

# RADIO WORLD

Title Reg. U.S. Pat. Off.

1925-1929

Vol. 7. No. 3. ILLUSTRATED. Every Week

### An Analysis of 1-Tube Distance-Getting Sets

By Lieut. Peter V. O'Rourke

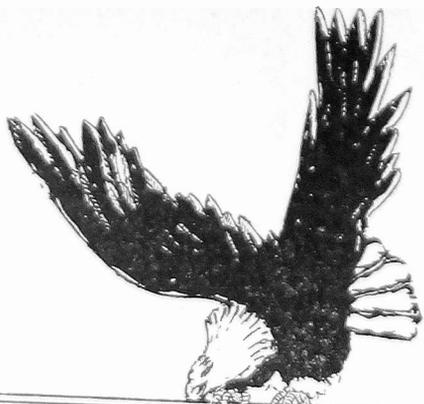
### A Quality and Volume Audio Hook-up

By Brewster Lee

### Coils for "The Diamond of the Air"



"MIKE" FRIGHT



Herman Bernard

## FOR BERNARD'S DIAMOND OF THE AIR

The 4-tube DX receiver described on page 7 of this issue. The receiver works on loop or aerial and brings in stations two thousand miles away, or more, on the loud speaker.

### The Best 4-Tube Set, Bar None

Tonal beauty, great volume and extreme DX assured! The editor of RADIO WORLD says so unqualifiedly!

## Complete Kit for the Diamond of the Air

# B.C.L. RADIO SERVICE CO.

220 FULTON STREET, NEW YORK

### LIST OF PARTS

LIST PRICE, \$56.80

As Certified Personally by  
Herman Bernard

OUR PRICE

\$ **41** .50

WITH LOOP, \$46.50

- One loop.
- One 3-circuit coupler (Bruno 77).
- One radio-frequency transformer (Bruno 55).
- Two .0005 variable condensers.
- One 6-ohm wire-wound rheostat.
- One Bradleystat.
- One .0025 mfd. fixed grid condenser.
- One .002 fixed condenser.
- One single-circuit jack.
- Two double-circuit jacks.
- Two audio-frequency transformers (Stromberg-Carlson).
- Three four-inch vernier dials.
- Three Dalco dial pointers.
- One Bruno socket strip, with 4 sockets.
- One terminal block.
- One 7x24" panel.
- One single-circuit jack.
- Two double-circuit jacks.
- Two audio-frequency transformers (Stromberg-Carlson).
- Three four-inch vernier dials.

**"Bruno"**

**"77"**  
Quartzite  
Tuning

Also wound on Quartzite glass, employing the newly designed Bruno tickler .... **\$7.00**

**"Bruno"**

**"55"**  
Quartzite  
R.F. Coil

Wound on Quartzite glass, making this the lowest of Low Loss Coils ..... **\$3.00**

**"Bruno"**

**Ultra-vario  
Condenser  
No. 18**

Capacity Range  
.000006 to .00054

Also can tune 2  
circuits at one  
time .....

**\$6.50**

No Vernier

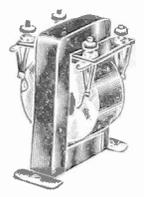
LOOK  
WHAT  
YOU SAVE!

## COMPLETE KIT FOR RADIO WORLD'S 1925 SUPERDYNE

**\$39.50**

## !! LOOK AT THIS WEEK'S SPECIALS !!

### Transformers



- Modern 4 to 1 Ratio \$3.10
- Modern 10 to 1 Ratio 3.95
- Modern Push Pull Set 7.95
- Raska R.F. .... 3.25
- Eria 3 to 1-6 to 1... 3.25
- Samson 3 to 1-6 to 1 3.25
- Samson Push Pull... 7.95
- Jefferson Star..... 2.10
- Jefferson No. 41..... 3.25
- Amertran ..... 4.50
- All American..... 3.25
- Federal ..... 4.50
- Thordarson 3 to 1... 2.95
- Thordarson 6 to 1... 3.10
- Thordarson 2 to 1... 3.50
- Thordarson Push Pull 9.50

### Sockets



- Na-ald 199 ..... \$0.45
- Na-ald Small Space... .35
- Na-ald DeLux..... .60
- Bell Square..... .60
- Caldwell ..... .45
- Waterbury ..... .35
- Tillman ..... .35
- Tillman Bakelite..... .45
- Federal ..... .85
- General Radio..... .40
- Pacent 199..... .40
- Glass Dury..... .95

### Manhattan "The Loud Speaker with Concert Modulator"



- Manhattan Jr..... \$6.75
- Manhattan Sr..... 12.50
- Amplion ..... 32.50
- Super Speaker..... 24.50
- Herald ..... 9.50
- LaBell ..... 7.50
- Sonora ..... 24.50
- Music Master..... 21.50

### Condensers



- "Bruno" 11P..... \$3.50
- "Bruno" 22P..... 6.50
- "Bruno" 44P No. 19 7.50
- General Inst. 11P... 3.25
- General Inst. 13P... 3.25
- General Inst. 17P... 3.50
- General Inst. 23P... 3.50
- General Inst. 43P... 3.50
- Manhattan 13V..... 3.50
- Manhattan 23V..... 3.95
- Hammarlund 23V... 4.25
- Hammarlund 43V... 4.50
- General Radio 23P... 2.95
- General Radio 23V... 4.25
- King Cardwell 11P... 3.10
- King Cardwell 17P... 3.25
- King Cardwell 23P... 3.50
- Preferred 11P..... 1.50
- Preferred 11V..... 2.00
- Preferred 23P..... 2.10
- Preferred 23V..... 2.45
- Murdock Inclose 23P 1.50
- Murdock Inclose 43P 1.60
- Midget Condenser... 1.25

### Loud Speaking Units and Phones



- Baldwin Type "C"..... \$3.95
- Baldwin Type "H"..... 5.50
- Baldwin Phone-Sp... 7.95
- Marrison ..... 3.10
- Manhattan ..... 3.50
- Western Electric... 7.50
- Diagraph ..... 7.95
- Amphion ..... 13.95
- N. & K..... 4.95
- Atlas ..... 7.50

### PHONES

- Baldwin Type "C"..... Pair \$7.50
- Brandes ..... 3.60
- Scientific ..... 2.95
- N. & K..... 4.95
- N. K..... 3.25
- Manhattan ..... 3.95
- Frost ..... 3.25
- Pacent ..... 3.25

### Miscellaneous

- Pacent Plug..... \$0.30
- Midget Low-Loss Con. 1.10
- Cutler Ham. Rh. 6 ohm .59
- Cutler Ham. Switch... .50
- Amperite ..... .95
- Clarostat ..... 1.95
- Univernier ..... .95
- Apex ..... 1.65
- Stirling Voltmeter
- 0 to 50..... 1.75
- Weston Plug..... .59
- Eby Post ..... .12
- Turn-It Leak..... .75
- Jones Double Jack... .60
- Jones Single Jack... .50
- Voltmeter 0 to 50... .75
- Glass Insulator..... .20
- A Battery Switch... .25

Write in for FREE  
3 and 4-Tube Hookups!

**"Bruno"**

Tuning Coil

"Bruno" No. "66"..... \$2.50

Bremer Tullyey..... 3.95

Ambassador ..... 4.85



### B.C.L. RADIO SERVICE CO.

Our Catalog  
of 1,000  
Bargains  
FREE!  
Ask for it.

# B-C-L RADIO SERVICE CO. 220 FULTON STREET NEW YORK

# RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Paper Published by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Phones: Lackawanna 6976 and 2063

Vol. VII. No. 3. Whole No. 159.

April 11, 1925

15c per copy, \$6.00 a year

## A Survey of 1-Tube DX Sets

By Lt. Peter V. O'Rourke

THE experimental newcomer's interest focuses usually on the 1-tube set. Formerly it was the crystal set, but this has passed, due to the extreme difficulty in getting satisfactory service from a simple crystal set. Stations have become too numerous for that. Interference, as all forms of audible conflict with the desired signals are called, proves too great. Besides, who among us has desire to feed our ears with programs from stations thousands of miles



LIEUT. O'ROURKE

away? Some of us old-timers at radio profess to have outgrown the adolescent desire for distance reception, colloquially called DX, but somewhere within us there must still remain that hankering, else we may lack the true radio soul.

Therefore the 1-tube set fills the bill, provided regeneration is used. Lacking regeneration, the 1-tube set will be in a class with the simple crystal receiver, a thing of much disappointment. The few years of intensive testing to which radio receivers have been subjected prove conclusively that regeneration must be used, else the objects the constructors seek to attain are futile hopes. Beyond that point it is needless to go. Regenerative 1-tube sets will radiate, but they will perform.

Just what will a 1-tube regenerative set do? Why, it will perform on a par with a Neutrodyne! Why? Because the presence of regeneration is equal to the two stages of tuned radio-frequency amplification ahead of the non-regenerative detector stage in the standard Neutrodyne. Of course, the Neutrodyne is a 3-tube set, really, since the audio stages should not be counted in determining what the radio receiver will do. The two extra tubes (making five in all) are for audio-frequency amplification, making the signals louder, so that a speaker may be operated. And the audio part of a set really isn't radio at all.

### Which Is the Best?

There is much interest in what is the best regenerative 1-tube hookup. The best will be the one that brings in the programs with finest signal quality, is most selective, gets the most distance and affords the most possible earphone volume. If one assumes that each set is built properly, so that no constructional shortcomings will handicap one circuit as against another, Fig. 1 can scarcely be excelled in the 2-control class. All regenerative sets that fully utilize the benefits of regeneration have at least two controls, even the so-called One Knob set, for there the rheostat controls regeneration. This method of control is not very stable. Fig.

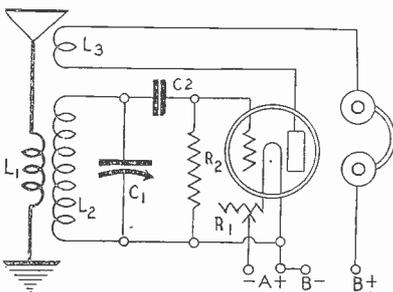


FIG. 1, the standard 3-circuit regenerative set, very selective and suitable for all locations. It works on either an indoor or outdoor aerial. C1 is .0005 mfd. C2, the grid condenser, is .00025, while the grid leak should be variable. Once the right leak setting is determined it need not be changed. Note that the rheostat is in the negative leg.

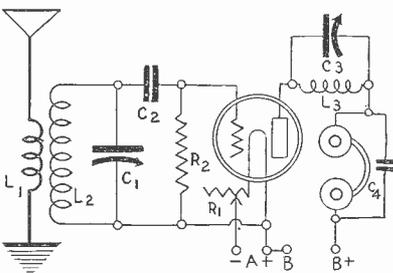


FIG. 2, regeneration obtained by the tuned plate method. Sometimes this does not work well with the 199 and 299 type of tubes. If a tube is growing feeble, even if it is of a type other than those mentioned, this method will not work, whereas the tickler method, shown in Fig. 1, is more generally dependable. In the diagram above a variable condenser tunes a fixed plate coil, which is not in inductive relationship to the other coils. The regeneration setting may be logged. As the tuning condenser setting (C1) always may be logged, this set becomes the 3-Circuit Tuner That You Can Log. How to use this circuit in a reflex arrangement, three tubes that work a speaker and get great DX, was described in RADIO WORLD, issue of March 14. The rotor plates of C2 go to the phone, the stator to the plate.

1 shows the regeneration when controlled by a rotary coil called the tickler (L3). This is the most satisfactory all-around method of controlling regeneration. If there are not too many turns on the tickler the dial controlling that coil may be moved for more than one-half of the calibrations for the various degrees of feedback required for the broadcast belt of wavelengths. The system is called feedback because the plate current, passing in and around the tickler coil, is fed back to the grid, which lowers the resistance in the circuit and makes for great selectivity. This achievement of selectivity makes the 1-tube regenerative set so popular.

As the tickler coil rotates within the secondary, L2, the current passes through the air to the field of the grid coil or secondary. Each coil sets up a flow of current known as the magnetic field, which is oval-shaped. This is true as much of

the aerial coil or primary, L1, as of either of the two other coils. The aerial coil's field is communicated to the field of the secondary, hence when the plate current is fed back to the grid coil it is also fed back to the aerial. This accounts in part for the radiation which takes place when too much regeneration is supplied.

There is a rather critical point, known as the saturation point, beyond which one cannot go without causing a squeal, and this squeal is modulated on a broad carrier wave produced by the receiver itself, so that in fact the receiver becomes a small transmitter, sending forth annoyance to neighbors. It is idle to assume that correct tuning prevents radiation, when one takes for granted that possessors of regenerative sets try to hear many distant stations. There is no way of constantly tuning in distant stations on such a set except by setting the tickler dial beyond the saturation point and attempting to pick up the whistle produced by the mixing of the receiver's own little false note with the carrier wave on which the station's program is riding the air. This mixing of two frequencies produces the whistle or heterodyned note. It is the same principle as used in the Super-Heterodyne, but in the Super-Heterodyne the objectionable features may be eliminated.

The feedback from plate to grid in the regenerative set is at radio frequencies; that is, takes place before the signal is detected or made audible in the earphones. Everything happens with such great rapidity—the radio action has the speed of light—that the difference in time is that of the tiniest fraction of a second. The voice or music impressed on the station's wave is carried right along in this feedback process, just as in the Super-Heterodyne, where, however, the incoming wave is first detected, then changed to a different frequency (higher wavelength) and then amplified at this higher wavelength (lower frequency) because of the greater success of amplifying long waves for multi-stages in modern receivers.

All this action in a regenerative set, mystifying to some, contributes no difficulty, however, into the actual construction. One needs know little or nothing about the action taking place and still may build a wonderful little receiver. But as one becomes more familiar with his set he desires some knowledge of the underlying scientific facts. Enjoying the effect, he yearns to know the causes. Then he studies up methods of transmitting and receiving programs, the theory of radio in all its entrancing glory, and becomes an honest-to-goodness radio enthusiast and semi-expert. Then he progresses, making larger, bigger, better sets, and finally begins the thrilling expedition, the goal of which is The Ultimate Receiver. In that hunt he will be aided materially by the radio knowledge he has gained meanwhile. Therefore, he may well begin the acquisition of that knowledge with the construction of a 1-tube regenerative set.

Some interesting questions arise in connection with the winding of the coils and

# The Theory of Regeneration

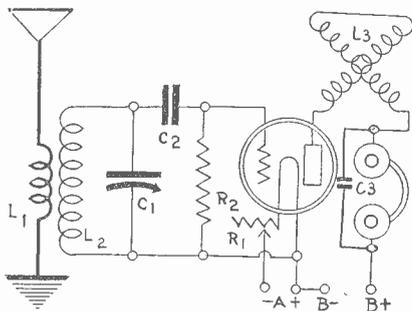


FIG. 3, the same effect as obtained from tuning a fixed coil by a variable condenser may be enjoyed by putting a variometer in the plate circuit. The same principle is involved, a form of capacitive coupling of plate to grid, through the internal capacity of the tube, that is, the condenser effect existing between the grid and plate elements. Tuning the plate accomplishes this internal transfer. C3 is .001 or .002 mfd.

the wiring of the set. For instance, how closely shall the primary  $L_1$  be coupled to the secondary  $L_2$ ? Normally, as close as possible. This, true enough, introduces greater resistance in the circuit, but the set often is rendered considerably more stable on that account. One may employ regeneration excessively without half trying, as, for instance, in passing the saturation point. The resistance may be lowered so much as to be below the safety point. This, of course, brings up the subject of low-loss, which has its foundation largely in the reduction of losses due to resistance in the circuit. As selectivity is nothing but the accomplishment of a relatively low resistance, it is futile to have the set resistance lower than necessary. Theoretically, the losses should be kept as low as possible. Actually, they should be kept no lower than that point at which they result in necessary selectivity and keep the circuit within control. A regenerative circuit in which the resistance is too low has a great tendency to squawk and howl when one tries to set the regeneration at the right point, but misses it the first or second time, as usually happens. These regenerative sets are not the easiest to tune, but the trick is readily learnt.

## Action of the Tickler

Therefore, in winding the coil it is well to keep the primary as close as possible to the secondary. Both these windings are on one form. The primary is aperiodic, that is, its own wavelength or natural period is below that of any station on the broadcast band of wavelengths. If it were not, the set would not tune in the lowest wavelength station. The signals picked up are those of a variety of stations at once, due to the coil being a part of the aerial system that responds to all broadcast waves. A constant babel theoretically exists in the primary. But the secondary, tuned by a variable condenser, establishes a path of least resistance for the desired station, and with the aid of the tickler, the otherwise interfering stations are rejected. The tickler usually is not rated as performing any tuning work, being simply described as a regeneration regulator, the fact being well known that the regeneration setting must be changed for different wavelengths. How these facts are reconciled is not so easy to imagine, for if feedback depends on wavelength, and tickler setting must be varied for different wavelengths, then surely there must be a relationship between wavelength and tickler setting and the tickler honestly may be rated as a wave-

length or tuning control. It is true that for stations not far apart in wavelengths the same setting of the tickler will do for both stations, but this is not true if the station is a distant one; in fact, is never true unless it is not only a local one but is a powerful or very near local at that. The correspondence of tickler to wavelength is not the same as the relationship between the variable condenser ( $C_1$ ) and the wavelength, but nevertheless exists. The condenser normally has even-edged round plates, the variation it produces being along capacity lines alone. With the movable plates entirely in mesh with the fixed ones the total capacity of the condenser is in use. There are other types of variable condensers, but the so-called "straight line capacity" condensers are those most often used. If 100 degrees represents the total capacity, as read from the dial, then 10 degrees equals one-tenth the total capacity, 25 degrees one-quarter, etc. This is approximate, however, and refers only to the capacity contributed by the condenser itself.

## Winding the Coil

Agreeing that the primary is to be closely coupled, we may wind 10 turns of No. 22 double silk covered wire for the primary, cut, and anchor the end of that winding, and immediately next to it begin winding the secondary, which consists of 41 turns of the same wire wound in the same direction. The tubing on which these are wound is  $3\frac{1}{2}$ " diameter, 4" high. The form on which the tickler is to be wound should be small enough to rotate smoothly inside the stator form. About  $2\frac{3}{4}$ " diameter, 2" high, will do nicely. Finer wire may be used, say No. 26 single silk covered, 30 turns being put on, 15 on one side of where the rotor shaft will enter the tickler form, and 15 on the other side. The fine wire is all right in the tickler coil, despite its higher resistance, because there are about 50,000 ohms resistance in the plate circuit, anyway, and even a theoretical 30 ohms (a generous allowance) added to that makes no difference in results.

## Two Questions

Two questions that arise in connection with the coil or its wiring in the set are (a) where shall the tickler be placed and (b) may not the primary be physically connected to the secondary? It is all right to put the tickler shaft atop the secondary, so that the shaft comes through just above the secondary, and part of the tickler rotation is on planes within the upper turns of the secondary. As for conductively coupling the primary to the secondary, this is a good plan, but in actual-practice little difference in results is found. An idea of what conductive coupling constitutes may be gathered from the fact that  $L_1L_2$  may be a single wind-

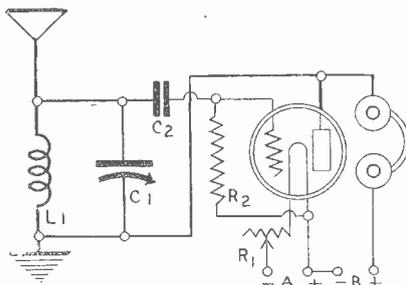


FIG. 4, the world's simplest 1-tube DX set. This circuit was described in RADIO WORLD, issue of December 13.

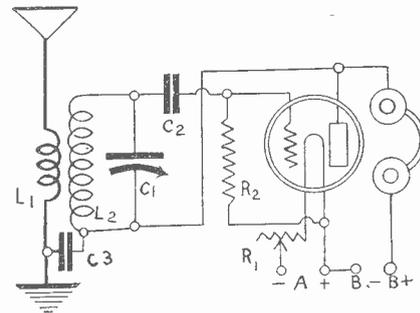


FIG. 5, the 1-Tube, 1-Dial DX Set, where, as in Fig. 4, the rheostat controls regeneration. This circuit was described in the December 6 issue. The fixed condenser C3 connecting primary and secondary is .001 or .002 mfd.

ing of 51 turns, tapped at the tenth turn. In that case connect aerial to the beginning of the coil; and connect ground, filament plus and the rotor plates of the variable condenser  $C_1$  to the tap, the remaining unconnected coil end going to one side of the grid condenser. The grid leak is connected from the G post of the tube (not the coil side of the grid condenser) to the A battery plus. A plus and filament plus are identical, due to the rheostat being in the negative lead.

## Rheostat In Negative Leg

It is better to connect the rheostat in the negative A battery leg in every instance, for that affords a bias on the grid of the tube equal to the voltage drop in the rheostat. In all amplifier circuits, radio or audio, the grid return is to negative (the end of the coil, whose beginning goes to grid, goes to A battery minus). Thus the grid bias is the difference between minus 6, the potential at the grid, which is the same as that of the minus post of the A battery because of connection thereto, and minus 5, the voltage at the filament minus post of the socket, a negative bias of 1 volt. This is the 1 volt "lost" in the rheostat, due to its resistance. In a detector circuit, with grid return to A plus, the grid is at a slightly positive bias. That usually works better in detector circuits. Storage battery operation is taken for granted, but the theory works out along the same lines when any other kind of tubes or battery are used.

In all the diagrams herewith the rheostat is shown in the negative leg.

## Use of the Tuned Plate

Another method of obtaining regeneration is by tuning the plate with a variable condenser in shunt with a fixed plate coil (Fig. 2) or by putting a variometer in the plate circuit (Fig. 3) to produce the same results. This method works well with all types of oscillating tubes, except the UV199 and C299 or similar tubes. That is due to the low internal capacity of the tube. As this method depends for its success on a transfer of energy by the condenser effect between the plate and grid elements of the tube, and as the capacity of these elements in the type of tubes mentioned is very small, and the energy may not pass, the regeneration may fail. The chances are about even, as to success. When the tuned plate method is used it is advisable to introduce a by-pass condenser, about .001 or .002 mfd. capacity, connecting one side of the condenser to one side of the phones and the other side of the condenser to the other side of the phones. The condenser may be placed

(Continued on page 28)

# Nearly Ideal Coils for Use With a .001 Condenser

"How to Wind Nearly Ideal Coils" was described by J. E. Anderson in the March 7 and 14 issues of RADIO WORLD. The following article is along the same lines, but is based on the use of a .001 mfd. variable condenser instead of a .0005. Why it may well be resurrected from its resting place is explained by Mr. Anderson herewith. The articles in the March 7 and 14 issues gave winding directions, formulas, etc., based on .0005 mfd. variable condensers.

In the March 14 issue Mr. Anderson wrote:

"For those interested in following the technique on which findings were based, I may say in respect to formulas for the calculation of the inductance of any given solenoid type coil, that the simplest and most convenient formula is, indeed, the one developed by Nagaoka. His formula, too, may be given in many forms, but the following is probably the most convenient:

$$L = .02507d^2NnK(nd/N), \dots \text{(No. 1)}$$

"L is the inductance in microhenries when d is the diameter of the tubing in inches, N is the total number of turns on the coil, n is the number of turns per inch, and K is a parameter called the shape factor which depends for its value on the ratio of the diameter to the length of the winding. The shape factor K is Nagaoka's contribution to this formula and it may be obtained from a Table VI."

The Table VI that he refers to is published herewith. Some of the deeper considerations which may seem intricate at first glance prove simple enough by recourse to the March 7 and 14 issues.]

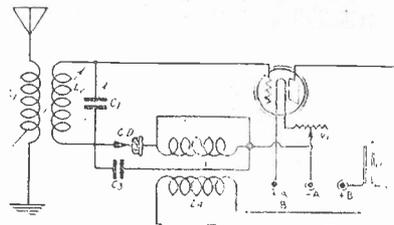
By J. E. Anderson

ONE advantage of using a large condenser like the .001 mfd. (43-plate) and a small tuning coil is that it is easier to cover the entire broadcast wave band with this combination than with a condenser half the capacity and with a coil of twice the inductance. This is because the distributed capacity of the tuning circuit is a smaller fraction of the total capacity when a large condenser is used than when a small one is used. This makes tuning in of the short wave stations easier and it obviates running the dial down to zero in order to get them.

### Selectivity Increased

Another possible advantage is that the use of a large capacity and a small inductance has a tendency to increase selectivity, because the coil, being smaller, has a lower resistance, and the condenser, having a larger capacity, has a lower phase difference. Settings near zero where the resistance of the condenser is large are not used. This of course is based on the supposition that the value of the coil has been adjusted properly with respect to the upper limit of the wave band.

The following are some of the circuits in which a .001 microfarad variable condenser may be used to advantage: wave traps, filters, and wave meters; oscillators, such as oscillating wave meters or circuit drivers, Super-Heterodyne oscillators, both standard and second harmonic; interstage couplers in which the primary is tuned, and across secondary windings when it is desired



WHAT VALUE inductance should L2 have if C1 is a .001 mfd. variable condenser. How many turns, what wire, what diameter, for most efficient results?

to cover the entire wave band without taps and without using the lower end of the condenser dial.

### Which Wire to Use

For certain purposes it is required that the coil be wound with heavy wire on a large diameter while for others about equally good results may be obtained if fine wire is used and wound on a small diameter. For wave traps, filters and couplers the wire should be heavy, while for oscillators it may be of finer gauge. Sometimes space limitations require that the coil be of medium size where it otherwise should be large. For these reasons, coils of all diameters from 1 1/2" to 4", in steps of 1/4", have been designed, and in each case the number of turns and turns per inch have been given.

The inductance of each of these coils is very nearly 82 microhenries. This value was chosen on the supposition that the distributed capacity of the circuit is 50 micro-microfarads, that the capacity of the condenser is 1,000 micro-microfarads (.001 mfd.), and that the upper limit of the tuning range is 550 meters. The shape ratio for each coil is 2.3, that is, the diameter is 2.3 times as great as the axial length of the winding. This coil is slightly longer than one having the ideal shape ratio of 2.46, but it is in accordance with the practice of the Bureau of Standards, the coil being made a little longer in order to reduce distributed capacity and high frequency resistance. The design data for these various coils are given in Table 1. herewith.

## Values to Use When You Calculate Inductance

TABLE VI

Value of K for Use in Formula I (March 7 issue) to Calculate Inductance

Diameter length or nd/N	K	Diameter length or nd/N	K	Diameter length or nd/N	K
1.00	.6884	2.00	.5255	4.00	.3654
1.05	.6777	2.10	.5137	4.10	.3602
1.10	.6673	2.20	.5025	4.20	.3551
1.15	.6573	2.30	.4918	4.30	.3502
1.20	.6475	2.40	.4816	4.40	.3455
1.25	.6381	2.50	.4719	4.50	.3409
1.30	.6290	2.60	.4626	4.60	.3364
1.35	.6201	2.70	.4537	4.70	.3321
1.40	.6115	2.80	.4452	4.80	.3279
1.45	.6031	2.90	.4370	4.90	.3238
1.50	.5950	3.00	.4292	5.00	.3198
1.55	.5871	3.10	.4217	5.20	.3122
1.60	.5795	3.20	.4145	5.40	.3050
1.65	.5721	3.30	.4075	5.60	.2981
1.70	.5649	3.40	.4008	5.80	.2916
1.75	.5579	3.50	.3944	6.00	.2854
1.80	.5511	3.60	.3882	6.20	.2795
1.85	.5444	3.70	.3822	6.40	.2739
1.90	.5379	3.80	.3764	6.60	.2685
1.95	.5316	3.90	.3708	6.80	.2633

This table is published principally for those who, being advanced in the radio science, may desire to make calculations on their own account. But J. E. Anderson did the calculation necessary to determine which coils were preferable and gives the winding directions.

TABLE I

1	2	3	4	5	6
Diam. inches	N	n	Nearest wire sizes		
1.50	43.8	67.2	2.5	.5	34DCC or 28SSC
1.75	40.6	53.4	2.9	.6	30DCC or 27DSC
2.00	38.0	43.7	3.1	.7	27DCC or 24SSC
2.25	35.8	36.6	3.3	.8	25DCC or 23DSC
2.50	34.0	31.2	3.5	1.0	23DCC or 21SSC
2.75	32.4	27.1	3.7	1.2	22DCC or 20DSC
3.00	31.0	23.8	3.8	1.4	20DCC or 19DSC
3.25	29.8	21.1	3.9	1.7	19DCC or 18DSC
3.50	28.7	18.9	4.0	2.0	18DCC or 17DSC

In Table I the Column 1 gives the diameter of the tubing on which the coil is wound, Column 2, the required number of turns to give an inductance of 82 microhenries, Column 3, the number of turns per inch required if the coil is to have a shape ratio of 2.3, Column 4, the number of microhenries contributed to the inductance by a single turn (the number of turns per inch remaining constant); Column 5, the change in the inductance of the coil caused by a change of one in the number of turns per inch, the number of turns on the coil remaining constant. The use of these Columns 4 and 5

(Continued on page 24)

# The Theory of Regeneration

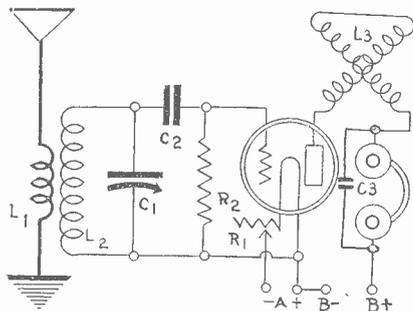


FIG. 3, the same effect as obtained from tuning a fixed coil by a variable condenser may be enjoyed by putting a variometer in the plate circuit. The same principle is involved, a form of capacitive coupling of plate to grid, through the internal capacity of the tube, that is, the condenser effect existing between the grid and plate elements. Tuning the plate accomplishes this internal transfer. C3 is .001 or .002 mfd.

the wiring of the set. For instance, how closely shall the primary L1 be coupled to the secondary L2? Normally, as close as possible. This, true enough, introduces greater resistance in the circuit, but the set often is rendered considerably more stable on that account. One may employ regeneration excessively without half trying, as, for instance, in passing the saturation point. The resistance may be lowered so much as to be below the safety point. This, of course, brings up the subject of low-loss, which has its foundation largely in the reduction of losses due to resistance in the circuit. As selectivity is nothing but the accomplishment of a relatively low resistance, it is futile to have the set resistance lower than necessary. Theoretically, the losses should be kept as low as possible. Actually, they should be kept no lower than that point at which they result in necessary selectivity and keep the circuit within control. A regenerative circuit in which the resistance is too low has a great tendency to squawk and howl when one tries to set the regeneration at the right point, but misses it the first or second time, as usually happens. These regenerative sets are not the easiest to tune, but the trick is readily learnt.

## Action of the Tickler

Therefore, in winding the coil it is well to keep the primary as close as possible to the secondary. Both these windings are on one form. The primary is aperiodic, that is, its own wavelength or natural period is below that of any station on the broadcast band of wavelengths. If it were not, the set would not tune in the lowest wavelength station. The signals picked up are those of a variety of stations at once, due to the coil being a part of the aerial system that responds to all broadcast waves. A constant babel theoretically exists in the primary. But the secondary, tuned by a variable condenser, establishes a path of least resistance for the desired station, and with the aid of the tickler, the otherwise interfering stations are rejected. The tickler usually is not rated as performing any tuning work, being simply described as a regeneration regulator, the fact being well known that the regeneration setting must be changed for different wavelengths. How these facts are reconciled is not so easy to imagine, for if feedback depends on wavelength, and tickler setting must be varied for different wavelengths, then surely there must be a relationship between wavelength and tickler setting and the tickler honestly may be rated as a wave-

length or tuning control. It is true that for stations not far apart in wavelengths the same setting of the tickler will do for both stations, but this is not true if the station is a distant one; in fact, is never true unless it is not only a local one but is a powerful or very near local at that. The correspondence of tickler to wavelength is not the same as the relationship between the variable condenser (C1) and the wavelength, but nevertheless exists. The condenser normally has even-edged round plates, the variation it produces being along capacity lines alone. With the movable plates entirely in mesh with the fixed ones the total capacity of the condenser is in use. There are other types of variable condensers, but the so-called "straight line capacity" condensers are those most often used. If 100 degrees represents the total capacity, as read from the dial, then 10 degrees equals one-tenth the total capacity, 25 degrees one-quarter, etc. This is approximate, however, and refers only to the capacity contributed by the condenser itself.

## Winding the Coil

Agreeing that the primary is to be closely coupled, we may wind 10 turns of No. 22 double silk covered wire for the primary, cut, anchor the end of that winding, and immediately next to it begin winding the secondary, which consists of 41 turns of the same wire wound in the same direction. The tubing on which these are wound is  $3\frac{1}{2}$ " diameter, 4" high. The form on which the tickler is to be wound should be small enough to rotate smoothly inside the stator form. About  $2\frac{3}{4}$ " diameter, 2" high, will do nicely. Finer wire may be used, say No. 26 single silk covered, 30 turns being put on, 15 on one side of where the rotor shaft will enter the tickler form, and 15 on the other side. The fine wire is all right in the tickler coil, despite its higher resistance, because there are about 50,000 ohms resistance in the plate circuit, anyway, and even a theoretical 30 ohms (a generous allowance) added to that makes no difference in results.

## Two Questions

Two questions that arise in connection with the coil or its wiring in the set are (a) where shall the tickler be placed and (b) may not the primary be physically connected to the secondary? It is all right to put the tickler shaft atop the secondary, so that the shaft comes through just above the secondary, and part of the tickler rotation is on planes within the upper turns of the secondary. As for conductively coupling the primary to the secondary, this is a good plan, but in actual-practice little difference in results is found. An idea of what conductive coupling constitutes may be gathered from the fact that L1L2 may be a single wind-

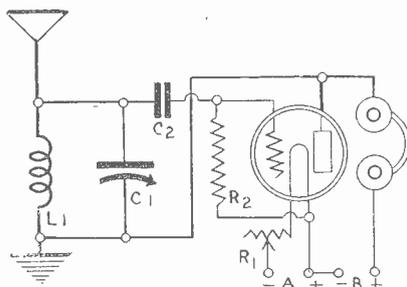


FIG. 4, the world's simplest 1-tube DX set. This circuit was described in RADIO WORLD, issue of December 13.

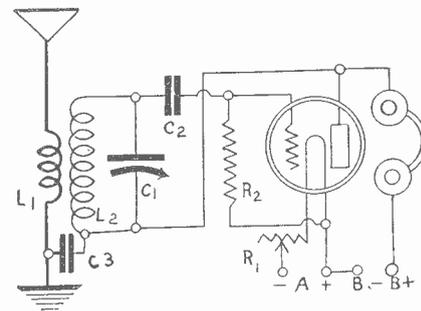


FIG. 5, the 1-Tube, 1-Dial DX Set, where, as in Fig. 4, the rheostat controls regeneration. This circuit was described in the December 6 issue. The fixed condenser C3 connecting primary and secondary is .001 or .002 mfd.

ing of 51 turns, tapped at the tenth turn. In that case connect aerial to the beginning of the coil, and connect ground, filament plus and the rotor plates of the variable condenser C1 to the tap, the remaining unconnected coil end going to one side of the grid condenser. The grid leak is connected from the G post of the tube (not the coil side of the grid condenser) to the A battery plus. A plus and filament plus are identical, due to the rheostat being in the negative lead.

## Rheostat In Negative Leg

It is better to connect the rheostat in the negative A battery leg in every instance, for that affords a bias on the grid of the tube equal to the voltage drop in the rheostat. In all amplifier circuits, radio or audio, the grid return is to negative (the end of the coil, whose beginning goes to grid, goes to A battery minus). Thus the grid bias is the difference between minus 6, the potential at the grid, which is the same as that of the minus post of the A battery because of connection thereto, and minus 5, the voltage at the filament minus post of the socket, a negative bias of 1 volt. This is the 1 volt "lost" in the rheostat, due to its resistance. In a detector circuit, with grid return to A plus, the grid is at a slightly positive bias. That usually works better in detector circuits. Storage battery operation is taken for granted, but the theory works out along the same lines when any other kind of tubes or battery are used.

