship had a short-wave radio outfit on board similar to his own, he immediately put his set into operation in an effort to get in communication with the boat's operator. After a few hours he was successful, and passed the message to the Boothic.

A few days later he was agreeably surprised to get an acknowledgment saying that the message had been delivered to the proper party, a Royal Northwest policeman on duty in the Far North, who in thanking the amateur operator wished to explain that this message was the second he had received from home in two years.

Some Sound Reasoning

Explains Hearing By Sense of Touch



"A person may hear not only what is coming over the radio, but also feel it, and feel it through the medium of a newspaper she or he is holding."

By Brunsten Brunn

A PERSON may hear not only what is coming over the radio, but also feel it, and feel it through the medium of a newspaper she or he is holding. The loud speaker sets up vibrations in the air, the air communicates these vibrations to the newspaper, the newspaper to the lady's fingers, and these in turn send the vibrations to her brain. The vibrations arriving to her brain by this roundabout route are essentially the same as those that reached another section of her brain by the more direct route of the ear, and if she is able to interpret them she can literally hear with her finger tips. Many persons are able to do this.

Table Vibration

Many radio fans have undoubtedly noticed that when they place their loud speaker on the table the table will vibrate. Of course it does not shake so that the motion may be seen, but hard enough that it may be felt with the fingers. In this case the vibrations are communicated by actual mechanical contact, and the table becomes a part of the speaker. In fact the table alone may be used as a speaker. It is only necessary adequately

to couple a loud speaker unit to the table and turn on the current.

Less Volume, More Quality

The sound volume emitted by the table when it vibrates in this manner is not to be compared with that emitted by a horn when actuated by the same unit, but the quality is vastly superior. Put the ear near the table and listen.

Most physical objects have natural periods of vibration. For example, the body of air enclosed in a room, a stretched string, a metallic plate, a wooden board, a stick of wood, a bridge or a building. When a vibration having a period equal to the natural one is communicated to any material body, that body is set into vibration, and it requires a very little energy to cause it to vibrate violently. Since a table also has a natural period of vibration, there is one frequency at which it will vibrate more strongly than at others, and the vibrations at this frequency may most easily be felt with the fingers.

Natural Frequency High

This natural frequency of vibration is usually very high for a rigid table, and it may be in many cases above audibility.

This, however, does not mean necessarily that it is also above sensibility. Just what the upper limit of sensibility is has not been determined. It may be that the limit of sensibility as applied to feeling sound is rather low, and that what is felt is not the individual vibrations but the variations in the amplitude of these, that is, their frequency of modulation.

Many have noticed that when the loudspeaker is placed too close to the amplifier, or in certain positions in the room at comparatively large distances, the set will set up a howl.

Elements Physically Vibrate

This howl is usually aggravated when the table on which the receiver stands is jarred, and particularly when the detector tube in the receiver is jarred ever so little. There are several reasons. In the first place it is caused by air coupling between the loudspeaker and the input circuit to the audio frequency amplifier. This coupling is the same type as the coupling between the loudspeaker and the newspaper referred to previously.

Just as the newspaper picked up the air vibrations, so the audio tubes in the receiver pick up the vibrations.

But in the amplifier the vibrations are
(Concluded on page 23)

Good Advice On Efficient Resistor AF

High Mu Tubes Best for the First Two Stages— Correct C Bias Necessary on Final Tube—Resistor Values Subject to Experiment

By K. B. Humphrey

RESISTANCE coupling for the audio amplification of music and speech received over the radio has become very popular and deservedly so. It gives a very close reproduction which is very desirable in most cases and the only disadvantages are the extra tube needed and the higher plate voltages required. These points, however, are not serious.

Resistance coupling differs from transformer coupling in that there is no step-up effect between stages outside of the tube itself. In other words, the turn ratio which is present in the transformer can not be had by this method. This reduces the amplification per stage to that of 8, which is the amplification factor of the —01A type of tubes.

Limit of Amplification

In no case can the amplification be greater than that of the tube and in all cases due to slight losses it is less. The addition of the extra tube more than compensates for the low amplification per stage and the total overall voltage gain is more in this type of amplification than in the transformer coupled type of amplifier. This is supposing that the ordinary type of tube is used.

With high mu tubes more amplification is possible. These tubes have an amplification factor of around 20 and will when used with resistance coupling, give as

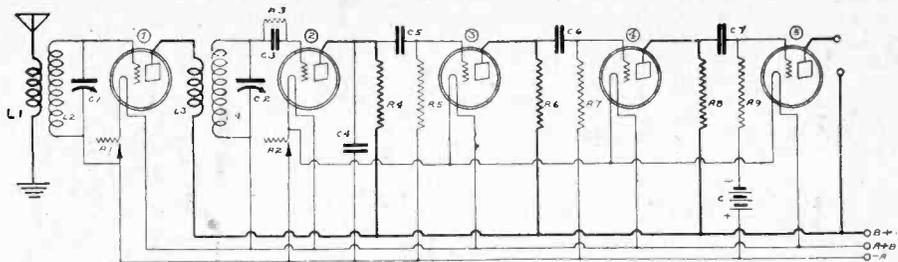


FIG. 1

Design of a circuit using resistance coupled audio frequency amplifications throughout. Tubes 3 and 4 should be high mu, while tube 5 should be a power tube. If the highest B voltage used is 90 a common lead, may be employed, but 90 is an inefficient voltage for resistance coupling.

much amplification per stage as the transformer coupled audio amplifier. There are three factors which determine the effectiveness of the tube used—the voltage, the resistor value and the amplification constant of the tube.

Internal Resistance Counts

Besides these three there is the question of the internal resistance of the plate circuit of the tube itself. The tube in order to be most effective must have a fairly low plate resistance, on the order of 40,000 ohms. The plate resistor value may be changed, though it is almost universal practice now to use the value of 100,000 ohms as standard. Sometimes slightly better results may be obtained by the use of slightly higher or lower values. The fan should experiment along this line.

Many of the home builders are wondering why it is necessary to use the higher voltage with this type of amplification. The voltage amplification is dependent to some extent on the value of the resistance in the plate circuit. The transfer of energy from one tube to the other is dependent on the voltage change and this voltage change is obtained by the drop across the resistance. It would seem offhand that the greater the value of the resistance the greater the voltage drop and consequently the greater amplification. It must be remembered that there is also a resistance in the tube itself and there must be enough current flowing in the tube to make it operative.

Minimum Current Problem

Practically every one is familiar with the characteristic curves of vacuum tubes and it is shown from these that the current flow is a function of the plate volt-

age and that this voltage must be high enough to take care of the variations in current due to the signal on a straight line basis. This limits the working current to some minimum value. If the resistance were made too high the voltage drop would be so great that there would be practically no effective voltage reaching the tube. There necessarily has to be a compromise and this is obtained by making the resistor value fairly high and then applying enough extra voltage so that the tube will receive the proper amount to get efficient results. In other words, the actual voltage applied to the tube is not 135 or 180 but is much less than this. If 135 volts were used on the B battery only about 80 or possibly 90 volts would be applied to the plate of the tube as a working voltage. From this it may be seen that as a matter of fact we are not really raising the effective voltage in the least. This same factor accounts for the recommendation that at least 90 volts should be applied to the detector in order to take care of the resistance and to get at least 45 volts on the plate of the tube. However, the detector voltage may be considerably less. In fact, the plate resistor may be connected to A plus, in which case a .5 meg. plate resistor is often best.

Last Stage Power Tube

The last tube in any amplifier whether transformer or resistance coupled should be of the power type in order to take care of the power and deliver the signal undistorted to the loud speaker. This tube must not be of the high mu type but should be designed to carry enough wattage to give efficient results.

No resistor is used in the last plate circuit and the full voltage can be applied when the proper C battery is used. Some fans have made the mistake of calculating the C battery from the voltage applied at the battery in cases of tubes other than the last.

This almost invariably leads to a higher C voltage than is necessary and there is danger of distortion. In fact the cut and try method is the only safe way to determine this voltage.

The rules which may be laid out for the fan who wishes to get the very best results from his resistance coupled amplifier are as follows:

1. Use high mu tubes for the first two AF stages.
2. Use a power tube in the last stage.
3. Use correct resistor values.
4. Use all the voltage you may desire, but
5. Use the correct C battery voltage.

It will be found that if these simple things are followed that the fan will be able to get real results, distortionless amplification and general satisfaction.

HOW TO REDUCE PLATE CURRENT

The current drain from the B source in modern high quality sets is quite considerable. Suppose that the set has six tubes, one of which is a power tube. The current requirements for the plate circuits of such a set may run up as high as 25 milliamperes. If such a set is run on an average of four hours a day, 100 milliampere-hours plate current is used every day.

Methods of reducing the drain may not be out of order. In the first place, the current in the plate circuit of a tube depends on the applied plate voltage. Therefore, to reduce the current, the applied voltage should be reduced as far as this may be done without impairing the efficiency of the set. All the radio frequency tubes may well be operated on 45 volts, the detector tube will work well on either 22.5 or 45 volts, the first audio tube may require 90 volts. The voltage

requirements of the last tube depend largely on the volume desired. If only a moderate volume on the loud speaker is wanted, 90 volts are enough. If great volume is desired the voltage should be 135 or more.

One of the most important means of reducing the current drain is the negative bias on the grids of the tubes. It is possible to reduce the plate current to one third of its maximum value by applying the proper grid voltage, and the gain is not only a saving in battery current but an increase in the volume and improvement in the quality. The grid bias should be adjusted for each of the amplifier tubes in the set.

Another way of keeping the current drain down is to use no larger tubes than necessary. Thus the radio frequency amplifiers may be of dry cell type, as may be detector. The only large tube necessary is the last.

HOW TO CURE TROUBLE, an accurate detailed summarization on finding and curing troubles in radio receivers, was given in the Nov. 27 issue of RADIO WORLD. 15c per copy or begin your subs. with that number. RADIO WORLD, 145 West 45th St., N. Y. City.

Loop Called Best Aerial On City Sets

Interference Avoided by Utilizing Directional Effect of Frame Antenna, Says Gernsback—Cites a Remarkable Feat of Tuning Out Own Station

By Hugo Gernsback

WHEN the telephone art was still young it was almost impossible to lift up a telephone receiver and enjoy a conversation. There was usually a background of many other voices, particularly if you were talking over any great distance. Pandemonium seemed to reign on the wires in those days. However, it required no law to rectify this situation, and in a few years the telephone engineers had solved the problem satisfactorily.

Today it is a most unusual thing to hear cross-talk on telephone lines. As a matter of fact, we are now using the telephone lines to telegraph several messages simultaneously along with our conversation, but no interference is caused thereby. We are also using the same telephone lines for multiplex telephony, and for the so-called "phantom" circuits, whereby a number of telephone conversations are carried on simultaneously over the same wire—but there is no interference, no cross talk.

Forty Years Apart

Radio is at the stage where the telephone was forty years ago. We are having some interference right now, particularly in our large centers, where there are a great many stations. Every big city seems to have this trouble, but what few people realize is that, when they are located only a few miles from a station, the effects experienced are totally different from those obtained when they are removed some ten or twenty miles from the same station. In some of our large cities it seems impossible to separate the stations at all, and there seems to be a background of one station continuously overlapping its neighbors. Take the same receiver ten miles away and you will find that you can separate the "interfering" stations nicely. The reason is that, so long as you are in the magnetic field of a local station, you will have this condition of interference, particularly if you have an outdoor aerial.

Loop Is Advocated

If you use a loop antenna, with a fairly good set, this condition—that is, interference—is done away with almost completely. Even within a few blocks of a station it is possible, with a loop set, to tune out a powerful nearby station and bring in a weak, distant station. I myself performed the curious feat, the other day, of tuning out WRNY on a set located right in the transmitting room of this station, and brought in another local station only twenty kilocycles removed, in the frequency band, from WRNY. The receiver in question, of course, was a loop set that tuned sharply. It was possible

OUT FOR A LARK



HARRY REISER, leader of the Cliquot Club Eskimos, which broadcasts from WEAJ and a chain of stations weekly, is riding his zoological hobby, a tortoise.

to tune out WRNY's transmitter entirely and bring in the other local station without much trouble.

This suggests several things. First of all, it would seem that, unless great advances are made in radio broadcasting itself, the future receiver for congested districts will have to be a loop set. The loop receiver has the advantage that it is directional and that you can tune in or out wanted or unwanted stations, merely by turning the loop. The heterodyning and interfering station can usually be tuned out nicely.

This is not the case with the aerial-operated set, which is non-directional. In such a case the only recourse is a wave-trap; but even this is of no avail if you are located within half a mile of the broadcast station unless, of course, the aerial is a very short one. The longer the aerial, the more interference, and the harder it becomes to tune out an unwanted station. The sharpest-tuning sets are the ones which employ regeneration. If, on the other hand, you make the set over-sharp, you lose more than you gain. It is possible to have a set extremely sharp; but, in that case, you begin to chop off the "sidebands" of the broadcast station you wish to hear. The result is that the quality begins to suffer and the sounds received will be muffled and not clear.

No Sharper Tuning In Sight

It would seem that we have about reached the limit of sharp tuning, by

means already known; and it would also seem that, during the next decade, not many instrumentalities will be invented to make the sets tune sharper than they do now—so that the only remedy would seem to lie in the broadcasting itself.

Already some progress has been made in this direction. Radio physicists have succeeded in chopping off one side of the "modulation envelope," a feat which makes possible, immediately, the accommodation of twice as many broadcast stations as we have now. To elucidate this statement for the non-technical reader, let me make this analogy: the radio wave that a broadcast station sends out may be compared to a river. This is the "carrier wave." Actually its frequency is high above audibility—that is, we cannot hear it, but when no one is speaking or singing into the microphone you can often detect the carrier wave's presence; it sounds like steam escaping slowly through a small vent.

Let us now, in our analogy, place a ship in our river. Usually a ship is narrower than the river itself, but we can imagine a ship on which the upper deck is actually wider than the river. In other words, it would overhang both banks of the river, let us say, ten feet on each side. This is the condition we have in radio broadcasting, where the ship, in our simile, is the voice or sound carried along by the carrier wave. Like our supposed ship, the broadcast carrier-wave has a certain "width." If the music or sound broadcast from the station were the exact "width" of the wave itself, we would have a condition similar to that of a river on which floats a ship of the exact width of the river.

