March 7 1925

THE IDEAL COILS FOR BEST CIRCUITS

15c.

Kind and Size of Wire, What Diameters Are Best,
Computed by J. E. Anderson on Bureau of Standards Ratio

RADIO WORLD

Title Reg. U.S. Pat. Off.

VOL. 6. NO. 24. ILLUSTRATED EVERY WEEK

How to Make a Storage B Battery

By Herbert E. Hayden

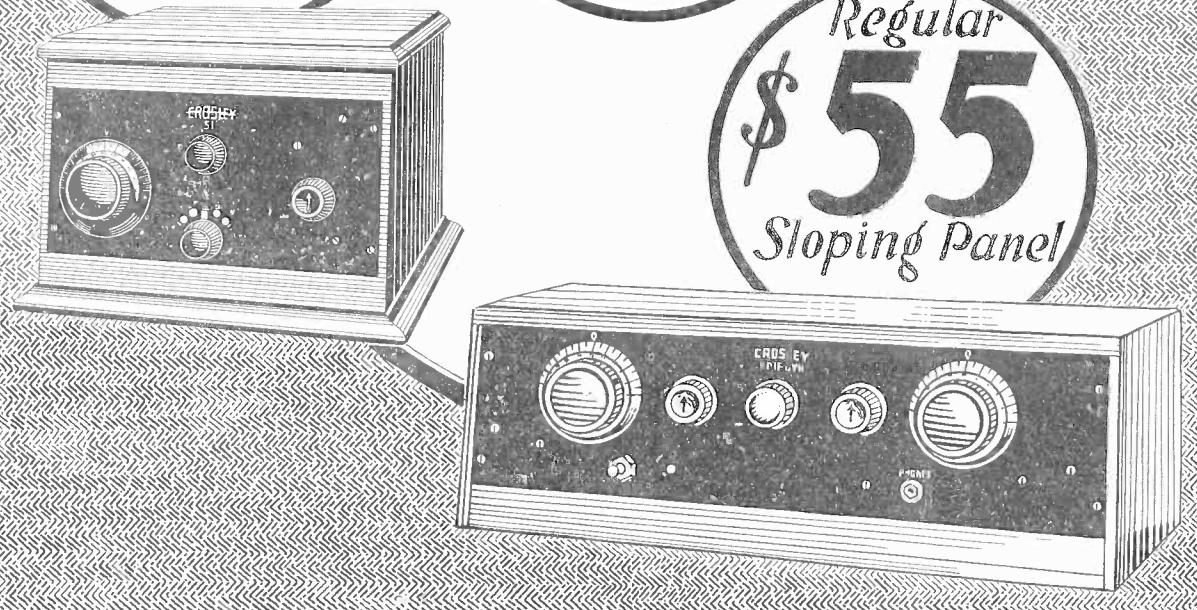
Picture Diagram of Benson's New 6-Tube Super-Heterodyne

CROSLEY 51-SPECIAL AND NEW TRIRDYN

51 Special
$23.50
2 Tube

The Biggest Selling Radios in the World

Regular
$55
Sloping Panel



The recognized outstanding achievement in radio is the Crosley Trirdyn. An overburdening amount of evidence proves that it is excelled by none and superior to most receivers costing many times more. It is a three-tube radio, combining one stage of tuned radio frequency, regenerative detector and reflex amplification. This combination enables three tubes to do the work of five or six. Brings in every large station in the country on the loud speaker. Is very selective, easy to tune and economical to operate. Trirdyns can be purchased from any good dealer at the following prices: $50.00—$55.00—$60.00 and $65.00. The price depends entirely upon the style of cabinet you select.

The Crosley two-tube, 51 Special, at $23.50, is the same as the nationally known Crosley 51, except it is installed in a larger cabinet with sloping panel in which there is room for dry cell batteries. This radio is as artistic as it is efficient, appealing to the housewife who demands beautiful appearance and elimination of visible batteries. The performance of the Crosley 51 has never been excelled by any instrument at anywhere near the price. All Crosley radios are licensed under the Armstrong Regenerative U. S. Patent 1,113,149. Other models priced from one tube 50 at $14.50, to the Trirdyn Special with sloping panel at $65. For Sale by Good Dealers Everywhere. Prices quoted are without accessories.