In all the diagrams herewith the rheostat is shown in the negative leg.

## Use of the Tuned Plate

Another method of obtaining regeneration is by tuning the plate with a variable condenser in shunt with a fixed plate coil (Fig. 2) or by putting a variometer in the plate circuit (Fig. 3) to produce the same results. This method works well with all types of oscillating tubes, except the UV199 and C299 or similar tubes. That is due to the low internal capacity of the tube. As this method depends for its success on a transfer of energy by the condenser effect between the plate and grid elements of the tube, and as the capacity of these elements in the type of tubes mentioned is very small, and the energy may not pass, the regeneration may fail. The chances are about even, as to success. When the tuned plate method is used it is advisable to introduce a by-pass condenser, about .001 or .002 mfd. capacity, connecting one side of the condenser to one side of the phones and the other side of the condenser to the other side of the phones. The condenser may be placed

(Continued on page 28)

# Nearly Ideal Coils for Use With a .001 Condenser

"How to Wind Nearly Ideal Coils" was described by J. E. Anderson in the March 7 and 14 issues of RADIO WORLD. The following article is along the same lines, but is based on the use of a .001 mfd. variable condenser instead of a .0005, should one have a .001 around the house. Why it may well be resurrected from its resting place is explained by Mr. Anderson herewith. The articles in the March 7 and 14 issues gave winding directions, formulas, etc., based on .0005 mfd. variable condensers.

In the March 14 issue Mr. Anderson wrote:

"For those interested in following the technique on which findings were based, I may say in respect to formulas for the calculation of the inductance of any given solenoid type coil, that the simplest and most convenient formula is, indeed, the one developed by Nagaoka. His formula, too, may be given in many forms, but the following is probably the most convenient:

$$L = .02507d^2NnK(nd/N), \dots (No. 1)$$

"L is the inductance in microhenries when d is the diameter of the tubing in inches, N is the total number of turns on the coil, n is the number of turns per inch, and K is a parameter called the shape factor which depends for its value on the ratio of the diameter to the length of the winding. The shape factor K is Nagaoka's contribution to this formula and it may be obtained from a Table VI."

The Table VI that he refers to is published herewith. Some of the deeper considerations which may seem intricate at first glance prove simple enough by recourse to the March 7 and 14 issues.]

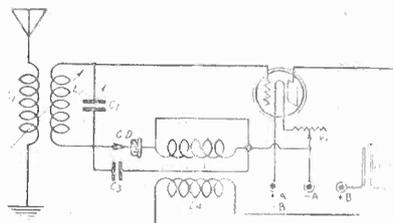
By J. E. Anderson

ONE advantage of using a large condenser like the .001 mfd. (43-plate) and a small tuning coil is that it is easier to cover the entire broadcast wave band with this combination than with a condenser half the capacity and with a coil of twice the inductance. This is because the distributed capacity of the tuning circuit is a smaller fraction of the total capacity when a large condenser is used than when a small one is used. This makes tuning in of the short wave stations easier and it obviates running the dial down to zero in order to get them.

### Selectivity Increased

Another possible advantage is that the use of a large capacity and a small inductance has a tendency to increase selectivity, because the coil, being smaller, has a lower resistance, and the condenser, having a larger capacity, has a lower phase difference. Settings near zero where the resistance of the condenser is large are not used. This of course is based on the supposition that the value of the coil has been adjusted properly with respect to the upper limit of the wave band.

The following are some of the circuits in which a .001 microfarad variable condenser may be used to advantage: wave traps, filters, and wave meters; oscillators, such as oscillating wave meters or circuit drivers, Super-Heterodyne oscillators, both standard and second harmonic; interstage couplers in which the primary is tuned, and across secondary windings when it is desired



WHAT VALUE inductance should L2 have if C1 is a .001 mfd. variable condenser. How many turns, what wire, what diameter, for most efficient results?

to cover the entire wave band without taps and without using the lower end of the condenser dial.

### Which Wire to Use

For certain purposes it is required that the coil be wound with heavy wire on a large diameter while for others about equally good results may be obtained if fine wire is used and wound on a small diameter. For wave traps, filters and couplers the wire should be heavy, while for oscillators it may be of finer gauge. Sometimes space limitations require that the coil be of medium size where it otherwise should be large. For these reasons, coils of all diameters from 1/2" to 4", in steps of 1/4", have been designed, and in each case the number of turns and turns per inch have been given.

The inductance of each of these coils is very nearly 82 microhenries. This value was chosen on the supposition that the distributed capacity of the circuit is 50 micro-microfarads, that the capacity of the condenser is 1,000 micro-microfarads (.001 mfd.), and that the upper limit of the tuning range is 550 meters. The shape ratio for each coil is 2.3, that is, the diameter is 2.3 times as great as the axial length of the winding. This coil is slightly longer than one having the ideal shape ratio of 2.46, but it is in accordance with the practice of the Bureau of Standards, the coil being made a little longer in order to reduce distributed capacity and high frequency resistance. The design data for these various coils are given in Table 1. herewith.

## Values to Use When You Calculate Inductance

TABLE VI

Value of K for Use in Formula I (March 7 issue) to Calculate Inductance

Diameter length or nd/N	K	Diameter length or nd/N	K	Diameter length or nd/N	K
1.00	.6884	2.00	.5255	4.00	.3654
1.05	.6777	2.10	.5137	4.10	.3602
1.10	.6673	2.20	.5025	4.20	.3551
1.15	.6573	2.30	.4918	4.30	.3502
1.20	.6475	2.40	.4816	4.40	.3455
1.25	.6381	2.50	.4719	4.50	.3409
1.30	.6290	2.60	.4626	4.60	.3364
1.35	.6201	2.70	.4537	4.70	.3321
1.40	.6115	2.80	.4452	4.80	.3279
1.45	.6031	2.90	.4370	4.90	.3238
1.50	.5950	3.00	.4292	5.00	.3198
1.55	.5871	3.10	.4217	5.20	.3122
1.60	.5795	3.20	.4145	5.40	.3050
1.65	.5721	3.30	.4075	5.60	.2981
1.70	.5649	3.40	.4008	5.80	.2916
1.75	.5579	3.50	.3944	6.00	.2854
1.80	.5511	3.60	.3882	6.20	.2795
1.85	.5444	3.70	.3822	6.40	.2739
1.90	.5379	3.80	.3764	6.60	.2685
1.95	.5316	3.90	.3708	6.80	.2633

This table is published principally for those who, being advanced in the radio science, may desire to make calculations on their own account. But J. E. Anderson did the calculation necessary to determine which coils were preferable and gives the winding directions.

TABLE I

1	2	3	4	5	6
Diam. inches	N	n	Nearest wire sizes		
1.50	43.8	67.2	2.5	.5	34DCC or 28SSC
1.75	40.6	53.4	2.9	.6	30DCC or 27DSC
2.00	38.0	43.7	3.1	.7	27DCC or 24SSC
2.25	35.8	36.6	3.3	.8	25DCC or 23DSC
2.50	34.0	31.2	3.5	1.0	23DCC or 21SSC
2.75	32.4	27.1	3.7	1.2	22DCC or 20DSC
3.00	31.0	23.8	3.8	1.4	20DCC or 19DSC
3.25	29.8	21.1	3.9	1.7	19DCC or 18DSC
3.50	28.7	18.9	4.0	2.0	18DCC or 17DSC

In Table I the Column 1 gives the diameter of the tubing on which the coil is wound, Column 2, the required number of turns to give an inductance of 82 microhenries, Column 3, the number of turns per inch required if the coil is to have a shape ratio of 2.3, Column 4, the number of microhenries contributed to the inductance by a single turn (the number of turns per inch remaining constant); Column 5, the change in the inductance of the coil caused by a change of one in the number of turns per inch, the number of turns on the coil remaining constant. The use of these Columns 4 and 5

(Continued on page 24)

# Audio Hookup for Fine Volume and Quality as Well

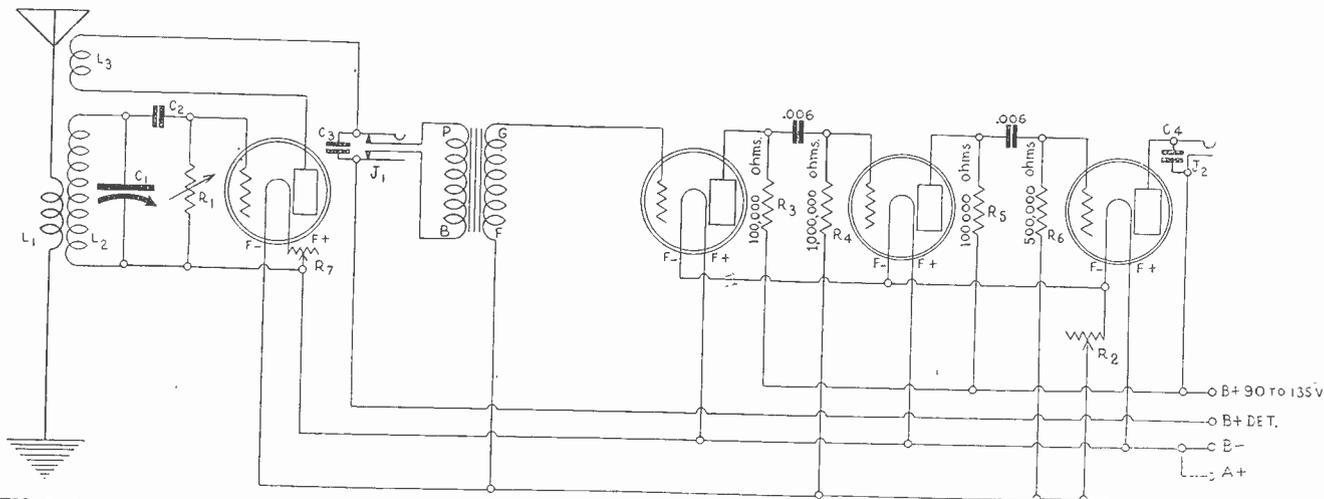


FIG. 1, circuit diagram of a 3-circuit tuner, tickler variety, with three stages of audio-frequency amplification. The first audio stage is transformer-coupled, the two others resistance-coupled, Daven resistors being used.

By Brewster Lee

ONE OF the favorite combinations of audio-frequency amplification with fans who are strong for volume and quality embodies one stage of transformer coupling and two stages of resistance coupling. The advantage of this type of audio-amplification is that there is an all-sufficient voltage step-up in the first stage, and when the signal is further amplified this is accomplished without sacrifice of quality.

The volume is all that any one could ask. Especially when a type of loudspeaker is used that reveals the slightest trace of distortion, this audio hookup will function without offending the speaker's sensibilities.

Used with the popular 3-circuit tuner

this combination of audio-amplification is eminently satisfactory. The resistances used in the audio stages are designated in ohms in Fig. 1, the wiring diagram. R4 and R6 are grid leaks, and you may have the 1 megohm leak R4 around the house, also the .5 megohm grid leak R6. R3 and R5 are .1 megohm.

### The Coils For the Set

The vario-coupler L1L2L3 may be a standard 3-circuit coupler, tuned by C1, a .0005 mfd. variable condenser, normally 23 plates. Use vernier for the condenser dial. A coupler may be constructed at home by winding L1L2 on a 3 1/2" diameter tubing 4" high, using No. 20 double silk covered wire. The primary L1 consists of ten turns. Right next to it, as close as possible, wind 43 turns for the secondary. The tickler, L3, may be spider-web, Lorenz or any other form of winding, consisting of 28 turns of No. 26 single silk covered wire on a 2 3/4" diameter form 2 1/2" high. Lorenz (basket weave) winding may be used throughout, with the same mean diameters preserved, with

larger wire used only for L1 and L2. No. 18 double cotton covered wire is good for this purpose. The tickler should have finer wire, as previously described. But when the larger wire is used for L1L2, add four more turns than those specified. I used a solenoid, the Arc Tri-Tuner.

### Other Parts in Set

The grid condenser C2 is of the fixed type, .00025 mfd. capacity. R1 is a variable grid leak, connected from the grid post of the detector tube socket to the filament plus post of that socket, which means, in this case, to A battery positive. C3 is a fixed condenser, .001 mfd., used as a by-pass. J1 is a double-circuit jack, J2 a single circuit jack. The wiring diagram may be used for employing this system of audio-amplification on any set, after the detector tube or crystal.

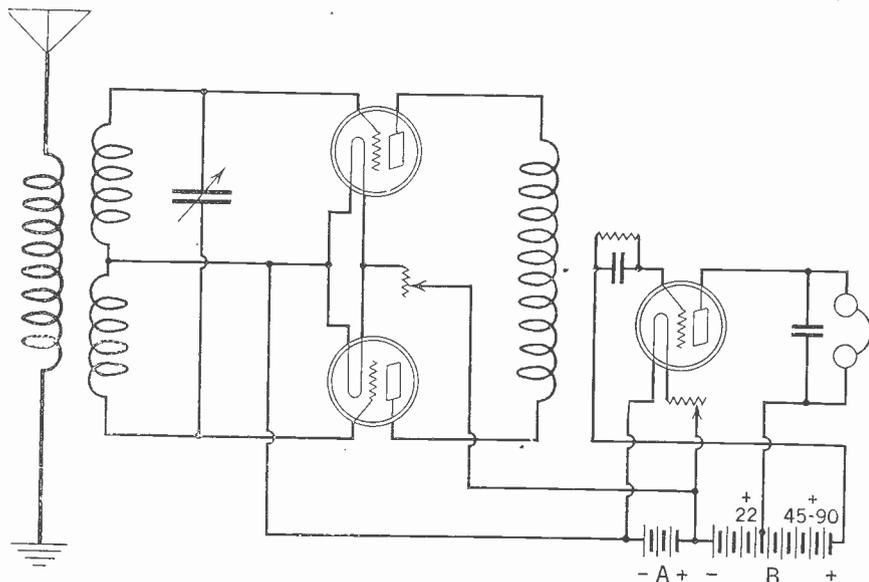
R7 is a 15-ohm rheostat for UV201A or C301A tubes, or 20 ohms for the Sodian tube. If the Sodian is used the grid return of this tube should be to the negative and the detector tube rheostat be placed in the negative lead, instead of the positive. This holds true also for the UV200 and C300 tubes. The audio tubes should be UV201A or C301A, although WD11 or WD12 tubes, as well as UV199 and C299, may be used throughout with somewhat less volume.

### Rheostats to Use

In the audio part of the circuit C4, .001 mfd. fixed condenser, is optional. The coupling condensers are .006 mfd., as designated. One rheostat, 6 ohms, designated R2, controls all three audio tubes. Thus when one desires to listen on ear-phones only the three audio tubes may be turned off by means of the rheostat R2.

## Many Ignore License Rule in Ontario

WASHINGTON. RADIO enthusiasm in all sections of Northern Ontario is at its highest and the demand for radio sets and accessories is increasing rapidly, say Consular advices to the Department of Commerce. Although a government license is necessary for every set in operation it is understood that many have failed to comply with the required formality and are still operating their sets without a license.



AS A TEST see what results you get with push-pull RF. The aerial coils are a coupler, mid-tapped. See at what point on the other coil proves the best connection to the grid condenser. No connection for this is shown in diagram.

# The Coils for "The Diamond"

By Herman Bernard

## PART II

ONLY a 3-circuit variocoupler is needed for "The Diamond of the Air," if the object is loop operation exclusively, but nearly everybody will want to provide a radio-frequency transformer so that an optional aerial and ground may be used for reception from great distances. The wiring diagrams published last week did not include the RFT, but Fig. 5, a special detail, showed how to include the RFT, a double-circuit jack being used. The loop terminals are connected to a jack plug, and when the plug is inserted the secondary of the RFT is disconnected, thus cutting the aerial-ground system out. This is because the plug lifts the two springs off the outside leaves of the jack, to which the two sides of the variable condenser C1 are joined, the loop making contact to the condenser instead of the secondary making this contact.

### Why the Option Is Attractive

The optional use of loop or outdoor antenna is very convenient. For instance, if the set is to be moved to some other room in the house where there is no aerial-ground connection, the loop solves the problem. Likewise, if one lives close to a powerful broadcasting station and cannot tune it out, the loop improves the possibility of achieving this desired result. Indeed, the selectivity of the set, when the loop is used, is on a par with that of the Super-Heterodyne. Moreover, for Summer use a loop is good, since it has a lower static-to-signal ratio than an outdoor open-end antenna.

### The Coils for the Set

It is hard indeed to excel the solenoid coil for efficiency. Single-layer winding was used in the original model. This form is familiar to all radioists, as it consists of turns wound next to each other on a cylindrical form. In this instance, the form consisted of two circular end-pieces supporting glass quartzite rods, for the inherent low-loss qualities this type possesses. The outside diameter of the stator form is 3 3/4" and the form may be about 4" high. These forms are obtainable commercially, being known as the Bruno. The radio-frequency transformer, not shown in the wiring diagrams, may be designated L for the primary and L0 for the secondary. The primary and secondary of the variocoupler L1L2L3 are wound just like the primary and secondary of the RFT. Each primary consists of about 12 turns while the secondary is composed of 45 turns. No. 24 silk over cotton wire was used. The tickler L3 is wound curkoid style, or may be spider-web, since the coil is to be made at home the curkoid fashion is difficult. However, the coils themselves, ready for use in this set, are commercially obtainable.

In lieu of the above, home-constructors may use their own pet style of coil, if it is different from what is outlined, although the results obtained were based on the inclusion of the specified coils. In any case the number of turns on the primary is not vital, but should be approximately one-quarter the number on the secondary. Those desiring to wind spider-web coils throughout may use a form with a 5" outside diameter, hub diameter about 1 1/2", and wind 47 turns of No. 22 single cotton covered wire for the secondaries, the primaries being wound simultaneously with the secondary for ten turns near the end of the secondary. Thus you would wind about 30 turns for the secondary before picking up the length of wire, about 12 feet, that will constitute the primary. Then when the length of primary wire is exhausted, due to the winding there-of side by side with the secondary as de-

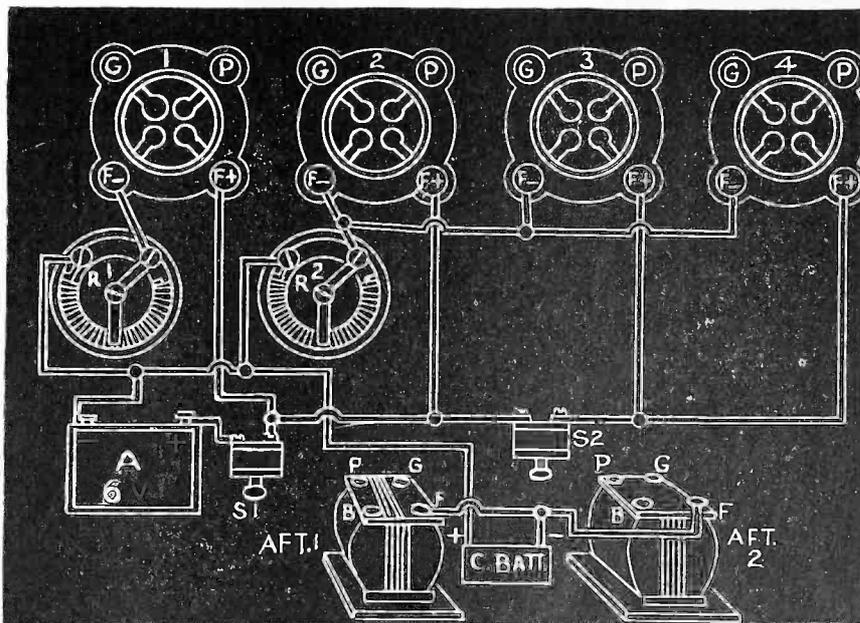


FIG. 6, showing how the filament connections are made in "The Diamond of the Air."

scribed, the secondary is completed alone. In that way the primary is secure. As for the tickler, that would have to be wound on a separate form, consisting of 32 turns of the same kind of wire, and a means provided for varying the inductive relationship of the tickler to the primary-secondary. A gearing device may be used, or a front-and-back motion provided. Usually in home-made variocouplers of this style the mechanical firmness of the product is much less than one would desire.

### Use of a 4" Diameter Tubing

If 4" diameter tubing or other cylindrical form of the same size is to be used it should be at least 2" high. The primary would consist of seven turns of No. 22 double cotton covered or silk-and-cotton covered wire, while the secondary would take 31 turns of the same wire. All coils used in this circuit are wound in the same direction. The tickler would be put on a 3" diameter tubing, 2 1/2" high, and would comprise 30 turns of No. 26 double silk covered wire. 15 turns being put on one side of where the rotor shaft pierces the movable form, and the other 15 on the opposite side. The 4" diameter is too large for maximum efficiency.

### Winding on a 3" Form

For 3" diameter tubings or equivalent, wind 41 turns of No. 24 double silk covered wire for the secondary and 10 turns for the primary, the tickler being 1 3/4" diameter and 2 3/4" high, the wire on the tickler consisting of 36 turns of No. 26 double silk covered, 18 on one side, 18 on the other.

The secondary is wound right next to the primary in every case. There is no 1/4" spacing.

### The Lorenz Type of Coil

Devotees of the basket-weave (Lorenz) style of coil may use No. 18 double cotton covered wire, because of the greater firmness resulting and the all-around suitability of this large wire for the Lorenz type. The primary consists of 15 turns, the secondary of 49 turns. The tickler may be basket-weave or spider-web. If of the Lorenz type, the tickler of course requires an extra winding form. The directions for the primary and secondary take into consideration a 3" diameter, divided into 15 equal

parts, which is easily done by measuring from a given point on the circumference a straight line 5/8" long and marking where this touches the circumference. Keep this up and you will find your circle divided into 15 equal parts. Insert dowel sticks in holes at these 15 points. About 2 1/4" diameter should be used for the tickler, and smaller wire employed, say 32 turns of No. 26 single silk covered. The tickler may be Lorenz or spider-web variety. A 2 1/4" outside diameter is used for the spider-web, with a 3/4" hub diameter, the form being wound full with No. 26 SSC wire.

In winding Lorenz coils, put the wire "under two, over two," that is, lace it through alternate rods.

### Same Setting for Both

One problem that may arise is the synchronization of inductance in the loop and in the secondary of the RFT. Otherwise the loop will have different dial settings for given stations, as compared with the settings of C1 when the aerial is cut in. This is nothing serious, but if the set is to be logged as to C1 and C2, which renders the reception of all stations within range quite certain, many would like to have these readings the same in either case. Therefore as to the RFT it would be preferable to add a few more turns than prescribed, so that turns may be removed from L0 in case the loop, when in use, occasions lower readings than does the RFT secondary. The inductance reduction method is preferable because once the RFT is finished it is hard indeed to add more turns, scrape insulation and soldering being required, while the removal of turns is a simple thing.

C1 and C2 are .0005 mfd. variable condensers, therefore be sure that the loop is one designed to be tuned with the same capacity instrument. The inductance of the loop should be about 163 microhenries. A loop with variable inductance (due to collapsibility) makes watching a simple matter, e. g., the Werner loop.

[This concludes Part II of the 3-part article on "How to Build The Diamond of the Air." Part I was published last week, issue of April 4. Part III will be published next week, issue of April 18. It will take up the assembly, wiring, and tuning.]

# Putting Finished Touch on Hayden Circuit

Parts I and II of this article on the construction of the 1-A Portable, 1925 Model, were published March 28 and April 4. The conclusion is printed herewith. The set consists of a detector tube and a stage of AF and produces "the most in volume and DX that a 2-tube set can deliver," says the author, Herbert E. Hayden. The present circuit is an improvement on the "DX Dandy," published October 4, but is along the same general lines. The present set should be built instead of the other.

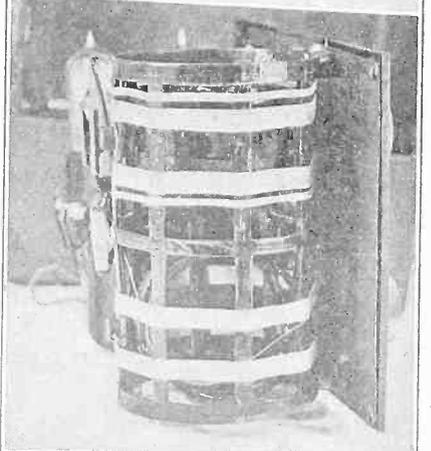
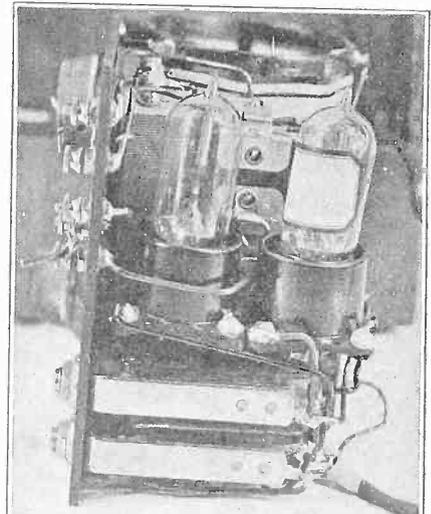
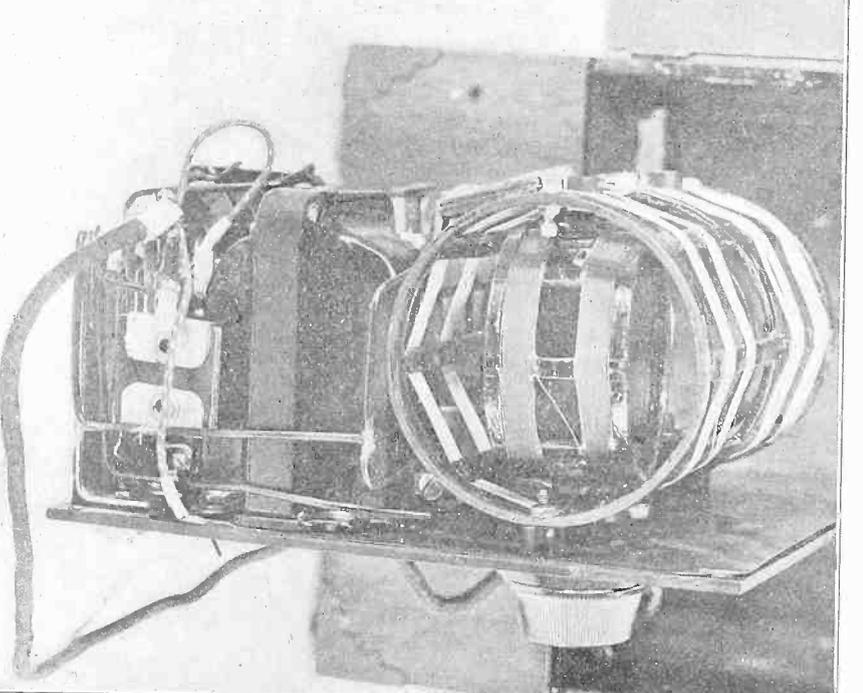
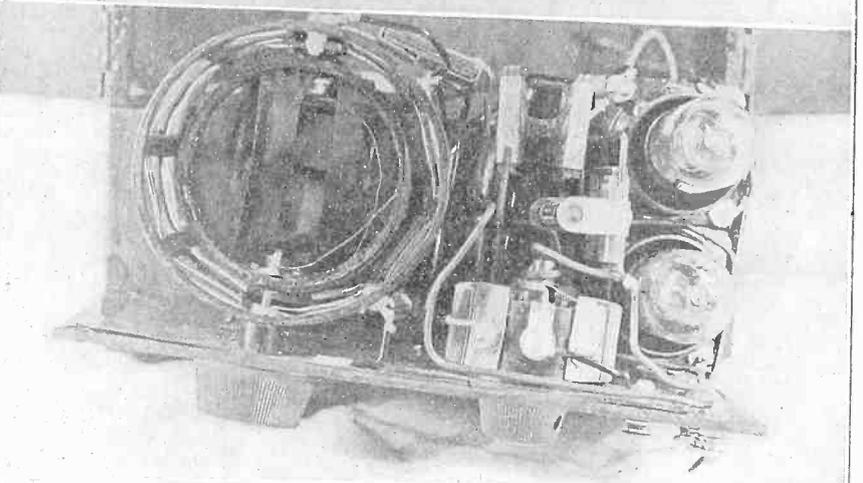
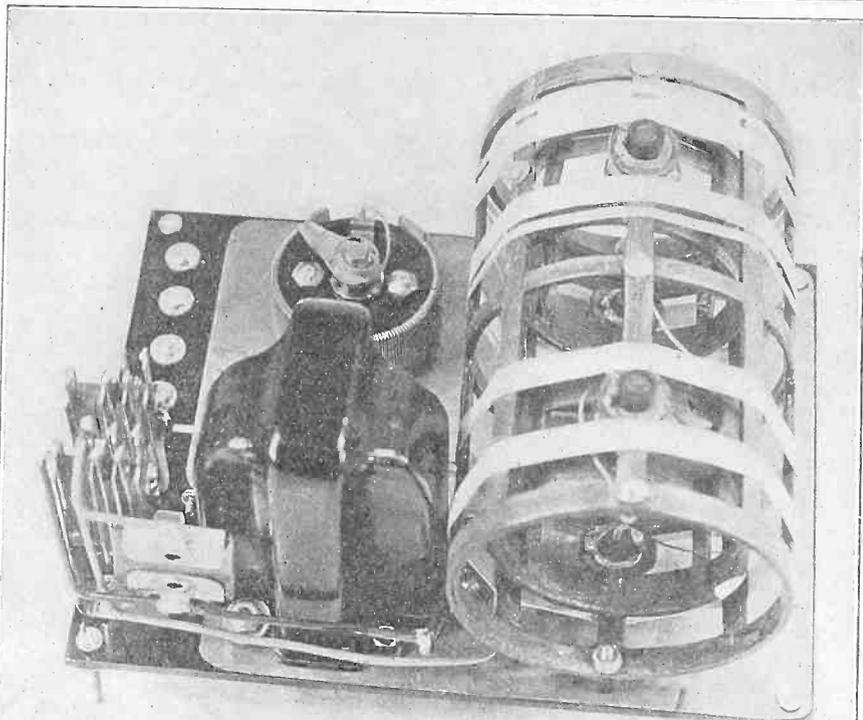


FIG. 25, top, right-side view; Fig. 26, left-side view. The windings are distinguishable here, too. Top to bottom, D, L, P, C, B and A.

FIG. 22 (top), preliminary assembly, with scant wiring; Fig. 23, top view, with tubes in place; Fig. 24 (bottom), the jack wiring, and cable.

**THE MODEL 1-A 1925 PORTABLE**, by Herbert E. Hayden, a 2-Tube DX Set of Wonderful Volume and Tone, fully described in RADIO WORLD, issues of March 28, April 4 and 11. Send 30 cents, get the March 28 and April 4 issues. This set is the successor to Hayden's famous DX Dandy. RADIO WORLD, 1493 Broadway, New York City.

# 1925 MODEL PORTABLE

By Herbert E. Hayden

Illustrations by the Author

## PART III

**T**HIS week we complete the 2-Tube 1-A Portable, 1925 Spring model, and the work is not a bit difficult. The cabinet has been made, the panel prepared, the forms for the coils put in readiness, so now we shall put on the windings and do the assembly and wiring. Then we shall tune in and hear stations several thousands of miles away.

Refer to Fig. 21 on page 11 of last week's issue, April 4. Also get out the previous issue, March 28, and look at the circuit diagram, Fig. 1. Note in the wiring diagram that there appear to be eight coils. For simplicity's sake, we shall regard each subdivision of a coil as a separate winding. If a coil is divided over a part of the form, half on one side of a given point, half on the other, we shall honor each by a separate identity, excepting when we consider the rotary coils.

### Which is Which?

Now, referring to Fig. 21, the windings from top to bottom are A, B, C, P, L and D, all these being on the stator form, shown at left. The form as shown in Fig. 21 is upside down, so to speak. See Fig. 26. The other windings, those on the rotary forms, designated E and F, are identical.

With a pencil mark the letters designating the stator windings. A and B are very plain and can't be missed. C, however, is a tiny winding, and be sure to distinguish it. D, the lowest winding on the stator, is likewise very small, so be careful to designate it.

The wire used throughout is No. 26 double silk covered. The number of turns follows:

A=18 turns, B=18 turns, tapped at the midpoint, the ninth turn; C=6 turns, P=18 turns, L=18 turns and D=6 turns.

E and F are 36 turns each, the winding being put on each small rotor form, half on one side of the shaft hole, half on the other.

### Comparison with Circuit

By comparing the finished coil with the wiring diagram it will be seen that the rotor E picks up the aerial energy. One terminal of this rotor is connected to the top of the stator winding A, and the end of A is connected to the beginning of B. The tap on B is joined to one side of the .0005 mfd. fixed condenser. The end of B connects to the beginning of C, while the end of C goes to the beginning of D and to the shield used in the set. The ground connection is soldered to the shield, too, you will notice. Thus the aerial-ground path is continuously traced through one winding, consisting of E, A, B, C and D, with part of the split plate coil, LPF, separating part of the aerial-ground windings. One terminal of L goes to the plate of the detector tube, the other L terminal to one P terminal, the other P terminal to one end of F and the other F terminal to the P post of the audio-frequency transformer. As filament-control jacks are used, this lead is continued to the frame of the jack No. 1. Fig. 1 details the filament control wiring in jacks Nos. 1 and 2.

### Assembly and Wiring

The photo published on the front cover of the March 28 issue shows clearly how the parts are assembled. The wiring consists simply of making the connections to the coils, etc., as shown in the diagram, Fig. 1, an easy matter.

One point that may cause trouble if the socket bases are not small is that the sockets may not fit into the space allowed. To remedy this saw off the interfering part (Fig. 29), making a round socket into a square-based one. Hexagonal nuts may be substituted for the round-top variety, in the interests of space conservation, and smaller-length screws used. The right-hand view in Fig. 29 shows this.

Another constructional tip is shown in Fig. 30. A pigtail is provided for the rheostat connection, the sliding contact being retained as auxiliary. With this precaution taken there will be no bearing contacts in the set.

In the actual wiring I used a spaghetti wire. This is very good and does not take up much room.

Fig. 27 shows how to mark the panel once a station is found. The same settings will bring in the same stations. A white pencil is used to mark the station letters on the panel, just outside the circumference on which the wavelength knob travels. Fig. 27 shows the wavelength dial being marked. This will be invariable as to settings for a given aerial connection, although changes in dial settings of the modulator (upper dial) may be expected. The dial settings will not be the same, however, when a different aerial is used. Take the aerial that will be your stand-by, such as a 50-foot length of Talking Tape (Fig. 28), and then you will have a permanent standard even in your travels, for the Talking Tape can be taken along and strung up between insulators anywhere. Personally, I found no advantage in

## Kinks Solved

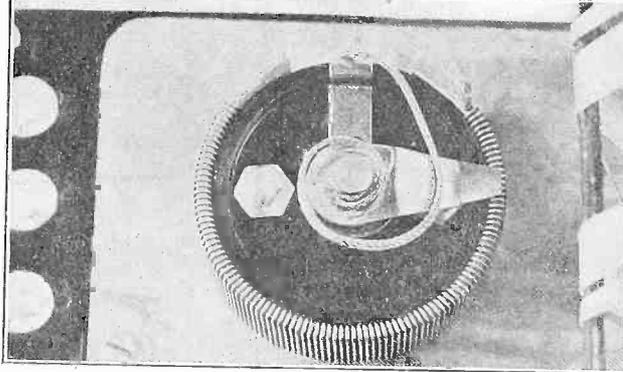
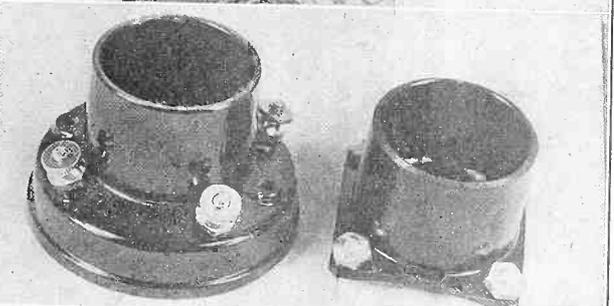
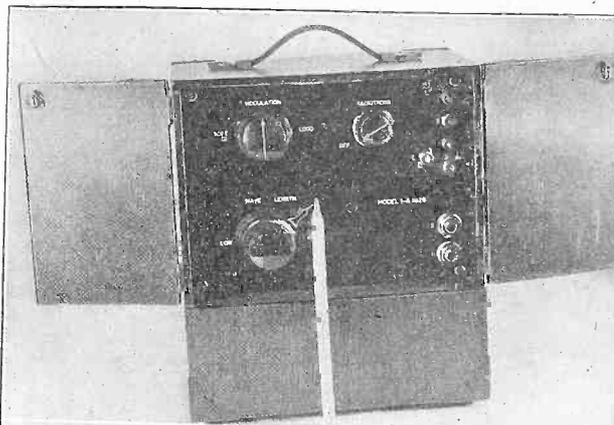


FIG. 27 (top) shows how the stations are logged on the wavelength dial. The call letters of the station are marked on the panel with a white pencil, such as Faber makes, at the very point where the stations prevail. This setting will hold good so long as the same aerial conditions prevail. One may use a standard, such as a 50-foot strip of Talking Tape (Fig. 28) and this will give the same dial settings if used indoors or outdoors. Fig. 29 discloses the manner of sawing the sockets to conserve space, and Fig. 30 depicts the pigtail on the rheostat. Figs. 27 and 28 give an idea where the small supporting wooden strip goes, so as to afford a purchase for the bottom of the panel and serve as a tiny shelving.