The Modulated Component

Unfortunately, for technical reasons, we have never been able to accomplish this in radio; and we have an overhang for the "modulated," or sound-bearing part of the wave, of five kilocycles on each side of the carrier wave. This makes a ten-kilocycle band for each broadcast station. It is conceivable that, in time to come, it will be possible to have a carrier wave with a modulation band only one or two kilocycles wide, or even less. When we do arrive at that stage in broadcasting, there will be very little interference between stations, and we will be able to accommodate, without undue interference, many more stations than at present.

Today, such a condition seems impossible of attainment, technically; but greater and seemingly more impossible problems have been solved by our engineers, and I do not doubt, that we shall, sooner or later, accomplish this feat.

SQUEAL STIFLING IS VITAL ASSET

It is not so long ago that the big cry in radio was "low loss." Manufacturers went to extremes in building low loss coils. Radio fans had become excited on the proposition and they would have nothing but coils that were so-called low loss. Coils winders did their utmost to supply this demand.

A circuit in which losses has been reduced to a minimum is a ready oscillator. For that reason many of the receivers which were designed and built in the low loss era were squealers. Now, squealers had been thrown in the discard long before the low loss craze broke loose, and the two ideas of low loss and no squeals could not easily be reconciled. But the two ideas finally were reconciled in a most practical manner. The coils

were made of low loss construction and then resistance was introduced somewhere in the set to offset any tendency to squeal. Thus the fans got what they wanted, they got low loss coils and receivers free from squealing.

The method the manufacturers of sets used for balancing varied. Some chose to put the low loss coil up against a metal plate, as the end plate of the tuning condenser, others chose to do a thorough shielding job, that is, putting metal all around the coils. Both of these methods serve equally well to introduce the resistance necessary to make the circuit work without excessive squealing, and yet without cutting down excessively the selectivity and the sensitivity which are so necessary.

Radio University

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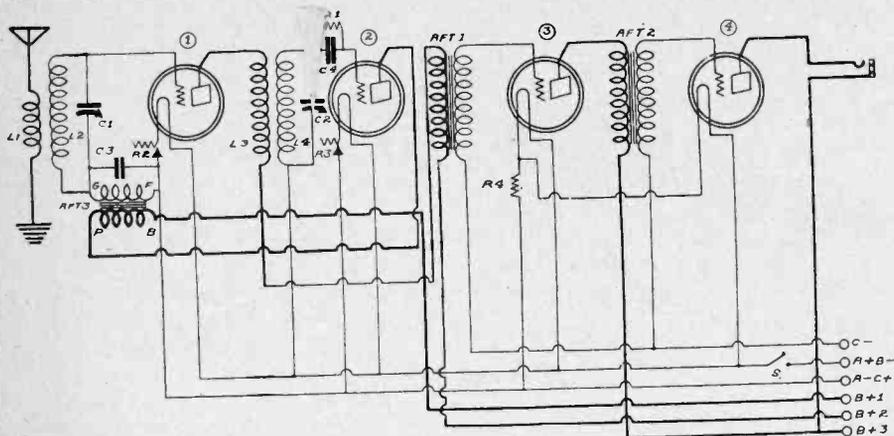


FIG. 481
The circuit diagram of the 4-tube reflex

I WISH to construct a 4-tube receiver using three 3 to 1 ratio audio frequency transformers, two .00025 mfd. variable condensers and two 20 ohm rheostats. Please give a circuit diagram, stating the coil data.—Merwin Stone, South Bend, Ind.

Fig. 481, shows the electrical diagram of a set, employing the parts you have. Standard tuned radio frequency transformers are used. The primaries consist of 10 turns, while the secondaries consist of 65 turns. These are wound on tubings, 3" in diameter, using No. 24 double cotton covered wire. Allow a 1/4" space between the primary and secondary windings. The .00025 mfd. condensers shunt these secondaries. One of the three 3 to 1 ratio AFT is used in the reflex stage, while the other two are used in the standard audio stages. Both rheostats are used to control both the radio-audio frequency and detector tubes. A single ballast resistor controls the filament temperature of the audio tubes. A .00025 mfd. grid condenser and 3 megohm grid leak is used. Use the -01A tubes throughout. S is a filament switch. B plus 1 equals 45 volts. B plus 2 equals 67 1/2 volts. B plus 3 equals 90 volts. C minus equals 4.5 volts. A .001 mfd. fixed condenser is shunted across the secondary winding of the reflex transformer AFT3. Place the radio frequency transformers at right angles to each other. A single circuit jack is used at the output. It is possible to listen to the detector-RF-AF output by inserting a pair of phone tips in series with the B+ lead of the reflex AFT. These posts should be connected when using the entire 4-tubes.

CAN ANY type of wire be used in wiring the Hayden Hi-Power receiver described in the Nov. 13 issue of Radio World, such as bell or plain bus bar? (2) What does B plus AMF, B plus RF and B plus DET. mean?—Jackson Willson, Portland, Me.

(1) Yes. (2) B plus AMF, should have read B plus AMP. or amplifier plate voltage. B plus RF means B voltage for radio frequency tubes, while B plus DET. means the voltage for the detector tube. The -01A type are used. Usually, 45 volts are used for the detector B; 67 1/2 volts for RF B, while for the AF B, either 90 or 135 volts are used. A 4 1/2 volt C is used when 90 B is used, and a 9 volt C, when 135 volts are used.

PLEASE GIVE the length and dia-

meter of form, size of wire and number of turns, and spacing of windings to constitute the coils employed in the 4-tube Diamond of the Air, using .0003 mfd. variable condensers across the secondary windings?—Grainger Hyer, Los Angeles, Cal.

Tubings 3" in diameter, 4" high should be used to wind the primary and secondary. The tickler should be wound on a 1 3/4" diameter tubing, 2" long. No. 22 double cotton covered wire should be used to wind the primary and secondary. The primaries of both coils consist of 10 turns. The secondaries of both coils consist of 65 turns. Allow a 1/4" space between the two windings. The tickler consists of 40 turns, using No. 26 single silk covered wire.

SHOULD ONE get a click out of the head phones, when the terminals, (connected with battery) are placed across the primary and secondary leads of an AFT? (2) I connected one terminal of the phones to a terminal of a 1 1/2 volt battery. The other terminal of the battery was left open, as well as the other phone terminal. Is this correct? (3) I am using a UX112 in the last stage of amplification. What C voltage should be applied?—Mortimer Smith, Kansas City, Mo.

(1)—You should get a louder click from the primary winding than from the secondary winding. There should be no click heard when the terminals are connected between the primary and secondary terminals or on the core. The click in both cases will not be as loud as a perfect short. (2) Yes. That is O. K. (3) At 90 volts B+, 6 volts C; at 135 volts B+, 9 volts C and at 157 1/2 volts B+, 10 1/2 C.

WHAT SIMPLE method can be used to determine the polarity of the DC line?—John Guerny, Atlantic City, N. J.

With the aid of a glass of water and a teaspoonful of salt, this test can be made. Immerse the DC electrodes in this solution, which should be shaken up well before use. Around the negative electrode, bubbles will gather. It is best, when conducting this test, to insert a 25 watt lamp or some other protective resistance in series with the line. If the voltage is too high, that is, without the use of the lamp, the action will be terrific and it will be difficult to tell, exactly which is the negative pole, since it will seem as if the action is around both electrodes.

I AM now installing a receiver, wherein

an outdoor antenna is used. How can I connect the antenna lead-in to the antenna wire proper, without using a soldering iron for soldering, as it is difficult for me to keep the iron warm.—Frank Mason, Louisville, Ky.

Take a porcelain tubing about 5" long and 1/2" in diameter. Run the leadin wire and the antenna wire through this tubing. Push the tubing down, so that you can join the leadin and the antenna wire in the ordinary fashion. Now push the tubing back. Melt some solder in a pan. Pour the solder in this tubing and allow to cool. After it has hardened, break the porcelain tubing with a hammer. This will leave the solder around the connection.

WILL YOU please tell me where I can get data describing how to become an amateur?—Stanley Russell, Des Moines, Ia.

Suggest you see the June 27, July 4, 11, and 18, 1925 issues of Radio World.

WHO IS the director-announcer of KMOX, St. Louis, Mo.? (2) From what station does the Nutty Club and the Coonsanders' Original K. C. Nighthawks broadcast? (3) On what nights and hour? (4) What is the wavelength of the station?—Fred Casey, Atlanta, Ga.

(1) George Junkin. (2) WBBM, Chicago, Ill. (3) They broadcast every Wednesday, Saturday and Sunday, from 12:00 Midnight to 2:00 A. M. (4) This station broadcasts on 226 meters, or a frequency of 1330 kc.

AS TO the circuit diagram of the 5-tube receiver, shown on page 15 of the Aug. 28 issue of Radio World, I would like to know the exact data on the coils, condensers, etc., to use, to obtain the best results.—Richard Mason, Louisville, Ky.

The primaries, L1, L3 and L5, consist of 10 turns. The secondaries, L2, L4 and L6, consist of 44 turns. Each primary and secondary is wound on a 3" diameter tubing, with a 1/4" spacing between the two windings. No. 22 double cotton covered wire is used. C1, C2 and C3 are .0005 mfd. variable condensers, shunting the secondaries. A 10 ohm rheostat controls the filament temperature of both RF tubes, which are of the -01A type. A 20 ohm rheostat controls the filament of the detector tube, also of the -01A type. The filaments of the AF tubes, both of the -01A type, are controlled by a 1/2 ampere ballast resistor, Amperite No. 112. R3 is a 2 megohm grid leak. C4 is a .00025 mfd. fixed condenser. C5 is a .001 mfd. fixed bypass condenser. AFT1 and AFT2 are low ratio audio frequency transformers of the 3 to 1 type. R5 is a variable high resistance, about 500,000 ohms maximum. S1 is a switch, used to cut this resistance, which is a volume control, in or out of the circuit. J1 is a single circuit jack. S2 is the filament switch. To the C minus post, connect the minus post of a 4 1/2 volt C battery. The plus post of this battery is connected to the A minus. It is advisable to include the C battery. The voltages stated for the RF and detector may be raised or lowered, depending upon the tube itself. Generally, the voltages given allow the best reception. The three dials should read alike. The adjustment of the detector rheostat is not critical. Be sure to follow the coils potentials, e. g., (1) low; (2) high; (3) high, and (4) low.

I WISH to build the 2-tube reflex, shown in the Radio University columns of the May 15 issue of Radio World. Could I use a 3-circuit tuner, having a 10 turn primary, a 62 turn secondary and a 30 turn tickler, primary and secondary being wound on a 2 1/2" diameter tubing with No. 22 double cotton covered wire tickler being wound on a 1 3/4" diameter tubing with No. 26 single silk covered

wire; and a tuned radio frequency transformer, having a 10 turn primary and 62 turn secondary wound on a 2½" diameter tubing using No. 22 double cotton covered wire in this receiver? (2) How should the tickler be connected? (3) What size variable condensers should be used?—Henry Kriet, San Francisco, Cal.

(1) Yes. The three circuit tuner is used in the antenna portion of the circuit, while the tuned RFT is used in the detector portion. The addition of the tuner may cause the receiver to become a bit difficult to control. If this happens, take off a couple of turns on the tickler, or reduce the B voltage. (2) One terminal of the tickler is connected to the plate post of the first socket. The other terminal of this tickler is connected to the beginning of the primary winding of the tuned RFT. The end of this winding is connected to the P post on AFT2. (3) .0005 mfd. variable capacity.

UNDER THE latest list of stations, which appeared in the Nov. 27 issue, WGBS is stated twice, once under the New York address and once again, under an Evansville address. Which is correct?—Florence Mask, Mexico City, Mex.

The WGBS under the New York address is correct. The other WGBS, should read WGBF, Evansville.

I HAVE a tubing 8" long, 3" in diameter, two tubings, 2½" in diameter, 2" long and some No. 24 double cotton covered wire. Please give the circuit diagram of a 1-tube receiver regenerative receiver, using these tubings to make up some type of coils, perhaps wound in variometer style.—Hal Strengen, Garden City, L. I., N. Y.

In Fig. 482, you have the circuit diagram of a receiver using these tubings wound in variometer style. R indicates rotor sections, while S indicates stationary sections of the variometers. The stator L1 consists of 35 turns. The stator L4 consists of the same number of turns. These are both wound on the one long tubing (3" in diameter and 8" long). However on both sides of the stationary winding L4, five turns for L2 and L3 are wound. Between each of the windings, a ¼" space is left. The 2½" diameter tubings are used for the rotors. The rotor placed in inductive relation to L1, consists of 40 turns. The rotor placed in inductive relation to L4, consists of 42 turns. Both these windings are wound in two sections, either 20 on each side or 22 on each side, a shaft being placed between the windings. A ¼" space is allowed for the shaft. It is advisable to use about 26 single silk covered wire for the rotary windings. C1 is a .0005 mfd. fixed condenser, which may be shunted in or out of the circuit, via the switch S. That is, if your antenna is a bit long and you cannot receive the lower wave length stations, open the switch, and vice versa. A .0005 mfd. variable condenser may be installed in series with the antenna for better tuning. Doing this will require—increasing the number of turns on the stator L1 to 40. R1 is a 3 megohm grid leak. C2 is a .00025 mfd. fixed grid condenser. C3 is a .001 mfd. fixed condenser. R2 is a 20 ohm rheostat used to control the filament of a -01A type tube. B plus is equal to 45 volts. This voltage may be varied to as high as 67½ volts. The rotors should be mounted with fairly long shafts, so that the entire unit may be placed quite a bit away from the panel, about 4". Angle irons are used to mount the unit about 3" from the base, so that the dials on the shafts may be placed in the center of the regulation 7" high panel. The rotors are placed at the extreme ends of the stationary form, about a 1" space between the shaft and the end of the form being allowed. The rheostat is mounted between the rotors. If the variable condenser is used, it should

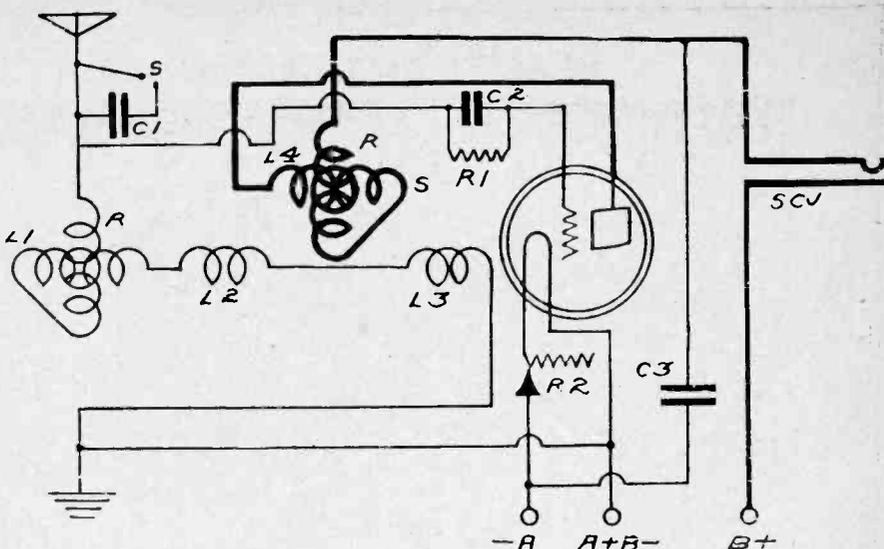


FIG. 482
The circuit diagram of a 1-tube regenerative receiver, using specially constructed variometers for tuning, requested Hal Strengen.

be placed above the stationary form. Any form of audio frequency amplification may be added to the output in the conventional way, using the single circuit jack as the output terminals. Care must be exercised when tuning this receiver. Excellent results will be obtained if this is done. A 7x14" cabinet and panel may be used. The baseboard may be about 6" wide and 13" long.