Prices West of Rockies—add 10%
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RADIO'S GREATEST DEVELOPMENT!

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AN EXTREMELY BEAUTIFUL and Powerfully Efficient 5-Tube Radio Receiver with only 2 Dials to Control, for . . . **$55.00**

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Five perfectly balanced and guaranteed tubes, regularly selling for $15.00. These tubes are given free with each set purchased in order to introduce this wonder set to the great masses of people who want something besides a lot of noise and who do not desire studying the technique of Radio Engineering in order to be competent operators of their instrument.

Specifications—

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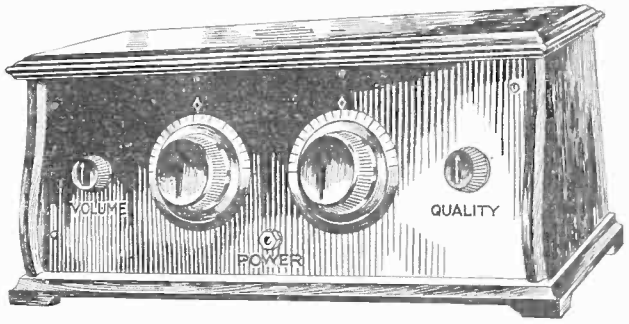
Absolutely Guaranteed For One Year



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Each set is assembled by experts—is three times tested before it leaves our factory. Yet— if you decide within *3 days* that you are not satisfied, we will cheerfully return your money.

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3 DAYS' FREE TRIAL

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THE RADIO SYNDICATE OF NEW YORK

240 BROADWAY NEW YORK CITY

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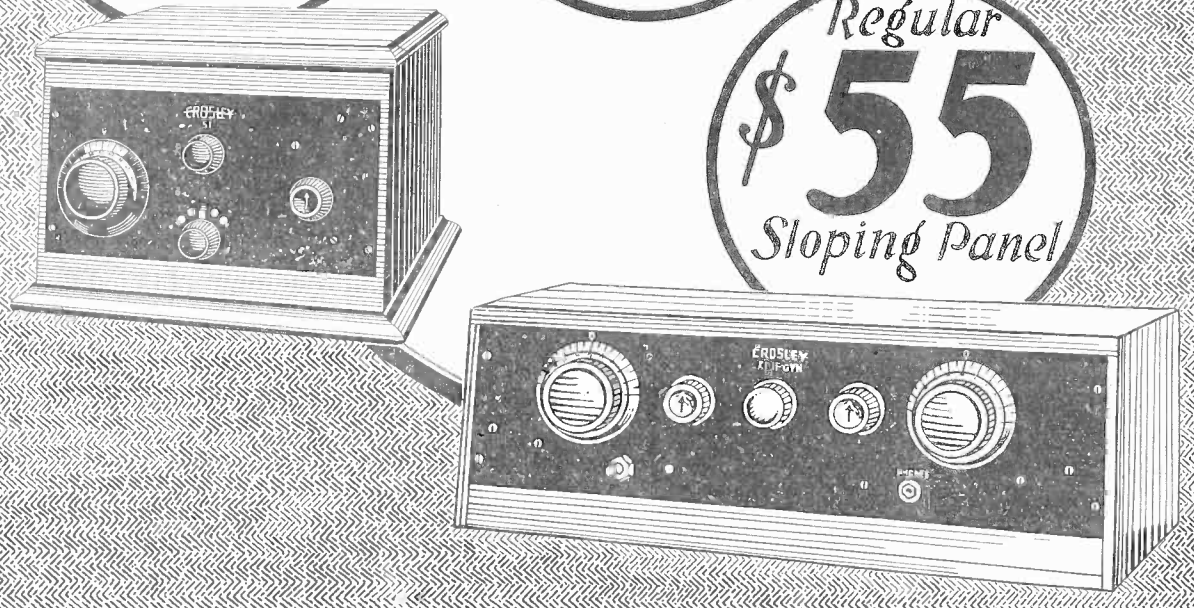