# Frenchman Claims 88 Patents; Forces Companies to Terms

**P**ROF. MARIUS C. A. LATOUR, French scientist, steeped in intellectual achievements during the four years that radio was making its noted advance in the United States, managed somehow to get wind of the commercial developments here, and immediately a transformation took place. He shook off his character as an academic person and, with commercial desires whetted, booked hasty passage to the United States. For several months he made careful note of the devices and inventions used in broadcast receivers and transmitters and their adjuncts. Carefully indeed did he check these as against certain important legal documents he possessed, which attested to his sole, exclusive and authentic ownership of about everything that looks patentable and that goes into a radio set, except the air dielectric between plates of a condenser, and the thread on the binding posts!

## Corporation Formed

The Latour Corporation was formed in true Delaware style and the transformed academician, now a business man indeed, got busy with American corporations. The basis of his negotiations were the almost countless patents he had taken out, based on inventions made during the war, when he concentrated his great skill on trying to win the war with a radio hookup.

He never imagined riches would come his way, that radio would develop into the commodity it now is. Indeed, true to the inbred patriotism of his race, he had been fancying all along that no country had gone any farther in radio commercialization than had his own dear France. The patriotic motto, "What France Doesn't Do Isn't Done" seemed somehow to have been contradicted, just this once.

## Hazeltine Buys Rights

The upshot of his quest for justice in terms of gold was a contract with the Hazeltine Corporation, signed after he had won a suit against that corporation. The Hazeltine Corporation bought not only Latour's 88 radio patents but the right to all patents he may develop in the field for the next five years. The notable 88 include about everything there is, if all claims are substantiated, including broadcasting, receiving and even wireless.

## Cash, Cold Cash!

Speaking as a business man, Prof. Latour said that he had insisted on being paid in cash for what he was selling, the royalty idea being repugnant to him after he had read and heard of other inventors' experiences in this line. He modestly admitted that he had been paid "several hundred thousand dollars," but did not

specify in what medium, or in the legal tender of what country (there being a difference, so the exchange tables disclose).

Nevertheless the situation is serious, except for the professor. Letters have been pouring into so many radio companies' offices that the professor's postage bill has been enormous. But from every 2-cent

(Concluded on page 26)

## List of Parts

### For the Cabinet

Wood cut  $\frac{1}{4}$ " thick to sizes as follows:

Two pieces, each  $9\frac{1}{8} \times 5$ " (sides).

Two pieces,  $7\frac{1}{2} \times 5$ " (top and bottom).

One piece  $8 \times 8\frac{1}{8}$ " (back wall of cabinet).

Two pieces, each  $4 \times 6$ " (doors).

One piece,  $7\frac{1}{2} \times 1\frac{1}{2}$ " (strip inside front doors).

One piece,  $31/16 \times 8$ " (board for bottom, front).

One  $7 \times 1\frac{1}{2}$ " piece of leather, for handle.

Two brass strips,  $\frac{5}{8} \times 1\frac{1}{4}$ ", to be bent to accommodate handle.

Two push-button catches for top of doors.

Two  $1 \times 1\frac{1}{2}$ " brass anchor strips, to provide purchase for the catches.

Four brass hinges.

Eight brass protective corner-pieces.

Two knobs for front doors.

Steel wool, No. 00.

Shellac.

Glue.

### For the Panel

One  $7\frac{1}{4} \times 5\frac{1}{2}$ " panel.

Five binding posts (four for aerial connections and one, with pigtail on it, that goes to shield, marked L on panel).

Six machine screws and nuts.

Two Saturn filament-control jacks, one single-circuit, the other double-circuit (Cat. Nos. 4 and 5).

One pointer knob (wavelength), Kurz-Kasch, No. 702.

One plain knob (modulator), Kurz-Kasch, No. 18.

One rheostat knob, Kurz-Kasch, No. 17.

### Internal Parts

One coil as described, home-constructed, or commercial ready-made type.

Two bakelite rods, bushings, etc., for coil.

Two sockets for WD11 tubes.

Two WD11 tubes.

One General-Radio audio-frequency transformer.

One 2-megohm grid leak.

Cable, 3-conductor.

Five fixed condensers, two .00025, one .0001, one .0005, and the fifth .005.

One shield, slightly less dimension than panel.

### Batteries

One  $1\frac{1}{2}$ -volt No. 6 dry cell.

Two Eveready B batteries, each  $22\frac{1}{2}$  volts, small size, No. 763.

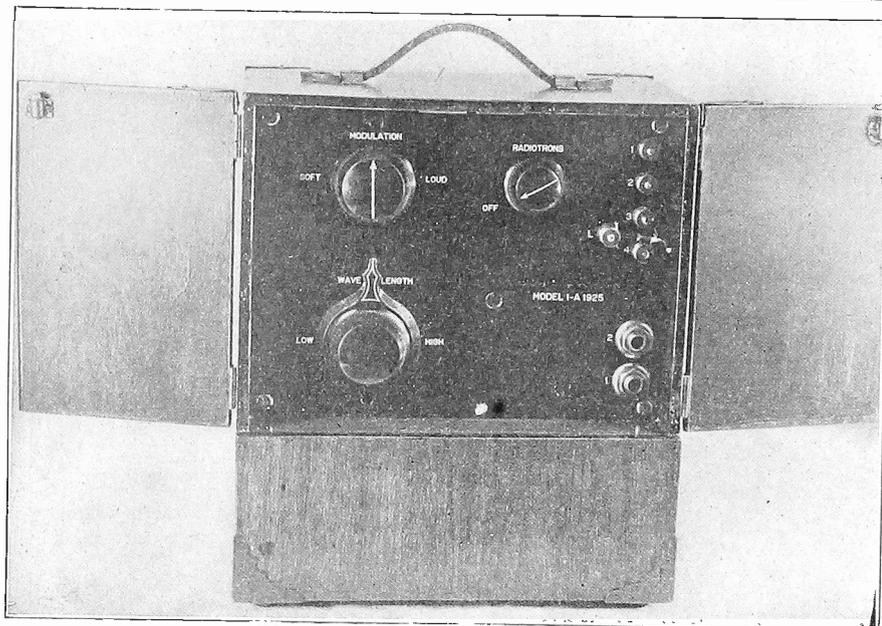


FIG. 31, the completed Model 1-A 1925 Portable.

(Concluded from preceding page)

attempting to mark settings of the modulator, as these must be changed, depending on how much volume you desire, what the internal condition of the tube is, etc. Hence I have provided facilities only for marking the wavelength settings and I am sure that you will find that sufficient.

What the completed set looks like from the outside, with doors open, is shown in Fig. 31. The aerial posts are plainly marked and the designations correspond to those in Fig. 1. Also the jacks are marked Nos. 1 and 2 on the panel, corresponding to that diagram in that particular, also. Note that the catches that hold the doors shut are plainly in view, showing where they should be attached. The

idea of the handle, too, is well conveyed in that illustration.

The modus operandi should be as follows:

First, gather all your material together. Second, make the cabinet and prepare the panel.

Third, place the parts in their proper places.

Fourth, wire the set, connecting filament leads first, then doing the other wiring as desired.

If any degree of nicety is desired on the panel lettering it is better to have the work done by a regular radio panel engraver, such as the Cortlandt Panel & Engraving Co., as I did.

# BROADCAST PROGRAMS

(Wavelengths in meters; Eastern, Central Mountain and Pacific Standard Time specified.)

## Friday, April 10

**WGN, Chicago, Ill., 370 (C. S. T.)**—9:31 A. M., time, 9:35, quotations, 10, quotations, 11, quotations, weather, market, 11:30, quotations, 11:56, time, 12 M., quotations, 12:10 P. M., quotations, 12:30, quotations, 12:40, Drake concert ensemble, Blackstone string quintet, 1, quotations, 1:25, quotations, 2:30, Lyon and Healy concert hall, 3, Rocking Chair Time, 5, quotations, 5:30, Skeezix Time for Children, 5:57, time, 6, organ, Edwin Stanley Seder, 6:30, Drake concert ensemble, Blackstone string quintet, 8, classic hour, 10, Drake hotel orch.

**WOAW, Omaha, Neb., 526 (C. S. T.)**—4 P. M., matinee program, 5:45, news, 6, story hour, 7:15, sports, Ivan L. Gaddis, 9, Good Friday program.

**WEAF, Fort Worth, Tex., 475.9 (C. S. T.)**—12:05 P. M., Ward, "Trail Blazers," 7:30, Venus String band, 9:30, Wagner's Hawaiian trio.

**WRBC, Valparaiso, Ind., 278 (C. S. T.)**—7:30 P. M., "The Crucified Redeemer."

**WCAE, Pittsburgh, Pa., 462 (E. S. T.)**—12:30 P. M., weather, news, 3, Holy week sermon, 4:30, Sunshine Girl, markets, 6:30, concert from William Penn Hotel, 7:30, Uncle Kaybee, 7:50, police reports, 8:30, concert from studios of Mme. Lelia Wilson-Smith.

**WWJ, Detroit, Mich., 352.7 (E. S. T.)**—8 A. M., exercises, 9:30, "Tonight's Dinner," Woman's Editor, 10:25, weather, 11:55, time, 12 M., Good Friday services, 3 P. M., Detroit News orch, 3:50, weather, 3:55, markets, 6, concert, 8, Detroit News orch, 9, Goldkette's Victor Recording orch.

**WHAS, Louisville, Ky., 399.8 (C. S. T.)**—4 P. M., concert from Louisville Conservatory of Music, police bulletins, weather, readings, 4:55, markets, 5, tie, 7:30, Children's Home Glee Club and orch.; George Colvin; Civil Service talk by O. A. Beckman.

**WDAF, Kansas City, Kans., 365.6 (C. S. T.)**—3:30 P. M., Star's radio trio, 5:50, marketgram, weather, time, road report, 6 (School of the Air): piano tuning-in; Tell-Me-a-Story Lady; Trianon ensemble, 8, popular program, 11:45, "Merry Old Chief" and Plantation Players.

**WEMC, Berrien Springs, Mich., 286 (E. S. T.)**—9 P. M., Radio Lighthouse quartet, 9:25, Miss Thelma Abel, soprano; Miss Nelva Mundt, contralto, 9:40, Bible Chat, Mr. Wm. Lake.

**WJJD, Moline, Ill., 278 (C. S. T.)**—3:30 P. M., Mooseheart's children's concert, Mr. M. P. Adams; Mooseheart concert band, 6:30, Albert F. Brown, organ, 7:15, music from Mooseheart studio; "Child Care," by Mr. M. P. Adams, 10:30, concert from the Garod studio; Charley Straight orch.

**WFEA, Dallas, Tex., 475.9 (C. S. T.)**—12:30 P. M., Dr. Robert Stewart Hyer, 4:30, woman's hour, Mrs. Bessie M. Tribble, in song, reading, instrumental music, 6:30, Paul Cretien, banjo quintet, 8:30, Treble and Bass Clef Clubs.

**WBZ, New England, 333.3 (E. S. T.)**—11:55 A. M., time; weather; markets, 7 P. M., markets, 7:05, bedtime story.

**WEAR, Cleveland, Ohio, 390 (E. S. T.)**—7 P. M., music.

**WGR, Buffalo, N. Y., 319 (E. S. T.)**—10:45 A. M., home service talk, Betty Crocker, 6:30 P. M., Buffalo trust hour, 2, Lenten service, Rev. Martin Walker, 8:30, Ontario M. S. Church, 9, "Cherry Blossoms," Zuleika Grotto Chlanders, 10, Larkin string orch.

**WCAL, Northfield, Minn., 336.9 (C. S. T.)**—8:30 P. M., "Poetry and Immortality," Dr. George W. Spohn.

**WPG, Atlantic City, N. J., 299.8 (E. S. T.)**—9 P. M., Hotel Traymore concert ensemble, 10, Madame Lillian Strading, contralto; Dr. Ralph G. Morris, tenor; Nathan Reinhart, pianist, 11, Hotel Traymore dance orch.

**WMC, Memphis, Tenn., 499.7 (E. S. T.)**—7:30 P. M., the stationfinder, 8:30, Britling's Cafeteria orch, 11, midnight frolic.

**WGY, Schenectady, N. Y., 379.5 (E. S. T.)**—11:55 A. M., time, 12 M., service from First Methodist Episcopal church, Rev. Philip L. Frick, D. D., 6, news, 6:30, Sunday school lesson, 7, Albany Strand theatre orch, 7:30, health talk, 7:40, WGY orch, 8:30, drama, "Our New Minister," WGY Players, 10:30, Chamber Music ensemble; "Dissertation on Chamber Music," Leo Kliven.

**WOC, Davenport, Iowa, 484 (C. S. T.)**—12:57 P. M., time, 1, radio farm school, 2, quotations, 3, "Home Management," "Aunt Jane"; 4, Rainbow orch, 5:45, chimes, 6, police reports; bulletins, 6:30, Sandman's visit, Val McLaughlin, 8, Moose Band.

**WCCO, Saint Paul, Minn., 416.4 (C. S. T.)**—10:45 A. M., home service talk, Betty Crocker, 2 P. M., woman's hour, Gardening Club, 2:15, woman's hour, Mrs. J. L. Sizer, 4, Readers' Club, 5:30, children's hour, 6:15, Minneapolis Athletic Club orch, 7:30, "Auto Camping," R. B. Anderson, 7:45, health talk, 8, debate, Minneapolis Central High School v. St. Cloud, 9, "The F. & R. Family," 10, "The Seven Last Words"; People's Church choir.

**WRC, Washington, D. C., 469 (E. S. T.)**—4 P. M., fashions, Eleanor Gunn, 4:10, piano, Eleanor Glynn, 4:20, "Beauty and Personality," Elsie Pierce, 4:30, New Willard Hotel trio, 6,

children's hour, Peggy Albion.

**WIP, Philadelphia, Pa., 509 (E. S. T.)**—7 A. M., exercises, 10, daily menu, talk to housewives, Mrs. Anna B. Scott, 7 P. M., Uncle Wip's bedtime story.

**WOS, Jefferson City, Mo., 440.9 (C. S. T.)**—8 P. M., "Springtime Suggestions on Dairying," E. G. Bennett; original poems, LeRoy H. Kelsey; sacred song service.

**WAHG, Long Island, N. Y., 316 (E. S. T.)**—12 M., Brooklyn Fed. of Churches program, 8 P. M., Davison Sisters, songs; 8:15, Sophie Kraman, violinist, 8:30, Jack Shatter, tenor, 8:45, M. Lamberti, cellist, 9:15, Dorothy & Jean Davison, songs, 9:30, Sophie Kraman, violinist, 9:40, Nerold Tollessen, baritone, 9:55, time, weather, 10:05, Jack Shatter, tenor, 10:15, Eida Treulich, pianist, 10:30, Nerold Tollessen, baritone.

**WEAF, New York, N. Y., 492 (E. S. T.)**—6:45 A. M., exercises, 11, music, Leonard Barron; "Talk to Women," Mrs. Arthur Griswold; markets; weather; Lenten services from Palace Theatre, 4 P. M., WEAF ensemble "Olivet to Calvary"; talk to children, 6, Merry Music Makers; "Sir Hoooblin," Blanche Elizabeth Wade; Mischa Godman, violinist; Sterling Piano Duo; Chalmers String ensemble, "Parsifal"; Dubois' oratorio, "The Seven Last Words"; Edna Beatrice Bloom, soprano; Gordon Thomas, tenor; Paul Parkes, baritone; Carl Tollefson, violin; Mrs. Charles Gay, pianist; Henry Repp, organist; St. Mark's Choral Soc.

**WOO, Philadelphia, Pa., 508.2 (E. S. T.)**—11 A. M., organ, 11:30, weather, 11:55, time, 12 M., Golden's Crystal Tea Room orch, 4:40 P. M., police reports, 4:45, organ, trumpets, 7:30, Hotel Adelphia orch, 8, J. W. C. I. Band, 8:30, broadcasting from Houston Hall, U. of P., 9, WOO orch.; Mae Mackie, soprano; Harriette G. Ridley, accompanist, 9:55, time, 10:02, weather, 10:03, Georgian music, choir of St. Peter's.

**WLIT, Philadelphia, Pa., 395 (E. S. T.)**—12:05 P. M., Lenten service of Philadelphia Fed. of Churches.

**WGBS, New York, N. Y., 316 (E. S. T.)**—10 A. M., Timely talks, Terese, 10:10, Estelle Abramson, soprano, 10:20, Patricia Lee, "Modern Marriage," 10:30, Estelle Abramson, 10:40, Lillian Regan, fashions, 10:50, Estelle Abramson, 1:30 P. M., scripture reading, 1:35, Jack Wheaton's orch, 3, "The Radio Solymusts," 3:10, Rosalie Leavitt, "Landscape Architecture," 3:30, Rosalie Blanchard, 3:40, Dr. Alfred G. Robyn, Harmony and Composition Lessons, 3:50, Rosalie Blanchard, 6, Uncle Geebee, 6:30, Herman Bernard, "What's Your Radio Problem?" 6:40, Howard's Musical Aces.

**WJZ, New York, N. Y., 455 (E. S. T.)**—12 M., services from Trinity church, 4 P. M., Eva Tugby, soprano; Edward Bouchard, tenor, 4:30, Hotel Ambassador trio, 5:30, quotations, 7, Hotel Commodore orch, 8, Wall Street review, 8:10, Emma J. DuBois, trumpet, 9:45, Symphonic String quartet.

**WJY, New York, N. Y., 405 (E. S. T.)**—7:30 P. M., organ, 8:30, "Our New Minister," WGY Players.

**WQJ, Chicago, Ill., 448 (C. S. T.)**—11 A. M., home economics, Helen Harrington Downing; Mann's menu, 3 P. M., Josephine Naylor, "An April Shower"; Mr. Wynn Ferguson, "Bride Lessons"; Mrs. Harry T. Sanger, Glacier National Park, 7, Rainbo Garden club; Everett G. Mitchell, baritone; Otis Pike, fester, soprano; Mary Thrash House, pianist; Henrietta Nolan, violinist, 10, Rainbo Skylarks; West Brothers, Hawaiian steel guitar; Zeigler Sisters; Lauretta Giles, soprano; Nate Caldwell, pianologue; Larry Brundage and Harry Kraemer, harmony singers, 1 A. M., Ralph Williams, Gingham and Little Skylarks.

**WLW, Cincinnati, Ohio, 422.3 (C. S. T.)**—10:45 A. M., weather, business reports, 11:55, time, 12:15 P. M., Ahaus Brunswick orch, 1:30 quotations.

**WOR, Newark, N. J., 405 (E. S. T.)**—6:45 A. M., gym class, 2:30 P. M., Eleanor Van Der Kar, soprano, 2:45, Wallace Hermann, tenor, 3, Janet Beecher, actress, 3:15, Wallace Hermann, tenor, 3:30, Eleanor Van Der Kar, soprano, 3:45, Mae Jacobus Flemming, "Chat on Books," 6:15, Hotel Lorraine orch, 6:30, "Man in Moon" stories, Josephine Lawrence and William F. B. McNeary, 7, Hotel Lorraine orch.

**WMAC, New York, N. Y., 340.7 (E. S. T.)**—9 P. M., Vera Resnikoff, pianist, 9:15, Diomed P. Avlantis, violin, 9:30, Mme. Augustine Jacquillard, soprano, 9:45, Montie Purdy, cellist.

**WNYC, New York, N. Y., 233 (E. S. T.)**—7:30 P. M., police alarms, 8, cantata, "The Darkest Hour," from Calvary Episcopal Church, 9:10, William Kroll, violin; Dr. Nicholas J. Elsenheimer, piano, and chorus of Church of Most Holy Redeemer, 10:30, police alarms, weather, 10:35, "The Crucifixion," Prof. J. G. Carter Tropp.

**WHN, New York, N. Y., 360 (E. S. T.)**—6:30 P. M., Olcott Vail, violinist, 7, Hotel Alamac orch, 7:30, health talk, Dr. Landis, 7:35, Club Moritz orch, 8, James Taylor, tenor, 8:10, Judith Roth, songs, 8:30, Ray Klages and Stephen Levitz, songs, 8:45, Burt Dixon and Co., 9, "The Lure of Maine," 9:10, Rubey Cowan, tenor, 9:20, Margaret Leary, soprano, 9:30, Crystal Palace orch, 10, Charles Tobias, songwriter, 10:25, "Storage Batteries," H. B. Shontz, 10:30, Roseland dance orch, 11:30, Alabam Club orch, 12, Parody Club revue and orch.

**WAAM, Newark, N. J., 263 (E. S. T.)**—11 A. M., Happy Hour, Rev. Haines and Scott, 11:15, Miss Ada H. Swann, cooking school, 11:30, Happy Hour, 7 P. M., sports, Major Tate, 7:15, Jolly Bill Steinkes's Bowery Night, 8, Harold Spencer, tenor, 8:45, Alice Rinck, violin; Lillian Spitzer, piano, 8:40, Dick Finch, Ben Friedman, 9, Vivi trio, 9:30, Original Egyptian Six orch, 10, Victor

Wilbur, tenor, 10:15, Hilda White Kiernan, a radio trick, 10:30, Original Egyptian Six orch.

**KPO, San Francisco, Cal., 423 (P. S. T.)**—7 A. M., "Daily Dozen," 10, Home Making, by Prudence Penno, 10:30, "Ye Towne Cryer," 10:40, local theatres, 11:50, markets, 12 M., time, Scriptures, 12:45 P. M., Commonwealth Club luncheon, 1, Fairmont Hotel orch, 4:30, Fairmont Hotel orch, 8, Oratorio, "Seven Last Words of Christ."

**KFAE, Pullman, Wash., 348.6 (P. S. T.)**—7:30 P. M., baritone, Prof. Heber Nasmyth; piano, Mrs. Louise Nasmyth; Scotch songs and readings, Janet Rae; piano, Nathalia Balakshin; College Y. W. C. A., Marcia Seeber; book chat, Alice Lindsey Webb; bees during fruit bloom, B. A. Slocum; lecture inoculation, Dr. S. C. Vandecaveye; purebred dogs, Prof. R. P. Smith.

**KNX, Los Angeles, Cal., 337 (P. S. T.)**—11:30 A. M., Estelle Lawton Lindsay's talk to women, 6:15 P. M., Beverly Ridge Co. program, 7:30, Eastern Outfitting Co. program, 8, west coast theatres, 9, Davis program, 10, feature program, 11, Cocoanut Grove orch, 12, Night Hawks.

**KGW, Portland, Ore., 491.5 (P. S. T.)**—11:30 A. M., weather, 12:30 P. M., Rose City trio, 5, children's program, 6, concert, 7:15, market, weather, news; police reports, 8, lecture, University of Oregon Extension division, 10:30, Hoot Owls.

**KGO, Oakland, Cal., 361 (P. S. T.)**—11:10 A. M., Home Making, Prudence Penny, 11:30, concert, 1:30 P. M., stocks, 1:40, stocks, 1:45, weather, 3, music, 4, orch, Hotel St. Francis, 5:30, Girl's Half Hour, Esther Wood Schneider, 6:45, stocks, 6:55, stocks, 7, weather, 7:05, produce news, 7:15, news.

**KFDM, Beaumont, Tex., 315.6 (C. S. T.)**—9 P. M., Refinery band.

**KOA, Denver, Colo., 323 (M. T.)**—12:30 P. M., organ, 1, quotations, weather, 3, matinee, 6, stocks, news, 6:40, Book of Knowledge program, 8, Rigby theatre orch, 8:10, Olinger Highlander Boys' band.

**KOB, State College, N. M., 348.6 (M. T.)**—7:30 P. M., Popular Science Course, Dr. D. S. Robbins; "From Stone Axe to Band Saw," by D. M. Lang.

**KTHS, Hot Springs, Ark., 374.8 (C. S. T.)**—8:30 P. M., Fischer orch.; Tubby Veil, Doug Johnston, cornet; Burton Fischer, piano, 9, New Arlington Hotel orch, 10 to 11, Jack O' Lantern Tea Room.

**KFOA, Seattle, Wash., 455 (P. S. T.)**—12:30 P. M., Seattle Chamber of Commerce, 4, Hoffman's Olympic Hotel orch, 6:45, Sherman, Clay & Co. program, 8:15, weather, 8:30, Times program, 10, Harkness orch.

**KHJ, Los Angeles, Cal., 405.2 (P. S. T.)**—12:30 P. M., Palace ballroom orch, 2:30, matinee musicale, 6, Art Hickman's orch, 6:30, Prof. Walter Sylvester Hertzog, story of American History; Richard Headrick, screen juvenile; Vyola Von, screen juvenile; Mary Gertrude Gallagher, child reader; Piggy Wiggy Hawaiian trio, 7:30, Gladys De Witt, "Romance of the Santa Fe Trail," 8, John Wright, the Right Tailor.

**KSAC, Manhattan, Kans., 341 (C. S. T.)**—9 A. M., exercises of rural schools, 12:35 P. M., reading, weather; "The Sheep Flock," C. G. Elling; question box; "Hints from Club Boys," A. J. Scoth, 7:20, Radio College quartet; "White Diarrhea," W. R. Hinshaw; "Radio College quartet; "Control of Rodents," G. E. Johnson.

**KYW, Chicago, Ill., 536 (C. S. T.)**—6:30 A. M., exercises, 9:30, markets, 11:35, table talk, Mrs. Anna J. Peterson, 6 P. M., markets, 6:35, bedtime story, "Uncle Harry," 7, Joska DeBabary's orch, 7:10, Coon-sanders Original Nighthawks, 7:20, Joska DeBabary's orch, 9, midnight revue, 1, Coon-Sanders Original Nighthawks.

**KSD, St. Louis, Mo., 545.1 (C. S. T.)**—12 M., "Tre Ore" service from Church of St. Francis Xavier, 7:45 P. M., "Seven Last Words of Jesus," from Christ Church Cathedral; Arthur Davis, organist.

**KFRC, San Francisco, Cal., 268 (P. S. T.)**—6:30 P. M., Bem's Little Symphony; News, 8, police broadcast, 8:03, Bem's Little Symphony, 9, George Olmo, tenor; Robert Baxter Todd, tenor; Thomas Jussuf Dermott, violinist; Henriette Bruse, soprano; "Stage and Screen," Lionel Houser, 10, Paul Kelli's orch.; Paul Nelson, pianist.

**KDKA, Pittsburgh, Pa., 309 (E. S. T.)**—7 A. M., exercises, 8, exercises, 9:45, markets, 11:55, time, 12 M., weather; markets, 12:20 P. M., Kammerer, Ph.D., 3:30, quotations, 6:15, Charlie Gaylord's orch, 7:15, markets, 7:30, Daddy Winkum's magical rhyme machine, 8:15, "Let's Go Fishin'" by Dr. Charles Reittel, 8:30, "From Oliveth to Calvary," Second Presbyterian church choir; KDKA String ensemble, 9:55, time; weather.

**CNRA, Moncton, N. B., 313 (E. S. T.)**—7:30 P. M., bedtime stories, Uncle Alf, 8, markets, 8:30, Mrs. W. A. Whynocht, pianist; Mrs. G. O. Baker, soprano; Mrs. B. G. Oxner, contralto; Mr. W. A. Whynocht, baritone; Mr. R. G. Silver, tenor.

**CNRT, Toronto, Ont., 356 (E. S. T.)**—6:30 P. M., King Edward Hotel concert orch.

## Saturday, April 11

**WBZ, New England, 333.3 (E. S. T.)**—11:55 A. M., time, weather, 6 P. M., Hotel Lenox ensemble, 7, markets, 7:05, bedtime story, 7:15, United States Naval History by E. R. Brandt; "Radium," by the Automobile Insurance Co, 7:30, Hotel Kimbell trio, 8, Joseph F. Austin, tenor, accompanied by Liane Laramee, 8:15,