AS TO the circuit program, which appeared on page 15 of the May 29 issue of Radio World. (1) Can individual variable condensers of a .0005 mfd. capacity be used, instead of the double condenser? I am going to use standard RFT, containing 10 turn primaries and 45 turn secondaries, each wound on a 3" diameter tubing, using No. 24 double cotton covered wire, with a ¼" space between the windings. (2) My primary is not variable. Must it be made so as to get complete efficiency? (3) Using an -01A tube, is R1 a 20 ohm rheostat?—John Keller, Newark, N. J.

(1) Yes. These coils and condensers can be used. (2) Although the receiver will work with a non-variable primary, better results will be obtained, if it is made variable. This can be done easily, by procuring a 2½" diameter 2" long tubing and winding 15 turns. The tubing is then inserted inside of the beginning of the secondary winding of the first RFT. (3) Yes.

IN BUILDING the transmitter and receiver described in the June 5 issue of Radio World, is it possible to employ a 3-circuit tuner instead of the capacity

feedback method, for regeneration? (2) Is it all right to do away with the double circuit jack at the detector output and add on another stage of transformer coupled audio frequency amplification?—Carl Mench, Asbury Park, N. J.

(1) Yes. Don't forget the radio frequency choke coil, though. (2) Yes.

IN BUILDING the Crystal Set, shown on page 11 of the June 26 issue of Radio World, can 2 stages of transformer coupled audio frequency amplification be added, the phone posts being taken as the output? (2) Is it necessary to include C2? If so what is its capacity. (3) I am going to use a variocoupler, with a 20 turn secondary, tapped at every 5th turn and a 50 turn secondary, with no taps. The primary is wound on a 3¼" diameter tubing, while the secondary is wound on a 2¾" diameter tubing. No. 26 silk over cotton covered wire is used. Is this coupler O. K. to use, with a .0005 mfd. condenser across the secondary?—Marty Filler, Salt Lake City, Utah.

(1) Yes. (2) Yes, use this condenser. It has a .001 mfd. fixed capacity. (3) Yes.

CAN A standard individual primary-secondary 3-circuit tuner be used instead of the continuous winding primary-secondary tuner in the receiver diagrammed under Fig. 398 in the Radio University columns of the Aug. 7 issue of Radio World? (2) What changes in wiring are necessary?—Allan Croswell, Pittsburgh, Pa.

(1) and (2) No. The results will not be satisfactory.

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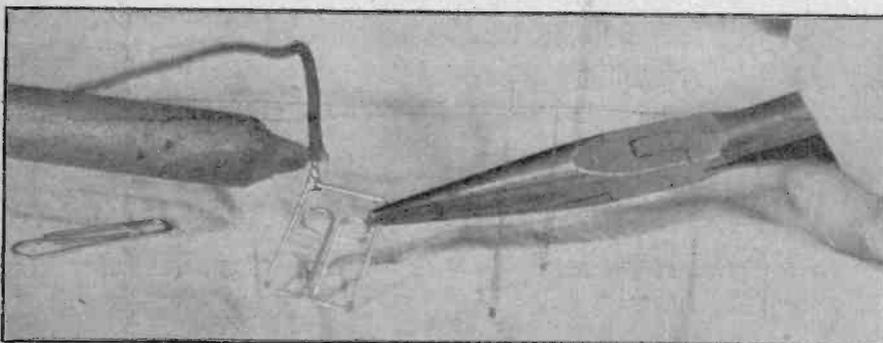
City and State

BEAUTY BACK TO MIKE



CAROLINE ANDREWS, of Major Bowes' Capitol family, returned to the popular group which broadcasts every Sunday evening from a WEAF chain, after a concert tour.

A FAST CLIPPER



IT IS difficult to solder on tin or aluminum foil used for shielding. Therefore, solder a lead onto a paper clip, clip the clip to the sheet for tests.

EVEREADY STAR



LAURETTE TAYLOR

Laurette Taylor, who starred in "Peg O' My Heart" through one of the longest continuous runs in the history of the New York stage, did several scenes from her most popular successes in the Ever-ready Hour program broadcast recently from WEAF, of New York and its "network."

Miss Taylor had a supporting cast of actors selected especially for radio presentations of characteristic scenes from "Peg O' My Heart," "Happiness" and "Humoresque," the last named based on Fannie Hurst's story.

Miss Taylor is a native of New York City and one of the best known of American actresses. In early childhood the stage was her school room and while she was still a child she was cast as the star in several successful plays.

It was in 1910 that the young Miss Taylor first attracted special attention among New York critics and theatre goers. She was playing at that time opposite H. B. Warner in "Alias Jimmy Valentine." Two years later, in 1912, she made a distinct success as "Luana," in "The Bird of Paradise," and later in the same year she made her first appearance in "Peg O' My Heart." The play was written especially for her by her husband, J. Hartley Manners. It ran for more than 600 performances at the Cort Theatre and in 1914 Miss Taylor took the play to London where it duplicated, virtually, its American success, with a run of over 500 performances. In 1921 the play had an American revival with Miss Taylor again in the title role and for the third time its success was notable. Then the lovable "Peg" was done in motion pictures and Miss Taylor scored again.

Other plays in which "La Belle Laurette," as she was known as a child, in vaudeville, has achieved success are "Happiness" and "Out There," both also written for her by her husband. Miss Taylor's most recent appearance in New York was during last season in Philip Barry's comedy "In a Garden."

MILLION IN FARM CLASS

WASHINGTON

More than 100 broadcasting stations are using regularly the new government farm programs which cover a wide scope such as of interest to farming and urban communities. About a million students have enrolled.

NOTED SOPRANO



LUCREZIA BORI, famous Spanish soprano of the Metropolitan Opera Company, who nearly two years ago made her radio debut with John McCormack, appeared recently again during the Atwater Kent Radio Hour, broadcast through a WEAf chain.

SMACK GOES THE BOTTLE



• (Underwood & Underwood)

MRS. JAMES J. WALKER, wife of the Mayor of N. Y. City, christened WPCH, on the roof of the new Park Central Hotel, N. Y. City, while George F. Sulzbach, president of the Peoples Broadcasting Corp., owner of the station, and Miss Eunice McCabe, assistant director of the station, looked on.

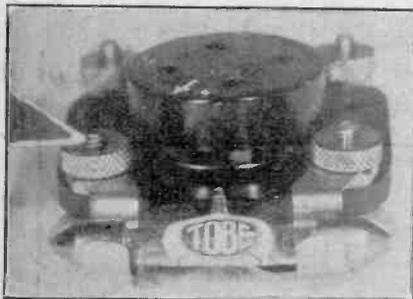
TRIP CALLED OFF



(Hayden)

SO THAT you may not trip over the phone cord, if you have the speaker in one room and the set in another, place the lead underneath the carpet.

GRID LEAK HINT



A **GRID** leak may be held by clips that are mounted on the G and F minus or plus pocket posts (depending upon tube used) as detector, instead of across the grid condenser.

CLOCK TURNS SET ON OR OFF

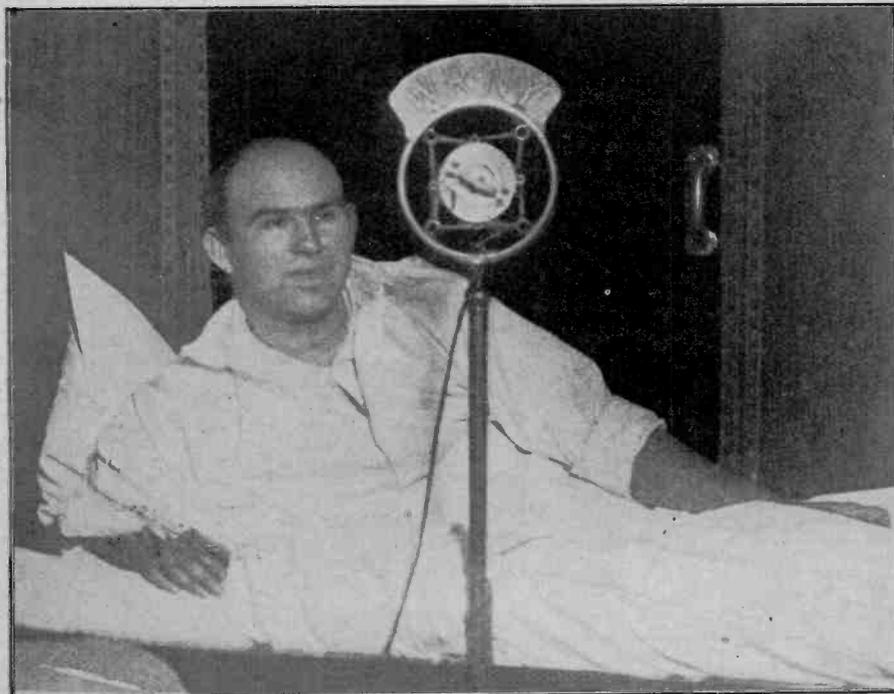


(Underwood & Underwood)

A **CLOCK** that automatically turns a receiver on or off at a set time is one of the season's novelties. Thus if one is dozing in a chair she may do so confident that she will be awakened in time for her favorite program. The receiver shown in the photograph is the famous single dial Ferguson.

The First Invocation

To Radio Lauds Effect on Life



(Underwood & Underwood)

FOUR years an invalid, Sol Rothschild, automobile accident victim, broadcast the story of his fight for life.

Joy of Living Is Heightened, the Sick and the Maimed Are Enspirited, Education Is Spread and Music Made More Broadly Effective, Says Bernard

A tribute to radio was paid recently by Herman Bernard, managing editor of Radio World, in a speech from WGBS, the Gimbel Bros. station in New York City. Mr. Bernard broadcasts each Friday at 7 P. M. from that station, discussing technical radio problems, but the speech was on another night and was part of a special program. "An Invocation to Radio" was the title of the broadcast address. Floyd Neale, after Mr. Bernard had finished the 10-minute talk, announced that this was the first invocation to radio ever broadcast from any station.

The effect of radio on modern life was briefly analyzed by Mr. Bernard. His speech follows:

Things to be thankful for are ever presenting their new faces to the mirror of the world. In the days of three hundred years ago and more the great humane achievements were in the unshackling of intrepid and liberty-loving peoples from the dictates, the dominance and the cruelty of persecutors, both civil and religious. Today the world has advanced to a state of religious freedom and civic self-expression. Feats of science beckon our better natures to acknowledge the beneficent influence those achievements bestow.

Greatest Combined Agency

In the last quarter of a century, and most particularly during the last six years, there has developed the lofty science of radio. We utter our deep thanks that radio has created the greatest combined agency for education, information and entertainment that has ever been wrought.

In the present state of program development radio's chief service is to render entertainment. It carries enlivening music to the homes of rich and poor alike. It brings a thousand voices into a dingy room into which ten persons could not crowd. It enters the sickroom to cheer the suffering patient. It brings the orchestra to the helpless cripple as well as the microphone to the patient's bedside, and stirs anew in the breast of any invalid the confidence that life is worth the living. It gives the deaf, or some of them, the power to hear. Many are those who never heard a sound before who could, through feeling the vibration of a telephone unit against their finger, hear the cherished sounds so long denied them. Radio is thus an angel of mercy. It is the spirit of the Red Cross set to music. The lonely keeper of the lighthouse, serving voluntary imprisonment as his sacrifice to the safety of others' life and limb, is thrilled by the constant visits of radio, and no less the solitary sheep herder on the Western plains.

New Meaning of Music

We dance to radio in our homes, we sing with the orchestra, we listen without word or motion to the symphonic concert, and we find that music has a new meaning in our life, because we have come to know music more intimately.

In the rendition of classical music the symphonic orchestras deserve classification not only in the entertainment field but also under the educational heading. Their service helps us to understand music and makes us realize its finer influence and its deeper significance. The more we know and understand music, the

Eloquent Passages From the Invocation

In his tribute to radio, Herman Bernard, broadcasting from WGBS, uttered several eloquent passages:

"Radio enters the sickroom to cheer the suffering patient. It brings the orchestra to the helpless cripple. It gives the deaf, or some of them, the power to hear. Radio is thus an angel of mercy. It is the spirit of the Red Cross set to music."

"Men bring their experiences from the far corners of the earth and lay them at our hearth."

"The radio wave travels the air and the earth so that he who tunes may listen."