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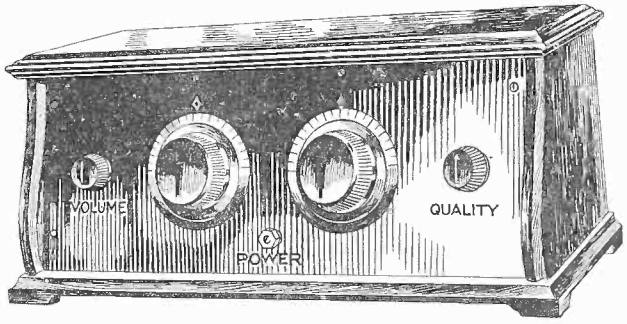

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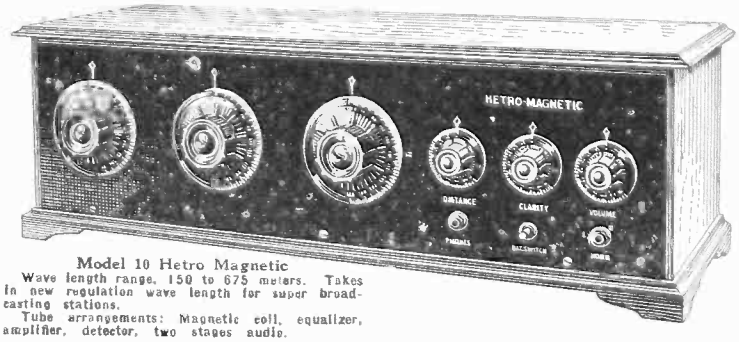
THE RADIO SYNDICATE OF NEW YORK

240 BROADWAY NEW YORK CITY

GRASP THIS OPPORTUNITY NOW

THIS $150 HETRO-MAGNETIC RECEIVER



Model 10 Hetro Magnetic
Wave length range, 150 to 675 meters. Takes in new regulation wave length for super broadcasting stations.
Tube arrangements: Magnetic coil, equalizer, amplifier, detector, two stages audio.

ONLY $43.50

FREE 10-DAY TRIAL

Through our good fortune we obtained the license to manufacture the newly developed Trans-Oceanic 5-tube Hetro-Magnetic Receiver, the most modern receiver of the day, made world famous for its ability to enable European listeners to hear American Broadcasting stations.

At this time the receiver needs no introduction, for the reason that many thousands have been sold in the States and manufacturers of this type of instrument are far behind in production and deliveries. The instrument is considered to be the most powerful receiver available recognized throughout the entire world in receiving distant stations. English and South American stations have frequently been heard, but cross continental reception is nothing new to tell about when using Hetro Receivers.

Allow us to present to you this newly developed, most modern 5-tube Hetro-Magnetic Receiver, the most sensitive, most powerful and greatest distance getter of all.

Its construction is entirely different than the common radio frequency sets now being offered on the market at break neck prices. Each instrument is custom built.

The cabinet is a beautiful mahogany and highly polished product.

The tuning is exceptionally simple, stations always being obtainable at the same dial settings.

The daylight distant adjustment, something new in Receivers enables one to get real distant stations in broad daylight and makes the set exceptionally powerful at night.

The instrument makes a beautiful appearance and is suitable for the most aristocratic reception room.

An amazing feature is the fact that stations can be tuned out at wish within two degrees. This makes it possible to enable one to tune out local broadcasting stations without difficulty.

Other improvements enable the batteries to last much longer than usual, as very little current is used.

Most all progressive farmers, schools and banquet halls are using Hetro Receivers, for reason of its exceptionally good volume and clearness in speech. The volume control regulates the amount of power required when receiving stations.

The reason for the remarkably low price is only because we have adopted a policy to sell direct to the consumer. Competitive manufacturers are selling this Receiver for $100.00 and $150.00 respectively. Deducting the dealers', the jobbers' and salesmen's discounts, the rock bottom net price would therefore be $43.50.

GENERAL INFORMATION

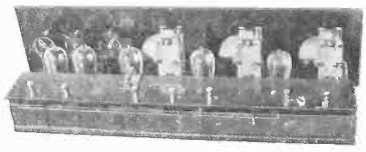
ANTENNA: Single wire, 10 to 150 feet long; works satisfactorily on indoor antenna.