**A \$5 HOME-MADE LOUDSPEAKER,** by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD, 1493 Broadway.

- Katherine Gravelin, pianist. 8:30, Hawaiian trio. 9, Albert D. Edwards, baritone. 9:15, Pauline Taylor trio. 9:30, Maria di Pesa, soprano; 9:45, Pauline Taylor trio. 10:05, Albert D. Edwards, baritone. 10:15, Pauline Taylor trio. 10:30, Maria di Pesa recital.
- WFFA, Dallas, Tex., 475.9 (C. S. T.)—12:30 P. M., address, Epps G. Knight. 3:30, music. 6, Henry Adler's orch. 8:30, Miss Evelyn Flinty, soprano; Mrs. Fred B. Ingram, pianist. 11, Adolphus Hotel orch.
- WBRR, New York, N. Y., 272.6 (E. S. T.)—8 P. M., violin, Dr. Hans Haag. 8:15, Bible questions and answers. 8:45, violin, Dr. Hans Haag.
- WWJ, Detroit, Mich., 352.7 (E. S. T.)—8 A. M., exercises. 9:30, tonight's dinner, the woman editor. 10:25, weather. 11:55 time. 12:05 P. M., Hotel Statler orch. 3, Detroit News orch. 3:50, weather. 3:55, markets.
- WHAS, Louisville Ky., 399.8 (C. S. T.)—4 P. M., concert from Louisville Conservatory of music, organ, police bulletins, weather, readings. 4:55, markets. 5, time. 7:30, Sylvian trio, concert by WHAS Stock company, time.
- WDAF, Kansas City, Kans., 365.6 (C. S. T.)—3:30 P. M., Star's radio orch. 5:50, marketgram, weather, time, rod report. 6, school of the air, piano tuning-in, Roger W. Babson; Tell-Me-a-Story Lady. Trianon ensemble. 11:45, "Merry Old Chief," Plantation Players, Kuhn's Kans. City Athletic Club orch., Campbell's Kans. City Club orch.
- WLW, Cincinnati, Ohio, 423 (C. S. T.)—8 A. M., exercises. 10:45, weather, business reports. 11:55, time. 1:30 P. M., business reports. 3, dance program. 6, concert.
- WOAW, Omaha, Neb., 562 (C. S. T.)—12:30 P. M., horticultural program. 5:45, news. 6, Davis Studio of Expression. 9, Walter B. Graham. 9:45, Sigma Omicron Society, Omaha University. 11, Nightingale orch. 11:30, Arthur Hays, organist.
- WCAE, Pittsburgh, Pa., 462 (E. S. T.)—12:30 P. M., news, weather. 2:30, music from Nixon restaurant. 6:30, concert from William Penn hotel. 7:30, Uncle Jaybee. 7:45, police reports. 8, current motor topics. 8:30, Chilcott Family quartet.
- WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M., news. 8:30, Community Fund Campaign program.
- WEAF, New York, N. Y., 492 (E. S. T.)—6:45 A. M., exercises. 4 P. M., Ingraham's orch. 6, music from Hotel Waldorf-Astoria; synagogue services, United Synagogue of America: "Trips and Adventures," by Fred J. Turner; Richard Franklin, pianist; Fannie L. Todd, soprano; Huyler's "Foremost Four"; Vanston Lee, baritone; Waldorf Astoria concert orch.; Pan American trio; Mabel Corlew, soprano; Georgia Childs, contralto; Thomas McGranahan, tenor; Walter Kieselbach, baritone; sacred music, Easter program. Vincent Lopez orch.
- WGY, Schenectady, N. Y., 379.5 (E. S. T.)—9 P. M., Maria Carreras, pianist. 9:30, Phil Romano's orch.
- WCCO, Saint Paul, Minn., 416.4 (C. S. T.)—10:45 A. M., home service talk, Betty Crocker. 2:30 P. M., high school artists' program. 6, Community Amusement Assoc. concert. 8, "Fire-side Philosophies," Rev. Roy L. Smith. 8:15, "China and Its People," C. A. Bauers. 8:30, Swedish Male chorus of St. Paul. 10, St. Paul Athletic Club orch.
- WGR, Buffalo, N. Y., 319 (E. S. T.)—6 P. M., Hallpyrd string trio.
- WRC, Washington, D. C., 469 (E. S. T.)—6:45 P. M., children's hour, Madge Tucker. 7, Boernstein orch. 7:45, Bible talk. 8, Wurdlitzer musical; Savastas, soloist. 8:30, "Bach," Dr. Otto Simon. 8:45, dialect stories, W. Alfred Falconer. 9, Maria Carreras. 9:30, "Interfering Waves," piano. 10, Vincent Lopez Mayflower orch. 10:30, Crandall's Saturday Nighters, Metropolitan Symphony orch. 12, Sidney Seidenman's orch.
- WIP, Philadelphia, Pa., 509 (E. S. T.)—7 A. M., exercises. 10, daily memo, talk to housewives, Mrs. Anna B. Scott. 1 P. M., organ, Karl Bonawitz. 1:30, weather. 3, Manor dance orch. 6, weather. 6:05, Charles Higgins and Billy McKee. 6:15, Hotel St. James orch. 6:45, markets. 7, Uncle Wip's bedtime story. 8, Lenten meditations, E. A. E. Palmquist. 8:15, Temple Male quartette. 9, Lenten program by Central Methodist Episcopal church; Caroline Rolle, soprano; Paul Volkman, tenor; Noble Hirst, baritone. 10:05, Benjamin Franklin dance orch. 11:05, organ, Karl Bonawitz.
- WAHG, Long Island, N. Y., 316 (E. S. T.)—12 M., Glen C. Smith's Paramount orch.
- WHBF, Rock Island, Ill., 222 (C. S. T.)—2 P. M., Hawaiian music. 7, orch.
- WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M., time. 1, weather; quotations. 5:45, chimes. 6, police reports; bulletins. 6:30, Sandman's visit, Val McLaughlin. 6:50, Sunday school lesson, Rev. M. A. Getzender. 9, program of Davenport Locomotive Works. 11, LeeClaire Hotel orch; Peter McArthur, baritone.
- WCAL, Northfield, Minn., 336.9 (C. S. T.)—12 P. M., music.
- WOO, Philadelphia, Pa., 508.2 (E. S. T.)—11 A. M., organ. 11:30, weather. 11:55, time. 12 M., Golden's Crystal tea room orch. 4:40 P. M., police reports. 4:45, organ, trumpets. 9:55, time. 10:02, weather.
- WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M., Helen Harrington Downing, home economics; Miss Margery Curry, "Pictures"; Miss Jane Neil, "Chicago's Handicapped Children"; Mr. Sterling Bryan McDonald, "Pleasant Surroundings." 3 P. M., Koffee Klatch; Jerry Sullivan, percolator; Harry Geise, Chief Koffee Pot. 7, Rainbo Gar-
- den orch; Milford Burdsall, baritone; Margaret Snook, accompanist; Agatha Karlen, reader; Florence Opheim, pianist. 10, Rainbo Skylarks; "The New Orleans Boys"; the Melodians; Alfred Tweed, harmonica, guitar; Clarence Theders, tenor; Jerry Sullivan; Harry Geise; Hickey and Johnson, Hawaiian steel guitar; Clyde Hager, songs.
- WGBS, New York, N. Y., 316 (E. S. T.)—10 A. M., timely talks, Terese. 10:10, Schorer's Kiddie Klub. 10:40, Mme. Geo. French fashion expert. 1:30 P. M., scripture reading. 1:35, Amphions. 3, interview with Rose Pelswick, by Terese Rose Nagel. 3:10, Jan Dunbar, tenor, accompanied by Ralph Phillips. 3:20, Spanish lessons, Prof. Perez de Vegas. 3:30, Jan Dunbar. 3:40, Mrs. John Clapperton Kerr. 3:50, Jan Dunbar. 6, Uncle Geebee. 6:30, Piccadilly Four. 7:30, Armand Vecsey orch. 8:15, music week winners. 9, Samuel Shankman, pianist. 9:30, Sam Comly, "Movie Chats." 9:45, Leona Oliver, contralto. 10, Paul Robeson, Negro singer. 10:30, Frances Halliday and Fraser Allen, Canadian composer. 11, concert.
- WJZ, New York, N. Y., 455 (E. S. T.)—1 P. M., Park Lane orch. 4, Beulah Braunberg, soprano. 4:30, Sherry's tea music. 5:30, quotations. 7, Hotel Astor orch. 8, "Savata and Harp Ensemble." 8:30, "Winter Festivals," Mr. A. B. Skinner. 8:45, William Orton Bell, tenor. 9, Maria Carreras, pianist. 10:30, Waldorf Astoria dance orch.
- WLIT, Philadelphia, Pa., 395 (E. S. T.)—12:02 P. M., daily almanac. 12:05, organ from Stanley theatre; Lenten service of Philadelphia Fed. of churches; Arcadia concert orch. 2, Arcadia concert orch.; Lillian Gordoni, mezzo-contralto; Marcella North, pianist and accompanist. 7:30, Arcadia concert orch.
- WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat. 10:30, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital. 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezi time for children. 5:57, time.
- WOR, Newark, N. J., 405 (E. S. T.)—6:45 A. M., gym class. 2:30 P. M., Florence Ballou, pianist. 3, George Watson Little, D.V.M., "Distemper." 3:15, Clifford Lodge orch.; Wachman's Clifford Capers. 6:15, Hotel Riviera orch. 7:30, "The Commanders," 8, "Bermyda," James Albert Wales. 8:15, Marian Estelle Adam, contralto. 8:45, Marian Estelle Adam, contralto. 9, Kathleen Norris, novelist. 9:15, Thos. Jefferson Memorial meeting. 10, Kentucky program. 11, Ciro's orch.
- WNYC, New York, N. Y., 233 (E. S. T.)—6:30 P. M., Club Alabam orch. 7:30, police alarms. 7:35, Chateau four. 8, John E. Bowe, Commissioner. 8:15, Chateau four. 8:45, police quartet. 9:15, Mercedes Posthauer, soprano, accompanied by Henrietta Eberhardt. 9:30, Harry B. Shaw, "Plant Enemies." 9:45, Miss Posthauer. 10:10, "Traveling in the Near East," Florence Duryea. 10:30, police alarms, weather.
- WHN, New York, N. Y., 360 (E. S. T.)—2:15 P. M., Mabel Chanley, soprano. 2:25, Mary Gleenson, reader. 2:35, Larry Moen and Harold Flavin, pianologue. 2:45, Cooper Poker Dots Boys. 3:45, Isabelle Henderson, soprano. 3:55, Williams Radio trio. 4:15, Evelyn De Stefan, soprano. 4:25, Frank H. Ochs, tenor. 4:35, Bernard Share, violinist. 4:45, Broadway Melody Boys. 6:30, violin, Olcott Vail. 7, Hotel Alamac dance orch. 7:30, health talk, Dr. Landis. 7:35, Hotel Carlton Terrace orch. 8:05, Arthur Fisher, one string violin. 8:20, Silvio Volpe, baritone. 8:30, Strand Roof orch. 9, John A. Hartvedy, tenor. 9:15, Clarke White Way entertainers. 9:45, Fitzpatrick Brothers, songs.
- KFRC, San Francisco, Cal., 268 (P. S. T.)—6:15 P. M., Boob McYutt and Elmer Tuggle. 6:30, Hotel Whitcomb orch.
- KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—12:30 P. M., Warner's Southern Californians; Kathryn Von Stein, violinist. 2:30, musicale. 6, Art Hickman's concert orch. 7, Uncle John's KHJ "Catalina Easter Caravan."
- KYW, Chicago, Ill., 536 (C. S. T.)—6:30 A. M., exercises. 9:30, news, markets. 10:30, farm and home service. 11:35, table talk, Mrs. Anna J. Peterson. 6:02, news, markets. 6:35, bedtime story, "Uncle Harry." 7, Joska DeBabary's orch. 7:10, Coon-Sanders Original Nighthawks. 7:20, Joska DeBabary's orch. 8, Merle Walker, soprano; Luther Carter, tenor; E. Richardson Smith, reader; Stephenson & Heather, duos; Mac & Gross, Jubilee Gospel singers. 9:05, Youth's Companion. 9:35, "Congress Classic." 12 M., 1 A. M., "Congress Carnival." Coon-Sanders Original Nighthawks.
- KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M., markets, weather, music. 8:30, Charles McGill and Louis Davis, concert.
- KOA, Denver, Col., 323 (M. T.)—12:20 P. M., organ. 1, stocks, weather. 9, Rainbow-Lane orch.
- KGO, Oakland, Cal., 361 (P. S. T.)—11:30 A. M., concert. 12:30 P. M., stocks. 12:40, stocks. 12:45, weather. 4, orch. of Hotel St. Francis. 8, "The Marriage of Figaro."
- KGW, Portland, Ore., 491.5 (P. S. T.)—11:30 A. M., weather. (12:30 P. M., Rose City trio.
- KPO, San Francisco, Cal., 423 (P. S. T.)—7 A. M., daily dozen. 10:30, "Ye Towne-Cryer." 10:40, local theatres. 11:50, markets. 12 M., time, scripture reading. 1 P. M., Fairmont Hotel orch. 8, St. Michaels choir.
- KDKA, Pittsburgh, Pa., 309 (E. S. T.)—9:45 A. M., markets. 11:45, time. 12 M., weather; markets. 12:20 P. M., Lenten services from Trinity church, Rev. Frederic C. Lauderburn. 1:30, Daugherty's orch. 3:30, quotations. 6, Westinghouse band. 7:30, Wimple the Wanderer. 7:45, "Helps to the Bible School Teacher," Carman Cover Johnson. 8, Radio Sphinx Club, Richard the Riddler. 8:30, Westinghouse band, Rhenamae W. Burnett, contralto. 9:55, time, weather.
- KSD, St. Louis, Mo., 545.1 (C. S. T.)—7 P. M., music from City Club. 10:30, Elva Magnus, soprano.
- KSAC, Manhattan, Kans., 341 (C. S. T.)—12:35, question box.
- KFOA, Seattle, Wash., 455 (P. S. T.)—4 P. M., Hoffman's Olympic Hotel orch. 6:45, Moran School program. 8:30, Times program. 10, Harkness orch.
- CKAC, Montreal, Que., 411 (E. S. T.)—7 P. M., kiddies' stories. 7:30, Windsor Hotel trio. 8:30, La Presse studio entertainment. 10:30, Windsor Hotel dance program.
- CNRO, Ottawa, Ont., 435 (E. S. T.)—7:30 P. M., bedtime story, Lullaby, Aunt Agnes. 8, Chateau Laurier concert orch. 8:30, Ottawa male quartet; 'cello; Miss Helen Langdon; tenor, Mr. Richard Pentland; Hawaiian selections, Mr. Al. Nani; bass, Mr. Howard Olmstead; tenor, Mr. Allan Carr; Hawaiian selections, Mr. Al. Nani; bass, Mr. Graham Brown.
- PWX, Cuba, 400 (E. S. T.)—8:30 P. M., Campos Julian, pianist; Fausto Alvarez, tenor; Maria Perovian, soprano; Nestor del Prado, baritone.

## Sunday, April 12

- WFFA, Dallas, Tex., 475.9 (C. S. T.)—6 P. M., radio Bible class, Dr. William M. Anderson; gospel singing. 7:30, service of City Temple. 9:30, Alita Ladies' Band.
- WWJ, Detroit, Mich., 352.7 (E. S. T.)—11 A. M., St. Paul's Episcopal Cathedral service. 2 P. M., Detroit News orch. 7:20, "Roxy and His Gang." 9:15, organ.
- WEMC, Berien Springs, Mich., 286 (E. S. T.)—11 A. M., radio lighthouse quartet, Mr. Maitland Alred, tenor. 11:40, sermon, pastor W. R. French. 8:15 P. M., radio lighthouse quartet, Mr. Charles Garber, clarinetist; Mrs. Gertrude Hanson, contralto; Mrs. H. B. Taylor, soprano. 8:55, sermon, Pastor John Knox.
- WCAE, Pittsburgh, Pa., 462 (E. S. T.)—10:45 A. M., Rodef Shalom temple service. 3 P. M., radio church service. 4, piano, Otto Kalteis. 6:30, concert from William Penn hotel.
- WRBC, Valparaiso, Ind., 278 (C. S. T.)—7:30 P. M., Easter services.
- WOAW, Omaha, Neb., 526 (C. S. T.)—9 A. M., radio chapel service, Rev. R. R. Brown. 1:30 P. M., matinee. 2:30, Easter cantata. 6, Bible study, Mrs. Carl R. Gray. 9, Easter service, First Methodist Episcopal church, Dr. James E. Wagner, pastor.
- WIP, Philadelphia, Pa., 509 (E. S. T.)—3:30 P. M., Philadelphia Music League concert; Helen Buchanan Hittner, soprano; Bertrand Poland, tenor; George C. Ames, baritone; Helen Boothroy Buckley, piano. 7:15, service from Holy Trinity church, Rev. Floyd W. Tomkins, D.D., rector. 9:30, Germantown Theatre orch.
- WDAF, Kansas City, Mo., 365.6 (C. S. T.)—4 P. M., University Methodist Protestant church. 5, Sunday school lesson, Dr. Walter L. Wilson; hymns by radio quartet.
- WCAL, Northfield, Minn., 336.9 (C. S. T.)—6 A. M., Easter service. 8:30 P. M., sacred program; sermon, Dr. Martin Hegland.
- WOS, Jefferson City, Mo., 449.9 (C. S. T.)—7:30 P. M., First Presbyterian church service.
- WCBD, Zion, Ill., 345 (C. S. T.)—8 P. M., Zion choir; Mrs. Thomas and Mr. Barton, soprano and tenor; Mrs. G. R. Sparrow, contralto; Mr. G. R. Sparrow, tenor; Mr. Mark Whiteside, barytone; Miss Louise Burgess, reader; Mrs. L. J. Reid, piano.
- WOAI, San Antonio, Tex., 394.5 (C. S. T.)—11 A. M., First Presbyterian church service, sermon, Dr. P. H. Hill, pastor. 7:30 P. M., Central Christian church service, sermon, Dr. Hugh McLellan, pastor. 9:30, WOAI Entertainers "The Seven Last Words of Christ," by Dubois.
- WHO, Des Moines, Iowa, 526 (C. S. T.)—11 A. M., service from University Church of Christ, Dr. Chas. S. Medbury, pastor. 4 P. M., Knight Templars program. 7:30, Reese-Hughes orch.
- WBRR, New York, N. Y., 272.6 (E. S. T.)—10 A. M., Watchtower orch. 10:20, tenor, Mr. Fred W. Franz. 10:30, "Resurrection of the New Creation," Judge Rutherford. 11:10, I. B. S. A. vocal quartet. 11:20, Watchtower orch. 9 P. M., Watchtower string quartet. 9:15, tenor, Mr. Fred Twarosch. 9:25, I. B. S. A. choral singers. 9:35, "Swallowing Up Death in Victory," Mr. Fred W. Franz. 10:05, I. B. S. A. choral singers. 10:15, Watchtower string quartet. 10:20, I. B. S. A. choral singers.
- WHAS, Louisville, Ky., 399.8 (C. S. T.)—9:57 A. M., organ. 10, service of Broadway Baptist church, Rev. R. J. Pirkey, pastor; Mrs. W. O. Edinger, soprano; Miss Angelina McCrocklin, contralto; Charles H. Barnes, Jr., tenor; William Cornwall, baritone. 4 P. M., vesper song service.
- WOO, Philadelphia, Pa., 508.2 (E. S. T.)—10:30 A. M., Bethany Presbyterian church services; Caroline Quigg, organist; Rev. A. Gordon MacLennan, pastor. 2:30 P. M., musical exercises of Bethany Sunday school. 6, Clarence K. Bawden, organist.
- WEAF, New York, N. Y., 492 (E. S. T.)—2 P. M., "Sunday Hymn Sing" and services of Greater N. Y. Fed. of churches, Rev. Wm. B. Millar, Aida Brass quartet, Fed. male and mixed quartet, Rev. Charles L. Goodsel, D. D. 3:45, men's conference, from Bedford Branch Y. M. C.

A.; Dr. S. Parkes Cadman; Gloria Trumpeters; George Betts, chime soloist. 7:20, "Roxxy and His Gang." 9:15, organ.

WRAV, Yellow Springs, O., 263 (E. S. T.)—7 P. M., impromptu.

WQJ, Chicago, Ill., 448 (C. S. T.)—10:30 A. M., Dr. Preston Bradley's service of People's church; Clarence Eddy, organist. 8 P. M., Rainbo Garden orch.; Dr. C. B. Roe, baritone; Dr. Robert N. Price, tenor; Mrs. May Seavey, soprano; Dr. Carl Bertsinger, pianist.

WGR, Buffalo, N. Y., 319 (E. S. T.)—3 P. M., Vesper services. Dr. Don D. Tullis, 4 organ. Robert Denning, 7:15, Wm. Wall Whiddit, organist. 7:30, evening service, Rev. R. J. MacAlpine, D.D.

WLW, Cincinnati, O., 423 (C. S. T.)—9:30 A. M., school by Methodist Book Concern. 11, church services, Dr. Frank Stevenson. 7:30, church services, E. P. Dannenfeldt, pastor. 8:30, concert by the Western and Southern orch., William Kopp, director.

WBZ, New England, 333.3 (E. S. T.)—10:55 A. M., South Congregational Church services, Rev. James Gordon Gilkey, pastor; Prof. Wilson P. Moog, organist; choir. 7 P. M., Copley-Plaza orch. 7:30, service from Trinity Church. 9, quartet of First Parish Church.

KFRC, San Francisco, Cal., 268 (P. S. T.)—6:30 P. M., Bem's Hotel Whitcomb Little Symphony. 8, Whitcomb Symphony orch. 10, Il Trovatore Cafe orch.

KFI, Los Angeles, Cal., 467 (P. S. T.)—10 A. M., Los Angeles Church Fed. service, Dr. M. E. McCulloch, pastor. 4 P. M., vesper services. 6:45, radiatorial, "Music Appreciation." Harold Isbell; Metropolitan theatre. 8, Gayski, Jugo-Slav orch. 9, George Stump, tenor; May Ann Howland, cellist; Florence Hardy, pianist. 10, Los Angeles orch.

KGO, Oakland, Cal., 361.2 (P. S. T.)—11 A. M., service of First Baptist church, John Snape, D. D., pastor. 3:30 P. M., KGO Little Symphony orch., Carl Rhodehamel, conductor; Arthur S. Garbett, musical interpretative writer. 7:30, service of First Baptist church, John Snape, D. D., pastor.

KNX, Los Angeles, Cal., 337 (P. S. T.)—10 A. M., First Presbyterian church. 2 P. M., Stainers "Crucifixion" from First Presbyterian church. 5, Radio Sunset service, Rev. Charles F. Asked. D. R., Rev. Frank Dyer, D. D. 8, Ambassador concert orch. 9, Durant program.

KGW, Portland, Ore., 491.5 (P. S. T.)—10:30 A. M., First Presbyterian Church service, Dr. Harold Leonard Bowman, pastor. 6 P. M., services. 7, Colburn concert orch.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—11 A. M., services of First Presbyterian Church, Rev. Chauncey Hickok, pastor. 7:45 P. M., services, St. Luke's Episcopal church. 9, New Arlington Hotel orch. 10, Phil Baxter's singing orch.

KOA, Denver, Colo., 323 (M. T.)—10:45 A. M., Easter Sunday service from St. John's Episcopal cathedral. 4:30 P. M., vespers from Plymouth Congregational church. 7:30, sermon from St. John's Episcopal cathedral, Rt. Rev. Irving P. Johnson, D. D.

KPO, San Francisco, Cal., 429.5 (P. S. T.)—8 A. M., "Funnies," Mr. Scotty. 10:30, local theatres. 11, church services; talk by Dr. H. H. Bell; violin, Marjory M. Fisher; organ, Theodore J. Irwin. 6:30 P. M., local theatres. 6, States Restaurant orch. 8:30, Fairmont Hotel orch.

Monday, April 13

WGST, Atlanta, Ga., 270 (E. S. T.)—9 P. M., Tech. Woman's Club program.

WEMC, Berrien Springs, Mich., 286 (E. S. T.)—8:15 P. M., radio lighthouse musicians.

WRBC, Valparaiso, Ind., 278 (C. S. T.)—7:30 P. M., Easter Cantata, Immanuel Lutheran choir.

WOAW, Omaha, Neb., 562 (C. S. T.)—12:30 P. M., Fontenelle orch. 5:15, Malie and Stedt. 5:45, news. 6, Arthur Hays, organist. 6:45, Gus' Lucky Strike orch. 9, father and son program. 9:30, Lenhart's orch.

WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M., farm talk, Dr. C. W. Watson. 8:30, Gayoso Hotel orch.

WOI, Ames, Iowa, 270 (C. S. T.)—9:30 A. M., weather. 12:30 P. M., chimes; weather; markets; Prof. T. R. Agg, "The Highway System of England." 9:30, weather, 10, music.

WWJ, Detroit, Mich., 352.7 (E. S. T.)—8 A. M., exercises. 9:30, tonight's dinner, woman's editor. 10:25, weather. 11:55, time. 12:05 P. M., Hotel Statler orch. 3, Detroit News orch. 3:50, weather. 6, concert. 8, Detroit News orch. 9, concert.

WDAF, Kansas City, Mo., 365.6 (C. S. T.)—3:30 P. M., Newman and Royal theatre programs. 5, weekly Boy Scout program. 5:50, marketgram, weather, time, road report. 6, school of air; piano tuning-in art; reading, Miss Cecile Burton; Tell-Me-a-Story Lady; music, Trianon ensemble. 8, "Around Town with WDAF." 11:45, "Merry Old Chief" Plantation Players.

WCBD, Zion, Ill., 345 (C. S. T.)—8 P. M., mixed quartet; school chorus; trombone quartet; Mr. Fred Passen, organist; Mr. Arthur Rendall, clarinet; Miss Ida Peterson, soprano; Miss Esther Nafeziger, piano; Mrs. Evangeline Rendall, reader.

WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M., Stewart Watson, baritone; Helen Birmingham accompanist; Leota Schakel, whistler; Flossie Holmes Cowper, 11, organ. L. Carlos Meier. WBBR, New York, N. Y., 272.6 (E. S. T.)—8 P. M., soprano, Mrs. Irene Kleinpeter. 8:10, vocal duets, Mrs. Irene Kleinpeter, Mr. Fred

Twaroschk. 8:25, News digest by editor of Golden Age. 8:40, vocal duets. 8:50, tenor, Mr. Fred Twaroschk.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—1 P. M., concert from Louisville Conservatory of Music; organ; police bulletins; weather; readings; news. 4:55, markets. 5, time.

WHBF, Rock Island, Ill., 222 (C. S. T.)—8 P. M., music.

WOS, Jefferson City, Mo., 440.9 (C. S. T.)—8 P. M., "Training for Efficient Home Making," Miss Ella Moore; adding, Jones and Oliver Brothers.

WOO, Philadelphia, Pa., 508.2 (E. S. T.)—11 A. M., organ. 11:30, weather. 11:55, time. 12 M., Golden's Crystal Tea Room orch. 4:40 P. M., police reports. 4:45, organ, trumpets. 7:30, Hotel Adelphia French Room orch. 8, music from Mark Strand Theatre. 8:30, Hans Barth, pianist. 8:50, Justin Lawrie, tenor. 9, A. & P. Gypsies. 9:55, time, weather. 10, Blue Ribbon quartet. 10:30, Hotel Roosevelt orch. 11, Hotel Sylvania orch.

WEAF, New York City, N. Y., 492 (E. S. T.)—6:45 A. M., "Health Drill." 4 P. M., Murray Scott, baritone; "Be kind to Animals Week." General Stotesbury; French lessons, William Douber-Kerr; "Talk to Children," Dr. Clarence J. Harris. 6, music from Hotel Waldorf-Astoria; "Women Versus Politics," Edith Ellis; music from Mark Strand Theatre; Hans Barth, pianist; "Health Talk," A. & P. Gypsies; "Blue Ribbon quartet; Hotel Roosevelt orch.

WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M., Home Economics program, Helen Harrington Downing; Mr. F. H. Leonhard, "Spring Fever"; Mrs. Margaret Reese Filkins, "The Paper Box." 3 P. M., Helen Harrington Downing, "Spring Breakfasts"; Madame Huntington, "The Care of the Hair"; Mr. Sterling Bryan McDonald, "Color Harmony and Distribution."

WEEI, Boston, Mass., 476 (E. S. T.)—6:45 A. M., exercises. 2 P. M., Billy Bemis' Arabians. 6:30, Big Brother Club. 7:15, news flashes. 7:20, historical talk. 7:30, Francis Tanner and Doris Shack. 7:45, Abbott Worsted band. 8:45, health talk. 9, A. & P. Gypsies. 10, organ.

WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat. 10:30, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital. 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezix time for children. 5:57, time.

WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 A. M., concert, M. A. Schmitt. 8, Jack Little and Paul Small, record artists. 8:35, Margaret D. Staples, soprano; Henry Murtagh, accompanist. 9, Pass-over program. 10, Buffalo Welsh Women's club.

WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercises. 10:45, weather, business reports. 11:55, time. 12:15 P. M., services conducted by Rev. G. H. Kase. 1:30, business reports. 3, market reports. 4, recital by pupils of Helen Abercherle. 6, concert. 10, Oxford College Glee club, Oxford, Ohio. 11, dance by Alvin Roehr's Music Makers.

WAHG, Long Island, N. Y., 316 (E. S. T.)—8 P. M., Howard Forst, saxophone. 8:15, James M. Savell, baritone. 8:30, Maude Mason, piano. 8:50, Alfred Elliott, reader. 9, Synchrophase string trio. 9:30, Edna Enderson, whistler. 9:40, Mae Ustered, soprano. 9:55, time, weather. 10:05, Synchrophase string trio. 10:30, Smith's Paramount orch. 12, midnight program.

WBZ, New England, 333.3 (E. S. T.)—11:55 A. M., time, weather, markets. 6 P. M., Westinghouse story. 7:15, "Bringing the World to America." National Conference Board news. 7:30, "Joseph Conrad." 8, Aleppo Drum Corps band. 8:30, violin, Marjorie Posselt, accompanied by Delancey Cleveland. 9, Hebrew University celebration. 9:55, time, weather. 11:30, McEnelly's Singing orch.

WMAQ, Chicago, Ill., 447.5 (C. S. T.)—1 P. M., Radio Farm School, "Swine Day." 4, Mothers in Council, Mrs. Frances M. Ford. 4:30, Chicago High School Teachers' Council. 6, organ. 6:30, Hotel LaSalle orch. 6:50, Family Altar league.

KFAE, Pullman, Wash., 348.6 (P. S. T.)—7:30 P. M., piano, Ruth Farnha; vocal solos, Kathro Ancut; pianologues, Ida, Louise Anderson; humorous reading, Ida Anderson; the meaning of art, Prof. W. T. MacDermitt; summer school, Dean A. A. Cleveland; farming; the news-paper, Lincoln Lounsbury; agricultural business, Dean E. C. Johnson.

KOA, Denver, Colo., 323 (M. T.)—12:20 P. M., organ. 1, stocks; weather. 6, stocks; news. 6:40, bedtime stories. 8, Rialto theatre orch. 8:10, Shorter choir, Mr. and Mrs. Robert D. Kenworthy, accompanist, Margaret French.

KPO, San Francisco, Cal., 429.5 (P. S. T.)—10:30 A. M., the local theatres. 12 M., time; scripture reading. 1 P. M., Fairmont Hotel orch. 4:30, Fairmont Hotel orch. 5:30, the book Rosebrook. 6:30, States Restaurant orch. 7, Amphians. 8, Theodore J. Irwin, organist. 9, John Hartigan program. 10, Johnny Buick's Amphians.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M., news. 5:30, Examiner program. 6:45, radiatorial. 7, Herald program. 8, Owl Drug Co. program. 9, L. A. String quartet, Virginia Flohri. 10, Roy Novin Syncopter.

KGO, Oakland, Cal., 361.2 (P. S. T.)—9 A. M., California State Dept. of Edu. 10:40, classroom instruction. 11:30, concert. 1:30 P. M., stocks; weather. 3, music; speaker. 4, Halstead's dance orch. 5:30, Aunt Betty stories. 6:45, stocks, weather, news. 8, Arion trio; "Soil Classification and Mapping." C. F. Shaw; "English," Wilda Wilson Church; "Secrets of Personality," Albertine Richards Nash; "New Books," Joseph Henry Jackson. 10, Henry Halstead's orch.

KNX, Los Angeles, Cal., 337 (P. S. T.)—6:15 P. M., dinner program. 8, Western Auto Supply Co. program. 10, Silvertown orch., Lillian May Challenger, soloist. 11, Cocoon Grove orch.

KOB, State College, N. M., 318.6 (M. S. T.)—7:30 P. M., "The Medicine of Old Greek World." Dr. R. M. McBride.

KGW, Portland, Ore., 491.5 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City trio. 5, children's program. 6, organ, William Robinson Boone. 7:15, markets, weather, news, police reports.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M., markets, weather, music. 8:30, Henderson-Brown College artists. 9, New Arlington Hotel orch. 9:45, Henderson-Brown talent. 10:15, Fischer Eastman Hotel orch.

KFRC, San Francisco, Calif., 268 (P. S. T.)—10 A. M., household hints, Mary Lewis Haines. 6:30 P. M., news, police broadcast.

KSAC, Manhattan, Kans., 341 (C. S. T.)—9 A. M., exercises of rural schools. 12:35 P. M., reading, weather; "Prairie Dogs," Roy Moore; question box; "Bugs That Bother New." E. G. Kelly. 7:20, songs, Ethyl Robinson; 7:30, sheet, H. E. Reed; 7:40, songs, Ethyl Robinson. 7:50, "Soft Cheeze," N. E. Olson.

CKAC, Montreal, Que., 411 (E. S. T.)—4:45 P. M., concert from Windsor Hotel. 4, stocks. 4:30, 10 lessons.

Tuesday, April 14

WOAW, Omaha, Neb., 562 (C. S. T.)—12:30 P. M., horticultural program. 5:45, news. 6, "Advice to Lovelorn," Cynthia Grey. 6:45, Royal Fontenelle orch. 9, WOAW's studio. 10:30, Nightingale orch.

WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M., health talk, Dr. E. E. Francis. 8:30, Hull-Dobbs program. 11, Memphis Local of Musicians.

WOI, Ames, Iowa, 270 (C. S. T.)—9:30 A. M., weather. 12:30 P. M., chimes; weather; markets; Professor T. R. Agg, "Highway Systems of Europe." 9:30, weather.

WDAF, Kansas City, Mo., 365.6 (C. S. T.)—3:30 P. M., Star's radio trio. 5, child talent program. 5:50, marketgram, weather, time, road report. 6, school of air, piano tuning-in, Tell-Me-a-Story Lady; radio piano lessons, by Miss Maudellen Littlefield; Trianon ensemble. 11:45, "Newman Nighthawk Night."

WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M., music. 11, dance program.

WWJ, Detroit, Mich., 352.7 (E. S. T.)—8 A. M., exercises. 9:30, tonight's dinner, woman's editor. 10:25, weather. 11:55, time. 12:05 P. M., Hotel Statler orch. 3:50, weather. 3:55, markets. 6, concert. 8, concert.

WOAI, San Antonio, Tex., 394.5 (C. S. T.)—8:30 P. M., WOAI entertainers. 9:30, Jimmie Joy's orch.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M., concert from Louisville Conservatory; organ; police bulletins; weather; readings; news. 4:55, markets. 5, time. 7:30, Eddie Rosson orch. news, time.

WOO, Philadelphia, Pa., 508.2 (E. S. T.)—11 A. M., organ. 11:30, weather. 11:55, time. 12 M., police reports. 4:45, organ, trumpets. 9:55, time. 10:02, weather.

WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M., Home Economics program, Helen Harrington Downing; Mrs. Josephine P. Burdette, garden talk; Mr. J. A. Heist, "Laundry Prejudice"; Mr. H. A. Malcom, "Modern Refrigeration." 3 P. M., Josephine Naylor, "Recipes—Mexican." Dr. Lena K. Sadler, "Food for Fat Folks." Dr. Rainbo Garden orch.; Isabelle Freeman, soprano; Loretta Streehl, contralto; Ellen Doolittle, pianist; Marie Lenks, reader. 10, Rainbo Skylarks; Tommy Janosek, harmonica; Ned and Chas, singers; Will Rossiter; Mack Sisters. 1 A. M., Ralph Williams, the Gingerman; the Little Skylarks.

WEAF, New York, N. Y., 492 (E. S. T.)—6:45 A. M., "Health Drill." 11, music, June Miller; motion pictures, Adele Woodard; markets; weather. 4 P. M., University Eight orch. 6, music from Hotel Waldorf-Astoria; Mary Mayo, soprano; Eagle Neutrodyne trio; finances, Dudley F. Fowler; Harriette Cady, pianist; "The Gold-Dust Lewis"; "Eveready Hour"; grand opera, "Carmen."

WEEI, Boston, Mass., 476 (E. S. T.)—6:45 A. M., exercises. 1 P. M., Civitan Club. 2, Napoli Four. Club. 3:15, Palm Garden Ramblers. 6:30, Big Brother Club. 7:15, historical talk. 7:40, Telechron Topics, Joe Toye; 8, musicale. 8:30, Gold Dust Twins. 9, Eveready hour. 10, Silvertown orch.

WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat. 10:30, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital. 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezix time for children. 5:57, time.

WMAQ, Chicago, Ill., 447.5 (C. S. T.)—12 M., Illinois Manufacturers' asso. program. 1 P. M., Radio Farm School, "Poultry Day." 4, American