"Radio plays no favorites. It makes its happy entrance to all homes and all places and flies with eager wings alike to the golden dome of a king's palace and to the squalid hut of the hermit in the hollow of the hillside."

more it becomes our alternate language. The educational opportunities offered by radio are only beginning to be realized. Courses of instruction are broadcast from some stations. Political speeches that make us better acquainted with civic problems and the issues of hotly contested campaigns are welcome to our ears. All of us have, what virtually none of our ancestors had, the opportunity of hearing the President of the United States and in our homes. Such things bring us to a closer relationship with the problems and servants that are truly ours.

Effect on Language

We hear our language spoken more than did our ancestors, because we have radio and they had it not. The pronunciation of words is forcibly brought to our attention almost nightly, and we learn where we had erred.

We hear talks on scientific subjects. Men bring their experiences from the far corners of the earth and lay them at our hearth. We come to know the world better. And as a nation we find ourselves more solidly united and more homogeneous because of radio. It is the greatest cementing force that has descended upon the earth since the popularization of printing.

At our dinner table we listen to a program made up of artists performing in remote sections of our country—one in Chicago perhaps, another in Independence, Kansas, and so on—and all voices collected at one point in New York City and sent forth from there through 24 stations. Such events strike deeper than the surface, because they help fortify confidence in the fundamental structure of our government, an indissoluble union.

Enlarges Joy of Living

Radio appeals to all classes and all ages. Without the bedtime stories what would become of the ennui of the guests at Sailors' Snug Harbor? If not for radio, where would Congress have another legislative problem to to nothing about? Without radio where would the good wife

(Concluded on page 19)

find a suitable excuse to deter an intemperate husband from spending still another night outside the home? Wife, mother, grandmother, sister, father, brother, son, all find in radio something to be extremely thankful for, something that contributes very considerably to the joy of living.

Commercially there is much in radio that accelerates our economic progress. Radio as an industry is the eighth largest one in the United States, a growth achieved in little more than five years. It has established a great new field for the employment of labor, skilled and unskilled. It has lent its services to the dissemination of programs calculated to build up good will for commercial institutions, and thus has enlarged sales in fields having nothing directly to do with radio.

Plays no Favorites

And, best of all, radio, with all its glorious advantages, offers none from which any class is barred by economic or geographical reasons. Its service is democratic in the extreme. The radio wave that originates at the station travels the air and the earth so that he who tunes may listen. Radio plays no favorites. It makes its happy entrance to all homes and all places and flies with eager wings alike to the golden dome of a king's palace and to the squalid hut of the hermit in the hollow of the hillside.

WHN Cites WRNY As An Interferer

Since WRNY, the "Radio News" station in N. Y. City, changed its wavelength from 258 to 373.8 meters, George Schubel, director of WHN, the Loew's station in N. Y. City, which operates on 361 meters, states that it has been impossible to receive his station in certain parts of the city without interference from WRNY.

As a result, Mr. Schubel has retained John F. Hylan, former Mayor of New York City, as counsel.

"Unless immediate steps are taken by your station to discontinue this interference, we will be obliged to take such legal steps as may be advised by counsel," stated Schubel in a letter to Hugo Gernsback.

The change of wavelength by WRNY was made last Spring after the ruling by the Department of Justice that the Department of Commerce was without authority to regulate wavelength, power, etc., of stations.

Mr. Gernsback said that his station is located nine miles from the city now, since the recent removal of the transmitter to Palisades, and also that it operates at a frequency which is 30 kilocycles apart from WHN's. He added that WHN is using 1,000 watts power, making it impossible for people to hear WRNY.

Lower Waves Win Support In Congress

WASHINGTON.

A few members of Congress are agitating the opening up of the wavelength band below 200 meters for broadcasting purposes. They see it as the one and only solution for present congestion. According to the plan which they will propose, the shorter waves would be assigned to new broadcasters and some of those which have obtained licenses during the past two or three months.

N. B. C. WILL MOVE TO BIG NEW HOME

15-Story Building Being Erected and Four Floors Will be Devoted Ex- clusively to the Radio Enterprise

Radio broadcasting will soon have the distinction of a great building dedicated primarily to its purposes, according to an announcement by Merlin H. Aylesworth, President of the National Broadcasting Company, N. Y. City.

The fifteen story structure, now being erected at 711 Fifth Avenue, at the corner of Fifty-fifth Street, will be known as the National Broadcasting Company Building, as a result of negotiations recently completed. It will house the greatest broadcasting plant in the United States. Four entire floors, the twelfth, thirteenth, fourteenth and fifteenth will be given over to the work of the National Broadcasting Company. It is expected to be ready for occupancy in May, 1927.

The National Broadcasting Company Building will contain eight completely equipped studios designed for every type of broadcasting program. On the top floor an Auditorium studio, large enough to seat an orchestra of one hundred and fifty musicians, as well as to accommodate distinguished guests who may be invited on occasions, will occupy almost the entire floor. The ceilings of the studios on the twelfth floor will contain glass panels, so that spectators seated on the thirteenth floor will be able to view the artists at the microphone. Loud speakers will be installed in practically each room occupied by the National Broadcasting Company with the exception of the studios, thereby enabling listeners with the turn of a switch to hear any particular program being broadcast without interfering in any way with the actual transmission of the program.

"The most advanced principles of studio construction and plant control will be embodied in the National Broadcasting Company Building," said Mr. Aylesworth. "It is a fundamental fact, not always recognized, however, that broadcasting reception can be no better than broadcast transmission. Heretofore plans for broadcasting studios had to be drawn with reference to existing facilities in one building or another. This will be the first time that the fundamental construction of a



(Foto Topics)

MERLIN H. AYLESWORTH
President of the National Broadcasting
Company

great building will be planned along lines that will meet the special requirements of radio broadcasting.

In addition to the studios, the building will contain the executive offices of the National Broadcasting Company, which has signed an eighteen year lease with the Bethlehem Engineering Corporation.

Mr. Aylesworth made public the fact that a management contract had been signed by the company with the Radio Corporation of America, whereby the program activities of WJZ will be directed by the National Broadcasting Company.

WJZ, it is declared, will be the central service station for a new broadcasting network and will not be merged with the chain of broadcasting stations interconnected by wire with WEA. WJZ, directed largely by its present personnel, will continue to broadcast its own programs and serve the same listening public which it has always commanded.

Unified program direction, it was pointed out, would not only permit the greatest possible broadcasting of fine programs to the public, but would insure non-interference of interest in the broadcasting of such great national events as might be put on the air.

Set Confiscation A Penalty In Peru

WASHINGTON.

Fans in Peru who have failed to take out a license for their receiving sets are likely to have it confiscated. According to a report to the Department of Commerce, the police of Peru are making a careful check to see that all fans have licenses.

The license fee in Peru is about \$3.60 and must be paid twice a year. The fee is payable in advance, and if not paid, the radio set of the delinquent owner is subject to confiscation. The proceeds from the sale of confiscated sets are divided between the Peruvian Broadcast Company and the person who reports the clandestine installation. So far there hasn't been much to divide up.

Colon Purchases Large W. E. Station

The International Telephone and Telegraph Corporation has received an order for the Colon Opera House, one of the principal theatres in Buenos Aires, for installing a 5-kw broadcasting station, of Western Electric design and very similar to that used by WEA in N. Y. City. The studio and speech input equipment will be located in the Opera House, while the transmitting station will be located in the outskirts of the city. Since this House enjoys frequent visits from great artists and important musical organizations, including the stars of the Metropolitan Opera Company of New York, this station's programs will be of the highest grade.

A THOUGHT FOR THE WEEK

Motion pictures have their place in the general scheme of entertainment, but God's gift of speech and the sense of hearing are prime factors in the success of radio. What a dull, monotonous place this would be if it were peopled with deaf mutes.

RADIO WORLD

REG. U.S. PAT. OFF.

The First and Only National Radio Weekly

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

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ADVERTISING RATES

General Advertising

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1/2 Page, 7" x 5 1/2"	231 lines	150.00
1/4 Page, 8" x 4"	231 lines	150.00
1/4 Page, 4 1/2" x 11"	115 lines	75.00
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Musical Taste In Small Towns High, Says Star

Mabel Garrison, soprano of the Metropolitan Opera Company, and Ernst von Dohnanyi, Hungarian pianist composer, shared honors in the Atwater Kent radio concert broadcast over fifteen stations December 5.

"Whichever I am doing at the moment occupies me completely," for I throw my heart and soul into it," declared Miss Garrison, when asked whether she liked to broadcast. She added that radio had performed a great public service in developing musical appreciation in the many small towns of the country.

"It is a joy to me to see how musical appreciation and understanding have grown all over the country," she said, "and what attentive audiences are now found in small places, where, perhaps they had never had a song recital before the advent of radio."

WGN DECISION HAILED BY DAVIS

Acting Secretary of Commerce Finds Established Stations Protected in Their Right to Given Wavelength, Under Chicago Ruling

WASHINGTON.

Decision by the Illinois Court that an established broadcasting station rendering a public service is entitled to protection from newcomers is interpreted by Washington authorities as a long step toward clearing radio lanes for the listener's benefit.

The decision is an outgrowth of the case between WGN and WGES, both of Chicago, and probably will go down as one of the most important in the history of the radio industry. WGN was operating on 302.8 meters. WGES originally used 226 meters, later changed to 249.9 meters and on September 7 again changed to a wave which interfered with WGN. The case was taken to court and a temporary injunction granted preventing WGES from operating on a wave that would interfere with WGN. Upon appeal, the Court granted a permanent injunction restraining WGES from operating within 50 kilocycles of the WGN wave.

Davis's Statement

Acting Secretary of Commerce Stephen Davis considers that the decision does not in any way grant a vested right in a wave length as against the government but that it does recognize the priority right of one individual against another.

"The decision of the Illinois court in the Tribune case," says Judge Davis, "does not hold that there is any vested right in wavelengths. Judge Wilson points out that the case before him was entirely a contest between individuals, one attempting to enforce a civil right against the other under common law rules. Neither party claimed any right as against the United States and none is recognized in the opinion. To the contrary, Judge Wilson upholds the power of Congress to regulate the situation fully and completely when it chooses to do so.

"This decision, if it is followed by the higher courts and in other jurisdictions, means that stations with efficient and established services may protect themselves and their listeners against unreasonable disturbance by stations in the same locality and subsequent in time. Judge Wilson applies the 'rule of priority in time greater in right' and in so doing he blazes a new trail so far as radio is concerned, for this is the first time in the United States, and probably in the world, in which the rule has been thus invoked.

Principle Well Founded

"Judge Wilson points out, however, that he has merely adapted an old and well recognized principle to a new condition, for it has been applied over and over again in other situations where priority has offered the only solution. 'First come first served' is good law as well as a good adage. In the absence or delay of legislation, the decision is a long step towards the clearing of radio lanes for the listener's benefit."

Senator C. C. Dill and Representative Wallace White, authors of the Senate and House bills, respectively, expressed gratification at the decision and the belief that the decision does not in any way question the right of Congress to regulate radio, nor does it grant a vested right in a wavelength.

NEW STATION FOR LIMA

WASHINGTON.

A new wireless station is being constructed near Lima, Peru, by the Marconi Co. of Peru, according to a report to the Department of Commerce. The station will be a 15 kilowatt, c. w., and is designed to replace the existing 10 k. w. spark station which is located on San Cristobal Hill, near Lima.

PIANO INVENTION OMITS THE MIKE

MINNEAPOLIS.

Folk who have listened in to programs from WCCO, Minneapolis-St. Paul, Minn., have recently been astounded at the remarkable fidelity with which piano solos were being received. These solos were broadcast for test purposes at that time of the day or night when few stations were on the air. The cause of this mystery has been solved by the announcement of a new device, invented by Fred W. Roehm and Frank W. Adsit, which they state will revolutionize the piano industry and improve reception and transmission, of particularly piano broadcasts. The device is known as the radiano.

When used in conjunction with radio broadcasting apparatus it eliminates the use of a microphone for piano and other instruments. It does not apply to voice. Its importance both to radio receiving

and to the piano industry lies in the fact that it converts the piano into a high loud speaker, from which all sounds, whether vocal or instrumental, are reproduced with excellent quality.

The device resembles that of the unit used in many cone speakers, a piece of metal projecting from the center and secured to the sounding board of the piano. An amplifier is used in conjunction with the device when used with broadcast apparatus. There is no metallic sound or microphonic roar emitted. All tones and overtones are distinctly amplified.

Some manufacturers are already making plans to install a drawer arrangement of a radio receiver in a piano and a talking machine motor and disk. The radiano will then be attached for use with the radio set and to replace the horn of the talking machine.

The invention stirred much interest.

COMMISSION RADIO RULE GAINS FAVOR

Compromise Being Considered Between White and Dill Bills—Right of Court Review of Decisions Safeguarded

By Thomas Stevenson

WASHINGTON.

Radio legislation may be enacted early in the coming session of Congress if a proposal now under consideration is acceptable to Senator C. C. Dill, of Washington, and Representative Wallace White, of Maine, authors of the Dill and White bills.

The proposal is a compromise between the Dill and White bills which are in conference between the two Houses. If the compromise is adopted in conference, it would go to the Senate and House for approval and if approved would be sent to the President for signature.

The main controversy between the Dill and White bills deals with who is to control broadcasting. Under the Dill bill an independent commission would be established to sit permanently in Washington. The White bill proposes that regulation of radio be placed in the Department of Commerce but establishes a Commission to review and finally pass upon matters referred to it by the Secretary or the public.

The Point at Issue

Advocates of the Dill bill claim the White bill gives too much authority to the Secretary of Commerce which might be used to political advantage. The White bill supporters are opposed to the establishment of an independent Commission without executive control. They also say an independent commission would be uneconomical because its services would not be required all of the time.

The compromise proposes the appointment of a commission of five members by the President, with the advice and consent of the Senate and subject to executive authority. The Commission would have entire control over the regulation of radio, but its decisions would be subject to review in the courts.

The Commission would meet in Washington the first Wednesday of each month and remain in session until all matters brought before it were disposed of.

Choice of Chairman

The Commission would elect one of its members as chairman who would have permanent headquarters in Washington. The chairman would have charge of the enforcement of the decisions of the commission and under him would be the radio section now in the Department of Commerce.