TUBES: For dry cells use 100 for 201A or C201A use 6-volt storage Battery. 90 volts for the B Battery.

PANEL: Beautifully engraved, highly polished.

DIALS: 3 4-inch, 3 2-inch.

CONTROLS: Germania system.



Rear View

CONDENSERS: Low Loss, special type.

SOCKET: Bakelite, side contacts.

CABINET: Beautifully finished 8 by 27 solid mahogany, piano hinged.

GUARANTEE: One year against defective workmanship and to work equally as well under the same conditions as any set ranging in price from $75.00 to $250.00, with a 10 day privilege to return the set for a refund should it fail to do so, or should the instrument not look its value.

Set comes with complete installation chart, and simplifies directions for installing and operating.
Can be installed by anyone within 60 minutes.

PRICE $43.50
for Receiver Only

PRICE for Receiver complete with 5-RCA tubes, 1 storage A Battery, Peerless Horn, B Battery, Aerial and Ground Equipment.

$82.50

Adirondack Mt. Service Co., 1582 Inwood Ave., New York, N. Y.

Enclosed please find my remittance of ($43.50 for which please send me at once one guaranteed Hetro-Magnetic Receiver. It is understood that I am to try this receiver for 10 days and should it not be as advertised I have the privilege to return the set in good condition and you will return my money.

Name .....
Address .....
City .....
State .....

ADIRONDACK MT. SERVICE CO.
1582 Inwood Ave., New York, N. Y.

Issue of March 7, 1925, Vol. 6, No. 24, Whole No. 154, of RADIO WORLD, a weekly paper dated Saturday and published by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. Per copy, 15c; per year, $6.00. Telephones: Lackawanna 6976 and 2063.

VOLUME SIX OF

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]

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Vol. VI. No. 24. Whole No. 154. March 7, 1925 15c per copy, $6.00 a year

How to Wind Nearly Ideal Coils for the Best Circuits

Directions for Making the Most Efficient Radio-Frequency Transformer to Be Tuned By a .0005 Mfd. Variable Condenser—What Turns Ratio to Use—Data for Winding Other Coils.

[Many are the considerations that affect the determination of what approaches "the ideal coil." J. E. Anderson, noted consulting engineer, has very sanely and expertly analyzed the conditions and presents herewith his directions for winding the preferred coils for given circuits. Where variable factors had to be considered, Mr. Anderson made a definite choice, carefully explaining how a different choice would require a different coil. For instance, as the .0005 mfd. variable condenser is most popular, and it is not always safe to use one of less capacity (for fear of not tuning in the entire broadcast belt) Mr. Anderson took a .0005 mfd. variable condenser for granted. Another consideration was the ratio of coil diameter to axial length. Roughly, the coil diameter may be identified by the outside diameter of the tubing on which it is wound. The axial length is the number of inches taken up by the coil when the sum total of turns and space between are measured, from one end of the coil to the other. The Bureau of Standards' finding that a diameter equal to 2.3 times the axial length was as near to ideal as was practical has governed Mr. Anderson's choice. Resistance was considered, too, and high-resistance wire (smaller than No. 26) was not used in the experiments.

It will be a surprise to many when they learn that No. 20 double silk covered wire was chosen for the "nearly ideal" radio-frequency transformer, if only because double cotton covered has been the ruling favorite with home constructors, due to the spacing afforded by the insulation and the air between turns. Mr. Anderson's choice was made because—

(1) *An inductance of between 160 and 170 microhenries was found necessary to reach 550 meters with the condenser, and 167.4 readily presented itself when one wound 41 turns of No. 20 DSC wire on a 3½-in. diameter tubing;*

(2) *The ratio of diameter to axial length was exactly 2.3; and*

(3) *No other combination came so close to satisfying the three requisites of inductance, diameter-to-length-ratio and resistance.]*