- Red Cross, Dr. H. W. Gentles. 4:30, Dayton Westminster choir. 6 organ. 6:25, Hotel LaSalle orch. 6:50, "Daddy." 8, Harry Hansen, literary editor. 8:20, Clara E. Laughlin, travel talk. 8:30, lecture. 8:50, Asso. of Commerce. 9:15, music, American Legion.
- WGR, Buffalo, N. Y., 319 (E. S. T.)—11 A. M., Mrs. Katherine Norton Britt. 8 P. M., joint variety program. 8:30, Gold Dust Twins. 9, Eveready hour. 10, grand opera, "Carmen."
- WLW, Cincinnati, O., 422.3 (C. S. T.)—8 A. M., setting-up exercises. 10:45, weather and business reports. 11:55, time. 12:15 P. M., Delta Omicron Sorority from College of Music. 1:30, business reports. 3, market reports. 4, piano recital by pupils. 6, State Memory Contest of the Ohio Federation of Musicians. 6:45, market reports. 8, Lyric male quartet. 8:15, concert, piano and orch. 8:30, Lyric male quartet. 9, concert featuring orch.
- WBZ, New England, 333.3 (E. S. T.)—11:55 A. M., time, weather, markets. 6:45 P. M., songs, Violet Gridley, accompanied by Don Ramsay. 7, markets. 7:05, bedtime story. 7:15, world markets. 7:45, St. James Theatre orch. 8:15, Ruth Lloyd Kinney, mezzo-contralto, accompanied by Esther Marvin Cutchin. 9, Brunswick hour of music. 9:55, time, weather.
- KSAC, Manhattan, Kans., 341 (C. S. T.)—9 A. M., exercises of rural schools. 12:35 P. M., reading, weather; Seyeband Varieties, L. E. Willoughby; question box; Spray Rings, L. C. Williams. 7:20, Radio College Quartet. 7:30, Feeding Alfalfa Hay, C. W. McCampbell. 7:40, Radio College quartet. 7:50, Brooder Houses, D. J. Taylor.
- KFRC, San Francisco, Calif., 268 (P. S. T.)—6:30 P. M., tenor, Tom O'Connor; soprano, Eleanor Werner; recitations, Edward T. Hannon; soprano, Mildred Long; piano, Grace Morris Hannon; reading, Edward F. Dougherty. 8, police broadcast. 8:03, Paul Kelli's orch.; Walter Duple, soloist.
- KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M., markets, weather, music. 8:30, Fischer Eastman ensemble. 9:45, New Arlington Hotel orch.
- KGW, Portland, Ore., 491.5 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City trio. 5, children's program. 7:15, markets, weather, news, police reports. 8, Oregon College lecture. 8:30, Civic Music Club. 10, Multnomah Hotel Strollers.
- KFMQ, Fayetteville, Ark., 299.8 (E. S. T.)—9 P. M., students of H. E. Shultz.
- KOA, Denver, Col., 323 (M. T.)—12:20 P. M., organ. 1, quotations; weather. 3, half hour matinee. 6, music. 6:30, stocks; news. 9, oje Mann's Rainbow-Lane orch.; Roy's Lakeside orch.
- KPO, San Francisco, Cal., 429.5 (P. S. T.)—7 A. M., exercises. 10:30, cooking and household management, Mrs. Belle DeGraf. 10:30, local theatres. 11:50, markets. 12 M., time; scripture reading. 1 P. M., Fairmont Hotel orch. 4:30, Fairmont Hotel orch. 5:30, children's hour stories, Big Brother of KPO. 6:30, States Restaurant orch. 7, Fairmont Hotel orch. 8, Wiley B. Allen Co. program. 10, Johnny Buick's Amphians.
- KNX, Los Angeles, Cal., 337 (P. S. T.)—6:15 P. M., Globe Ice Cream Co. program. 7:30, styles, Myer Siegel, Jr. 7:45, "Health." Dr. Robert T. Williams. 8, First Securities Co. program. 9, Independent Furniture Mfg. Co. 10, Abe Lyman's orch.
- KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M., news. 5:30, Examiner program. 6:45, radiatorial. 7, Hills Bros. orch. 8, Los Angeles Examiner. 9, Frederick Herman, Basso Contante, Karl Lubovsky, cellist. 9:30, one act play, the Bohemian Players. 10, Don Meany Night.
- KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M., concert. 1:30 P. M., stocks, weather. 4, orch. of Hotel St. Francis. 6:45, stocks, weather, news. 8, School of Music, Dominican College, San Rafael; Feather River Inn orch.; Jean A. Center, mezzo-soprano; Jennings Pierce, tenor; "A Toast to the Broncho." Donald Hayford; Ramon Oden Spanish and Hawaiian Players. 10, Henry Halstead's orch.
- CNRA, Moncton, N. B., 313 (A. S. T.)—8:30 P. M., music by Students of Maritime Universities. 10, Robert J. McCharles, Hawaiian Guitar and Ukulele. 10:30, CNRA orch.
- CNRR, Regina, Sask., 420 (M. T.)—3 P. M., bedtime tale; Ted Franklin concert party.
- CKAC, Montreal, Que., 411 (E. S. T.)—4 P. M., weather, stocks. 7, kiddies stories. 7:30, Windsor Hotel trio. 8:30, Frontenac Breweries entertainers. 10:30, Windsor Hotel dance program. 11:45, frolics from Montreal Press Club.
- 3:30 P. M., Star's radio trio. 5:50, marketgram, weather, time, road report. 6, school of air, Tell-Me-a-Story Lady, Trianon ensemble, Star's radio orch. 11:45, "Merry Old Chief," Plantation Players.
- WHO, Des Moines, Iowa, 526 (C. S. T.)—6:30 P. M., Reese-Hughes orch. 7:30, Miss Maude Eldredge, soprano; Mr. R. C. McHose, pianist; Mr. Edgar Hearsman, tenor; Ivan Botsford, Doris Rothenberg, Howard Turner, piano duets. 9, Des Moines theatre symphonic orch. 9:45, Bankers' Life Radio orch.
- WWJ, Detroit, Mich., 352.7 (E. S. T.)—8 A. M., exercises. 9:30, tonight's dinner, woman's editor. 10:25, weather. 11:55, time. 12:05 P. M., Hotel Statler orch. 3, Detroit News orch. 3:50, weather. 3:55, markets. 6, concert. 8, Detroit News orch. Anne Campbell, poet; Ice House quartet. 9, concert. 10, Goldkette's Victor Recording orch.
- WEAF, New York, N. Y., 492 (E. S. T.)—6:45 A. M., "Health Drill," 11, Lester Banker, pianist; "Young Mother's Program"; markets, weather. 4 P. M., May Hughes, soprano; Eleanor Perez Bahntge, pianist; children's stories. 6, Merry Music Makers; U. S. Army School band; D. C. Erna Korn, contralto; "Ipana Hour"; Lido-Venice orch.
- WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M., Home Economics program, Helen Harrington Downing; Mrs. Wilbur E. Fribley, "Our Clothes Closets"; Mrs. Murray Nelson, "Civil Service Talk"; Mary Hale Martin, "Desserts for Children." 3 P. M., Helen Harrington Downing, "Spring Cleaning"; Martha Logan, Home Economics. 7, Rainbo Garden orch.; Dorothy Davie Dillow, soprano; Edith Phillips Heller, pianist; Herman J. Techantine, baritone. 10, Rainbo Skylarks; Clyde Hager, songs; Larry Brundage, Harry Kraemer; Clarence Theders, tenor; Alfred Tweed, harmonica, guitar; Melodians; Fred Jacobson, monologues; Ziegler Sisters; Hickey and Johnson, Hawaiian steel guitar. 1 A. M., the Gingerman, Ralph Williams; the Little Skylarks.
- WRAY, Yellow Springs, O., 283 (E. S. T.)—8 P. M., impromptu.
- WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat. 10:30, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade, quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezix time for children. 5:57, time.
- WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 A. M., "The Emergency Shelf" Betty Crocker. 6 P. M., Jack Little and Paul Small, record artists. 6:30, Stewart's Lake Shore orch. 8, recital, Ethyl McMullen. 9, concert, Frederick Phillips. 10, Joe Latosinski, violinist. 10:30, "Southern Cruise of Lizzie Ford," Donal Hurley.
- WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercises. 10:45, weather and business reports. 11:55, time. 12:15 P. M., piano by Irene Downing and Marjory Hebestreit; Mu Phi Epsilon concert. 1:30, business reports. 3, market reports. 4, program for "Shut-Ins," auspices Cincinnati Exchange Club. 6, concert. 6:45, market reports. 10, Instrumental trio; other features to be announced.
- WAHG, Long Island, N. Y., 316 (E. S. T.)—12 M., cooking and etiquette. 7:30 P. M., Brooklyn Eagle program. 9:55, time, weather.
- WBZ, New England, 333.3 (E. S. T.)—11:55 A. M., time, weather, markets. 6 P. M., Hotel Lenox ensemble. 7, markets. 7:05, radio nature story, Thornton W. Burgess. 7:30, French course, Prof. Andre Morize. 8, "Uncle Bill," by Rip. 8:15, Musical Clubs of Boston U. 9:45, McEnelly's singing orch. 9:55, time, weather. 10:05, McEnelly's singing orch.
- WMAQ, Chicago, Ill., 447.5 (C. S. T.)—12:50 F. M., Radio Farm School, "Dairy Day." 1, luncheon of Asso. of Commerce. 4:30, music. 6 organ. 6:30, Miss Georgene Faulkner, the story lady. 8, lecture. 8:25, Armour Jubilee singers. 9, WMAQ players.
- KFAE, Pullman, Wash., 348.6 (P. S. T.)—7:30 P. M., violin quartet, musical readings, Barbara Posson, violin duet, audio frequency amplifiers, Dean H. V. Carpenter; egg laying contest, R. N. Miller; drainage, Prof. L. J. Smith; new books, Miss Aice L. Webb.
- KOA, Denver, Col., 323 (M. T.)—12:20 P. M., organ. 1, stocks. 6, stocks; news. 6:40, bedtime stories. 8, Rialto theatre orch. 8:10, Denver Kiwanis club program; Yeager Male quartet; KOA orch. 10, Rainbow-Lane orch.
- KPO, San Francisco, Cal., 429.5 (P. S. T.)—7:30 A. M., daily dozen. 10:30, local theatres. 11, market reports on eggs, butter, cheese and poultry. 12 M., time; scripture reading. 1 P. M., Fairmont Hotel orch. 4:30, Fairmont Hotel orch. 5:30, book of knowledge. 6:30, States restaurant orch. 7, Fairmont Hotel orch. 7:30, Fairmont Hotel orch. 7:30, Conn Band Instrument Co. program. 8, Atwater Kent Artist program. 9, instrumental, vocal selections. 10, Johnny Buick's Amphians.
- KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M., concert. 1:30, stocks, weather. 3, music from Cora L. Williams Institute. 4, orch. of Hotel St. Francis. 6:45, stocks, weather, news.
- KNX, Los Angeles, Cal., 337 (P. S. T.)—6:15 P. M., dinner hour. 7, Ambassador concert orch. 8, Broadway Dept. Store program. 10, Hollywoodland dance orch.
- KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M., news. 5:30, Examiner program. 6:45, radiatorial. 7, Nick Harris detective stories. 8, Herald program. 9, Los Angeles Examiner. 10, Patrick-Marsh orch.
- KOB, State College, N. M., 348.6 (M. S. T.)—7:30 P. M., International Code Course, Dean R. W. Coddard.
- KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—8:30 P. M., piano, Phil Wall. 9, New Arlington Hotel orch. 10, Eastman Hotel orch.
- KGW, Portland, Ore., 491.5 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City trio. 3, children's program. 6, Hotel Portland concert. 7:15, markets, weather, news, police reports. 8, concert.
- KFRC, San Francisco, Calif., 268 (P. S. T.)—10 A. M., household hints, Mary Lewis Haines. 6:30 P. M., Bem's Little Symphony. 8, Bem's Little Symphony; Fred B. Snook, baritone. 9, KFRC health service. 9:30, KFRC Cuckoo club. 11, Paul Kelli's orch.
- CKAC, Montreal, Que., 411 (E. S. T.)—1:45 P. M., Windsor Hotel trio. 4, weather, stocks.
- CNRO, Ottawa, Ont., 435 (E. S. T.)—7 P. M., talk for boys and girls, Uncle Dick. 7:30, markets. 8, CNRO Little Symphony orch.; Chateau Laurier dance orch.

## Thursday, April 16

- WOW, Omaha, Neb., 562 (C. S. T.)—12:30 P. M., horticultural program. 5:45, news. 6, child's story hour, Grace Sorenson. 6:45, Royal Fontenelle orch. 9, Auto Electric and Radio Corp. program. 10:30, Nightingale orch.
- WGST, Atlanta, Ga., 270 (E. S. T.)—7 P. M., French and Italian music, Dr. J. B. Crenshaw; Mr. S. W. Livermore, "Fiction Writers of the South."
- WOI, Ames, Iowa, 270 (C. S. T.)—9:30 A. M., weather. 12:30 P. M., chimes; weather; markets; Professor T. R. Agg, "The Highway System of the U. S." 8:15, music. 9:30, weather.
- WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M., science talk, Brother Joseph. 8:30, organ, Harry O. Nichols.
- WDAF, Kansas City, Mo., 365.6 (C. S. T.)—3:30 P. M., Star's radio trio. 5:50, marketgram, weather, time, road report. 6, school of air; piano tuning-in; Louis Mecker, "Books"; Tell-Me-a-Story Lady; Trianon ensemble. 11:45, "Merry Old Chief," Plantation Players, Eddie Kuhn's orch.; Campbell's Kans. orch.
- WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M., musical. 11, dance program.
- WWJ, Detroit, Mich., 352.7 (E. S. T.)—8 A. M., exercises. 9:30, tonight's dinner, woman's editor. 10:25, weather. 11:55, time. 12:05 P. M., Hotel Statler orch. 3, Detroit News orch. 3:50, weather. 3:55, markets. 6, concert. 8, concert.
- WBBR, New York, N. Y., 272.6 (E. S. T.)—8 P. M., Frank Wood, fustist. 8:10, vocal selections. 8:20, Sunday school lesson, Mr. S. M. Van Sipma. 8:40, vocal selections. 8:50, Frank Wood.
- WOAI, San Antonio, Tex., 394.5 (C. S. T.)—9:30 P. M., Fimmie Joy's orch.
- WCBD, Zion, Ill., 345 (C. S. T.)—8 P. M., the mixed quartet, clarinet quartet; celestial bells; Mrs. Thomas and Mrs. Larose, soprano and contralto; Mr. J. D. Thomas, barytone; Mrs. Mabel Gustafson, reader; Mr. Edwin Sach, piano.
- WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M., concert from Louisville Conservatory of Music, weather, readings, news. 4:55, markets. 5, time. 7:30, Happy Hoosier Harmonists; digest of Sunday school lesson; welfare talk; news; time.
- WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M., Home Economics program, Helen Harrington Downing; Erna Bertrams, "The Egg Season"; Mrs. Eleanor Chalmers, "Traveling Clothes." 3 P. M., Helen Harrington Downing, "Cake Baking"; Bertha Bridge, "Corsets." 7, Rainbo Garden orch.; Elsie Orr, soprano; Dorothy Egan, accompanist; Yvonne Rosenthal, pianist. 10, Rainbo Skylarks; Henri Therien and Joe Verges; Ida Shannabrock, soprano; The Giant of Radio; Ned and Ches, singers; Marie Wright, soprano. 1 A. M., Ralph Williams, Gingerman; the Little Skylarks.
- WEAF, New York, N. Y., 492 (E. S. T.)—6:45 A. M., "Health Drill," 11, "Smoked Fish," Mrs. Ada B. Vail; "Measure," by Dorothy B. Marsh; markets, weather. 4, Aurora quartet; "Current Events," Dr. William Carter; "The Billog House," Mrs. Clarence Hyde. 6, music from Hotel Waldorf-Astoria; mid-week services of N. Y. Fed. of Churches; William L. Guggolz, baritone; Columbia University, "American History"; Cushman's Serenaders; "Touring," George Elliott Cooley; Atwater Kent radio artists; Silvertown Chord orch.; Vincent Lopez orch.
- WEEL, Boston, Mass., 476 (E. S. T.)—6:45 A. M., exercises. 2 P. M., West End orch. 3:15, Fed. of Churches program. 6:30, Big Brother Brother Club. 7:15, historical talk. 7:35 Neapolitan male quartet. 8:30, "Breck's Garden Talk." 8:50, U. S. Army band. 9:30, Howes Valetaria. 10, organ.
- WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M., time. 9:35, quotations. 10, quotations, Liverpool cable. 11, quotations, weather, market. 11:30, quotations. 11:56, time. 12 M., quotations. 12:10 P. M., quotations. 12:30, quotations. 12:40, Drake concert ensemble and Blackstone string quintet. 1, quotations. 1:25, quotations. 2:30, Lyon and Healy concert hall. 3, fiction, humor, verse and topical entertainment. 5, quotations. 5:30, Skeezix time. 5:57, time. 6, organ, Stanley Seder. 6:30, Drake concert ensemble and Blackstone string quintet. 8, vocal and instrumental music. 10, The Drake Hotel orch.
- WGR, Buffalo, N. Y., 319 (E. S. T.)—8 P. M., Atwater Kent radio artists; Silvertown orch.
- WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercises. 10:45, weather and business reports. 11:55, time. 12:15 P. M., piano, by Elmer Behne; health talk, Dr. Carl A. Wilzbach. 1:30, business reports. 3, market reports. 4, French lesson; recital by Adelaide Apfel. 6, cen-

## Wednesday, April 15

- WEMC, Berrien Springs, Mich., 286 (E. S. T.)—8:15 P. M., Chameleon string trio; bird chat, Miss Mary Lamson.
- WEAO, Columbus, Ohio, 293.9 (C. S. T.)—8 P. M., "Psychology of Industry," A. Lee Henderson; University Men's Glee Club.
- WOI, Ames, Iowa, 270 (C. S. T.)—9:30 A. M., weather. 12:30 P. M., chimes; weather; markets; Professor T. H. Agg, "Highway Systems in Little Known Countries." 9:30, weather.
- WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M., concert from Louisville Conservatory of Music, organ, police bulletins, weather, readings, news. 4:55, markets. 5, time. 7:30, Kentucky Ramblers, news, time.
- WHBF, Rock Island, Ill., 222 (C. S. T.)—7:30 P. M., songs and orch.
- WOS, Jefferson City, Mo., 440.9 (C. S. T.)—8 P. M., "Ditching with Explosives," A. J. McAdams, "For a Greater Missouri," George A. Dickens; Joe Bowers String band.
- WDAF, Kansas City, Mo., 365.6 (C. S. T.)—

cert. 6:45, market reports; Secretary Hawkins. 10, Civil Service talk. 10:03, concert.

**WBZ, New England, 333.3 (E. S. T.)—11:55 A. M.**, time, weather, markets. 6 P. M., Westinghouse Philharmonic trio. 7, markets. 7:05, bedtime story. 7:15, New England Homestead letter; "At the Theatres," A. L. S. Wood. 7:30, "Serviceable Memory Training," Prof. Glenn Newton Merry. 8, Ruth Lloyd Kinney, mezzo-contralto; Esther Marvin Cutchin, pianist. 8:15, "Marathon Race," George V. Brown. 8:30, McEnelly's singing orch. 8:45, Ruth Lloyd Kinney, mezzo-contralto, accompanied by Esther Marvin Cutchin. 9, N. E. Staff Band of Salvation Army. 9:55, time, weather. 10:05, Westinghouse Philharmonic trio. 10:15, synopsis from "The Duchess of Broadway." 11, Ramsay's Radio four. 11:45, Hotel Brunswick orch.

**WMAQ, Chicago, Ill., 447.5 (C. S. T.)—1 P. M.**, Radio Farm School, "Legume Day." 4, household hour, Mrs. Elizabeth O. Hiller. 4:30, Illinois Fed. of Women's Clubs. 6, organ. 6:25, Hotel LaSalle orch. 6:50, "Daddy." 8, garden talk, James H. Burdett. 8:15, Boy Scouts' hour. 8:50, lecture. 9:15, Ella Spravka, pianist; Bozo Oumiroff, baritone.

**KFMQ, Fayetteville, Ark., 299.8 (E. S. T.)—7:30 P. M.**, mosquito, H. S. Warren; pasteurization of dairy products, W. C. Wilbanks; real estate, A. W. Jamison.

**KPO, San Francisco, Cal., 429.5 (P. S. T.)—7 A. M.**, daily dozen. 10:30, the local theatres. 12 M., time; scripture reading. 1 P. M., Fairmont Hotel orch. 4:30, Fairmont Hotel orch. 5:30, book of knowledge, Big Brother. 6:30, States Restaurant orch. 7:30, Fairmont Hotel orch. 8, Theodore J. Irwin, organist; Velma Cudworth, soprano. 9, Hazel Johnson, soprano. 10, Johnny Buick's Amphians.

**KOA, Denver, Col., 323 (M. T.)—12:20 P. M.**, organ. 1, stocks; weather. 3, matinee. 6, stocks; news.

**KGO, Oakland, Cal., 361.2 (P. S. T.)—10:40 A. M.**, classroom instruction. 11:30 concert. 1:30 P. M., stocks, weather. 4, orch. of Hotel St. Francis. 6:45, stocks, weather, news. 7:15, golf jesson, Joe Novak. 8, "The Man on the Box," a comedy, the KGO players. 10, Halstead's orch. **KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M.**, news. 5:30, Examiner program. 6:45, radiatorial Y. M. C. A. speaker. 7, Polar Bear orch. 7:30, Irma DeHarty, female, baritone; Ed. Rufner, baritone; Florence Rogers, pianiste. 8, Standard Oil Co. play. 9, Colombian trio. 10, Examiner program.

**KNX, Los Angeles, Cal., 337 (P. S. T.)—4 P. M.**, Estelle Lawton Lindsay's travel talk. 6:30, dinner program. 7:30, business talk, J. R. Douglas. 8, Peerless Products Co. program. 10, Coconut Grove orch. 11, Campus Night, students of U. of C.

**KGW, Portland, Ore., 491.5 (P. S. T.)—11:30 A. M.**, weather. 12:30 P. M., Rose City trio. 5, children's program. 7:15, market, weather, news, police reports. 8, concert. 10, Multnomah Hotel Strollers.

**KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M.**, markets, weather, orch. 8:30, Eastman Hotel orch. 9:15, organ, Lawson Reid. 10, New Arlington Hotel orch.

**KFRC, San Francisco, Calif., 268 (P. S. T.)—8 P. M.**, police broadcast. 8:03, Paul Kelli's orch.; David Zimet, pianist.

**KSAC, Manhattan, Kans., 341 (C. S. T.)—9 A. M.**, exercises of rural schools. 12:35 P. M., reading, weather; Common Drainage Problems, Claude K. Shedd; question box; Plant Diseases, Donald R. Porter. 7:20, music, L. R. Putnam. 7:30, selection of pictures, Araminta Holman. 7:40, music, L. R. Putnam. 7:50, Malnourished Mary, Pearle E. Ruby. 8, Farm Bureau Women's Meeting.

**CKAC, Montreal, Que., 411 (E. S. T.)—4 P. M.**, weather, stocks. 4:45, Leonard's Red Jackets. 8:30, Canadian National Railways.

**CNRM, Montreal, Que., 411 (E. S. T.)—8:30 P. M.**, Orpheus male quartet; Tenor, Mr. J. Stewart; banjo trio; baritone, Mr. Bert Savage; Hawaiian guitar, Mr. J. T. Livingstone; soprano, "Smile of Spring," Miss Kathleen Fox; Tenor, Mr. Jno. Harris; banjo trio; bass baritone, Mr. Lewts Gould.

**CNRW, Winnipeg, Man., 384.4 (C. S. T.)—8 P. M.**, market. 8:15, bedtime tale. 8:30, Imperial Veterans' Band, march, "Trus and Trusty." 10 Frank Wright's orch.

**CNRC, Calgary, Alta., 430 (M. T.)—7 P. M.**, bedtime tale, Mrs. Conquest. 9, The Excelsior Entertainers."

**Friday, April 17**

**WOAW, Omaha, Neb., 562 (C. S. T.)—4 P. M.**, matinee program. 5:45, news. 6, story hour, Doris Claire Secord. 6:30, Harry Brader, violinist; Frank Strawn, pianist. 7:15, sports, Ivan L. Gaddis. 9, "Burlington Route," Dr. G. E. Condra. 10:30, Robison orch.

**WEMC, Berrien Springs, Mich., 286 (E. S. T.)—9 P. M.**, radio lighthouse choir, Mr. Cecil Woods, baritone; Miss Mary Lamson, reader; Miss Martha Hutchinson, soprano; Bible chat, Mr. Orville Dunn.

**WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M.**, radio talk. 8:30, Britling's Cafeteria orch. 11, midnight frolic

**WOL, Ames, Iowa, 276 (C. S. T.)—9:30 A. M.**, weather. 12:30 P. M., college; weather; markets; Professor T. R. Agg, "Highways of Tomorrow." 9:30, weather.

**WOS, Jefferson City, Mo., 440.9 (C. S. T.)—8 P. M.**, "Homing Pigeons," Frank H. Hollman; "Corn Growing in Missouri," Samuel M. Jordan; original poems, LeRoy H. Kelsey; music.

At Station  
**WHN**  
with Irving Hoffman  
Radio World Cartoonist



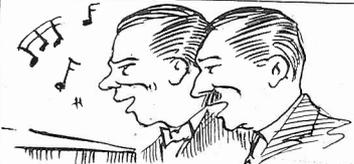
**NILES T. GRANLUND (NTG). HE IS ONE OF THE MOST POPULAR RADIO ANNOUNCERS.**



**PERRY C. PAPA, STUDIO MANAGER, AND EVERETT BROWN, ANNOUNCER.**



**VIOLET AND DAISY HILTON, THE SIAMESE TWINS, BORN JOINED TOGETHER. A BIG HIT!!**



**BERNARD GROSSMAN AND JACK STANLEY POPULAR SONG WRITERS.**



**MISS EVELYN SCHLINGER, SONGSTER.**



**JOE DAVEY, HIS PIANO SONGS SCORE.**



**MARIAN MORGAN, BEAUTIFUL PRIMA DONNA.**



**RAY TRAVNOR, ACCOMPANIST.**

**WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M.**, concert from Louisville Conservatory of Music, organ, police bulletins, weather, readings, news. 4:55, markets. 5, time. 7:30, Original Kentucky Night Owls; tenor solo, William Rinehart, accompanied by Mrs. Fred Brockman; news, time.

**WWJ, Detroit, Mich., 352.7 (E. S. T.)—8 A. M.**, exercises. 9:30, tonight's dinner, woman's editor. 10:25, weather. 11:55, time. 12 M., Good Friday services. 3, Detroit News orch. 3:50, weather. 3:55, markets. 6, concert. 8, Fox Brothers orch. 9, Goldkette's Victor Recording orch.

**WDAF, Kansas City, Mo., 365.6 (C. S. T.)—3:30 P. M.**, Star's radio trio. 5:50, marketgram, weather, time, road report. 6, school of the air, piano tuning-in number, Tell-Me-a-Story Lady, Trioan ensemble. 8, popular program. 11:45, "Merry Old Chief," Plantation Players.

**WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M.**, Hapac Grotto quartet; Veda Phillips pianist. 11, dance program.

**WEAF, New York, N. Y., 492 (E. S. T.)—6:45 A. M.**, "Health Drill." 11, Milton Katz, pianist; "Outdoor Talk"; markets, weather. 4 P. M., Irving Listengart, violinist; talk to children. 6, music from Hotel Waldorf-Astoria; Aline Hurrell, soprano; Premier Male quartet; "Sir Hobboglin"; Blanche Elizabeth Wade; "The Happiness Candy Boys"; Spear & Co. entertainers; Lido Venice orch.

**WOJ, Chicago, Ill., 448 (C. S. T.)—11 A. M.**, Fred Mann's menu. 3 P. M., Josephine Naylor, "A Cotton Wedding Anniversary"; Wynne Ferguson, "Bridge Lessons"; Mrs. Harry T. Sanger, "Hawaiian Islands." 7, Rainbo Garden orch.; Henrietta Nolan, violinist; Otis Pike Jester, soprano; Mary Thrash House, pianist. 10, Rainbo Skylarks; Larry Brundage, Harry Kraemer, harmony singers; West Brothers, Hawaiian steel guitar; Ziegler Sisters; Nate Caldwell, pianologue; Lauretta Giles, soprano. 1 A. M., Ralph Williams, Gengerman, the Little Skylarks.

**WEEI, Boston, Mass., 476 (E. S. T.)—6:45 A. M.**, exercises. 1 P. M., luncheon, Boston Chamber of Commerce. 3:15, Noah's Arkadians. 6:30, Big Brother Club. 7:15, Cuffe entertainers. 7:45, historical talk. 7:55, news flashes. 8, musicale. 8:30, musicale. 9, Atwater-Kent Artists. 10, Silvertown orch.

**WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M.**, time. 9:35, quotations. 10, quotations. 11, quotations, weather, market. 11:30, quotations. 11:56, time. 12 M., quotations. 12:10 P. M., quotations. 12:30, quotations. 12:40, Drake concert ensemble, Blackstone string quintet. 1, quotations. 1:25, quotations. 2:30, Lyon and Healy concert 1:11. 3, Rocking Chair Time. 5, quotations. 5:30, Skeezix Time for Children. 5:57, time. 6, organ, Edwin Stanley Seder. 6:30, Drake concert ensemble, Blackstone string quintet. 8, classic hour. 10, Drake hotel orch.

**WMAQ, Chicago, Ill., 447.5 (C. S. T.)—12:25 P. M.**, Y. M. C. A. forum. 1, Radio Farm School, "Special Farm Service Day." 4, fashions, Jean Mowat. 4:30, pupils of Bush conservatory. 6, organ. 6:30, Hotel LaSalle orch. 6:50, Family Altar league. 8, weekly Wide-Awake club. 8:30, musical geography, Mr. and Mrs. Marx E. Oberndorfer. 9, Edward G. Taylor. 9:15, Mae Graves Atkins program.

**WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 A. M.**, cooking school, Betty Crocker. 6:30 P. M., Buffalo Trust hour. 8, "Madame Butterfly." 9, Woodside male chorus. 10, recital, Muriel Frankenstein. 10:30, Jack Little and Paul Small, record artists.

**WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M.**, weather and business reports. 11:55, time. 12:15 P. M., dance by the Ahaus orch. 1:30, business reports and stock quotations.

**WBZ, New England, 333.3 (E. S. T.)—11:55 A. M.**, time, weather, markets. 7 P. M., markets. 7:05, bedtime story.

**WAHG, Long Island, N. Y., 316 (E. S. T.)—11:55 A. M.**, time, weather. 12:05 P. M., Brooklyn Fed. of Churches. 8, Irving Firstenberg, pianist. 8:15, Morningside string quartet. 8:35, Genevieve Williams, soprano. 8:50, M. Lambert, cellist. 9:20, Genevieve Williams, soprano. 9:30, Sterling male quartet. 9:40, Morningside string quartet. 9:55, time, weather. 10:05, Wm. F. Diehl, radio engineer. 10:20, Sterling male quartet. 10:30, Ascutto Brothers orch.

**KSAC, Manhattan, Kans., 341 (C. S. T.)—9 A. M.**, exercises of rural schols. 12:35 P. M., reading, weather; Planting Soybeans, L. E. Willoughby; question box; Worms in Young Chicks, D. J. Taylor. 7:20, Radio College quartet. 7:30, Soil Bacteria and Plant Food, P. L. Gimes. 7:40, Radio College quartet. 7:50, Birds Value to Agriculture, J. A. Ackert.

**KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—8:30 P. M.**, Fischer trio. 9, New Arlington Hotel orch. 10, Jack O'Lantern orch.

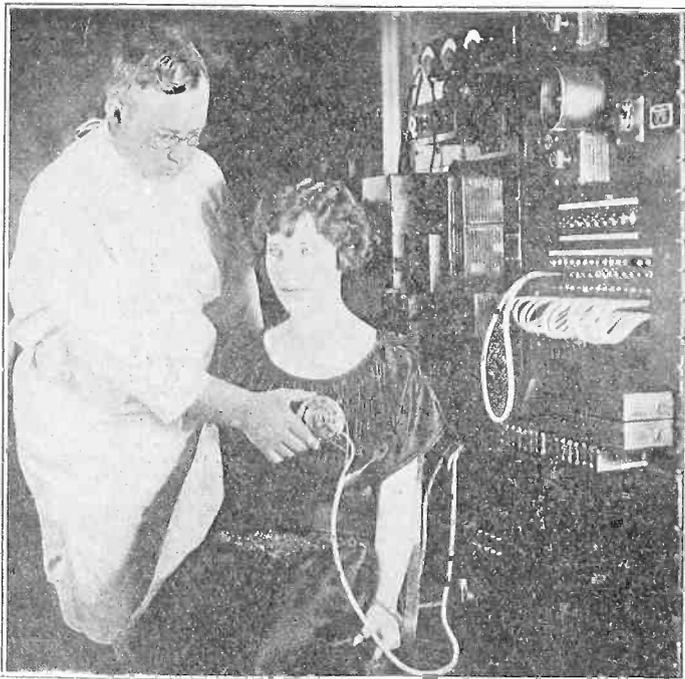
**KFRC, San Francisco, Calif., 268 (P. S. T.)—6 P. M.**, Hotel Whitcomb orch. 6:30, Bem's Hotel Whitcomb Little Symphony. 8, Symphony, Hotel Whitcomb. 9, one act play, Theatre Arts Club; Emile H. Ravegno, baritone; Gladys Boys, pianist; Bernadette Austin, pianist. 10, Paul Kelli's orch.; Paul Nelson, pianist.

**KGW, Portland, Ore., 491.5 (P. S. T.)—11:30 A. M.**, weather. 12:30 P. M., Rose City trio. 5, children's program. 6, concert. 7:15, market, weather, news, police reports. 8, lecture, University of Oregon. 10:30, Hoot Owls.

**KGO, Oakland, Cal., 361.2 (P. C. T.)—11:10 A. M.**, homemaking talk, Prudence Penny. 11:30, concert. 1:30 P. M., stocks, weather. 3, music, speaker. 4, orch. of Hotel St. Francis. 5:30, girls' half hour, Esther Wood Schneider. 6:45, stocks, weather, news.

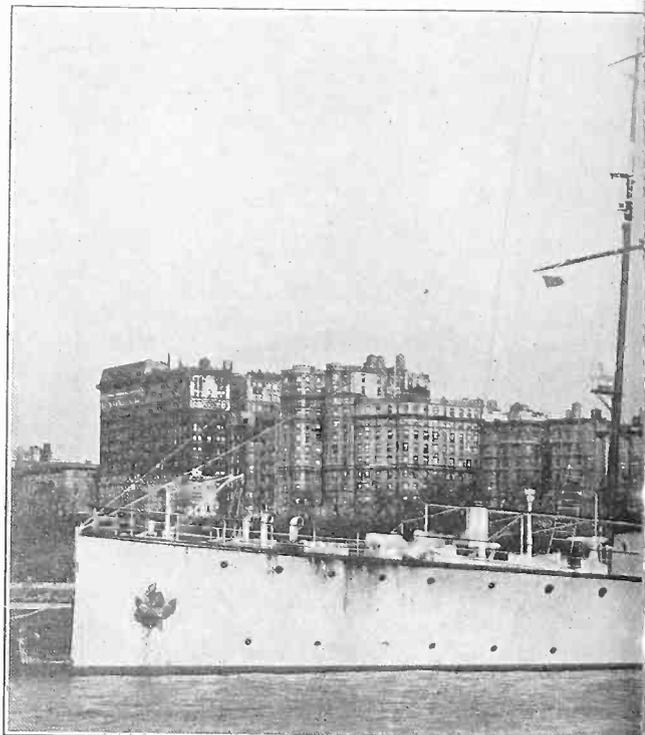
(Concluded on page 26)

## Heartbeats on Air

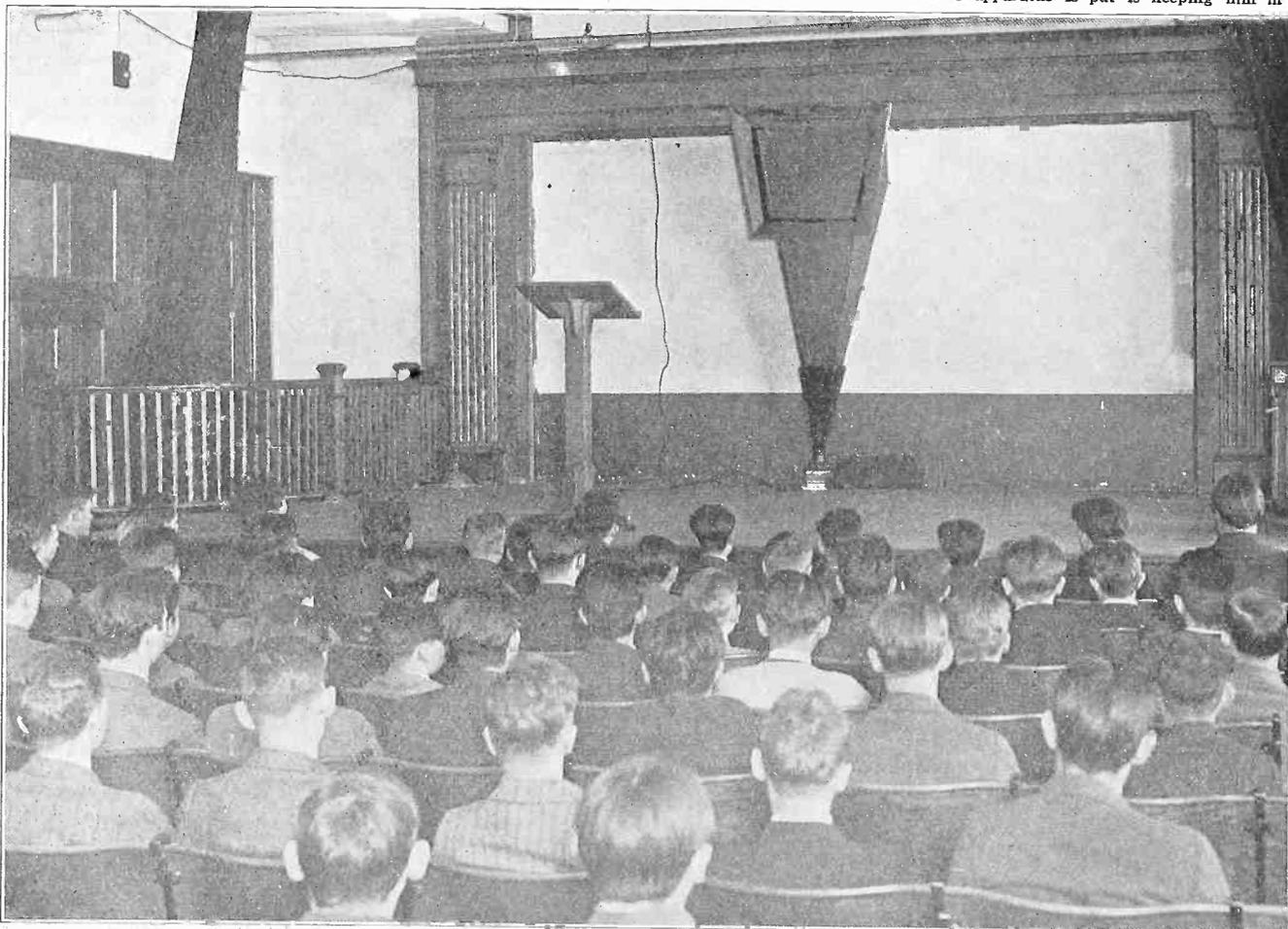


THROUGH station KFI, Los Angeles, heartbeats have been successfully broadcast, a specially constructed microphone being employed. Dr. Robert M. Dunsmoor, assistant police surgeon, is shown testing the heartbeats of Miss Betty Holmes. This experiment has aroused much interest in medical circles and leading practitioners have expressed the opinion that various ailments affecting the heart may soon be diagnosed over the radio. This presages the saving of many lives on such vessels and aircraft that do not carry a physician aboard. (International Newsreel).

## Wm. K. Vanderbilt's



WM. K. VANDERBILT'S \$3,000,000 yacht, Ara, has the largest and most almost identical with that of the ocean liner, Majestic. It consists of a for both long and short wavelengths. And in addition there are a 1500 and to which Mr. Vanderbilt's apparatus is put is keeping him in touch.



THE STUDENTS of Brooklyn Technical High School listen in at assembly to the music and lectures from a huge loud speaker which they constructed by themselves, under the supervision of their instructors. The loudspeaker, which is eight and a half feet long, is connected to an 8-tube Super-Heterodyne. (Kadel & Herbert).



## 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.  
Trade Service Editor,  
Radio World,  
1493 Broadway, New York City.  
I desire to receive radio literature.  
Name .....  
City or town.....  
State.....  
Are you a dealer?.....  
If not who is your dealer?  
His Name.....  
His Address.....