The radio section primarily would be devoted to inspection service, the keeping of records and other matters of routine nature.

All questions of wavelengths, time division, power, licensing of stations, etc., would be decided by a majority vote of the Commission.

The Commission would be authorized to hold public hearings on all matters of general importance such as questions of who is to broadcast.

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CONGRESS ERRS, SAYS HARBORD

Legislative Proposals, in General, on Wrong Track—
Commission Rule Held Perilous—Confiscation
Cry Raised on Other Bills

By James G. Harbord

President, Radio Corporation of America

The present scramble for wavelengths sufficiently proves the fact that there are many more persons and interests eager, able and willing to supply the facilities of broadcast transmission than there are wavelengths to accommodate them. With 610 broadcasting stations dotting the country, there are great regions of unserved territories on the radio map. There are still many hundreds of thousands of homes only within whispering distance of a good broadcasting station. There are still many millions of people whom radio has not reached. There are existing laws against monopoly which cover all industry, and there is neither need nor reason to single out radio for special legislative treatment in this respect.

The best possible way to discourage the creation of a great and permanent service of radio broadcasting in the United States is to limit every broadcasting station to a mere twenty-four months of tenure in the air, regardless of the character and policy of the station affected, regardless of the service which it renders to the nation and the public, regardless of the capital investment represented by the property. And yet legislative consideration contemplates that no license to operate a broadcasting station be granted for longer than two years.

Confiscation Point

With the vast possibilities inherent in radio communication, the extension and financing of this great service should be encouraged; not discouraged.

There is a provision now under consideration that a broadcasting station, if sold, may not be sold for more than the actual cost of the apparatus. The good will accumulated by years of faithful service to the public is to mean nothing. The rewards of initiative and enterprise are to be ignored. The right of the owner of a broadcasting station to make a contract in his own interest is to be destroyed.

Such legislation would establish a precedent as destructive to industry in general as to radio in particular.

And as if this were not enough, there is the provision debarring from a license to broadcast, any person, firm or corporation found guilty by any, even a minor, Federal court, of attempting to "monopolize" radio communication, of unfair methods of competition, and other infractions. This practically vitiates the right of appeal, a right guaranteed constitutionally to every citizen in the United States, and might not only jeopardize investments of millions of dollars, but also deprive the public of much needed communication facilities through some unintentional violation of a minor trade legislation or statute.

Charges of Monopoly

Every outstanding act of initiative or enterprise in the broadcasting field has been made the excuse for charges of attempted monopoly of the air. Superpower, it has been said, was a sinister plan to

monopolize the air. Chain broadcasting has been termed another attempt to accomplish the same purpose. And yet where should we be today without these two systems of broadcasting?

Such law would paralyze and make mute great broadcasting stations by the non-renewal of license, even though a Federal court decision was later reversed and the alleged act of guilt entirely denied by a higher court.

Some of our legislators in Congress evidently believe that a ponderous and unwieldy permanent radio commission as proposed in pending radio legislation would prove an immediate boon to the development of the art and of the industry and promote the best interests of the public.

In my opinion, such a commission would be most objectionable from the standpoint of the radio industry, in that it would require formal proceedings for the determination of all minor routine matters, many of which should be acted upon with expedition.

Fears Too Much Politics

The formation of the commission would tend towards making the control of radio an agency for political manipulation. From the standpoint of the public it would entail an unnecessary and great expense to the taxpayers as well as conflict with the well-established policy against the creation of new independent governmental bureaus and commissions. Furthermore, in creating this independent commission for handling radio, Congress would place vexations and hampering restrictions on radio—a new and yet undeveloped art—while not imposing any such limiting influences upon the older and established services and industries. Another independent bureau reporting only to the President would add to his burdens while it could not hope to receive his personal supervision.

There is no form of administrative agency which so efficiently lends itself to the evasion and sidestepping of responsibility and finality as the Board or Commission. Behind its collective action the one or two strong members who invariably dominate it can hide their individual responsibilities. Inevitably slow, ponderous, and expensive, its decisions are always compromises, never black or white, always a dull gray.

Regulation Approved

I believe in fair and wise regulation of utilities and trade practices. To such regulation we offer no objection. The test, however, of such regulation is that it be in the interest of the public. Regulation which would retard or throttle the continued and almost phenomenal development of radio would not be in the interest of the public. Furthermore, it would menace the greatest instrumentality for the dissemination of education, news and entertainment since the invention of the printing press.

Not all the proposed radio legislation now pending is in my opinion destructive. Alternative measures to several of those which I have characterized as objectionable are available in the form of bills also now pending in Congress.

Literature Wanted

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

RADIO WORLD,
145 West 45th St., N. Y. City.
I desire to receive radio literature

Name

Address

City or town

State

Earl Bailey, 112½ North 1st St., Ponca City, Okla.

Dr. French Thurston, 1334 Third Ave., Los Angeles, Cal.

L. R. Conner, 1015 Averill St., San Pedro, Calif.

C. V. Schwerdt, Box 2573, Ft. Lauderdale, Fla.

J. E. De Forrest, Aberdeen, Aberdeen, S. D.

E. J. Martin, 301 East Higham St., St. Johns, Mich.

A. V. Borton, Fayette, O.

Carl A. Kellerman, P. O. Box 194, Huron St., Oakland Beach, R. I.

A. M. Burlingame, 105 North 5th, Beatrice, Nebr.

J. E. Wilkinson, 132 Wall St., Corning, N. Y.

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H. Roy Depew, 108 Maple St., Lebanon, Pa.

J. C. Miller, Route 6, Waterloo, Ia.

Philip Brady, 570 West 190th St., N. Y. City, N. Y.

J. W. Verell, 1428 Perry St., South Richmond, Va.

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R. A. Sancken, 2601 Semmes Ave., Richmond, Va.

William Vosslev, 156 Hazelwood Ave., Buffalo, N. Y.

Joseph Francis Francis, 503 West 6th St., Reno, Nev.

William J. Carter, Pennsylvania Ave. Station, Washington, D. C.

Cora Johl, 120 Pearl St., Little Rock, Ark.

Elmer Heath, Old Glory, Tex.

W. Wissman, 2209 Dixie Highway, Hamilton, O.

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H. J. Schutte, 999 Kahn Ave., Hamilton, O.

Benjamin Elson, 212 East 13th St., N. Y. City.

Harvey Everhart, 611 South Poplar, Wichita, Kans.

M. A. Sequin, 110 Pitt St., Cornwall, Ont., Canada.

C. J. Brars, c/o Cljir Co., Ford City, Pa.

W. E. Dennis, 6141 Webster St., Philadelphia, Pa.

Clark & Son, Lutesville, Mo. (Dealers)

John G. Frank, P. O. Box 276, Hudson, Mass.

H. Stricker, 608 North 13th St., Reading, Pa.

W. J. H. Epler, 524 North 13th St., Reading, Pa.

R. Neider, 1243 Greenwich, Reading, Pa.

E. R. Parshell, 1210 W Elizabeth, Detroit, Mich.

Fred W Holland, 21 Gorman Ave., Baltimore, Md.

THE RADIO TRADE

Trade Stabilized, Is Dawes' Comment

In a report on the Third Annual Radio Industries Banquet, recently held in the Hotel Astor, New York City, Paul Klugh, the general chairman, revealed remarks of Vice-President Charles Dawes. Shortly after the festivities had begun Mr. Dawes looked over the table and said: "This is a great sight, Mr. Klugh. It looks as if the radio business is becoming stabilized."

"This, coming from a man who is a great banker, is indeed complimentary to our industry," commented Mr. Klugh in his report.

Jones Introduces New Wall Box Plug

Howard B. Jones, of Chicago, manufacturer of the Jones Multi-Plug line for battery connections, announces a new type W. B. (Wall Box) Multi-Plug. This item consists of the standard seven contact socket mounted on a switch box cover and the regular plug and cable.

By installing this socket in the baseboard of the room, the batteries with their messy wires and unsightly appearance can be removed from the living room entirely and placed in basement or adjoining closet. A connection from the batteries or power supply unit can then be made in the same manner as the ordinary floor lamp.

Report on Export Shows Big Gain

American sales of radio to South America in 1925 were more than treble those of the United Kingdom to that continent and the Falkland Islands, although British shipments to British Guiana and Peru exceeded those of the United States to those respective countries.

American shipments of radio equipment to Asia, excluding those to the Philippine Islands, exceeded those of the United Kingdom to the same area by \$808,909. British shipments to Asia were valued at \$1,497,350, of which over 23 per cent went to divisions of the British Empire.

Japan was the leading British market, but American sales to that country totaling nearly \$726,000 were more than double in value those of the United Kingdom, and, in fact, were greater than the total sales of British radio in Asia.

United States exports of radio to the Netherlands East Indies exceeded those of the United Kingdom, and American exports to the Philippines were valued at \$109,030. No British shipments to these islands were recorded.

British sales of radio equipment to Oceania totaled \$1,056,583 during 1925, which was about 36 per cent greater than the value of the United States radio exports to that area. The United Kingdom exports to Australia alone were value at over \$200,000 more than the American shipments to entire Oceania.

American sales to New Zealand exceeded those to the British. No British shipments were recorded for French Oceania, but our exports to that territory totaled \$312,000.

The value of United States radio exports to Africa totaled only \$25,281 in

1925 as compared with the United Kingdom value of \$336,825. British South Africa was the leading market in this area, receiving equipment valued at \$20,334 from America and at \$259,285 from the United Kingdom.

French Africa, which purchased \$275 worth of American equipment, was the only territory which imported more from the United States than from the United Kingdom.

Parley on Bills Is Ready to Start

The conferees of the Senate and House will not meet to discuss radio bills this week, Senator Dill says. First, the Senate must confirm the appointment of Senator Gooding, of Idaho, to succeed the late Senator Cummings of Iowa, as a member of the conference committee.

Much good may be accomplished by the emergency measure which passed the Senate and House at the end of the last session, but which failed of enactment because the Vice-president did not have time to sign it. This measure provides that no station shall have any vested right in a wavelength and requests anyone who pretends to have such a right to come forward with it. Just as soon as Congress convenes the bill will be signed by the Vice-president and sent to the President.

Although conditions are bad because of the congestion of stations, Senator Dill thinks they might be worse. He hopes an emergency measure may be passed limiting the number of stations, all other things failing.

NEW CORPORATIONS

Amalgamated Radio, N. Y. City, radio sets, \$20,000; E. A. Zadig, I. C. Friedman, M. Luber. (Atty., N. W. Wassman, 163 Broadway, N. Y. City).

Thermodyne Radio Corporation of America, New York City, 150 common, no par; J. E. Meyer, J. D. Farnam, A. Brunner. (Atty., Shapiro & Witte, 1540 Broadway, New York City).

Holland Radio Stores, New York City, \$50,000; R. E. and M. Holland. (Atty., C. M. Norden, 144 East 86th St., New York City).

Dependable Radio Service Corporation, Brooklyn, N. Y., \$5,000; J. Schlossberg, B. Grabisch, A. Finkelstein. (Atty., H. Haberman 305 Broadway, New York City).

Mohawk Battery Co., Schenectady, N. Y., \$20,000; D. H. and H. D. Wildman, E. A. R. Cohen. (Atty., H. G. Coplon, Schenectady, N. Y.).

Midwood Radio Co., Brooklyn, N. Y., \$10,000; W. Pyne, A. S. McGrover, R. C. Emery. (Atty., Emery & Pine, 95 Liberty St., N. Y. City).

Mica Trading Corp., N. Y. City, radios, 100 shares, \$100 each; 300 common, no par; A. Aaronson, E. M. Slote, Y. Allen. (Atty., Jacobson & Pollack, 165 Broadway, N. Y. City).

Grand Central Terminal Broadcasting Corp., N. Y. City, \$250,000; S. W. Baruch, N. Prince, E. N. Baar. (Atty., Baar & Donaldson, 52 Broadway, N. Y. City).

International Broadcasting Corp., wireless instruments, N. Y. City, \$100,000; I. Friedenthal, M. Kaplan. (Atty., L. Landos, 165 Broadway, N. Y. City).

OFFICIAL LIST OF STATIONS, giving call letters, owner, location, wavelength in meters, even unto decimal fractions, and the frequency in kilocycles, was published in the November 6 issue of RADIO WORLD. Send 15c for copy. RADIO WORLD, 145 West 45th St., N. Y. City.

DX Antenna Is Self-Directional

The DX Laboratories, of 39 Soper Ave., Oceanside, Rockville, N. Y., are now manufacturing in their new spacious factory, a new type of antenna, which according to tests held in Radio World laboratories and elsewhere, is very efficient. Specially treated wood is used to wind specially triple tinned, double insulated wire around unique constructed porcelain insulators. The antenna resembles a hugh box loop, and is placed on top of a pole on the roof of a home. It is self directional, receiving signals from stations in all direction with equal intensity.

Birnbach In Demand

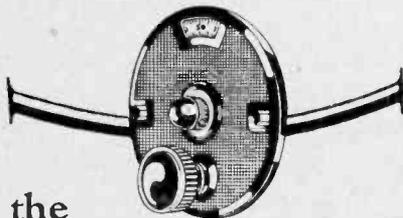
The Birnbach six lead battery cable has been specified by Herman Bernard for the Bernard Batteryless set. Birnbach cables are also being used in the four and five tube Diamond of the Air, the Bernard, the Singletrol and the Antennalless circuits. These cables are well made and durable and simplify the connecting of a set, besides acting as a protection against short circuits. The Birnbach line of extension cords with connectors is equally well-made and in great demand. This concern makes a complete line of these useful cords, making them in sizes of 20, 30, 40, 50 and 100 foot units. Comprehensive literature will be sent to all interested. Address the Birnbach Radio Co., 370 Seventh Avenue, New York City.

SOUND FACTS

(Concluded from page 11)

communicated to the elements of the tube, that is, to the grid, plate and filament. These change their relative positions, and as soon as they move relative to each other at a certain frequency, a variation of the same frequency is set up in the plate currents of the tubes. These variations are amplified by the amplifier and finally are emitted as sound by the loudspeaker. The air vibrations of the same frequency are intensified and the tubes pick up a greater vibration. Thus the original vibrations are intensified until the circuit oscillates, and by circuit in this case one meant the amplifier tubes, the loudspeaker, the air column and the elements of the tubes regarded as purely mechanical devices.

The chief offender in this chain of oscillation is the detector tube. This is so because it is the first in the series of audio amplifier tubes and any disturbance that occurs between its elements is ampli-



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C BATTERY MOUNT



(Hayden)

AN ORDINARY grid leak single mount may be used for holding a small C battery, e. g., Eveready 1½ volts.

fied by all the other tubes. A detector tube, or any other tube for that matter, which picks up vibrations from the air or from its supports is called microphonic, because it acts exactly the same as a microphone.

Exclude Acoustical Vibrations

To prevent this trouble all mechanical or acoustical vibrations should be excluded from the amplifier tubes, and particularly from the detector. This exclusion may be accomplished in two ways. One is to mount the tubes on something which will kill off the vibrations without communicating them to the elements of the tubes. For this sockets are mounted on soft rubber, on leather, or on very pliant metal springs. This method of reducing microphonism is effective against both mechanical and acoustical vibrations, but is particularly effective against jars of the tube communicated from the table or support. As a means of preventing acoustical vibrations, that is, air vibrations, the trouble-making tube should be enclosed in a sound proof container, e. g., a McDonald howl arrester.

Mechanical coupling between the loudspeaker and the detector tube may be reduced by removing the speaker some distance, or by placing it on a non-elastic support. For instance, the speaker might be placed on a pillow if it must be kept near the amplifier, or on several layers of soft felt, or on sponge rubber.

What determines the frequency at which the circuit howls when it is due to air coupling and a microphonic detector? There are many contributing factors, but

the main one is the natural period of vibration of the elements of the detector tube. The circuit howls most easily at or near the frequency at which the elements will vibrate one with respect to the other.

Modification of Frequency

This frequency is modified to a slight degree by the natural frequency of the loudspeaker, that is, the frequency at which this is most sensitive. Similarly, it is modified by most frequency at which the amplifier is most sensitive. If these three frequencies should happen to be identical or very nearly the same, the circuit would be in a most excitable condition. It would be almost impossible to prevent howling. This happens very often, because all these natural frequencies very often happen to be in the neighborhood of 1,000 cycles per second. Another contributory factor is the phase of the vibration, and this depends mainly on the distance between the sensitive tube in the set and the loudspeaker. This distance is quite critical, particularly when the howling frequency is high. Suppose that the frequency is 1,000 cycles. The wavelength is then about one foot. If the set howls violently in one position, then it should stop if the speaker or tube be moved six inches away from or toward each other. Changing the distance between the two one-half wavelengths changes the feedback through the air from aiding to opposing, and it has the same effect on the audio frequency oscillation as reversing the tickler on radio frequency oscillation. The difference is only in degree.



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LOSS IN DETECTOR CREATES BIG NEED FOR RF STRENGTH

In effect, a detector tube is really a "distortion" device since it is by distorting one half the incoming radio frequency wave that the signal is made audible. The distortion of this incoming wave is accomplished by operating the detector tube at grid and plate voltage values where a slight positive charge will result in an abnormal plate current and a negative charge in subnormal plate current with respect to the effect of similar charges on the grid if the tube were operated on the "straight" part of its grid volts-plate current characteristic curve. Thus, the incoming wave train, having positive and negative alternations, will be represented in the plate circuit in the form of abnormal plate current for the positive half and subnormal plate current for the negative half and it is this difference of plate current value that causes an audible sound in the phones.

Since it is only the difference between the distorted positive and negative half cycles that is responsible for reproduction, it is evident that much of the signal strength is lost in the process—the lower half of the wave entirely missing, as well as that part of the upper half lost through the opposing effect of the distorted lower half. For this reason, weak signals must be amplified before detection if results of any kind are desired.

In the audio frequency end of the receiver it is found that, due to inertia of reproducing mechanisms, the air and last but not least the detector tube, considerable energy is required to faithfully reproduce musical tones in the lower register. In other words, in order to secure good, round low tones it is necessary first to have power.

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KING PRESENT AT MARCONI'S TALK

ROME.

In the presence of the King and Queen, most of the members of the Cabinet and many others, Senator William Marconi gave a detailed lecture explaining his latest achievement, short wave directional wireless (beam transmission).

Marconi's first experiments on this type of transmission and reception were made in Genoa, in 1916, during the World War. Although the results were not wholly satisfactory, a foundation had been made. However, in 1921 real successful tests were held over comparatively long distances. The improved system allows transmission over vast distances using less than one-tenth of the power of the old type stations. He hopes soon to solve the many baffling problems of difficult transmission of photographs and television, and also possibly transmission of energy.

come the effect of inertia of air and reproducing mechanisms but it cannot compensate for the loss of energy caused by the detector tube. The only remedy for this is amplification before detection. Thus, the radio frequency amplifier comes into its own as a contributor to good audio reproduction and the more well-designed stages ahead of the detector, the better the quality at the output of the set. There is one drawback, however, in multi-stage radio frequency amplification and this is due to pick-up and interstage coupling between various coils in the receiver. With several stages of tuned radio frequency amplification, a receiver becomes so sensitive that coils in the set tend to act as miniature loop aeri-als and thus broaden tuning and destroy selectivity.

Such effects, however, are neutralized with the use of individual stage shields which not only eliminate external pick-up and prevent interstage coupling but also, by virtue of introduction into the fields of the coils, tend to still further stabilize the receiver against oscillation.

Four wavelengths were used in the tests, namely 92, 60, 47 and 32 meters. The shortest of the wavelengths gave best results, under all conditions, during the day-time. Further experiments will tend to show which what shorter wavelengths if any, will give better service.

This new system, as stated by Marconi, makes wireless completely independent of atmospheric disturbances, even in the tropics. It greatly decreases fading, renders greater speed, and makes stations more independent of each other. It will be of a great help to broadcasting, he said, since it will allow subdividing into various zones. In this way, one city will be able to transmit music to the United States and at the same time transmit a totally different program to another country with no interference of either, he asserted.

Recent tests proved the system a huge success, stated Marconi.

Outlaw Broadcast Attacks WPCH Talk

Using the call letters of WBRS, the Universal Radio Manufacturing Company's station in Brooklyn, some mysterious station broadcast a short program during an afternoon recently, attacking the policies of station WPCH, formerly WFBH, New York City.

After a comparison of letters received, WBRS concluded that the mystery station was located somewhere in New Jersey and operated on a wave length of 315 meters. WBRS uses 394 meters and was not on the air at the time of the outlaw broadcast or for hours afterward. The broadcast concerned a stock sale talk over WPCH by the recent purchaser of that station, George Sulzbach.

A. LeCurto, part owner of WBRS, said that the illegal broadcast program might have been executed by an amateur radio phone station.

WBNY REVIEW SHOWS

WBNY features a dramatic review every Friday evening of the new shows on Broadway during the current week by Leon Edward Joseph. These criticisms are offered for the listeners' benefit and not paid for by the shows. Mr. Joseph writes regularly for two New York newspapers and for magazines.

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90 VOLTS HELD O. K. FOR CONE

Lewis M. Clement, engineer, said there seems to be a general belief in the trade that a cone speaker requires considerably more power for its operation than the average horn speaker.

Mr. Clement's comment on this question of power required to run a cone speaker is particularly interesting since he is responsible for the design of one of the latest models of cone speakers upon which he worked for a long time. Mr. Clement says that a cone speaker gives excellent results on a set operating on 90 volts B battery. He added:

"Of course, when using 90 volt plate supply there is not much advantage in using a 112 tube, but considerable gain in volume on local stations over that obtained with the CX-301A tube may be had by using a -71 tube. On the other hand, with 90 volts on the plate circuit the A tube will be found extremely satisfactory."

EXCELLENT AUDIO VERY IMPORTANT

Due to the fact that a considerable amount of real research work has been done by various radio laboratories on the radio frequency end of our receiver and that similar development work has been done by the tube manufacturers such as the C. E. Manufacturing Co. in the preparation of special detector tubes which are highly sensitive, we can without very much difficulty provide ourselves with a receiver which up to the detector is a very satisfactory and reliable instrument. Immediately following the detector we find that the exponents of various schools of audio frequency amplification divide themselves into approximately four classes. Roughly, they are, the exponents of transformer coupling, resistance coupling, impedance coupling, and double impedance coupling. Each one of these systems has its own particular advantages as well as its own particular disadvantages.

In order to properly apply any system, it is necessary that the builder of receivers understands, before he attempts to build, just what it is he is after. A type of audio frequency amplification which is becoming increasingly popular is the use of one good transformer in the first stage of the amplifier system followed by two stages of resistance coupling and a tone filter output. This system was described in August by Arthur H. Lynch, and the reason given by the author for the use of the transformer was that, up to the output tube, 199 tubes were employed in the amplifier and the transformer gave the increased amplification necessary to provide real loud speaker operation for the receiver when long distance reception was desired. The quality of this system has been commented upon with much favor by a great many radio enthusiasts and experts throughout the country.

Another system of reliable amplification is the use of one stage of impedance as the input, two stages of resistance and again a tone filter.

In fact, almost any type of audio frequency amplification may be made to perform in a satisfactory manner with the single exception of two stages of audio where the transformers used in the system are of an inferior quality.

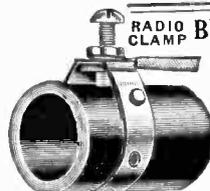
The point in any system of amplification where most engineers or so called engineers go wrong—and this fault is found in almost every radio circuit ap-

pearing in the current publication—is to do with the failure on the part of the designer to include the tone filter in series with the plate lead of the output tube.

The output of the -71 tube is satisfactory to provide very loud signals, plenty loud enough for the average home. This tube is becoming increasingly popular, and to use it without a tone filter or an output transformer is to put a very severe load on the loud speaker windings and possibly burn them out.

Too little attention has been paid to this subject by the designers and by the radio publications as well as by the general public building radio receivers. A tone filter is a very simple thing to make. It consists of a combination of small impedance of anywhere between 30 and 100 henries and a 4 mfd. condenser so connected in the plate circuit of the -71 power tube that the AC component of the plate current passes only through the loud speaker and not through the B power unit. The DC component of the plate current by this arrangement will not pass through the speaker.

The use of such an output system is highly desirable when either semi-power tubes or power tubes are employed and its use will eliminate a great deal of the distortion which now exists in receivers for which there is seemingly no accounting.



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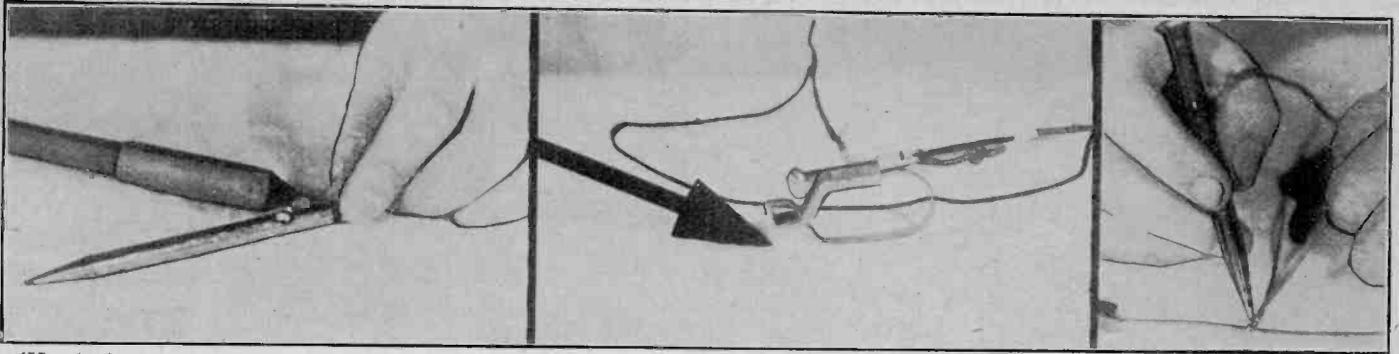
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(Hayden)

A LEAD PENCIL having a clip attached to the outside case, which in turn is attached to the lead, may be successfully used as an iron for soldering small connections. A 6-volt storage battery is used for power. One terminal of the battery is connected to the clip. The other terminal of the battery is connected to the point where the connection is to be made. Then when the piece of lead is placed onto the wire, a complete circuit is made. Photo to left shows wire being soldered to pencil clip. The arrow in center photo shows the clip from the battery being connected to joint to be soldered. The photo to right shows the pencil being touched to Kester acid core self-fluxing solder for making the joint.

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Not the least important personage in the radio drama group is the man who builds scenery out of sound.

It is not enough, in the production of a play by radio, to announce at the beginning of an act that the action takes place indoors or outdoors, at the shore or in the woods. The listener must gain his mental picture of the setting from the

lines of the play and from supplementary sounds.

These sounds are usually produced by the use of "props," but sometimes the most striking effect is gained by importing the sounds from the scene depicted. For example, the British Broadcasting Company placed a microphone at a busy London street corner and produced these sounds as a background for the lines of the playing cast. There are effects, however, that might be difficult of importation. For example a forest fire might not always synchronize with a play. At WGY some time ago a most realistic forest fire was created by the use of a plumber's blow torch for the sound of flame and wind and by breaking up matches to simulate the sound of cracking, breaking, burning tree limbs.

Oh, Those Doors!

Since the listener is unable to see anyone enter a scene, the character's presence is generally denoted by the closing of a door or by the lines. For this reason the doors in all the homes of the radio drama characters are likely to be squeaky affairs and the slamming of doors which has won many a boy or girl a corrective word from parents, becomes a necessity.

Ten Eyck Clay, director of the WGY Players, is a seasoned actor of the legitimate stage and he has a working knowledge of the stage "prop." He has found

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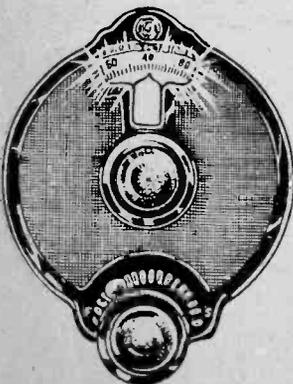
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that the most difficult problem in the radio drama, demanding most in time and energy, is the production of sound-scenery. Actors readily throw themselves into character and in the radio production it is not necessary to memorize lines. At most, two rehearsals of a cast are sufficient for a worthy radio performance.