- H. A. Kuckny, dealer, Haddam, Kans.  
Dietrich & McReynolds, dealers, Wyconda, Mo.  
Dimmitt Drug Co., dealers, Dimmitt, Tex.  
Lewis Malin, 350 25th Ave., Seattle, Wash.  
Wilson Steel Products Co., 4840 South Western Ave., Chicago, Ill.  
Lawrence A. Shinn, dealer, 2529 Seybert St., Philadelphia, Pa.  
O. E. Vestal, Jr., 1526 South Negley Ave., Pittsburgh, Pa.  
Forbes & Murray Electric Co., dealers, 5853 Forbes St., Pittsburgh, Pa.  
Albert L. Fisk, dealer, Valley, Wash.  
Robert Schaver, 98 Maple St., Lyons, N. Y.  
James Whaley, dealer, Nashville, Tenn.  
S. Szurek, 2412 Casmere St., Hamtramck, Mich.  
P. Olewinski, 11690 Klinger St., Hamtramck, Mich.  
L. Michaleski, 2302 Berger St., Hamtramck, Mich.  
W. Balcer, 11400 St. Aubin, Hamtramck, Mich.  
J. Rozanski, 11690 Klinger St., Hamtramck, Mich.  
S. Chmielewski, 11726 Moran St., Hamtramck, Mich.  
Lee Sherman, R. F. D. No. 1, Jakin, Ga.  
Ed. Roach, 20 Dashwood St., Oak Island, Revere, Mass.  
J. J. Richardson, 549 North St., Sausalito, Cal.  
Bernard S. Werner, 214 Audubon Ave., New York City.  
Abelowitz Phonograph Co., dealers, 1353 St. Nicholas Ave., N. Y. C.  
M. L. Brown, dealer, Box 47, Largo, Fla.  
S. C. Smith, 2613 Jeffries Ave., Los Angeles, Cal.  
E. E. Tompkins, dealer, 2635 Dayton Ave., Los Angeles, Cal.  
R. J. Simota, R. 3, Redford, Mich.  
Bermie Rudner, 15 Widman St., Rochester, N. Y.  
Walter E. Bateman, Bellmore, L. I., N. Y.  
W. J. Edmond, Jr., Whitehall, N. Y.  
B. Goodboud, dealer, Whitehall, N. Y.  
George E. Edmonds, dealer, Ridgefield, Wash.  
H. E. Enders, P. O. Box 220, Viroqua, Wis.  
G. McLennan, Kitchener, Ont.  
G. W. Webster, Northfield, Vt.  
O. J. Lewis, 290 W. 147th St., New York, N. Y.  
L. A. Smith, dealer, 137 W. 149th St., New York, N. Y.  
Edward Wiebe, 110 Catherine St., Elizabeth, N. J.  
Paul W. Saddler, Hattiesburg, Miss.

## INFALLIBLE HANDY RADIO LOG

THE Aston Card Index put out by S. T. Aston & Son, 114 Worth Street, New York City, is the latest aid to efficient radio enjoyment, enabling the user to record all stations received and to keep the records at his fingertips, stations and all information found instantly. It is a card index system, consisting of mahogany or oak finish cabinet of the highest quality together with a set of index dividers and 100 index cards with dials printed thereon to match those on the set, and spaces for all necessary information. The cards may be used by Neutrodyne owners, as well as possessors of all types of tuned radio-frequency sets, Atwater-Kent, Ambassador, Super-Heterodyne and Radiolas. The cards may be had printed to suit any special panel arrangement at the same price

## New Corporations

Mastercraft Radio Manufacturing Corp., \$20,000; A. Levine, A. Dick, C. W. Halpern. (Atty. J. C. Ranzenhofer, 51 Chambers St., New York City).  
Radio Service Corp. of New York; Wilmington, Del., parts, \$50,000. (Colonial Charter Co.).  
Mandel Talking Machine & Radio Co., \$50,000.  
J. Frost, D. Rubin, A. Bader. (Atty. Weinberg & Oltarsch, 158 Rivington St., New York City).  
Duo-Tone Radio Corp., Camden, N. J., supplies, \$50,000; Louis G. Larsen, Jersey City; Samuel Clare, Isadore Kolker, Newark. (Atty., Hood, Lafferty & Campbell, Newark.)

A \$5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD, 1493 Broadway.

# THE RADIO TRADE

## World Survey of the Demand for Receivers

WASHINGTON.

**F**OLLOWING is a survey of radio conditions in Europe and Canada, made by the Department of Commerce:

**Azores:** There is no local broadcasting and consequently only a few sets in operation.

**Belgium:** Considerable interest in radio, with thousands of sets, around one-fourth of which are American, in use. A few local stations.

**Bulgaria:** Importation, sale and use of radio receiving or broadcasting apparatus prohibited by the Government.

**Czecho-Slovakia:** Radio very popular, but restricted to wealthier class. Import license required for importation of sets, which costs five per cent. of invoice value.

**France:** Many sets in operation and this country presents a good market for radio apparatus of lower prices. A receiving set with a long radio is not generally required because of the abundance of broadcasting stations in this part of Europe.

**Germany:** Many sets in operation, mostly of local manufacture.

**Great Britain:** It is estimated there are 1,200,000 sets in operation in this country.

**Greece:** Little interest displayed in radio and government does not permit broadcasting.

**Ireland:** Radio ban lifted about a year ago and there is considerable interest in radio.

**Ireland:** Radio ban lifted about a year ago and there is considerable interest in radio.

**Netherlands:** Considerable market for radio parts of American, English, French and German manufacture.

**Norway:** First broadcasting station opened December 15, 1924, with resulting keen interest. Opening of station expected to increase market for American sets.

**Poland:** This market largely dominated by French, English and German radio manufacturers.

**Rumania:** Broadcasting is prohibited in Rumania.

**Spain:** English sets are in general use, and although there is also a sale for French receivers, those of American manufacture have not as yet met with any success.

**Sweden:** Market for radio equipment very active and should increase in near future.

**Yugo-Slavia:** Use of receiving sets permitted only to subjects and members of diplomatic and consular corps. Very little interest in radio.

**Canada:** Widespread interest in radio steadily increasing. American exports to this country during 1924 more than tripled those of previous year.

## Coming Events

[Readers are requested to send in dates and places of future events not scheduled in this department.]

**APRIL 18 TO 25**—Minneapolis-St. Paul National Radio Exp., Overland Bldg., Write, N. R. E., 1030 Marshall St., N. E., Minneapolis, Minn.

**APRIL 19 TO 23**—International Radio Exp., Steel Pier, Atlantic City, N. J. Write Long Amusement Co., Atlantic City, N. J.

**APRIL 21 TO 28**—Toledo, O., Radio Show.

**AUG. 22 TO 28**—3d Annual Pacific Radio Exposition, Civic Auditorium, San Francisco. Write P. R. E., 905 Mission St., San Francisco.

**SEPT. 6 TO 12**—National Radio Exposition, Grand Central Palace, N. Y. C. Write American Radio Exp. Co., 522 Fifth Ave., N. Y. C.

**SEPT. 14 TO 19**—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Road and Jerome Ave., N. Y. C. Write Radio World's Fair, Times Bldg., N. Y. C.

**SEPT. 14 TO 19**—Pittsburgh Radio Show, Motor Square Garden. Write J. A. Simpson, 420 Bessemer Bldg., Pittsburgh, Pa.

**SEPT. 15 TO 19**—Washington Radio Show. Write Chamber of Commerce, Homer Bldg., Washington, D. C.

**SEPT. 23 TO OCT. 4**—International Wireless Exp., Geneva, Switzerland.

**SEPT. 23 TO OCT. 3**—National Radio Exposition, American Exp. Palace, Chicago. Write N. R. E., 440 S. Dearborn St., Chicago, Ill.

**OCT. 12 TO 17**—St. Louis Radio Show, Coliseum. Write Radio Trades Assn., T. P. Convey, Mgr.

**OCT. 17 TO 24**—Brooklyn Radio Show, 23d Regt. Armory. Write Jos. O'Malley, 1157 Atlantic Ave., Brooklyn, N. Y.

**OCT. 19 TO 25**—Second Annual Cincinnati Radio Exp., Music Hall. Write G. B. Bodenhoff, care Cincinnati Enquirer.

**NOV. 19 TO 15**—Milwaukee Radio Exp., Civic Auditorium. Write Sidney Neu, of J. Andrae & Sons, Milwaukee, Wis.

**NOV. 17 TO 22**—4th Annual Chicago Radio Exp., Coliseum. Write Herrmann & Kerr, Cort Theatre Bldg., Chicago, Ill.

**DEC. 1 TO 6**—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

## New Broadcasters

WASHINGTON.

**S**EVEN new class A stations were licensed by the Department of Commerce during the past week, while two stations were transferred from class "A" to "B," and one station from class "C" to "B." The new stations follow:

Call	Stations	Meters	Watts
WHBU	B. L. Bing's Sons, 1002 Meridian St., Anderson, Ind.	218.8	10
WIBA	The Capital Times Studio, 237 West Gilman St., Madison, Wis.	236	100
WTHS	Flint Senior High School, Crapo St., Flint, Mich.	218.8	250
WHBW	D. R. Kienzie, 4916 Chestnut St., Philadelphia, Pa.	215.7	100
WADC	Allen T. Simmons, (Allen Theatre), Portage Hotel, Akron, O.	258	100
WHBT	Thos. W. Tizzard, Jr., 352 N. Prince Ave., Downers Grove, Ill.	206.8	10
KFVH	Whan Radio Shop (Herbert Whan), 221 Poyntz St., Manhattan, Kan.	218.8	10
<b>TRANSFERS FROM CLASS A TO CLASS B</b>			
KSL	Radio Service Corp. of Utah, 7 N. West Temple, Salt Lake City, Utah	299.8	1000
KJS	Bible Institute of Los Angeles, 536 S. Hope St., Los Angeles, Cal.	293.9	750
<b>TRANSFER FROM CLASS C TO CLASS B</b>			
KTW	First Presbyterian Church, 7th Ave. & Spring St., Seattle, Wash.	454.3	750

[The complete list of broadcasting stations in the United States was published in the April 4 issue of RADIO WORLD, corrected and revised. The above is supplemental thereto. A good plan is to cut out the above, cross out the station on the April 4 list if the above changes it and paste the above and subsequent additions, deletions, etc., on the last page of the April 4 issue. The line through the amended station will automatically refer you to a pasted-up clipping.]

## Business Opportunities Radio and Electrical

Rates: 50c a line; Minimum, 2 lines.

**FOR SALE**—Established retail radio store in a large western city. Excellent location, good business; owners interested in other business. Box 199, Radio World.

**RADIO CHAIN STORE** proposition offers exceptionally profitable investment and official connection to one or two men with \$5,000 to \$15,000; particulars personal interview only; give phone number. Box 111, Radio World.

**RADIO PRODUCTION MAN**—An established manufacturer of radio receivers with complete factory and good sales needs a man thoroughly experienced in the technical and production branch of the radio industry to handle that end of his business; for the right man there is an interesting proposition that will enable him to secure a liberal share of the business at an attractive price. Box 222, Radio World.

**BIG MONEY** Selling Radio Log Books and Complete Station Directories; guaranteed correct; in thousand lots to dealers, jobbers, mfrs., etc. Full proposition and samples, 16c coin or 18c stamps. State territory wanted. Radio Press, 1426 W. 3rd Street, Cleveland, Ohio.

**A MANUFACTURING SERVICE**—A large plate metal and machine shop located on tidewater in the New York metropolitan district desires to take on the manufacture of specialties where high class workmanship is required and where a highly functioning engineering department is capable of assisting in the development and perfection of such specialty. Box 333, Radio World.

# THE RADIO UNIVERSITY

A QUESTION and Answer Department conducted by RADIO WORLD for its Readers by its Staff of Experts. Address Letters to The Radio University, RADIO WORLD, 1493 Broadway, New York City.

**WHAT** can I do to get my Benson Super-Heterodyne to oscillate? Also how can I increase its selectivity?—Henry P. Goulston, 145 W. 45th St., New York City.

Try shifting of tubes, putting each in turn in the oscillator socket. The best oscillator should be left in the socket and a negative bias applied to the grid of the oscillator by connecting the grid return of the oscillator to C battery minus (Fig. 128). Another method is to increase the feedback from the plate to the grid circuit. Winding ten more turns on the plate coil of the oscillator. To increase selectivity incorporate a filter in the set. This filter is to take the place of the first intermediate or radio-frequency transformer. Its construction is diagrammed in Fig. 128 (lower). For the secondary of the filter use a 75-turn honeycomb or duolateral coil while next to it is tied a 35-turn coil (primary). The Trouble-shooting article was published in last week's issue, April 4.

**WHEN** circuits specify a .0005 or 23-plate condenser, can a .001 be used if more turns are added to the coil? (2) Please give number of turns on coil L2 in A \$30 1-Tube Set That Gets DX Clearly, issue of Jan. 24. (3) Is this set as selective as the \$25 1-Tube DX Circuit, issue of Jan. 17?—R. L. Ellerby, Burlington, Ont.

No. Turns must be taken off the coil. (2) 50. (3) Yes.

**SHOULD** the coils in the Magnadyne circuit be placed at any particular angle?—Carl W. Lofgren, Cambridge, Mass.

They may be mounted at 53.7 degrees.

**CONSIDERING** first and above all tone quality, second DX, third selectivity and fourth sensitivity, which set will give the better results, the Super-Heterodyne or the Neurodyne?—E. M. Lopez, P. O. Box 587, Providence, R. I.

It depends on the way the set is made. The Second Harmonic Super-Heterodyne fulfills all requirements. So do some Neurodynes.

**IN** "The Three Circuit Tuner You Can Log" (issue of Nov. 8), when Herman Bernard specifies 5" diameter for the coils, does he mean that the form should have this diameter or the finished coil?—Henry Peterson, R. F. D. No. 2, Charlottesville, Va.

The outside diameter of the form.

**I HAVE** a single-circuit regenerative set employing a 23-plate variable condenser. All the stations come in between 0 to 40 on the dial. What can I do so as to tune over the entire dial?—Marshall Closs, Nunda, N. Y.

Decrease number of coils in the secondary.

**MY** Sodian tube lights fine, but will not work in a circuit which works with other tubes. Can you tell me what is wrong?—John Kopchak, R. F. D. No. 1, Perry, Ohio.

Put your rheostat in the negative lead and use one of about 15 ohms resistance. Use the Sodian only as a detector.

**CAN** the Sodian tube be used in the Neurodyne circuit?—Al Peterson, Leonard, N. D.

Yes; as the detector. The Sodian is not an amplifier.

**I WOULD LIKE** to have a radio set, very selective, good volume, and great DX. What will fill the bill? (2) Does it howl or squeal? (3) Can you use a C battery?—George A. Meister, Rural Route 11, Chambersburg, Pa.

The Diamond of the Air fills the bill. (2) Not when properly tuned. (3) Yes.

**I NEED** a 200 and 400-ohm potentiometer. Can I use two 30-ohm rheostats in their place? (2) Last night sparks commenced to pop from my variable condenser. I disconnected the B battery but the sparks continued. When I disconnected the aerial they ceased. Fred Cushman, 268 W. 131st St., New York City.

No. (2) The sparks were due to static, the stray electricity of the air.

**WHAT** is the most desirable B battery voltage to use in an audio amplifier?—Ed. Luck, Tulsa, Okla.

From 45 to 90 volts and 100 volts if a C battery is employed. The greater the B battery voltage on the audio amplifier, up to the saturation point, the more effective the amplification

**WHAT** can I do to make my Anderson 4-tube set more selective?—J. J. Cardoza, 2506 67th Ave., Oakland, Calif.

Decrease the primary five turns. Be sure you followed Anderson's directions. The set is very selective.

**MY** new Radio World DX Wonder is all you claim it and lots more. However, I cannot get high wavelengths. How can I remedy this?—Dr. L. Chapman, Hibbing, Minn.

Increase your aerial length, or your secondary five turns.

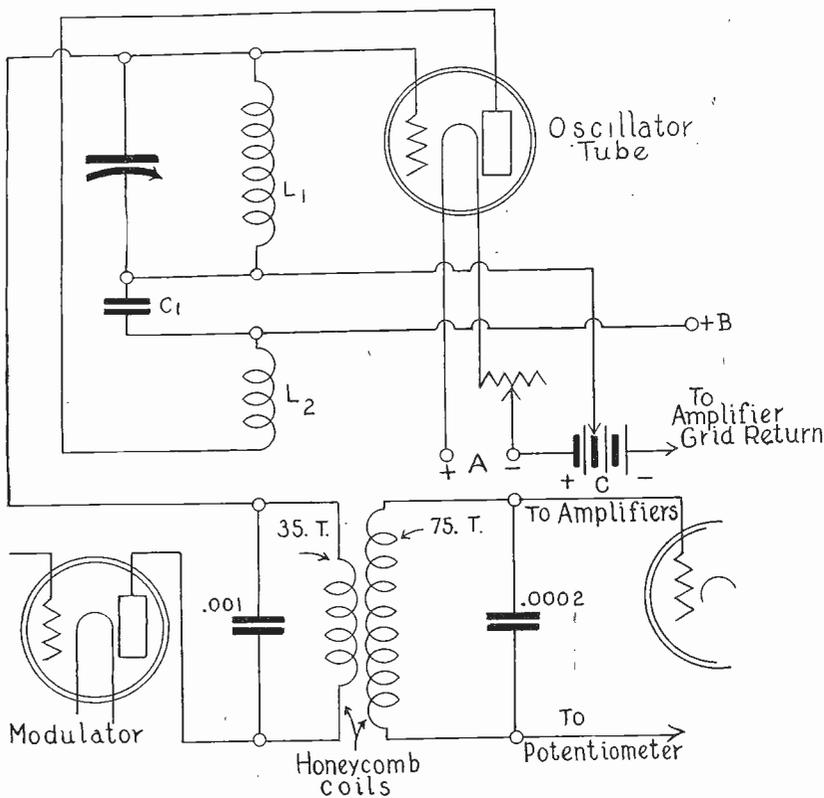


FIG. 128 (top), grid return of Benson's Super-Heterodyne oscillator to C minus, with a filter circuit included. Lower, detail of filter construction.

## Join RADIO WORLD'S University Club

and we will enter your name on our subscription and University lists by special number. Put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put it in your queries and the questions will be answered the same days as received.

And Get Free Question and Answer Service for the Coming 52 Weeks.

RADIO WORLD, 1493 Broadway, New York City:

Enclosed find \$6.00 for RADIO WORLD for one year (52 Nos.) and also consider this an application to join RADIO WORLD'S University Club, which gives me free information in your Radio University Department for the coming year, and a number indicating my membership.

Name .....

Street .....

City and State.....

# RADIO WORLD

# 1925 Popularity Test Under Way

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

TELEPHONES: LACKAWANNA 6976 and 2063

PUBLISHED EVERY WEDNESDAY

(Dated Saturday of same week)

FROM PUBLICATION OFFICE

HENNESSY RADIO PUBLICATIONS CORPORATION

ROLAND BURKE HENNESSY, President

M. B. HENNESSY, Vice-President

FRED S. CLARK, Secretary and Manager

1493 BROADWAY, NEW YORK, N. Y.

(Putnam Bldg., Times Square and 43rd Street)

European Representatives: The International News Co.,

Breains Bldgs., Chancery Lane, London, Eng., Paris,

France, Brentano's 38 Avenue de l'Opera.

EDITOR, Roland Burke Hennessy

MANAGING EDITOR, Herman Bernard

### SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months. Add \$1.00 a year extra for foreign postage—Canada, 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address also. State whether subscription is new or a renewal.

### ADVERTISING RATES

#### General Advertising

1 Page, 7 1/4"x11"	462 lines	\$300.00
1/2 Page, 7 1/4"x5 1/2"	221 lines	150.00
1/4 Page, 4 1/2"x7"	115 lines	75.00
1 Column, 2 1/4"x11"	154 lines	100.00
1 Inch		10.00
Per agate line		.75

#### Times Discounts

52 consecutive issues	20%
26 times consecutively or E. O. W. one year	15%
4 consecutive issues	10%

WEEKLY, dated each Saturday, published Wednesday. Advertising forms close Tuesday, eleven days in advance of date of issue.

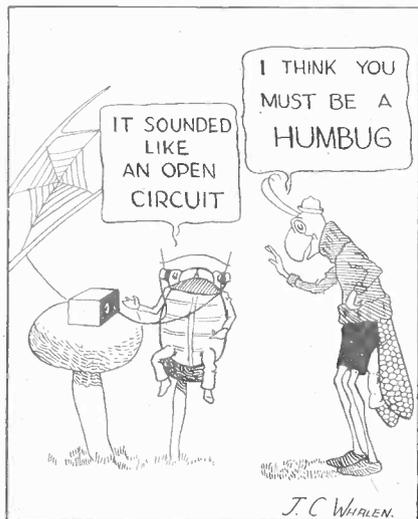
### CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum, 10 words. Cash with order. Business Opportunities, 50 cents a line; minimum, \$1.00.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

APRIL 11, 1925

## In a Radio Garden



### SNODGRASS NOW ON 2 RECORDS; INTRODUCED BY ANNOUNCER

HARRY SNODGRASS, winner of the RADIO WORLD'S 1924 Most Popular Radio Entertainer Contest, who, after serving prison sentence for participation in an attempted hold-up, reformed and went into vaudeville as a pianist, has recorded two numbers on Brunswick records. These are "Three O'Clock in the Morning," a piano solo, with J. M. Witten, announcer from Station WOS, introducing "The King of the Ivories," and "The Moonlight, a Waltz and You," composed by Snodgrass.

## Who Is the Radio Entertainer Most Worthy of the 1925 Gold Medal?—RADIO WORLD Readers Will Determine the Answer by Their Votes

WELL, here goes for the 1925 test to determine who, in the estimation of RADIO WORLD readers, is the most popular radio entertainer. Anybody who appears before the microphone may be voted for, and that, of course, includes announcers. Singers, instrumental musicians, bands, orchestras, speakers—all are potential candidates for this honor. Whoever is acclaimed most worthy of the championship will be presented with a gold medal, suitably inscribed.

Radio has grown considerably in influence and importance since the last popularity contest conducted by RADIO WORLD, decided late in 1924. Therefore the present test no doubt will bring a greater number of voters to the radio polls.

### Justice to Artists

No doubt some entertainer or organization, like an orchestra, is your favorite on the air. Here is an excellent opportunity to register your choice and do justice to those whose work you admire. Vote early and often. Here is one instance where the admonition is safe.

To cast a vote, clip the attached coupon, fill it out and mail it to Popularity Editor, RADIO WORLD, 1493 Broadway, New York City. Every coupon entitles you to one vote. You may use coupons obtained from copies of RADIO WORLD possessed by others, as well as coupons from copies that you yourself buy.

The contest will close July 31, 1925, and all votes in this office on or before that date will be counted. The progress of the balloting will be recorded in RADIO WORLD. Watch for the standing of the contestants and for important announcements.

### Chance for Subscribers

Those who newly subscribed to RADIO WORLD, or old subscribers who renew their subscription, have a special opportunity. They may cast, at one stroke, one vote for each copy embodied in the subscription. Thus, if one newly subscribes for one year, or renews an existing subscription for one year, or renews an existing subscription for one year, he or she may cast FIFTY-TWO VOTES AT ONE TIME for any one person or organization, specifying the choice on the subscription order. Then, when the copies arrive from week to week, the coupon may be used for further balloting. Thus subscribers double their voting strength.

If the result of the contest is a tie, a gold medal will be awarded to each of the contestants so tied.

## RADIO WORLD'S POPULARITY TEST

To Determine the Gold Medal Radio Entertainer for 1925

Popularity Editor, RADIO WORLD,  
1493 Broadway, New York City.

I hereby cast one ballot for:

(Name of Entertainer) .....

(Entertainer's Station) .....

(Voter Sign Full Name Here) .....

(Street and Number) .....

City ..... (State) .....

FILL OUT THIS COUPON AND MAIL NOW!

# “Keep Off the Air” is Order to Prospective Stations

WASHINGTON.

**W**ARNINGS are being sent by the Department of Commerce to the owners of broadcasting stations now under construction or contemplated that it will be impossible for them to operate upon completion because every wave length is crowded to capacity.

Every class A and class B wavelength has been assigned. There are in operation around 550 stations of all classes. Many individuals and companies who are aware of the publicity resulting from the operation of a station have either begun the construction of or made plans for class B stations.

### Necessary Safeguard

Some doubt exists as to whether the Department of Commerce has the authority under the law to refuse a wavelength to stations. Officials of the Department have thoroughly considered this point but are convinced that their action is absolutely necessary to safeguard the public interest.

At present class B stations are crowded so close together that a very selective set is required to separate them. Thousands of complaints reaching the Department have pointed to the desirability of even eliminating some of the present stations.

It is not expected that all the new stations will calmly accept the verdict that they cannot go on the air because of a shortage of wavelengths. In fact, they are already making the air ring with threats and pleas.

### “Free Air” is Cry

“The air is free to everybody,” is the most common plea. “That fellow (referring to another station) has a wavelength. We have just as much right to one as he has, and the law says that you shall give us a wavelength. If you don't, there is nothing left for us to do but to carry the matter to the courts.”

Under a strict interpretation of the law, no doubt the courts would hold that the new stations should be given a wavelength. But should the courts rule that the Department must give wavelengths to the new stations, it is more than likely that the presiding judge would be given this answer:

“Very, well, your honor. If you will tell us what wavelength to assign we shall be glad to give it to him.”

This, no doubt, would prove very embarrassing for somebody.

“We are going to do the best we can with the situation,” says Chief Radio Supervisor W. D. Terrell. “But we can't give away something we haven't got.”

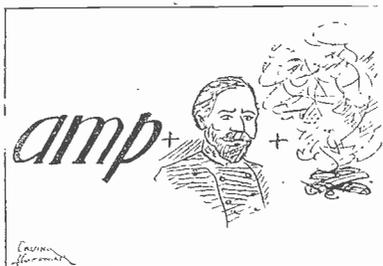
## 50-Pound Transmitter Heard 15,000 Miles

WASHINGTON.

**A** RADIO set weighing fifty pounds with a sending range of fifteen thousand miles, is now in use at the Marine Flying Field, Quantico, Va. This set sends on a wave length varying from 60 to 90 meters. Messages from this equipment were recently received on the Island of Guam, in the Western Pacific. Guam is 10,000 miles west of Quantico and 15,000 miles east. The message was sent at 2 a. m., Eastern Standard time, at which time a greater part of the world is in darkness to the east than to the west. Because radio waves travel better in the dark than in sunlight, and as equipment of this nature has never been known to send 10,000 miles in daytime, it is believed that the message “traveled easterly, by the longer but darker route.”

## The Weekly Rebus

**W**HAT does this represent? Send rebus answer to Rebus Editor, RADIO



WORLD, 1493 Broadway, New York City. The names of those sending the solution will be published.

- C. M. Phillips, West Chester, Ohio.
- S. Hetherington, 721 Madison Ave., Dallas, Tex.
- Edward Ginzel, 540 W. Lehigh Ave., Philadelphia, Pa.
- Leonard Browe, Menomonie, Wis., R. I.-Box 4.
- Newton Hielscher, 580 Magnolia, Beaumont, Tex.
- E. Fernandez, 115 W. 94th St., New York City.
- John A. Anderson, 19 Howe Ave., South Boston, Mass.
- Leonora Thompson, 6210 Huntress St., Pittsburgh, Pa.
- Mrs. Berner, 1609 Jefferson Ave., Brooklyn, N. Y.
- Henry Guenst, 600 W. Lehigh Ave., Philadelphia, Pa.
- Virgil T. Olson, 615 Florence St., Turlock, Cal.
- Harvey Scudder, 8417 102d St., Richmond Hill, N. Y.
- Gibbs Mason, 175 Tremont St., Boston, Mass.

## NEW LICENSE FORM FOR STATION OPERATORS

WASHINGTON.

**A** NEW set of regulations for operators of broadcasting stations has been formulated by the Department of Commerce, under which many were formerly ineligible may obtain a license for such duties.

## Bill Would Deprive Fight Promoters of Radio Ban

ALBANY, N. Y.

**R**EQUIREMENT to allow broadcasting of all boxing bouts authorized by the State Athletic Commission would be imposed on licensees of such contests under the terms of a bill introduced in the Legislature by Senator Thomas J. Walsh, Democrat, Richmond. The Athletic Commission would be empowered to prescribe the rules governing the broadcasting.

## Sunset Effect On Waves Tested

WASHINGTON.

**T**HE Bureau of Standards has begun a second series of observations on the marked changes of transmission occurring at sunset. It is hoped through these special tests to determine the causes and effects of certain phenomena in order that they may be overcome.

“The continuing expansion in the uses of radio,” says Dr. J. H. Dellinger, Chief of the Bureau of Standards Radio Laboratory, in commenting on the observations, “and the unexpected phenomena encountered in the very high frequencies now so extensively used, make important the determination of the laws and causes of the vagaries of radio transmission. Fuller knowledge of these phenomena is necessary before radio can fully grapple with the limitations at present imposed upon it by atmospheric disturbances, interference, and fading.”

## Room for No More Stations Says Batcheller

By Arthur Batcheller

U. S. Supervisor of Radio, Second District

**T**HE saturation point in radio broadcasting has absolutely been reached. There can be no more broadcasting stations simply because there is no place to put them. All available wavelengths are being used.

It is the policy of the Department of Commerce not to grant any licenses in any districts that will create conflict. The problem is a tremendous one, for conditions in the entire country must be studied before official permission to broadcast can be granted.

I have before me a chart representing the radio status of the United States. I absolutely cannot see where further stations can be put. If some one were to come to me to-morrow, and ask for a broadcasting license, I would have to tell him I have no place to put him, unless, of

course, he found some other station willing to share its wave length.

## 21,000,000 HOMES IN U. S. HAVE NO RADIO

**T**HERE are 11,000,000 homes in the United States without motor cars; 16,000,000 without phonographs; 13,000,000 without electricity and 21,000,000 without radio. The number of homes is 26,000,000.

## RICHARD LYNCH ON AIR

**R**ICHARD LYNCH, president and speaker of the Unity Scientific and Practical Christianity Society, broadcasts Mondays from WFBH., Hotel Majestic, New York City, on subjects relating to practical Christianity.

## RECENT BACK NUMBERS

of RADIO WORLD, 15 cents each, or any seven for \$1. Address Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

# How to Judge Condensers

By E. L. Hall

Associate Electrical Engineer, Bureau of Standards.

WHEN we speak of the condenser in a radio receiving set, some people will think immediately of the variable air condenser which is used for tuning in the desired station or some other one that happens to come in. Other people will think also of the fixed condensers which serve important functions in a radio receiving set. Fixed condensers are used in some radio receiving sets in the tuning circuit to extend the frequency

range of the set. In general, fixed condensers are found chiefly in the grid leak of the detector tube, and as a bypass for radio-frequency currents across a path of high impedance such as the primary winding of an audio-frequency transformer or the windings of a telephone receiver.

### Many Make Good Condensers

There are a very large number of manufacturers of variable air condensers at the present time and one desiring to construct a radio receiving set wonders which condenser to buy. A perusal of the advertising of the different manufacturers leaves the layman as undecided as ever, being overwhelmed by such terms as low loss, low minimum, grounded rotor, straight-line, square law, non-dielectric, etc. The result is that he buys a condenser recommended by the salesman, which may or may not be satisfactory. Now what constitutes a variable air condenser which will give satisfactory operation in a radio receiving set? A few years ago the list of manufacturers of good condensers would have included a very few names because there were very few manufacturers of such apparatus at that time. Today such a list would be very long indeed so that instead of mentioning the names of the makers of the best condensers the essential points to look for in the best condensers will be given.

Before giving these points let us consider the construction of a variable air condenser. It consists essentially of two sets of parallel metal plates, one set being rigidly fastened to a mounting while the other set is fastened to a shaft enabling these plates to rotate between the fixed plates. The two sets of plates are electrically insulated from each other. For this purpose different manufacturers use different materials and methods for obtaining this result. Materials used for insulation include bakelite, glass, hard rubber, isolantite, porcelain and quartz.

### Must Make a Compromise

The electrical requirements for the best condenser if met are such as to produce a very poor condenser mechanically, so that a compromise is necessary. However, a satisfactory condenser will have no lateral nor longitudinal motion of the shaft; will turn freely and positively; will have the plates made of material of sufficient thickness to maintain its calibration; will not have stops to prevent the complete rotation of the movable plates and the possible jarring of plates out of line or displacement of the dial; will employ a minimum amount of insulating material consistent with strong mechanical design and have it placed well away from the plates of the condenser; will have sufficient spacing between plates to guard against shorting the two sets of plates; will have a neat and pleasing appearance.

It will be noticed that these requirements are chiefly of a mechanical nature. None of the advertising terms have been mentioned because the advantages claimed for some types of condensers are questionable. One illustration will suffice. Manufacturers have vied with one another to produce a variable condenser having the lowest minimum capacity. Condensers used near the low part of the capacity scale have relatively large changes in total capacity of the circuit for a slight movement of the dial, which means

that it is extremely difficult to tune in a station on this part of the dial.

In some sets it may be found that the presence of the operator's hand or body will tune or detune the receiving set. In such sets this will be extremely marked for low settings of the dial of the condenser. The

**THE GENUINE LOUDSPEAKER**  
**\$1.50 Vacuum Tubes \$1.50**  
 C. O. D., JUST PAY POSTMAN  
 MONEY BACK GUARANTEE  
**JAMES H. KONKLE**  
 192 Market Street Newark, N. J.

**CUT OUT THIS AD**  
 Send it to us with \$1.00 and receive a brass base tipless type 201-A guaranteed tube.  
**Mastertone Radio Co.**  
 906 Broad St. Newark, N. J.

**RADIO DEALERS WANTED**  
 BIG DISCOUNTS ON STANDARD PRODUCTS  
**W. C. BRAUN CO.**  
 32-40 S. Clinton St., Chicago  
 ASK DEPT. 108 FOR DEALERS CATALOG

**CROSLEY**  
**RADIO CATALOG FREE**  
 Describes fully the complete line of radio frequency sets, regenerative sets (licensed under Aramstrong U. S. Patent No. 1,113,149) and parts  
 Write for Catalog Today  
**THE CROSLEY RADIO CORPORATION**  
 4402 Sassafras Street Cincinnati, Ohio

**"A THING OF BEAUTY AND A JOY FOREVER."**  
**5-TUBE TYPE 5A \$50**  
 American Interstate Radio  
 183 Greenwich St. N. Y. C.

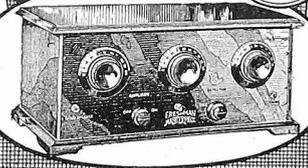
**Your Radio Tubes Replaced in Case of Burnout for 5-10c. per Month**  
**GET OUR PROPOSITION**  
 National Radio Tube Works  
 39 Tracy Avenue East Lynn, Mass.

**"STERLING FIVE"**  
 The utmost in 5-tube tuned radio frequency; solid mahogany cabinet ..... **\$60.00**  
 DISTRIBUTORS, DEALERS, USERS—it will pay you to write for details.  
**THE GIBSON-SEARS RADIO CORP.**  
 48 WEST BROADWAY NEW YORK

**WRITE FOR NEW CATALOGUE**  
 Home of Semi-Assembled Kits  
**THE RADIO SHACK**  
 55 Vesey Street Dept. B-154 New York

Regular \$30 Value  
**3 TUBE SET \$18.50**  
 3 Circuit Tuner Guaranteed to give as good results as sets selling at \$30. Fine mahogany Cabinet. Engraved Panel and dials to match. We pay transportation. Send Post Office or Express Money Order. Gives satisfaction or money refunded.  
**JULIUS HOWARD, Dept. R.W.**  
 217 West 125th Street, New York, N. Y.

Tested and approved by Radio World  
**"TRI-TUNER"**  
 Build Your Own Set! Use Arc Rad Products. A Three-Circuit Coil, all Litz wound on natural bakelite.  
**SENT PREPAID \$3.00**  
 Panel shield and hook-ups included. Fahnestock clips used. Eliminate Soldering  
**ARC RAD PRODUCTS**  
 48 South 7th Street Newark, N. J.  
 EVERY PRODUCT GUARANTEED

**Insist Upon The Genuine!**  
**FRESHMAN MASTERPIECE**  
 A FIVE TUBE TUNED RADIO FREQUENCY RECEIVER  
 Because of the wonderful performance and immense popularity of this wonder set, imitations and counterfeits are being offered by unscrupulous dealers and distributors.  
 Every genuine Freshman Masterpiece has a serial number riveted on the sub-panel. Be sure it appears on the set you buy. It is your protection and guarantee for the  
**Greatest Value Ever Offered in a Radio Receiving Set.**  
 At Your Dealers **\$60**  
  
**Chas. Freshman Co. Inc.**  
 Radio Receivers and Parts  
 FRESHMAN BUILDING  
 240-242 WEST 40TH ST., NEW YORK, N.Y.

**S. HAMMER RADIO CO.**  
 303 Atkins Avenue, Brooklyn, N. Y.  
 Please send me FREE, Your NEW  
**RADIO CATALOG**  
 Name .....  
 Address .....  
 City ..... State.....  
**FILL OUT AND MAIL**

# Mica Proves Good Dielectric

resistance of the condenser is also quite high for low settings of the dial which is a disadvantage. Where, then, is the advantage of the low minimum capacity condenser, if it can't be used when you have it except as any other condenser would be used?

The whole question as to the condenser may be summed up by saying that dependable results may be expected in a receiving set employing a variable air condenser made by a reputable firm, where due regard for mechanical design has been taken and insulation used which is known to be efficient at radio frequencies.

A few words regarding the shape of the movable plates of a variable air condenser may be of interest. The most common shape of the rotating plate and the one giving the greatest change in capacity is the semi-circular plate. The change in capacity of such a condenser for a given change in the dial setting is the same for any part of the scale, or, in other words, the condenser gives a uniform capacity change. This means that the broadcasting stations will be found very close together on the lower part of the condenser scale and far apart on the upper part of the scale. A change in the condenser setting which can scarcely be seen with the eye will tune out and completely lose one station and perhaps bring in another. This condition can be helped slightly in the use of another shape of plate in which the capacity varies as the square of the setting. This results in a curve which is practically a straight line if the wave lengths are plotted for the different condenser settings of the radio receiving set. There is, however, still a crowding of stations on the lower settings and a thinning out on the higher settings, since the broadcasting stations are assigned on the frequency basis rather than the wave length basis. Broadcasting stations have been assigned frequencies separated ten kilocycles apart.

If we shape the plates of the condenser so as to space the broadcasting frequencies equally about the condenser dial, we will improve the ease of tuning in different stations. The shape of a plate to give this straight-line frequency relation departs very decidedly from a semicircle, the radii 180° apart differing from each other by a ratio of more than two to one. There are a very limited number of such condensers available on the market today and at least one receiving set employing such condensers.

It is possible that these condensers and receiving sets will be very popular when the builder and user of the sets finds the great advantage gained in the ease in tuning in the higher frequency stations when straight-line frequency condensers are used. Fixed

condensers usually will have the two sets of plates which may consist of thin sheets of copper or tin foil, separated by thin sheets of mica or waxed paper. While air is the best dielectric, a condenser employing air will be many times larger in size than a condenser using mica having the same capacity. This may be illustrated by referring to the physical dimensions of mica and air condensers. A mica condenser may measure 1x1x1/4" overall and have four times the capacity of an air condenser occupying a space 3x3x2". This illustration is not intended as a scientific statement but rather to show the great difference in size. A more truly scientific statement would be made by saying that mica is from 4 to 8 times more effective in producing capacity than air. The capacity of a condenser using mica as a dielectric will be from 4 to 8 times larger than if the mica is replaced by air. The latter, of course, is not a practical case.

A fixed condenser can be made using almost any kind of insulating material such as air, bakelite, celluloid, fiber, glass, hard

rubber, marble, mica, paper, porcelain, wax or wood. However, a good grade of mica makes the best solid dielectric for condensers that is known today.

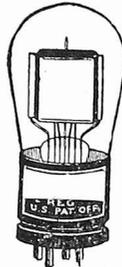
## GUARANTEED

**TYPE 201A**  
**Radio Tubes**  
**\$1.00**

Pay in Advance and Save Postage Charges.

**Dextron Radio Lab.**

74 STERLING ST.  
EAST ORANGE, N. J.  
ORANGE 9918 'Phone



## The DAVEN RESISTANCE COUPLED AMPLIFIER KIT

For those who build their own, and insist on quality amplification, there's nothing to equal Resistance Coupling. The

### DAVEN AMPLIFIER KIT

comes with full instructions for assembly. Easy to build—efficient in operation. (Without sockets and condensers.)

Supplied in either 3 or 4 stages. Sold Everywhere.

Ask your dealer for the "RESISTOR MANUAL." It's full of information on Resistance Coupling. Price, 25c.

### DAVEN RADIO CORP.

"Resistor Specialists"  
Newark New Jersey



A \$5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD.

## \$5 BRINGS The ALADDIN

Direct from the Factory to Your Home at the Wholesale Price

THE GREATEST RADIO VALUE IN THE WORLD

5 TUBE BALANCED RADIO FREQUENCY RECEIVER

BIG SPECIAL OFFER DIRECT TO YOU

**\$40**

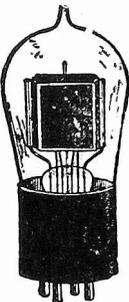
WILL BUY  
5 TUBE  
RECEIVER

Solid Mahogany Cabinet, 7x18,  
Same as \$60 Set, without Accessories.  
SELECTIVITY—VOLUME—TONE—LONG  
RANGE—EASY CONTROL  
You can Log Stations Permanently.

SATISFACTION ABSOLUTELY GUARANTEED

The Aladdin Radio Co., 158-R Fulton St., New York City

## INDEPENDENT



NEW TUBES EACH \$1.59

ALL TYPES OF HIGH CONDUCTANCE AND LOW IMPEDANCE, ALL MATCHED VOLUME

3 for Four Dollars  
5 for Seven Dollars  
Matched Characteristics

REPAIRED OR EXCHANGED \$1.39  
5 FOR \$6.00  
Matched Characteristics

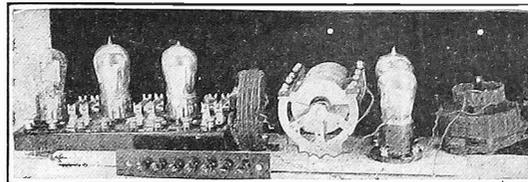
QUICK DELIVERIES  
EVERY TUBE CARRIES A  
MONEY BACK GUARANTEE

Dealers—Agents—Wanted Everywhere

### RADIO TUBE OUTLET

207 Market St. Newark, N. J.  
Exclusive Distributors for Associated Manufacturers

## RADIO WORLD'S 1925 Model 4-Tube DX Superdyne



## WONDERS

BERNARD'S  
"DIAMOND OF THE AIR"  
A Four-Tube DX Loop Set,  
In This Issue, including Loop.  
Complete Parts for

**\$44.75**

Complete parts for Bernard's 1925 Model 4-Tube DX Superdyne, including Wallace Coupler, Flewelling Double Condenser..... \$42.50

Complete Parts for Resistance Coupled, Amplified Superdyne Circuit as Checked, Specified and Certified by Herman Bernard in Mar. 28th issue \$45.00

All the parts we sell have been tested and approved by

*Herman Bernard*

We are Expert-Specialists on BERNARD'S WONDER and have helped hundreds of fans to success with these great sets. Let us help you.

The Famous WALLACE Low-Loss Coil for Superdyne..... \$7.50  
The Flewelling Condenser for All Bernard's Circuits..... 9.00

### WALLACE RADIO COMPANY, Inc.

Send 50 cents for latest list of Broadcasting Stations, Radio Log, Practical Radio Information in conjunction with the greatest Radio Catalogue issued in America. This will be refunded on any order of \$5.00 or over.  
135 LIBERTY STREET, NEW YORK CITY  
ADVICE on Superdyne Circuit FREE! If Not Listed Above, Write for it.

RESULTS GUARANTEED

MAIL ORDERS SOLICITED

# How to Figure Out a Coil

(Continued from page 5)

will be explained. Column 6 gives the wire sizes nearest to the ideal called for in Column 3.

Now, of course, it is not practical to wind a coil to a fraction of a turn. In nearly all

cases the number of turns is integral. If the number of turns is made equal to the nearest whole number in Column 2, the inductance will be either a larger or smaller than 82 microhenries, according to whether the whole number is larger or smaller than the number given in Column 2. The numbers given in Column 4 have been supplied as an aid in estimating the change in inductance caused by small changes in the number of turns on the coil. Let us consider a few examples. The 1.75" diameter coil requires 40.6 turns. The nearest whole number of turns is 41, which is greater by .4 turn than the number given. As is seen in Column 4, one turn contributes 2.9 microhenries to the inductance. Hence the 41-turn coil will have  $.4 \times 2.9 = 1.16$  microhenry more inductance than the ideal coil. The 41-turn coil may be considered to have an inductance of 83 microhenries. The 2.75" coil requires 32.4 turns. The nearest whole number of turns is 32, which is .4 less than the number required. Since one turn contributes 3.7 microhenries, the coil will have an inductance of about 80.5 microhenries. This method of estimating the inductance is valid to a fair degree as long as the change in the number of turns is not greater than four or five.

### Result is Simplified

There remains Column 5 to be explained. It has already been stated, the numbers in this column represent the change in the inductance of the coil caused by a change of unity in the number of turns per inch in the winding, the number of turns on the coil remaining constant. For instance take the 2.50" coil. The required number of turns on this coil is 34.0 and the number per inch is 31.2. If the wire used is such as to wind 32.2 per inch instead of 31.2, the inductance would be 1.0 microhenry greater than 82 microhenries. If the wire used is such as to wind 30.2 per inch, the inductance of the coil would be 1.0 microhenry less than 82 microhenries.

The object of supplying the numbers in Column 5 is that the exact wire sizes called for in Column 3 are rarely available, and it is not practical to so space the wires as to fulfill the requirements. The best method of procedure is to use the nearest size wire that is available, determine its number of turns per inch, compare this with the number given in Column 3, and from the difference estimate the effect upon the inductance, which may be done with the aid of Column 5. The change in the inductance may be compensated for by a change in the number of turns on the coil as determined from Columns 2 and 4. In determining the number of turns per inch it is not accurate enough to use the number given in tables. These are average values, and actual wire may vary considerably from them. It is always best to determine the turns per inch of any particular specimen of wire by making a test winding of an inch or two in length and counting the number of turns.

For the smallest diameter given in Table I, one turn contributes as much to the in-

ductance as the change in the inductance caused by a change of five turns per inch in the size of the wire, since the ratio of the numbers in Columns 4 and 5 is five to one. Also for the 3.50" coil one turn contributes

For **Maximum Amplification Without Distortion and Tube Noises** use the well known **Como Duplex Transformers** Push-Pull Send for Literature  
**COMO APPARATUS COMPANY**  
 448 Tremont Street Boston, Mass.

**THE ASTON CARD INDEX**  
 RECORD YOUR RADIO STATIONS  
 Copyright 1924 by S. T. Aston & Son  
 Telephone Franklin 2159  
**\$3.00** Complete Postpaid  
 100 Cards, Mahogany Finish or Oak Cabinet, and Index Dividers. A Useful Accessory to Any Set. Give Name of Set and Sketch of Dial Arrangement. Prepaid on Receipt of Cash or Money Order. Dealers Write for Terms.  
**S. T. ASTON & SON**  
 114 WORTH STREET NEW YORK CITY

**"Morsing Bus-Bar Union"**  
 Assemble Round or Square Bus Bar and Solder Three Wires at a Time.  
  
 Quick Assembling Can Be Made Without Taking Set Apart.  
**Enough for one set, 25c**  
**No. 1 for 14; No. 2 for 12 wire.**  
**Ten dozen for \$1.00.**  
 Newark Watch Case Material Co.  
 15 Ward Street Newark, N. J.  
 DISTRIBUTORS WANTED

**EUREKA DIAL POINTER**  
 A jewelry product which beautifies your set. Screws fast to panel.  
 Obtain at your dealers or samples mailed upon receipt of stamps.  
  
**10c each Nickel or Gilt**  
 Dealers—A vaer round seller. Send \$3.25 for handsome four-color display card which nets you a fair profit. Every set made can use Eureka Pointers. *Jobber wanted in each large city.*  
 Manufactured by **C. W. BUTTS, Inc.**  
 42 Hedden Place East Orange, N. J.

**LIST OF STATIONS**  
 Complete, Accurate, Official  
 Get this roster of American broadcasters, compiled in alphabetical order of call letters. Send 15c for April 4 issue, the great Third Anniversary Number, to Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

A \$5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD, 1493 Broadway.

**NEUTRODYNE KIT \$19.75**  
 Complete kit of licensed Neutrodyne parts including panel, tube sockets, rheostats, jack, fixed condensers and grid leak. Neutroformers complete with variable condensers and neutrodons. Every part included even to screws and wire. Easy read plans.  
 Send No Money Pay the Postman Order by Postcard  
**RADIO SURPLUS STORES**  
 HELENA MONTANA

**Federal** Standard RADIO Products  
 Over 130 standard radio parts, each bearing the Federal iron-clad performance guarantee.  
 Write for Catalog.  
**Federal Telephone & Telegraph Co.**  
 Buffalo, N. Y.

**Radiofeet** Cushion your Set!  
 Stop tube vibration! Prevent set from marring furniture! Used under set or tube shelf. Made of pure wool felt.  
 Set of 4 Radiofeet, including attaching screws or washers sent postpaid anywhere in the United States or Canada for \$1.00. Do not send stamps. Specify dark red (mahogany) or brown (oak) color.  
**NEODYNE ASSOCIATES**  
 3121 Bennington Building  
 165 BROADWAY, NEW YORK

**FILE-KO LIGHTNING ARRESTER**  
 SCIENTIFICALLY CORRECT RADIO LIGHTNING ARRESTER with the 100% Guarantee  
  
 Protects your set from lightning or we repair or replace the set. Send 2c stamp for literature on improved reception. Dept. R.W.-411.  
 \$1.50 \$2.10 in Canada  
**DX Instrument Company**  
 Harrisburg, Pa.

For Battery, Antenna and Ground Leads—  
  
**Jones MULTI-PLUG**  
 THE STANDARD SET CONNECTOR.  
**HOWARD B. JONES**  
 618 S. CANAL STREET CHICAGO

**Index Your Radio**  
**RADIO INDEX**  
 The Key To 720 Stations 50¢ POST PAID  
 All the 720 Broadcasting Stations of North America Indexed by Wavelengths, Dial Readings, Locations, Frequencies and Call Letters. Nothing to write but your dial settings. Gives dial positions for stations you have been unable to get. Self-indexing 36 pages 7x10 inches, beautifully bound cover. 50¢ post paid. Stamps taken.  
**The Radex Press**  
 220 Euclid Arcade Annex CLEVELAND, O.

TEAR OFF AND MAIL TODAY

# 8 Weeks' Trial Subscription, \$1.00

KEEP ABREAST OF THE LATEST RADIO DEVELOPMENTS  
**RADIO WORLD**  
 1493 BROADWAY NEW YORK CITY

# Correct Dial Setting for Tuning

as much as a change of two turns per inch in the size of the wire. As the diameters of the tubing and of the wire increases, the ratio decreases.

Table II. gives the number of turns required for each diameter for both double

**TABLE II**

Diam.	DSC		DCC		ind.	
	turns	wire	turns	wire		
1.50	45	29	83.3	44	34	82.0
1.75	41	27	83.6	41	30	83.6
2.00	38	26	83.2	38	27	82.3
2.25	36	23	82.9	36	25	82.9
2.50	35	21	84.2	34	23	83.0
2.75	33	20	83.6	32	22	83.1
3.00	31	19	82.0	32	20	84.2
3.25	30	18	84.5	30	19	82.5
3.50	28	17	81.3	29	18	83.5
3.75	27	16	81.0	28	17	82.8
4.00	27	15	84.1	27	16	84.1

**TABLE III**

Wavelength	Setting of dial or Fixing point	
	546	95
536	91	
526	88	
517	85	
509	82	
500	79	
492	77	
484	74	

capacity in most condensers. For instance if it is desired to cover the broadcast range, it is not necessary to go higher than 550 meters, and the coil should be adjusted so that 550 meters tunes in at 95 on the dial. KSD may be used to fix this point if a wave meter is not available. If KSD is not within the reception range then some other broadcasting station operating on one of the longer waves may be used, provided the proper allowance is made for the difference in wavelength between KSD and the station used. For instance if WEAF is used the coil should be adjusted until this station comes in at about 77 on the dial of a condenser having semi-circular plates. KSD will then come in at 95 on the dial. If other broadcasting stations are available the fixing point may be taken from Table III.

**FREE BOOKLET FOR INVENTORS**

IF YOUR INVENTION is new and useful it is patentable. Send me your sketch. Z. H. POLACHEK, 70 Wall St., New York. Reg. Patent Attorney-Engineer

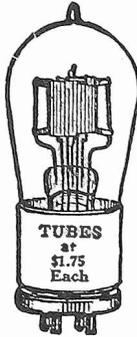
**SAVE \$1.25**

ON COST OF NEW TUBES BY HAVING YOUR OLD TUBES REBUILT AT \$1.75 EACH

Guaranteed equal to new. Send us your tubes by parcel post. We return them parcel post, C.O.D., and try to maintain 24-hour service.

400 Old Colony Ave. Boston, Mass.

**HARVARD RADIO LABORATORIES**



**THE "GOODE" TWO - O - ONE**

**A**

*Le Ton d'argent*

**Guaranteed**

BY MAIL ONLY

**\$1.89**

Postpaid

**QUARTER AMPERE AMPLIFIER-DETECTOR RADIO TUBE**

GUARANTEED SATISFACTORY

All "GOODE" Tubes Sold Direct to the Consumer—No Dealer Profits

ONE—"Goode" Detector-Amplifier ..... \$1.89

THREE—"Goode" Detector-Amplifiers ..... \$5.00

(All Postage Prepaid)

The "Goode" Two-o-One A Tube amplifies or detects. It is a quarter ampere, five volts, standard base, silvered tube.

Send express or postal money order, New York draft, or personal check to

**The Goode Tube Corporation**  
Incorporated Dept. B  
OWENSBORO KENTUCKY

silk and double cotton covered wire, also the approximate inductance of each coil.

As was pointed out above the value of 82 microhenries was selected because it fit certain conditions. It is probable that in many circuits these conditions will not be met, and it may be necessary to use either a larger or a smaller coil. One of the assumptions was that the distributed capacity was 50 micro-microfarads. In many of the simple circuits mentioned above it is much less than this, and the coil must be a little larger. Then again the condenser used for tuning may be overrated, in which case the coil should be a little larger to make up for the lack of capacity. Finally, it may be desired to have the upper limit of the tuning range a little higher than 550 meters, in which case the coil should also be a little larger. Hence in winding any of the coils it is best to put on two or three turns more than the number given in Tables I. and II. Then if it is found, after the coil has been placed in the circuit, that the tuning range is too high, turns may be removed one at a time until the tuning range is satisfactory.

**Dial Should Be Used to 95**

In adjusting the tuning range only one point can be fixed. It is most practical to fix the upper limit and let the lower be whatever it happens. The highest point should be fixed at about 95 degrees on a 100-degree dial. Above 95 there is little change in the

**Clear-O-Dyne**

Four and Five Tube Sets

No set of an equal number of tubes will do more, yet the price is very moderate.

The Cleartone Radio Co.  
466 East McMillan St.  
CINCINNATI, OHIO

**CLEAN UP TIME!**

Now is the time to take advantage of our special bargain prices.

Lightning Arresters, Insulators, Freshman Kits, Head Sets, Tubes, Complete Sets.

MR. DEALER, WRITE NOW FOR OUR LIST

Baseball Season is pretty near, GET READY.

**THE BOWER RADIO SHOP**

Wholesale Radio Reading, Michigan

THOUSANDS OF BARGAINS

FACTORY GUARANTEED MDSE. BY MAIL

Genuine New Radiotron or Cunningham Tubes

UV-199—290—291A—WD-11—12..... \$2.39

C299—300—301A—C11—12.....

Fresh Burgess or Eveready "B" Batteries

22 1/2 Volt large size \$1.68—45 Volt \$5.00 size \$3.38

Write for Free new Complete Catalog on Sets and Parts

STONE ELECTRIC CO., 714 Pine St., St. Louis, Mo. Dept W  
All Mdse. F.O.B. St. Louis, Mo.

The LARGEST RADIO STORES in AMERICA

**Hook-ups!**

All the latest and best kits in our new

**RADIO CATALOG**

**FREE**

NO other Radio Catalog includes such a complete assortment of the best and latest Knock-Down Kits, Parts and Accessories. You need this book—Write for your FREE copy today!

We Save You Money!

Our business is to buy up manufacturers' and government surplus stocks, jobber and dealer bankrupt stocks—but only brand-new, fully guaranteed, nationally advertised apparatus. Our catalogue crammed with bargains.

**CHICAGO SALVAGE STOCK STORES**

509 So. State St., CHICAGO, ILL., Dept. R.W.6

**FILL OUT AND MAIL NOW**

SUBSCRIPTION BLANK

**RADIO WORLD**

1493 Broadway, New York City

Please send me RADIO WORLD for..... months, for which please find enclosed \$.....

SUBSCRIPTION RATES:

Single Copy ..... \$ .15

Three Months ..... 1.50

Six Months ..... 3.00

One Year, 52 Issues..... 6.00

Add \$1.00 a Year for Foreign Postage; 50c for Canadian Postage.

# Frenchman Lists Patents, His Radio Gold Mine

(Concluded from page 10)  
stamp he expects a good return. Companies are worried.

## Open to All

The terms of the contract with the Hazeltine Corporation make it possible for all comers to get a license under any and all of the patents, if they pay the regular royalty, the amount of which is being kept secret. This free-for-all situation, with "free" subject to certain modifications, differs from the Neutrodyne patent, which is licensed only to a small group of manufacturers. Indeed, the very Neutrodyne patent itself is said to have had its basic origin in the Professor's busy brain.

The Radio Corporation of America, the Freed-Eisemann Corporation, the American Telegraph and Telephone Company,

## Write

for the FREE working drawings of the set that heard LONDON and all the big European stations:

### ELGIN SUPER-REINARTZ

the set that leads in selectivity and distances. Your name and a stamp will bring the drawings—FREE!

### ELGIN RADIO SUPPLY CO.

Dept. A, 207 E. Chicago St. Elgin, Ill.

## T. R. F. COILS

low loss type, requiring no angle mounting, per set of 3 \$4.50

Manufacturers, write for discounts.

### NOLTE MFG. COMPANY

61-C Gautier Ave. Jersey City, N. J.



## Famous for Quality and Service Amplitron Tubes

Bonded to Give Service \$4.

List Prices.....  
Send in your old set, bring out Tubes—We will send you new AMPLITRON—any model—at.....\$2.50  
Dealers and Jobbers—Write for Discounts.

**Pennant Radio Laboratories**  
Dept. RW., 23 Central Ave., Newark, N. J.

## PANELS

FOR ANY KNOWN CIRCUIT  
CUT, DRILLED AND ENGRAVED  
PRICES ON REQUEST

**Cortlandt Panel Engraving Co.**  
81 Cortlandt Street New York City



## Quality Parts—Lowest Prices

Complete Kit for 1925 DX Wonder 5-Tube Set as specified by Radio World.....\$43.50  
New Freshman Knockdown Kit..... 31.50  
Ultradyne 8-Tube Kit—list \$90..... 70.00  
Acme Reflex Kit—list \$80..... 60.00  
Acme Reflex Kit—list \$60..... 45.00  
Acme D. Coil Unit—list \$15..... 10.95  
Acme Transformers, all types..... 3.55  
Brownie Ver. Detector—list \$2.00 1.50  
Bremer-Tully 5-air. Tuner—list \$5 3.55  
Eastern Coils for 1925 DX set..... 5.95  
Daven Resistances and Kits, 25% off list

## Radio Shop



Thordarsen Transformers 3/4 to 1. \$2.75  
Thordarsen Transformers 6 to 1. 2.95  
Federal Transformers No. 65 and 65A..... 4.55  
Eastern Coils for Roberts Circuit..... 5.95  
Apex Dials, all types, 25% off list.

All Bruno Parts in Stock.  
20% Discount Off List on All Sets.

### GEORGE'S RADIO SHOP

214 St. Nicholas Ave., cor. 121st St.  
New York City  
10% Deposit with order, balance to Postman

and the Postal Telegraph Company, had acquired rights to some of the patents from the professor prior to the Hazeltine contract, which was made subject to these concessions.

## Some of the Patents

The following features of construction and design, according to Professor Latour, are covered by his patents:

Use of audio-frequency transformers containing an iron core, giving amplification without distortion.

Use of iron core transformers for radio-frequency to obtain a periodic amplification.

[One or more of the above transformers are included in practically every vacuum tube set.]

Using a common B battery for multi-tube sets, that is, having one set of B battery terminals for the whole receiver, instead of a separate B battery for each tube separately connected thereto.

[There are very few makers that do not use such a common B battery.]

The tapped coil, so common in most receiving sets.

Damping means to avoid self-oscillation, such as resistance in series, resistance in parallel or potentiometer.

Grounding the filament or storage battery to prevent oscillation—grounding directly or indirectly.

Reflexing any tube other than the first. Multi-stage reflexing.

Coupling before different stages of the same amplifier.

## Programs

(Concluded from page 15)

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M., news. 5:30, Examiner program. 6:45 radiatorial. 7, Examiner program. 8, Herald program. 9, Apollo male quartet. 10, Tilda Rohr, contralto, assisted by Carl Miller, pianist.

KNX, Los Angeles, Cal., 337 (P. S. T.)—11:30 A. M., Estelle Lawton Lindsay's talk to women. 6:15 P. M., Beverly Ridge Co. program. 7:30, Eastern Outfitting Co. program. 8, West Coast Theatres. 9, feature program. 11, Coconut Grove orch.

KOA, Denver, Col., 323 (M. T.)—12:20 P. M., organ. 1, quotations. 3, matinee. 6, stocks; news. 6:40, book of knowledge program. 8, Rialto theatre orch. 8:10, studio program; Rev. Mathias Groll, piano.

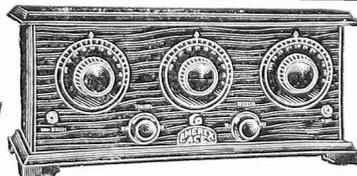
KPO, San Francisco, Cal., 429.5 (P. S. T.)—10 A. M., cooking and household management, Mrs. Belle DeGraf. 7, daily dozen. 10:30, the local theatres. 12 M., time; scripture reading. 12:45 P. M., Commonwealth Club luncheon. 1, Fairmont Hotel orch. 4:30, Fairmont Hotel orch. 5:30, markets. 6:30, the local theatres. 8, Wurlitzer night.

KOB, State College, N. M., 348.6 (M. S. T.)—7:30 P. M., Mrs. J. W. Christie, soprano; Mrs. Herman Kosch, piano; Negro Spirituals, Mrs. J. W. Christie.

CKAC, Montreal, Que., 411 (E. S. T.)—1:45 P. M., Harry Salter trio. 4, weather, stocks. 4:30, 110 lessons.

CNRE, Edmonton, Alta., 516.9 (M. T.)—7:30 P. M., children's half hour, the farmer. 8:30, Moonlight Serenaders' orch.

CNRT, Toronto, Ont., 356 (E. S. T.)—6:30 P. M., King Edward Hotel concert orch. 8:30, Aeolian



## 5-Tube Tuned Radio Frequency Set

\$59, Liberal discount allowed  
Thousands of satisfied owners

AMEREX ELECTRIC CORP.  
232-E GREENWICH STREET NEW YORK

Write for Circular R

male quartet. 10:30, King Edward Hotel dance orch.

CNRA, Moncton, N. B., 313 (A. S. T.)—7:30 P. M., bedtime stories, Uncle Alf. 8, markets. 8:30, L'Assumption band, Moncton Acadian male choir.

## LOG YOUR SET WITH "MY RADIO RECORD"

Broadcasting stations alphabetically arranged on forms for logging. Improved radio map. New device for locating stations on map and measuring distance.

A new pleasure and a real help in radio. Read about it in March 21st Radio World, page 15. Send Check or Money Order for 50 Cents. Rosebank, N. Y. A. W. WAITE, Inc. 23 Sea Avenue



## BRASS BRACKETS

LOWEST PRICES  
BIGGEST DISCOUNT FOR  
JOBBER AND MFGRS.

PAUL GLAMZO  
203 LAFAYETTE ST. N.Y.C.  
PHONE-CANAL 3835



## AT BARBLEY'S

SPECIAL—5 Tube

TUNED R. F. SET  
MAHOGANY CABINET \$32.50

FULLY GUARANTEED

MAIL ORDERS FILLED

BARBLEY'S RADIO SERVICE

135 LIBERTY STREET NEW YORK CITY

## RADIO CATALOG

AND HOOK-UPS FREE

Our great new catalog, fresh from the press, contains the very newest in complete sets, parts and accessories—hundreds of amazing bargains. 250,000 customers testify to our wonderful values and reliability. Complete instructions with diagrams for making most practical popular sets FREE. SEND QUICK for your copy. (Please include name of friend who is interested in Radio.)

### THE BARAWIK CO.

Dept. 121 32-40 So. Clinton Street Chicago



Tower's Scientific  
\$2.95  
ONLY  
8 1/4  
OUNCES



## BELLTONE

RADIO TUBES

201A 95c

12—199—\$1.50

199 With Standard Base

With Money-Back Guarantee  
Mail Orders Promptly Filled

### Manhattan Lamp Works

Room 411, 324 West 42nd Street, New York City

## RECENT BACK NUMBERS

of RADIO WORLD, 15 cents each, or any seven for \$1. Address Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

### LIST OF STATIONS

Complete, Accurate, Official

Get this roster of American broadcasters, compiled in alphabetical order of call letters. Send 15c for April 4 issue, the great Third Anniversary Number, to Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

A \$5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD, 1493 Broadway.

# What Makes a Set Selective

By William J. Schnell  
President the Reichmann Company

FUNDAMENTALLY selectivity in radio receivers is governed by the ratio of reactance to resistance in the circuit. The lower the resistance in proportion to the reactance the greater the degree of selectivity. Tuned radio circuits are made up of reactances and resistances. These reactances may be composed of pure capacity or pure inductance or of combinations of both capacity and inductance. With a circuit composed of pure induc-

tive reactance and capacitive reactance (i. e., containing no resistance) it would be theoretically possible to completely accept or completely reject, depending on the circuit used, a pure alternating current of any given frequency. Such a circuit would represent perfect selectivity. Such a combination is unattainable at this stage of the art because it is impossible to design any form of inductance or capacity which does not also contain more or less resistance.

Resistance in an alternating current circuit cannot be made to perform the one way street stunt, or literally, to discriminate between alternating currents of different frequencies as reactance will. Resistances will conduct alternating currents equally well, regardless of their frequency. Therefore the greater the proportion of resistance in a radio circuit, with less efficiency the circuit will separate signals of different frequencies.

### Radio Measures Selectivity

Speaking in terms of resonance curves, the greater the resistance value the wider the base of the resonance curve and also the lower the peak. From this it is seen that it is not impossible to rate receivers in degrees of selectivity based on the reactance-resistance ratio.

In an inductance resistance is caused, first by the ohmic or direct current resistance of the conductor itself. This is unavoidable, as there is no known method of building an inductance with a conductor having no ohmic resistance. This conductor resistance represents such a small portion of the total resistance that it can, for all practical purposes, be neglected. It hardly ever amounts to much more than 100th to 1000th part of the total resistance.

Next is the skin resistance of the conductor. It is affected by the surface area of the conductor and proportional to the current magnitude and frequency. As the current in radio receiving circuits is exceedingly small, skin resistance does not make up a very great part of the total resistance.

### Resistance Caused by Capacity

The next form of resistance that enters into an inductance is the apparent resistance caused by the fact that an inductance, as usually built, contains a certain amount of capacity, because it contains parallel turns of wire separated by a dielectric material. This capacity effect, with its consequent dielectric losses, introduces resistance into the circuit. Obviously the solution would be to remove as much as possible this capacity effect. This is done by spacing the conductors to reduce the voltage across the dielectric, or by so arranging the winding that the conductor does not run parallel, and also by using as little dielectric material as possible to separate the conductors. As this resistance, due to distributed capacity, is very often the greatest and most serious of the resistances which add to make up the coil resistance, it should be carefully considered.

### QUITS STAGE FOR "MIKE"

MAXINE BROWN, well known in musical comedy circles, notified the management of the "Plain Jane" company in New York City, that she was leaving the stage to become identified with radio station WTAS, owned by Charles E. Erbstein.

Miss Brown is the first musical comedy artiste to give up the stage for radio, and will be a salaried entertainer. Station WTAS is to have its own orchestra and entertainment staff.

## Latest Patents

WASHINGTON.

PATENTS on radio inventions granted by the Patent Office follow:

**RADIO VISION Mechanism** (No. 1,530,463), invented by C. Francis Jenkins, of Washington, D. C., Main object, the association of such parts as permit high speed and the required number of lines per inch for quality in the reproduction.

**RADIO SIGNALING SYSTEM** (No. 1,530,129), invented by Edward H. Loftin, of Washington, D. C., and Henry H. Lyon, of Hyattsville, Md. Improvement in operation of "low horizontal" antennae.

**RADIO DETECTOR** (No. 1,530,452), invented by Chas. E. Willey, of Louisville, Ky. Provides an improved construction and arrangement of parts for supporting the detector shaft, whereby such shaft is capable of universal adjustment.

**AMPLIFIER** (No. 1,530,364), invented by Edward F. Hennelly, of Schenectady, N. Y., and assigned to General Electric Co. Provides means whereby the degree of amplification which may be obtained with devices of the magnetron type may be greatly increased.

**RADIO SIGNALING SYSTEM** (No. 1,530,169), invented by Wm. F. Grimes, of Washington, D. C. Provides an apparatus which may be connected to the usual antenna circuit for maintaining the

**MAHOGANITE and BLACK RADION PANELS**

DIALS, KNOBS, TUBING, SOCKETS  
RADION LOUD SPEAKER HORNS, ETC.

"THAT SPECIAL SIZE" FOR YOUR  
PHONOGRAPH, PORTABLE OR SUPER

ALL STOCK SIZES  
WHOLESALE RETAIL  
Send for Complete Price List

New York Hard Rubber Turning Co.  
212 Centre Street New York City

The New Type 54

**SLEEPER MONOTROL**

Reg. U. S. Pat. Off.

Grimes Inverse Duplex System

The only set that has 3 stages of tuned radio frequency ON ONE TUNING DIAL.

23 Other Important Improvements

Write for booklet "W." It's FREE.

**SLEEPER RADIO CORPORATION**  
434 Washington Street Long Island City, N. Y.

**NEW REFLEX TUBES**

**\$1.50**

CANADA 35c EXTRA

All Tubes Guaranteed.

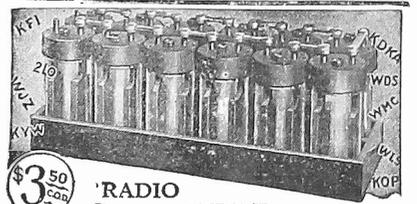
Mail Orders Solicited.

**DENNING RADIO MFG.**  
455 SPRINGFIELD AVE.  
NEWARK, N. J.

**CRAM'S INTERNATIONAL RADIO ATLAS**

This latest and greatest Radio Atlas has four big maps, a list of all the Radio Stations in the United States, Canada, and the entire world, alphabetically arranged by states and cities, latest wavelengths, kilocycles, and names of operators. Liberal space for your private log. Post paid on receipt of 50c, or one sent free with new yearly subscription for Radio World (\$6.00 for 52 nos.), but with no other premium.

**THE COLUMBIA PRINT**  
1493 Broadway New York City



**RADIO Storage "B" Battery**  
Lasts Indefinitely—Pays for Itself

Economy and performance unheard of before. Recharged at a negligible cost. Approved and listed as Standard by leading Radio Authorities, including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., LoFax, Inc. and other import at inst. a tons. Equipped with Solid Rubber Case, an insurance against acid and leakage. Extra heavy glass jars. Heavy ruzged plates. Order yours today!

Just state number of batteries you want and we will ship day order is received. Extra Offer: 4 batteries in series (96 volts), \$10. Pay expressman after examining batteries. 5 per cent discount for cash with order. Mail your order now!