The scenery, according to Mr. Clay, is another question entirely, for the obvious sound is not always the most suitable to produce a certain effect. Hours and hours are sometimes devoted to devising a fairly accurate sound production. After the "props" necessary to create the sound have been found or built radio rehearsals must be held in co-operation with the radio engineers.

Prop Rarely Useful

The stage "prop" is very rarely suitable for radio use, though the wind and thunder machine of the stage are usually used for the thunderstorm effect. In the movies the spectator sees the locomotive and the supplementary sounds produced in the orchestra pit need not be very accurate to emphasize the effect. The picture has registered in the mind of the spectator. On the stage also "prop"-produced noises are often poor imitations of the real thing. The radio microphone is so sensitive that the motion picture theatre or stage props are practically useless. The passing train must sound like a train and not a motorcycle or a tugboat.

One of the most stubborn "sound" problems that Mr. Clay has faced was the production of the sound of a speeding express train. This particular train was supposed to be on a one-track road, where the roadbed was none too smooth and where a flat wheel or two was not considered an offense. The player-director proceeded to make a sound study of railroad trains and after he was satisfied that he had learned all the sounds in their proper sequence he tackled the problem of producing those sounds so faithfully that the listener many miles away would know that he was listening to the passing of a steam-engine drawn train.

The Real Thing

A real locomotive bell and a creditable whistle were readily produced. To these were added boards covered with sandpaper which, when rubbed one against the other, produced what may be described as the chug-chug of the engine. A flour

sieve helped to define the sharp first sound heard as the engine puffs.

Then came the problem of producing the roar of the passing train and the pounding or bumping of the wheels on uneven track. A metal panel, five feet long and an eighth of an inch thick was decided upon for the roadbed. A couple of youngsters on roller skates speeding over the uneven surface of the sidewalk suggested the rolling stock and a pair of roller skates was utilized as a train. In the first rehearsal, Russell Hoff, chief of the control room crew suggested that a couple of heavy cords be stretched over the metal panel. As the roller skates passed over the panel one couldn't tell the sound from that of a train bumping over uneven rails.

Volume Controlled

The volume of sound was regulated in the control room. The listener first heard the distant whistle and the muffled roar and each second the control room crew built up the volume until the heavy train veritably thundered past the little country railway station. An added effect, familiar to those who live near passing trains, was the rattling of window glass. Six people were required to produce the train effect. one to whistle, one to chug, one to operate the roller skates, one to make the windows rattle and another to sound the bell and the sixth, the control room operator to control the sound volume.

The best recipe for a fast train then is: two short pieces of wood covered with sandpaper, a flour sieve, a pair of roller skates, a metal panel, a whistle, a bell and two pieces of heavy cord.

Five Continents Of Amateurs Meet

SCHENECTADY.

Using the General Electric Company's 32.79 meter station 2XAF in Schenectady as the powerful transmitter, the first inter-continental amateur convention was held recently. Officials of the American Radio Relay League, addressed the session, including Hiram Percy Maxim, president; K. B. Warner, secretary; F. E. Handy, communication manager of the A. R. R. L.; A. A. Herbert, treasurer, and Rose Hull, Australian amateur. Members listened on five continents.

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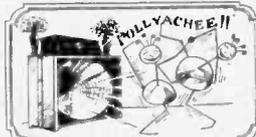
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Address _____
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ENGINEERS SERVICE CO., 25 Church Street (Desk W), New York City

HOW TO BUILD THE Hi-Q SET

(Concluded from page 7)

should be exercised when soldering. If the iron is hot enough to cause the solder to flow freely, no trouble should be experienced in making neat and permanent joints.

In wiring all leads should be run by the most direct routes and no attempt should be made to secure square bends or other old fashioned ideas in wiring. Care should be taken to see that none of the wires interfere with the full motion of the condenser rotor plates, moving primary coils and their cams and flexible connectors.

Now make the connections between the first coil, antenna switch, condenser and first RF socket as shown in the picture diagram on this page.

Now erect shield section No. 1B screwing the lip of the shield to the shield strip, and fasten the corner of the two

shield sections by means of one of the shield corner clamps.

Secure a soldering lug to the hole in the center of the shield, the head of the screw and the lug being on the outside.

Run a wire from this lug to upper end of soldering lug terminal R of condenser No. 1.

Now make the connections to the second RF stage. As each wire is put in place, check the connection with the picture diagram.

Connect terminal E of coil No. 2 through the remaining hole in the shield to the unattached terminal of Equalizer No. 1.

It might be mentioned here that for convenience in wiring some wires will be cut to designated lengths and only attached at one end. When the other end of the wire is later attached the wire should be cut to the exact length required.

Solder a 6" length of wire to one end of the resistance strip in the foundation unit. Solder the other end of the resistance strip to a soldering lug secured in place by the binding nut on terminal plus of socket No. 2.

Attach a 7" wire to terminal B of coil No. 2.

Attach an 8" wire to terminal P of socket No. 2.

Attach a 7" piece of wire to the unattached terminal of Equalizer No. 2.

Shield section 1D may now be erected, fastening it in the same manner as section 1B was fastened.

Pass the free end of the resistance strip wire through the shield hole and attach it to terminal A of the rheostat (the terminal next to the shield).

Thread the free end of the wire attached to terminal B socket No. 2 through the remaining hole in the shield. The free end will be connected later.

Secure a soldering lug in the center hole of shield section 1D.

Attach the grid leak clips to the .00025 mfd. fixed condenser using the screws furnished with the condenser. To one of the terminals on the under part of the condenser, attach the grid condenser con-

necting strip. The hole in the other end of the strip slips over terminal G of socket No. 3.

Condenser No. 3 should now be mounted. Place shield sections 1C and 2A together so that the condenser mounting holes in the sections coincide. Then mount the condenser against section No. 2A using two 1/4x6/32 round head screws which pass through both shield sections and hold these sections together. Erect this assembly, first placing shield section No. 2E under the lip of shield section No. 2A, taking care that the two socket holes in this section coincide with the socket fastening holes in the shield strip. Fasten the lips of the two shield sections to the shield strips and secure the corners with corner pieces.

Thread the free end of wire from terminal P socket No. 2 through shield section 1C and 2A as shown in the diagram.

Thread the free end of wire from Equalizer No. 2 through the same shield section as shown in the diagram.

Fasten socket No. 3 in place, and run a wire from the lower end of soldering lug R terminal of condenser 3 to terminal minus of socket No. 3.

Mount coil No. 3 to condenser No. 3. Terminal F of coil No. 3 to terminal minus of socket No. 3.

The free end of wire from Equalizer No. 2 to terminal E of coil No. 3.

The free end of wire from terminal P of socket No. 2 to terminal P or coil No. 3.

The upper end of soldering lug terminal S of condenser No. 3 to terminal G of coil No. 3.

Terminal G of coil No. 3 to the free end of the grid condenser.

Attach a 7" wire to terminal plus of socket No. 3.

Attach a 4" wire to terminal P of socket No. 3.

Attach a 6" wire to terminal B of coil No. 3.

Shield section No. 2B can now be erected.

Mount the midget condenser in the large hole in shield section No. 2B in the position shown. The large spacing washer in the foundation unit will be required in mounting the condenser to the shield.

Terminal S of midget condenser to terminal G of coil No. 3.

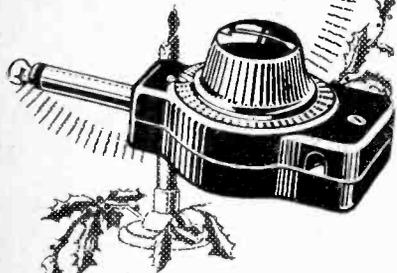
Shield section No. 2D should now be erected.

Thread free end of wire from terminal plus of socket No. 3 through shield section 1D.

Thread free end of wire from terminal B of socket No. 3 through shield.

Thread free end of wire from terminal B of coil No. 3 through shield, using hole near the front of the shield.

Best Gift for Radio Fans



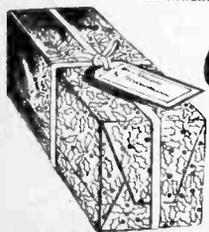
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Centralab Modu plu G

This is the wonderful invention that gives any radio set the new tone control of the latest high-priced receivers. Gives smooth, positive control of tone volume from a whisper to maximum. Attaches instantly without tools.

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TYPOGRAPHICAL ERROR IN DX ANTENNA COPY

In the advertisement of the DX Laboratories, 39 Soper Ave., Oceanside, Rockville Center, N. Y., on page 24 in Radio World's issue of Dec. 4 by a typographical error the price of the antenna kit complete was quoted at \$10 while the correct price is \$13.50; the price west of the Rockies being \$14.00 and in Canada, \$14.50.

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Circuit diagram and panel layout, price for both together \$1.50

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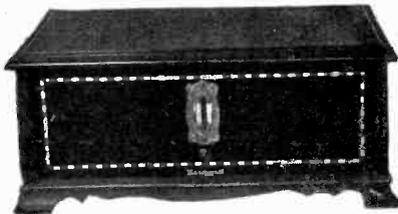
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A 6-TUBE CIRCUIT BEAUTIFUL TO EAR AND EYE



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Fully described in the October 16 issue of RADIO WORLD by Herman Bernard. Schematic and picture diagrams of the wiring, textual wiring directions, step by step; striking photographs of the completed receiver, all treated so that the veriest novice in radio can build the Bernard.

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

THE BROWNING-DRAKE CIRCUIT—Text and illustrations covering this famous circuit starting with our issue of Aug. 14. The 3 numbers sent on receipt of 45c. RADIO WORLD, 145 W. 45th St., N. Y. C.

How to Build

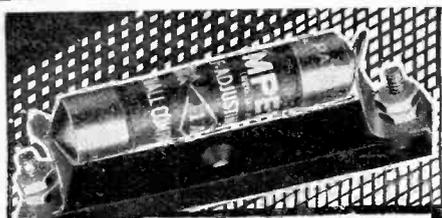
THE DIAMOND

Herman Bernard, designer of this wonder circuit, has written an illustrated booklet on "How to Build RADIO WORLD'S Improved Diamond of the Air." Send 50c and get this booklet, including a full-sized wiring blueprint

Send \$6 for year's subscription and get booklet, and blueprint FREE.

[Newsdealers or radio dealers, order the booklets with blueprints included, in quantity, direct from American News Co. or branches.]

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Tube life and efficiency, tone clarity and accurate tuning—all depend on filament control.

AMPERITE, the only self-adjusting filament control, regulates the tube current that governs these vital points. Eliminates hand-rheostats, simplifies set-wiring.

Accepted as standard equipment by every leading engineer, AMPERITE is specified in the feature circuit in this issue—DIAMOND of the AIR RECEIVER.

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The "SELF-ADJUSTING" Rheostat

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"Built Better"

Fixed Condensers and Resistors
Specified by HERMAN BERNARD

in the
FOUR AND FIVE TUBE
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The 6-Tube Receiver of Exquisite Tone

BERNARD BATTERYLESS
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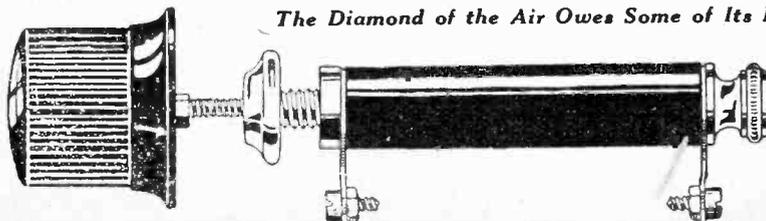
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Variable Grid Leak
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The Diamond



The Diamond of the Air Owes Some of Its Efficiency to This Leak

THE BRETWOOD

Improves Any Set!
Price, \$1.50

NORTH AMERICAN BRETWOOD CO., 145 West 45th Street, New York City

EDITOR LAUDS THE VICTOREEN

(Continued from page 4)

looked impossible to believe if it had not been for the fact that I, too, had practically duplicated the performance. 40-watters out in the middle west on a loud speaker—a 20-watter down in Allentown, Pa., for church services in the broad daylight on a Sunday morning.

Right Smart

I could go on for the rest of this edition telling about the reception stunts of this set. In making mention of them I do this simply to show that the Victoreen is a right smart receiver. I do this, too, to show the home constructor he does not necessarily need to be an engineer. When the set is built you're ready to start tuning and not start balancing.

I can twist my dials from 200 meters

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OVER TWO POUNDS BUILDER'S DATA, catalog, circuits—25c, prepaid. Twenty weekly mailings, newest "dope," \$1.00. Kladag Laboratories, Kent, Ohio.

SEND FOR PAMPHLETS OF THE GOODMAN TUNER—In use for years and still good. Tested and approved by many technical laboratories. L. W. Goodman, Drexel Hill, Penna.

PATENTS—Write for free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our inspection and instructions free. Terms reasonable. Radio, Chemical, Mechanical, Electrical and Trademark experts. Victor J Evans Co., 924 Ninth, Washington, D. C.

BRADLEY ANTENNALESS. World's first successful three-tube set using ground connection only. Wonderful volume—distance—selectivity—absolutely clear. Cost less than \$15.00 and easy to build. Child can tune it. Blue prints—details \$1.00. C. C. Bradley, 209 Hamilton Ave., Tampa, Florida.

ACQUIRE A KNOWLEDGE of modern Radio. Interesting booklet 20 cents. Arthur Hansen, Box 582, Station C., Los Angeles, Calif.

SALESMEN—51 Stations in 15 minutes. Vertical Antenna makes any radio tune 100% sharper—like Super-Heterodyne. \$9.00 profit each. 4412 Lisbon Ave., Milwaukee, Wis.

all the way up to KFUV at St. Louis and click in so many stations on one twist that it sounds like a shower of pebbles on a tin roof. Too, any set that will pick up Chicago and put it on the loud speaker without aerial, ground or loop certainly ought to pick up California under good conditions with aerial and ground or with loop. Chicago is about one-quarter to one-third the way to California and such distance ought to be negotiated if Chicago reception is possible on the speaker with bare set and batteries.

Now let's see why one gains this tremendous power.

Detector Strength

The secret of the Victoreen is its ability to pile up signal strength in the detector unit. The detector unit is a young power plant. That secret in the detector unit is the matching of the intermediate frequency transformers. No iron core is used in these and, therefore, the curve is very sharp. The air core is 2" in diameter which means that a minimum amount of wiring is used to get the proper inductance and the field is kept in close proximity to the coils, practically eliminating feedback and, too, this means that the transformers may be placed real close to each other all on the same plane.

The secondary of the transformers is tuned by a small variable condenser while they are in course of construction at the factory.

There is a precision of within 1-3 of 1 per cent. in each transformer. In case one Victoreen Intermediate Transformer, No. 170 for 5-volt tubes or 171, which operates better on 199 tubes, is broken, one need only to buy a new one, replace

Samson Dual Impedance



The latest improvement in amplification at a low cost. Connects like audio transformer.

SAMSON ELEC. CO.
CANTON, MASS.

- ### LIST OF PARTS
- 1—One Victoreen 2 ohm Rheostat.
 - 2—One Yaxley No. 10 Battery Switch.
 - 3—One Victoreen 400 ohm Rheostat.
 - 4—One Jewell No. 135 Voltmeter.
 - 5—One Victoreen 6 ohm Rheostat.
 - 6, 7—One Victoreen Master Control Unit.
 - 8—One Yaxley No. 60 DPDT jack switch.
 - 9, 10, 11—One Victoreen Audio Control Unit.
 - 12—One Eveready No. 950 1½ volt cell with brackets.
 - 13, 14, 15, 17, 18, 19, 21, 22—Eight Eby UX type Sockets.
 - 23, 16—Two Sangamo .00025 Mfd. fixed condensers, with clips.
 - 23, 16—Two Lynch 2 megohm metallized leaks.
 - 24, 25—Two Karas Harmonik all stage ratio audio transformers.
 - 26—One Sangamo .001 mfd. fixed condenser.
 - 27 to 30—Four Victoreen No. 170 (for -01A type tubes) or No. 171 (for -99 type tubes) RF Transformers.
 - 31—One Victoreen No. 150 Oscillator Coil.
 - 32—One Victoreen No. 160 Antenna Coupler.
 - 33, 34—Two Yaxley No. 416 pup jacks.
 - 35 to 47—Thirteen Eby binding posts.
 - One Mar-co vernier dial.
 - One Mathiesen-Sandberg Loop Aerial.
 - One Corbett Model C cabinet for Victoreen.
 - One Lignole Victoreen front panel, 7x26 inches.
 - One Formica post strip, 9/8x5/8".
 - One Formica post strip, 4 1/2x5/8".
 - One wooden baseboard, 9 1/2x25 1/2".
 - Assortment of hardware.

the broken number, and go back to his tuning.

Relative to the Victoreen method of tuning the transformers, this small capacity decreases the amount of inductance required and therefore decreases the radio frequency resistance which further accounts for the sharpness of the curve.

Inter-stage oscillations are the foremost and best-recognized little "bug" in the Super-Heterodyne. Inter-stage oscillations ruin selectivity and produce wondrous distortion. In the Victoreen transformers this is eliminated by a second adjustment, also made at the factory, which gives each transformer exactly the same amplification constant.

Tested and Sealed

Amplification constants are nice play fellows. If they are too great the transformer tends to oscillate—if too little, the transformer is sluggish and possesses no kick. Therefore, these adjustments—and there are two of them, most important—are made at Victoreen factory and the sealing prevents any change or detuning by the user.

One need not look to the matching of

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Indicate if renewal.

Offer Good Until

January 15, 1927.

Name

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City and State

tubes in a Victoreen. I have tried using a pair of new 200-A detector tubes in both the first and second detector and this proves that there is such a thing as adding too much efficiency. In the detector there is plenty of signal strength without the use of special detectors. I have used special radio frequency tubes—the difference by comparison is hard to tell from the average run of tubes.

No Tube Matching

Tube matching forgotten in a Super-Heterodyne! Hard to believe isn't it—but it's so. This is accomplished by another action of the condenser across the secondary. The variation in tube capacity in comparison with the shunt condenser, is so small as to become negligible. This also holds true with regard to the manner in which the general wiring is carried out. No special attention is necessary for success—only, it's always good policy to make your leads as short as possible—especially the grid leads.

Due to the truly resonant characteristics of the secondary, an aperiodic primary is used. This permits the transformers to be used with either 201-A or 199 tubes. If your Victoreen is to be operated on the large tubes—specify 170s for intermediates; 171s if you plan to build a dry cell tube affair. All the transformers are tuned to the same wavelength and it is an easy matter to make replacements in case any of the transformers are broken by handling or through other reasons.

The peak of these transformers has been designed that the variation in voice frequency will not cause distortion. Usually Super-Heterodyne transformers are tuned between 1,600 to 10,000 meters. On the latter wavelength iron core transformer alone can be used. This opens up the possibility of distortion. On 1,600 meters the amplification is hindered because of interstate oscillation and this would only be overcome through the "losser" system of potentiometer control.

Peaked at 3,400 Meters

Victoreen transformers have been established at 3,400 meters. This was considered as the best wavelength and is equivalent to 88,000 cycles and offers the least trouble in harmonics.

In the average Super-Heterodyne the potentiometer is used to prevent oscillation by decreasing the sensitivity of the tubes. In the Victoreen, although the potentiometer is used it does not act in this manner, and, on the other hand, is used purely as a control of the grid voltage on the radio frequency tubes. This use makes it appear to him who little understands radio as a volume control and it may be safely used as such.

I have operated a Victoreen on local and long distance stations with the detector B lead on 16 volts and even less. There was no lack of volume. This leads us to another thought. It must be most certainly granted that it ought cost more to own and operate Super-Heterodyne as compared with a five-tube set—and, in this statement which follows, although it may seem difficult to believe—it is the truth. There is less B battery consumption on the Victoreen than there is in the average five-tube and some four-tube sets. Yes! I'll even include some three-tube sets in this. The drain is from 8 to 10 milliamps. Well, there is real economy for you.

One does not bother about A battery drain these days for everyone owns and uses a battery charger or ought to.

Question of Tubes

If we've eliminated the "bugaboo" which has made Super-Heterodyne ownership costly what else is there to keep the radio fan from at last owning a real good super? Don't let eight tubes scare you. You have in your home this very minute tubes which you are not using because they don't seem to be very good on your present set.

toeren don't throw them away because this set will work on the tubes that are not good enough for a great many other sets. So, you see it's first cost only in case you have to buy tubes.

Regarding the Victoreen Master Control. This is very practical and is really better than two individual condensers. Of course your set will not work at 100% efficiency with the plates of both condensers at the same angle on all stations. So after you've hit into the frequency you want—there's a little knob you turn and the small angle of swing given the antenna tuning condenser is sufficient to establish the correct difference, thus making it possible to bring in the station at resonance.

Europe Next Stop

If you've built everything under the sun and are still looking for the ultimate in radio reception—quality, sensitivity, selectivity, distance and everyone of the other attributes that makes for the best possible reception, go to your favorite radio dealer and ask him for the "dope" on the Victoreen. If you do you'll go back to him again and thank him the day following your first visit.

There's no sense in printing my present log of stations picked up on the Victoreen. No, I haven't had Europe yet. But, mark my words, some one of these coming crisp, clear Sunday nights, just after nightfall, when WHN, New York, is off the air and CHYC, Toronto, hasn't come on yet, I'm going to listen to 2LO London, direct and I don't mean maybe! I did it last Winter several times on another super and as fine a balance as it was—it never did pick up Chicago without ground, aerial and loop.

[Constructional features will be discussed in next week's issue, dated December 18.]

BATTERY TIP



(Hayden)

ALWAYS USE a layer built battery, wherein the inner construction allows placing of the battery in any position, without fear of its deteriorating due to the compound shifting. Battery to which the pencil is pointing should be kept upright, however.

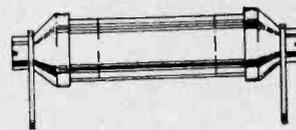
The 4-Tube Diamond

Due to the great demand from our readers for a full description of the Four Tube Diamond of the Air, it was found necessary to re-publish it in the issue dated Nov. 20, 1926. The circuit is described in its latest and improved form, accompanied by illustrations.

Send 15c or start subscription with Nov. 20 issue. A Blueprint has also been prepared for the set which can be had for \$1.00.

**Bretwood
Bullet Condenser**

for Your Detector Grid
Circuit



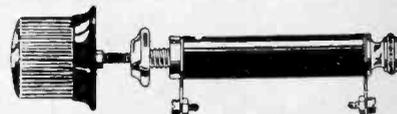
Capacity .00025 mfd. (actual size)

It Hits the Mark Every Time

Price 60 Cents

Just the Thing to Make Your
Detector Circuit Sensitive.

Let the Best Be None
Too Good for You!



Precision Range, 1/4 to 10 Megohms

Connect a BRETWOOD Variable Grid Leak in the detector circuit of your set and turn the knob until the signals clear up beautifully.

Use a BRETWOOD Variable Grid Leak across your last stage audio transformer, or put one in place of the fixed leak in the final grid of impedance or resistance coupled audio. Turn the knob and note the amazing improvement in quality.

In any circuit where a grid leak has to be used its value in ohms is important. Conditions differ in individual circuits and with different equipment. Experts cannot specify definite values that are applicable to all cases. The variable leak takes the guesswork out of the grid circuit, and the BRETWOOD is the best for the purpose. "It Does the Trick!"

NORTH AMERICAN BRETWOOD CO.,
143 West 45th Street, N. Y. City

Enclosed find \$1.50, for which send me one BRETWOOD Variable Grid Leak (or \$2.00 for leak with grid condenser attached) on five-day money-back guarantee. (Condenser alone, 60 cents.)

NAME

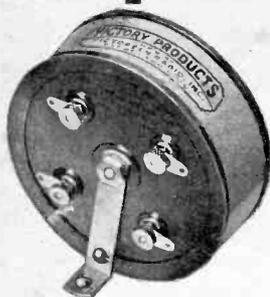
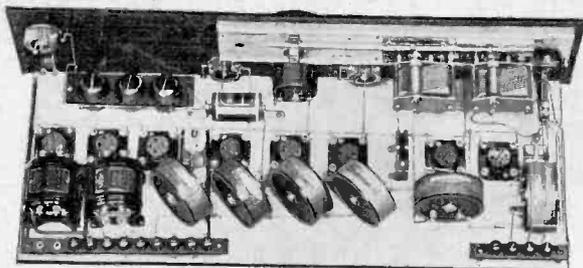
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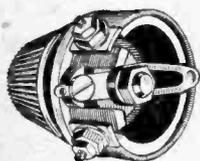
The Victoreen "Universal"

— breathes a vibrant living message into your home.



Victoreen R. F. Transformers
\$7.00

The Victoreen R. F. transformers have been called the heart of the circuit. This unit has a 2 inch diameter air core, permitting a minimum of wire to be used to obtain the proper inductance. The result is a very sharp curve or peak. The field is in close proximity to the coil, practically eliminating feed back and enabling the transformers to be placed in close relation to each other. Interstage oscillation is prevented and the amplification constants are uniform, due to a special adjustment which is made and then sealed at the factory. No other adjustments are required by the purchaser.



Victoreen Rheostats—Potentiometers
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The only rheostat with zero temperature coefficient no matter how warm the unit becomes the resistance remains absolutely constant.

Victoreen rheostats have double the number of turns of wire on ordinary rheostats—that means twice as fine adjustment.

This three terminal rheostat simplifies wiring. Made with 5 resistance, 2, 6, 10, 20, 30 ohms.

Victoreen Potentiometers
200 and 400 ohm resistances.

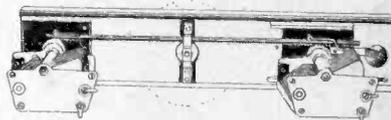
WINTER—drear, tedious and monotonous is at hand. But it has its compensations to the radio fan as it is the finest season for radio reception. And this season broadcasting studios have scheduled the finest artistic talent of the country as their contributions to the vast audience of radio fans.

Quality programs — diversified musicales, lectures, comedies, educational talks—click in your dials and take your choice. The air is full of selections waiting to respond to your receiver.

The Victoreen Universal Circuit makes all this possible. It has been designed with the one thought in mind to offer the best possible results in radio reception.

Now is the time—have your dealer give you a blue print—the layout is simple—it's easy to assemble—and the results will multiply themselves in terms of satisfaction.

Write us for your blue print

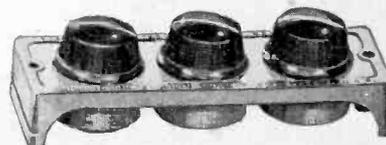


The Victoreen Master Control Unit \$19.50
Extra Condensers \$4.50

Featuring individual compensation with all the advantages of two dials but eliminating freak dial settings. Not a single dial control.

The Victoreen Master Control is furnished with two .0005 variable condensers attached.

The design of the unit has been so carefully planned that one or two additional condensers may be assembled to the unit by means of the holes provided in the metal unit panel, making it applicable for any multi tube set. In fact, the uses that this unit can be applied to are so broad, that any set requiring two, three or four condensers of .0005 capacity can be easily controlled by the means of one dial. By use of the compensator, attached to the condenser on the extreme end, adjustment is permitted up to 20 degrees, permitting a 360 degree motion of the compensator knob.



Victoreen Audio Control Unit
Type 3-R
\$4.50

This unit is designed to meet the popular demand for a minimum number of controls on the panel and when once regulated to furnish the proper voltage on the 2nd detector and audio tubes, requires but little further attention.

It is assembled and wired with three 30 ohm rheostats for use with 201A and 199 tubes—should you desire to use a bigger tube the rheostat on the right end should be replaced by a 6 ohm rheostat.

The George W. Walker Co.

Merchandisers of Victoreen Products
6528 Carnegie Ave., Cleveland, O.