**WORLD BATTERY COMPANY**  
1219 So. Wabash Ave., Dept. 871 Chicago, Ill.  
Makers of the Famous World Radio Storage Battery

Prices: 6-volt, 100 Amp. \$15.50; 120 Amp. \$16.50; 150 Amp. \$18.00.  
All equipped with Solid Rubber Base.

**World FOR RADIO STORAGE BATTERIES**

KOKA WEA WGN WJS KHU RGO KFAF WJY KOP

**FREE NAMEPLATE**

in beautiful colors will be supplied to all who request one for their Diamond of the Air. These nameplates will not be ready for distribution until May 15, but get on the list early.

Address Nameplate Editor, Radio World,  
1493 Broadway, New York City.

**REFLEXING THE 3-CIRCUIT TUNER YOU CAN LOG**, described by Herman Bernard in the March 14 issue of RADIO WORLD. A 3-tube reflex of great DX power, volume and quality. Send 15 cents to RADIO WORLD, 1493 Broadway, New York City.

**DURHAM Grid Leaks**

Used by Eagle, Howard, Thompson, Zenith and others. Fit all sets. Sold on guarantee.

**50c** Metallized Fixed Leaks  
18 sizes; under 1/4 meg., 75c; over 1/4 meg., 50c.

Glass Sealed Variable Leaks  
3 sizes fit all sets; 75c each for 1/10, 5 and 75c 10 megs. . . . .

At dealers or postpaid

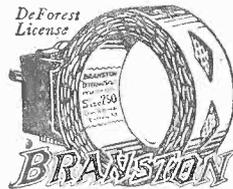
**DURHAM & COMPANY, Inc.**  
1936 Market Street Philadelphia, Pa.

# Capacity Control of Feedback

(Continued from page 4)

instead between the end of the plate coil (terminal that goes to one of the phones) and to A plus or minus. In any case, even with the tickler method, if regeneration isn't sufficiently plentiful this by-pass device may be resorted to.

The tickler method is preferable, there-



### HONEYCOMB COILS

The Universal all-wave inductance. Back and front panel mountings. Send 25c for Super Het., R. F. and Honeycomb Coil Circuits and Complete Catalog.

Chas. A. Branston, Inc.  
Dept. 5, 815 Main St.  
Buffalo, N. Y.

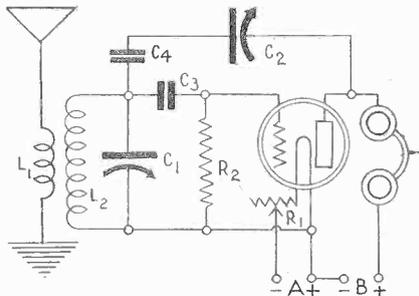


FIG. 6, a regenerative set where the capacity coupling is varied. L1, L2 may consist of 10 and 41 turns respectively of No. 20 double silk-covered wire on a 3 1/2" diameter tubing 4" high. Cardboard will serve nicely. C1 is .0005 mfd., normally 23 plates; C2, 5 plates. C4 is a safety condenser, preventing the tube from blowing out in case of short-circuit in condenser C2, unless C4 also is short-circuited. C3 is of small capacity, .00025 mfd. or so. R2 is the grid leak, preferably variable, R1 the rheostat. The B battery voltage may be from 22 1/2 to 45 for all tubes.

fore, because it is certain to work on any oscillating tube, whereas the other way works just as well only in such instances where it works at all. A point in favor of the tuned plate is that the regeneration control is spread over a greater surface of the dial. This makes for smoother control. Also, one may log the set with fair degree of success. Ordinarily a tickler setting cannot be depended on to be the same from week to week even for a given station, although in all cases the condenser dial setting C1 will be the same for the same stations.

Both tickler and tuned plated methods may be used simultaneously. This gives regeneration in great abundance and makes for still greater distance possibilities, but the set is harder to control and tune. The squawks, howls and whistles are likely to be quite annoying, no less to the operator of the receiver than to the neighbors. No remedy for this combined effect has been put forth. The condensers C1 and C2 may be logged. The tickler setting is uncertain, as always. If C2 is a .0005 mfd. variable condenser, as C1 is in all the circuits shown, then the plate coil L3 would consist of 43 turns of No. 24 double cotton covered wire on a 3" diameter tubing 3" high.

### Capacity Feedback

The simplest 1-tube regenerative circuit is shown in Fig. 4, where the coil is of the same dimensions and inductance as that for L3 in Fig. 4. A variation of this,

which affords greater DX, is shown in Fig. 5. In both these instances the rheostat serves as a regeneration control, but this method is not as stable as the others,

## KITS

### To Build Your Own Receiver

- Roberts—2 tube, Parts ..... \$31.44
- Roberts—4 tube, Parts ..... 48.35
- Rasla—1 tube, Parts ..... 23.78
- Rasla—2 tube, Parts ..... 31.43

GENUINE ERLA KITS IN FACTORY SEALED CONTAINERS

Write for Our 100-Page Catalog

### LIBERTY MAIL ORDER HOUSE

F682, 106 Liberty St., New York, N. Y.

## ONLY THREE TUBES

and it is the equal of any five-tube set ever built. It has selectivity and volume equal to any Super-heterodyne or Neutrodyne.

It has the purity and quality of tone of the crystal set.

It has the simplicity of control of the single-circuit set.

It has brought in Honolulu, Paris, London and other foreign stations on a loud speaker.

It gets distant stations while a 500-watt station only three blocks away is broadcasting.

It has only two controls and can be logged.

It is not a reflex; it is the result of years of careful and scientific research and experiment.

Any novice can build one successfully from our diagrams with complete instructions and special coil.

### PRICES

- Diagram, instructions and coil ..... \$5.00
- Three-tube instrument ready to use ..... 50.00
- One-tube instrument ready to use ..... 18.50
- gets everything on head-phones ..... 18.50
- Build or buy one of these wonderfully sensitive instruments and you will want no other.
- All goods shipped prepaid.

### S. A. TWITCHELL CO.

1930 WESTERN AVE. MINNEAPOLIS, MINN.

## RADIO MAILING LISTS

- 15870 Radio Dealers ..... Per M \$7.50
- 870 Radio Dealers in Mexico ..... Per List 10.00
- 1808 Radio Mfrs. .... Per List 15.00
- 2324 Radio Jobbers ..... Per List 20.00
- 1125 Radio Jobbers, rated \$5,000 and up ..... Per List 15.00
- 714 Radio Jobbers, rated \$50,000 and up ..... Per List 10.00
- 597 Radio Mfrs. making complete sets... 5.00
- 128 Radio Battery Mfrs. .... 2.50
- 125 Radio Cabinet Mfrs. .... 2.50
- 60 Crystal mounters for Wireless apparatus ..... 2.50
- 25000 Radio Amateurs ..... Per M 7.50
- 825 Photograph and Music Radio Dealers 5.00
- 7400 Radio owners ..... Per M 7.50
- Guaranteed 98% correct. Ask for Price List and all other lists.

### A. F. Williams, Mgr., List Dept.

Established 1880  
166 W. Adams St. Chicago, Ill.

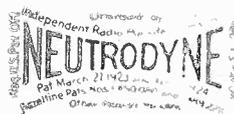


Write Today  
For Descriptive  
Folder of

## THE HOWARD 5-TUBE NEUTRODYNE

This Remarkable Set Has Created a Sensation Among Radio Enthusiasts.

Beautiful Walnut Cabinet with Special Howard Neutroformers, Tube Sockets and Rheostats.



### HOWARD MFG. COMPANY

451-469 E. Ohio St. Chicago, Ill.

# Two-For-Price-of-One Subscription Blank For NEW RADIO WORLD Subscribers Ordering NOW

Radio World has made arrangements

This is the way to get two publications

—To offer a year's subscription for any one of the following publications —with one year's subscription for RADIO WORLD

- RADIO NEWS or
- POPULAR RADIO or
- RADIO BROADCAST or
- WIRELESS AGE or
- RADIO DEALER or
- RADIO JOURNAL or
- RADIO (San Francisco) or
- BOYS' LIFE

- for the price of one:
- Send \$6.00 today for RADIO WORLD
- for one year (regular price
- for 52 numbers)
- and select any one of the other
- eight publications for twelve months.

- Add \$1.00 a year extra for Canadian or Foreign postage.
- Present RADIO WORLD subscribers
- can take advantage of this offer by
- extending subscriptions one year
- if they send renewals NOW.

### RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK

RADIO WORLD, 1493 Broadway, New York City.

Enclosed find \$6.00, for which send me RADIO WORLD for twelve months (52 numbers), beginning..... and also without additional cost, Radio News, or Popular Radio, or Radio Broadcast, or Wireless Age, or Radio Dealer, or Radio Journal, or \$10.00 for two yearly subscriptions.

Indicate if renewal.  
Offer Good Until  
April 25, 1925

Name .....  
Street Address .....  
City and State .....

# Regeneration in Abundance

and squeals may be fearsome. Nevertheless, the other sets do not get any more DX than the 1-dial set in Fig. 5. In both Figs. 4 and 5 the aerial goes to plate. Capacity coupling is relied on for returning the plate current to the grid. Another

## "EAGLE" ALL-METAL RADIO TOWERS

Adjustable to Fit Any Type of Roof

Get better reception with a good outside Aerial. Long distance sets, including ships at sea use the best possible Aerial. Eagle Radio Towers are handsome and sturdy. We ship on a money-back guarantee. Ask your dealer or write us for literature.

J. R. Burrell Co., 356 Folsom Pl., Milwaukee, Wis. Dept. 15



Ask an Owner He Knows

WHY PAY \$50 to \$150 FOR A 5 TUBE SET?

**\$17.50**

Buy Complete Parts to Build the Famous

**CLARO D. X. SPECIAL**

3 TUBE SET

PARTS INCLUDE ENGRAVED AND DRILLED PANEL:

- 2 23 Pl. Cond. L.L.
- 1 Coil, L.L.
- 2 Rheostats
- 2 Jacks
- 3 Sockets
- 2 Transformers
- 2 Dials
- 1 Filament Switch
- 1 Set B Post

Bus Bar—Down to the Last Screw, etc. For Volume and Distance It's a Knockout!

DIAGRAM FREE!

Special Cabinet for Above \$3.50

Send Money Order. We Pay Expressage. Satisfaction Guaranteed or Money Cheerfully Refunded.

**TUBES** Type 201A Every One Guaranteed **\$1.35**

**N & A RADIO CO.**

261 Washington St. Brooklyn, N. Y.

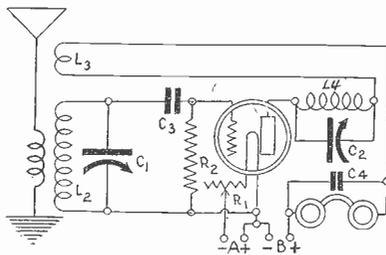


FIG. 7, a combination of tuned plate and tickler feedback. L1L2L3 is a 3-circuit tuning coupler, construction of which is described by Lieut. O'Rourke in the accompanying text, or may be any standard coupler. This is a great distance-getting set, but is rather critical to tune, especially if one desires to keep squeals at a minimum while tuning. Once the station is brought in quality is superb. Full details on construction of such a circuit were published in the December 20 and 27 issues of RADIO WORLD.

method of such capacitive coupling, but with a variable capacity, so that the rheostat need not be used for uncertain control, is shown in Fig. 6. Here an extra fixed condenser is included so that in case the rotor and stator plates of C2 should accidentally touch, the tube would not blow out. Otherwise a short-circuit of the B battery would take place across the filament.

A 7x10" panel will be ample for any of these seven circuits. In mounting the parts put the coil to the left and the condenser or condensers to the right of the coil. One exception is that the variometer goes at extreme right. The rheostat may be placed directly under one of the dials. The only other part that need appear on the panel is the jack, a single-circuit affair, should a jack be used. A terminal strip (binding posts on one block) is placed at the rear of a wooden baseboard and the battery leads introduced to the posts, the lugs being wired to the proper connecting points in the set. The aerial and ground may be directly connected to the primary without going to the intervening connection at the terminal block.

Two stages of transformer-coupled audio-frequency amplification or three stages of resistance-coupled AF may be added successfully to any of these circuits for speaker operation.

**Bankrupt Stock**  
Cunningham Regenerative one tube long range sets, \$10.50 each  
Formerly sold at \$32.50  
No Circulars. Order from This Ad. Hurry before they are all gone. Prepaid while they last.  
**S. A. TWITCHELL**  
1930 Western Av., Minneapolis, Minn.

**Finer Selectivity**  
Equip your receiving set with Apex Vernier Dials. They will greatly increase the efficiency of any set. Make tuning positive—bring in distant stations. Your dealer has them. If not, send \$2.00 for Royal Brass Finish—\$2.50 for Satin Silver Finish, or \$3.50 for DeLuxe Gold Plated (24k).

**APEX SUPER 5**  
This highly efficient tuned radio frequency receiver is most advanced in design and construction. An instrument that meets every critical expectation of the radio enthusiast.

Housed in a highly finished walnut cabinet, complete with Jones Multi-plug Battery Cable. All settings highly gold plated. Sells for \$95 complete excepting accessories.

At All Good Dealers  
**APEX ELEC. MFG. CO.**  
1410 W. 59th St. Chicago Dept. 423

## PROFESSIONAL SET BUILDERS!

and dealers who build sets

WE will shortly begin a series of newspaper advertisements, featuring the work of individuals and dealers who build sets using Cardwell Condensers.

If you build to specification or from original design, it will be to your interest to communicate with us immediately.

Ask for details of plan. Be sure to give name of your jobber.

**ALLEN D. CARDWELL MANUFACTURING CORP.**

81 Prospect Street, Brooklyn, N. Y.

### STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Radio World, published weekly at New York, N. Y., for April 1, 1925.

State of New York, County of New York, ss.:

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Roland Burke Hennessy, who, having been duly sworn according to law, deposes and says that he is the Editor of the Radio World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Hennessy Radio Publications Corp., 1492 Broadway, N. Y. C.; editor, Roland Burke Hennessy, 1493 Broadway, N. Y. C.; managing editor, Herman Bernard, 1493 Broadway, N. Y. C.; business manager, Fred S. Clark, 1493 Broadway, N. Y. C.

2. That the owner is (if the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent. or more of the total amount of stock should be given); Hennessy Radio Publications Corp., 1493 Broadway, N. Y. C.; Roland Burke Hennessy, 1493 Broadway, N. Y. C.; Mrs. Mary McArthur, 1886 East 82nd Street, Cleveland, Ohio.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and secur-

**LIST OF STATIONS**  
Get this roster of American broadcasters, compiled in alphabetical order of call letters. Send 15c for April 4 issue, the great Third Anniversary Number, to Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

ity holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown is . . . . . weekly. (This information is required from daily publications only.)

ROLAND B. HENNESSY, Editor.  
(Sworn to and subscribed before me this 30th day of March, 1925.)

KARL E. GOTTFRIED, Notary Public, New York County, New York County Clerk's No. 180, New York Co. Register's No. 6163. Term expires March 30, 1926.  
Note—This statement must be made in duplicate and both copies delivered by the publisher to the postmaster. General (Division of Classification), Washington, D. C., and retain the other in the files of the post office. The publisher must publish a copy of this statement in the second issue printed next after its filing.

# Waves Suffer Fatigue On Long Trip

LESS than 1/100th of a second is required for a radio wave to speed from a high-powered, 1,500-watt broadcasting station in New York to the antennae of Iowa receiving sets, Dr. Paul S. Helmick, professor of physics at Drake University, Des Moines, Ia., declared. But when a tired Iowa business man settles down in his easy chair after dinner and twists the dials of his Super-Heterodyne until the speaker floods the room with music of an Eastern

## GEM TUBE

A Guaranteed Radio Tube Within Reach of All

Every tube guaranteed. A tube for a dollar of \$3 value. A trial order will convince you as it has thousands of others. Send your orders at once.

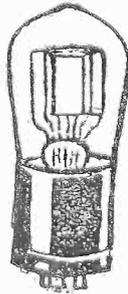
Orders sent C.O.D. parcel post.

Type .201A	All
Type .200	<b>\$1.00</b>
Type .199	
Type .199A	EACH

Dealers, Write for Discounts

**GEM TUBE CO.**

Dept. W, 200 Broadway  
New York City



## Hammond Patents Device to Control Moving Objects

WASHINGTON.

A PATENT was granted by the Patent Office during the past week to John Hays Hammond, Jr., of Gloucester, Mass., covering apparatus for controlling a moving object by radio. The objects of this invention (covered by Patent No. 1,529,065) are to provide a transmission means for producing a series of groups of sound waves having a predetermined wave frequency and a predetermined group frequency; to provide an improved receiving system for controlling a movable body or functioning device in response to sound waves; to provide an improved system for the control of submarines or other movable bodies and to provide an improved system of submarine mine sweeping.

orchestra, he little realizes the feeble intensity of the radio waves which pulse across the turns of his loop antenna at the rate of 600,000 waves per second, with a speed 300,000 times as fast as that of the bullet of a high-powered rifle, said Dr. Helmick. Notwithstanding its disregard for speed laws, a radio wave is not a good traveler,

Dr. Helmick adds. A long journey makes it quite fatigued. While a radio wave requires less than 1/100 of a second to travel from New York to Iowa, yet in this short interval of time it has become so attenuated that it is able to induce in the receiving loop a current of only a millionth of the intensity required to operate your cellar light.

But small as is the energy received from the 1,500-watt station, radio amplifiers are so effective that the power given the loudspeaker is billions of times the power received by the aerial.

### If Your Neut's Gone Back on You—

Rebuild it to this Kladag Coast to Coast Circuit, using same old panel, almost same parts, but no Nightmare of Neutralization. Twenty-two feet of gold sheathed wire, with only extra part and simple, complete instructions—\$3.00, prepaid anywhere. Nothing more to buy. Over a thousand "converted" Neuts are daily bringing in clean, resonant volume from Coast to Coast. Details—10c. 48 page meaty catalog of PARTS ONLY—10c.  
KLADAG RADIO LABORATORIES, Kent, Ohio

## FAHNESTOCK CLIPS

"Popular Wherever Radio Is Used"

14 Sizes in Beautiful Display Case  
Dealers write for big money-making proposition.

**FAHNESTOCK ELECTRIC CO.**  
Long Island City, L. I.



New York's newest and most beautifully furnished hotel—accommodating 1034 guests  
Broadway at 63<sup>rd</sup> Street.

ROOM WITH PRIVATE TOILET  
**\$250**  
ROOM WITH PRIVATE BATH—  
**\$350**  
ALL OUTSIDE ROOMS

**COMPLETE 1924 INDEX OF RADIO WORLD**

Appeared in RADIO WORLD dated Oct. 18, 1924, and Jan. 10, 1925. 15c per copy. RADIO WORLD, 1493 Broadway, New York.

## "SELECTODYNE COILS"

COPYRIGHT APPLIED FOR

SELECTIVITY—FOR THE ROBERTS CIRCUIT ALL THAT THE TONE—POWER THE NAME IMPLIES

A low loss winding that is self-neutralizing. The neutralizing condenser and bucking winding are eliminated with their loss of selectivity and volume. A new development in radio frequency amplification setting a much higher standard of efficiency.

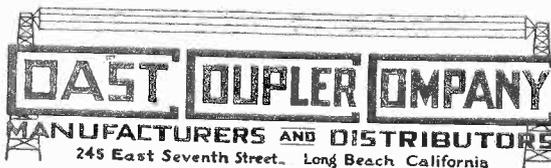
GUARANTEED WITHOUT RESERVATION

**PRICE, \$7.50 PER SET**

"When Better Coils Are Made They'll Be Selectodynes."

AT YOUR DEALERS OR DIRECT BY MAIL

SOME TERRITORY STILL OPEN TO JOBBERS—WRITE OR WIRE



# RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM

**STATIC ELIMINATOR**—The sensation of the year. Guaranteed to reduce "Static." \$2.65 delivered, complete with full instructions. Pay postman. Static Reducing Co., Iron Mountain, Mich.

**OVERSTOCKED—BRISTOL** One-Stage Power amplifiers, \$15.90; Bristol, \$22.50; loudspeaker, \$12.25; Acme Super-Heterodyne transformers, \$3.75 each. All new. C. O. D. Tribune Radio Co., Hardin, Montana.

**LEARN CODE** in one hour. Method now \$1.50 postpaid. H. Anderson, Box 593, Great Falls, Mont.

**CROSLY THREE-TUBE SET** with accessories, cheap. Sherman Diefenbacher, Mt. Healthy, Ohio, R. R. 14.

**COMPLETE LIST OF U. S. BROADCASTING STATIONS** appeared in RADIO WORLD dated April 4, 1925. 15c per copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, N. Y. C.

### RECENT BACK NUMBERS

of RADIO WORLD, 15 cents each, or any seven for \$1. Address Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

**RADIO HOSPITAL.** Specialists in Neurodynes and Superheterodynes. Radio Central, Abilene, Kansas.

**BE RADIO MAN** of your county. I show you how. Send \$2.00 for samples. Money back guaranteed. James H. Konkle, 192 Market Street, Newark, N. J.

**AGENTS**—Write for free samples. Sell Madison "Better-Made" Shirts for large Manufacturers direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Mfrs., 501 Broadway, New York.

**DINING AND SLEEPING CAR CONDUCTORS** (White) Exp. unnecessary. We train you. Send for book of Rules and application. Supt. Railway Exchange, Sta. C, Los Angeles.

**HOW TO MAKE A STORAGE B BATTERY** described by Herbert E. Hayden in March 7 issue. Copy, 15c. RADIO WORLD, 1493 Broadway, New York City.

**A \$5 HOME-MADE LOUDSPEAKER**, by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD, 1493 Broadway.

**2650 MILES DISTANCE** with one tube. We send complete understandable instructions with panel layout, picture diagrams, etc., for 25c. OR BIG BOOKLET FREE. VESCO RADIO CO., Box 117-RW Oakland, California.

**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 & So., 924 Ninth, Washington, D. C.

**LOUDSPEAKER ON TWO TUBES** accomplished by the Bluebird Reflex, described by Lieut. Peter V. O'Rourke in the Feb. 7 issue of RADIO WORLD. Picture diagram, also schematic diagram, panel and assembly plans. An inexpensive set to make and operate. One stage of tuned RF, crystal detector, one reflexed audio stage and one free audio stage. Selective and good for DX. Send 15c for a copy or start your subscription with the February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

**COMPLETE 1924 INDEX OF RADIO WORLD**, appeared in RADIO WORLD, dated Oct. 18, 1924, and Jan. 10, 1925. 15c per copy.

# JOIN THE A. B. C.

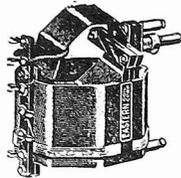
A. B. C. stands for the American Broadcast Club. Join it today. It involves no dues or payment of any kind, and no obligations. It was founded by **RADIO WORLD** simply to unite the broadcast listeners and radio fans in general in a common bond to promote their welfare as occasion requires. Send your name and address to A. B. C. Editor, **RADIO WORLD**, 1493 Broadway, New York City.

H. W. Eiden, Dickinson, N. D.  
Gustave Johnson, Wasca, Minn.  
Glen McMinney, Algona, Iowa.  
J. S. Valis, Reg. Dept., Station "Y", N. Y.  
Adam Stauck, 1915 Gates Ave., Brooklyn, N. Y.  
Ed L. Dearborn, 47 Broadway Ave., Bridgeport, Conn.

(Concluded in next column)

## LOW-LOSS COILS

in the Famous Pickle bottle form designed by M. B. Sleeper



Certified by **HERMAN BERNARD**

for use in the Radio World's 1925 Model

## DX SUPERDYNE

Guaranteed for best results in this wonder circuit

Price \$3.00 per set

At your Dealers or direct postpaid

**EASTERN COIL CORP.**

Dept. R.W., 22 Warren St., New York, N. Y.

## "HOW TO MAKE—"

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

- Sept. 6, 1924—A simplified Neutrodyne with Grid-Biased Detector, by J. E. Anderson.
  - A Low-Loss Wave Trap, by Brewster Lee.
  - Nov. 15—A Sturdy Low-Loss Coil, by Lieut. P. V. O'Rourke. An Ultra 2-Tube Receiver, by Byrt C. Caldwell.
  - Dec. 6—A 2-Tube Super-Heterodyne Using a Variometer, by J. E. Anderson. A \$1 Coil Winder, by Herbert E. Hayden.
  - Dec. 13—The World's Simplest Tube Set, by Lieut. P. V. O'Rourke.
  - Dec. 20—A 1-Tube DX Wander, Rich in Tone, by Herman Bernard. An Interchangeable Detector, by Chas. M. White.
  - Dec. 27—A 2-Tube Variometer Set, by Lieut. P. V. O'Rourke.
  - Jan. 3, 1925—A 3-Tube Portable That Needs No Outdoor Aerial, by Abner J. Gelula.
  - Jan. 10—A Low-Loss DX Inductance, by Herbert E. Hayden.
  - Jan. 17—A \$25 1-Tube DX Wonder, by Abner J. Gelula.
  - Jan. 24—A Selective \$15 Crystal Set, by Brewster Lee. A Variometer-Tuned Reflex, by Abner J. Gelula. An \$18 1-Tube DX Circuit for the Beginner, by Feodor Kopfatkin.
  - Jan. 31—A Transcontinental 2-Tube Set, by H. E. Wright. An Experimental Reflex, by Lieut. P. V. O'Rourke.
  - Feb. 7—The Bluebird Reflex, by Lieut. P. V. O'Rourke. A \$5 Home-Made Loudspeaker, by Herbert E. Hayden.
  - Feb. 14—A Super-Sensitive Receiver, by Chas. H. M. White. A Honeycomb BFT for DX, by Herbert E. Hayden.
  - Feb. 21—A 1-Tube Buffer for the Novice, by Feodor Kopfatkin. A Set for Professional Folk, by Lieut. P. V. O'Rourke. A Honeycomb Crystal Receiver, by Raymond B. Wallis.
  - Feb. 28—A Set That Does the Most Possible With 6-Tubes, by Thomas W. Benson. Three Resistance Stages of AF on the 2-Circuit Tuner, by Albert Edwin Swan.
  - March 7—Storage B Battery, by Herbert E. Hayden. Benson's Super-Heterodyne.
  - March 14—The Reflexed 3-Circuit Tuner That You Can Log, by Herman Bernard.
  - March 21—A Variable Leak, by Herbert E. Hayden. A 4-Tube, 3-Control Set That Gets the Most DX, by Lieut. P. V. O'Rourke.
  - March 28—The Improved DX Dandy Set, by Herbert E. Hayden. A 3-Tube Reflex for the Novice, by Feodor Kopfatkin.
  - April 4—The Diamond of the Air, by Herman Bernard. What the New Sodion Tube Is, by Sidney E. Finkelstein. Sets for the DX Devotee, by Lieut. P. V. O'Rourke.
- Any copy, 15c. Any 7 copies, \$1.00. The whole 20 copies for \$2.75, or start subscription with any issue. **Radio World**, 1493 Broadway, N. Y. City.

### LIST OF STATIONS

Complete, Accurate, Official

Get this roster of American broadcasters, compiled in alphabetical order of call letters. Send 15c for April 4 issue, the great Third Anniversary Number, to Circulation Manager, **RADIO WORLD**, 1493 Broadway, New York City.

## Entertainers on Air Organize for Pay Plan

At a meeting of radio entertainers held under the auspices of the Radio Artists' Association in New York City, a resolution was adopted requesting that the various broadcasting stations give the association the standard which they use in obtaining entertainers for broadcasting. The resolution said that the association wished to co-operate with the stations in arranging standards which radio entertainers must live up to before they are permitted to go on the air.

At the meeting it developed that one of the principal purposes of the association, which has branches in Chicago, Boston and Cleveland, is to secure payment for radio artists. It is at present studying methods of doing this. Among the speakers were H. A. Brune, James Clark, Robert Emmerich, Don Short and Richard I. Blythe.

- William F. Launder, 312 Stockbridge Ave., Buffalo, N. Y.
- J. W. Lane, 120 N. Main St., Coalgate, Okla.
- Perry D. Jones, 38 W. 137th St., New York City.
- Frank R. Brown, 222 7th Ave., Long Island City, N. Y.
- L. G. Benjamin, 968 Morris Ave., New York City.
- Merritt A. Greeley, Webster City, Ia.
- Albert Deck, 2612 Kingshighway, St. Louis, Mo.
- F. B. Robertson, 459 W. 163rd St., New York City.
- Lester C. Rhinehart, R. No. 8, West Lancaster, Pa.
- H. R. Weiss, Barrs Mills, O., Box 10.
- F. R. Wettig, 4950 Tyroler Ave., St. Louis, Mo.
- J. H. Ries, 1202 So. 2nd St., Norfolk, Neb.
- E. J. Angel, 27 Whittlesey Ave., East Orange, N. J.
- Frank J. Jolly, Jr., Station A, Ogden, N. Y.
- F. McDermott, care Long Island R. R., Jamaica, L. I.
- George H. Mack, 1408 Balto St., Baltimore, Md.
- Charles Markarian, 110 Summer St., Worcester, Mass.
- Frank Scheiber, 409 Duncannon Ave., Philadelphia, Pa.
- Percy Gruner, 2917a N. Newstead Ave., St. Louis, Mo.
- Thomas Dolan, 338 E. 35th St., New York City.
- George M. Ochikubo, Route 1, Box 184, Portland, Ore.
- A. L. Ockerman, Garfield, Utah.
- J. Besterman, 365 50th St., Brooklyn, N. Y.
- J. C. McFarland, P. O. Box 101, Sandersville, Miss.
- G. Warnuki, 584 Fairview Ave., Brooklyn, N. Y.
- William S. Gaul, 308 Caroline Ave., Scranton, Pa.
- George W. Cole, 35 Cedar Place, Great Kills, N. Y.
- Tony Morovac, 1610 S. Allport St., Chicago, Ill.
- Jack Pitman, Box 161, Grafton, W. Va.
- Romeo A. Schak, 72 E. 3rd Ave., Columbus, Ohio.
- J. Scott McKenney, Price, Md.
- Robert McCarvey, Jr., 627 Jackson Ave., Elizabeth, N. J.
- Herbert Chrysler, 31 Grove St., Homer, N. Y.
- W. M. Patterson, 1003 Indiana Ave., Monaca, Pa.
- Torss Yashanan, Rummelfield, Pa.
- Herbert A. Kaft, 51 E. Kransit St., Prior, N. J.
- John W. Huntsinger, 12 R. R. Ave., Bridgeton, N. J.
- R. H. Booth, 708 Stewart Ave., Cambridge, Ohio.
- Paul V. Fussner, Elmwood, Ill.
- Sam Iskow, 1115 E. 13th Ave., Denver, Col.
- Louis Kranik, c/o Thomas Roulston Store, 273 Front St., Hempstead, L. I.
- Richard S. Taylor, 1129 E. 144th St., Cleveland, Ohio.
- Martin Kasch, 102 Willowood Dr., Dayton, O.
- G. McLennan, 22 Maynard Ave., Kitchener, Ontario.
- Bernard B. Nelson, Gillette, Wyoming.
- Leonard Browe, R-2, Box 4, Stout Road, Menomonie, Wis.
- Ralph Wyant, P. O. Box 54, Hudson, N. Y.
- Richard B. Baldwin, 402 Center St., Bangor, Me.
- S. J. Phillips, 719 Hopkins St., Buffalo, N. Y.
- Henry J. Kunz, 134 Lafayette St., Glendale, L. I.
- Anthony Peters, 86 Cambridge St., Cambridge, Mass.
- Melvin Wertman, 179 So. West St., Geneva, N. Y.
- John Hughes, R. F. D. No. 1, Muskegon, Mich.

A. B. C. Editor, **RADIO WORLD**, 1493 Broadway, New York City.

Please enroll me as a member of the American Broadcast Club.

Name .....

Address .....

City or Town .....

State .....

## ACME POWR-BEE

Better Than "B" Battery

NO HUM

NO NOISE

Reduce the cost of radio. At your dealer's or write.

**THE ACME ENGINEERING CO.**

Dept. 3 LOUISVILLE, KY.

Dealers write for big sales proposition.

**BILTMORE RECEIVERS.**

Combines all the essentials of fine radio reception to the highest degree at lowest prices. Write for descriptive circular. Dept. X.

**BILTMORE RADIO Co.**  
BOSTON 30 MASS.

## HERCULES AERIAL MAST



20 Ft. Mast \$10  
40 Ft. Mast \$25  
60 Ft. Mast \$45

All steel construction, complete with guy wires and masthead pulley. We pay the freight.

S. W. HULL & CO., Dept. E3  
2048 E. 79th St., Cleveland, O.

Write for literature and FREE Blueprint

## JOFFE-GOLBERT CO.

Gilfilan Neutrodyne  
Somerset Receivers  
Marwol Sets  
Amplion Speaker  
Radio Furniture  
Radio Accessories

Distributors of

33 WEST 60TH STREET NEW YORK

**Free Mailing Lists**

Will help you increase sales. Send for FREE catalog giving counts and prices on classified names of your best prospective customers—National, State, Local, Individuals, Professions, Business Firms.

99% Guaranteed 5¢ each by refund of 5¢ each

**ROSS-Gould Co.** 315 N. 10th St. St. Louis

# IN THE WEST it's "RADIO"

For Seven Years the Best Practical Radio Magazine.

**A Free Sample Copy for the asking**

**PACIFIC RADIO PUB. CO.**  
Pacific Bldg. San Francisco

Did you get **Radio World's** Third Anniversary Number dated April 4, 1925?

Some features in that number:  
**RADIO WORLD'S** "Diamond of the Air," by Herman Bernard, with diagrams.  
 Trouble-Shooting for Benson Super-Heterodyne.  
 What the New Sodion Tube Is.  
 Coil for 1-A Portable.  
 Latest official list of Broadcasting Stations.  
 Radio University.  
 Sets for the Devotee of DX.  
 15c copy, or start your subscription with that number.

**RADIO WORLD**, 1493 Broadway, New York

EVEREADY HOUR  
EVERY TUESDAY AT 9 P. M.

(Eastern Standard Time)

For real radio enjoyment, tune in the  
"Eveready Group." Broadcast through  
stations

WEAF	New York	WFI	Philadelphia
WJAR	Providence	WGAE	Pittsburgh
WEEI	Boston	WGR	Buffalo

*Dry "B" Batteries  
are an economical,  
dependable and  
convenient source  
of plate  
current!*

# Satisfaction Reliability Economy

You need three things in radio "B" Batteries—satisfaction, reliability and economy. You get them all in Eveready "B" Batteries. Satisfaction, because they produce all the current needed by your tubes, giving you the maximum results of which your set is capable. Reliability, because you can depend on them to work at full power. Economy, because they long maintain their strength, and because they are low in price.

Advances in the art of battery manufacture make Evereadys last longer than ever. You actually get much longer service for your money.

There is an Eveready Radio Battery for every radio use.

Buy Eveready Batteries.

*Manufactured and guaranteed by*

NATIONAL CARBON COMPANY, INC.

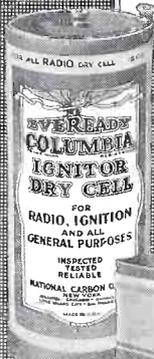
New York

San Francisco

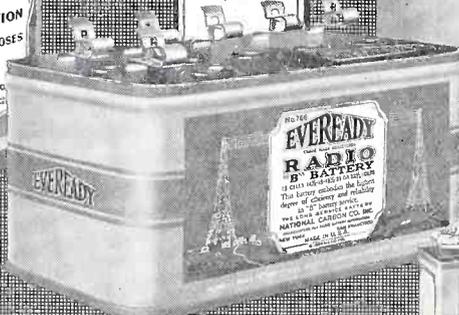
Canadian National Carbon Co., Limited, Toronto, Ontario

## EVEREADY Radio Batteries —they last longer

Eveready  
Columbia  
Ignitor  
Dry Cell  
"A"  
Battery  
for all  
Dry Cell  
Tubes  
1½ volt



No. 766  
22½-volt  
Large  
Horizontal  
Price  
\$2.00



No. 772  
45-volt  
Large  
Vertical  
Price  
\$3.75



No. 771  
4½-volt  
"C"  
Battery  
improves  
quality,  
saves  
"B"  
Batteries  
Price 60c