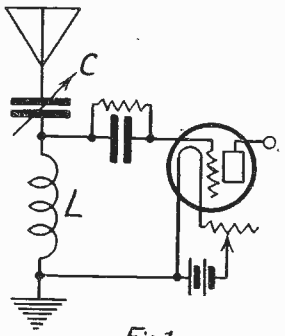


Fig. 1

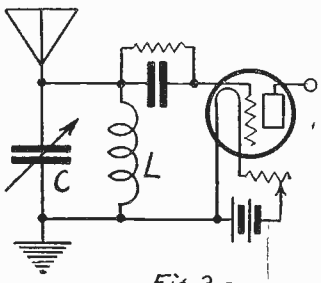


Fig. 2 a

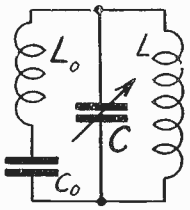


Fig. 2 b

A SERIES condenser tuning the aerial, a parallel-connected condenser in the aerial circuit and the antenna capacity effect (left to right).

By J. E. Anderson

Consulting Engineer

PART I

THE most common form of inductance coil in radio reception is the single-layer solenoid. The reasons for its prevalence are that it is the simplest to wind, it is about as efficient as any type, it is easy to design to have a predetermined value of inductance, and it is of rugged construction. It will be considered, therefore, that cardboard, bakelite or similar tubing is used, but if basketweave windings are employed the same winding directions may be adopted for the same mean diameter. The spider-web winding does not readily lend itself to calculation by standard formulae and as it is no better than the Lorenz (basketweave) type, it is not considered in this article.

A formula as devised by Nagaoka was used in the computations.

Two Great Requisites

In designing a coil for radio purposes two things are of great importance: making the resistance the least possible and keeping the distributed capacity down to a minimum. Investigation has shown that for a given length of wire the inductance will be greatest, and hence the low-frequency resistance will be least, when the shape ratio is equal to 2.46, that is, when the diameter of the coil is 2.46 times the axial length of the winding. This is the condition that should be sought in designing a coil, except as this may be modified by other factors.

The Bureau of Standards considers a coil having a shape ratio of 2.3 to be near the ideal when the several factors are taken into consideration. This is the ratio I followed in determining the nearest approach to the ideal.

There are many radio fans who desire to wind their own coils but who do not care to perform the necessary calculations. They wish to know directly how many turns of a given kind of wire they should use on a given size of tubing to give the desired inductance. Some of them do not even care what the inductance is; they want to know how to wind the coil to cover a given wavelength range with the particular tuning condenser they have. To their needs and preferences I have paid particular regard.

The Condenser Choice

Fortunately, many of the factors involved have been more or less standardized. The sizes of wire have also become standardized. Only the even numbers 26, 24, 22, 20, and 18 are universally carried in radio stores, and of these enamel, double silk, single silk, double cotton, and single cotton are most common. There is rarely any advantage in using finer wire than No. 26, and the advantage of using heavier wire than No. 18 is doubtful. Condensers also are more or less standardized. The so-called 23-plate, or .0005 mfd., variable condenser is universally available, and the various makes of these do not vary greatly from their rated capacity. A smaller condenser than one of .0005 mfd. is not always satisfactory when it is desired to cover the entire broadcast range without taps and switches in the tuned circuit. I took for granted that a .0005 mfd. variable condenser was to be used.

The distributed capacity of the coil and the capacities of the associated parts also affect the tuning range. So does the manner in which the coil is coupled to other parts, or the position in which it is used. But these points will be taken up separately. If the circuit is properly designed the effect of coupling on the effective inductance of the coil may be neglected, and the distributed capacities may be allowed for in fixing the value of inductance of the coil.

In designing a tuned circuit for the broadcast range it is not necessary to provide for wavelengths much in excess of 550 meters. But it is always well to allow a margin of safety in case some of the factors vary appreciably in an unfavorable direction. If the tuning coil be chosen so that the upper limit of the tuning range is 560 meters when the

Anderson's Scientific Coil Data

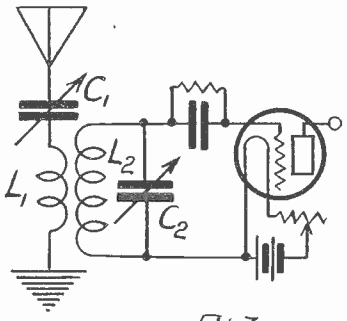


Fig. 3

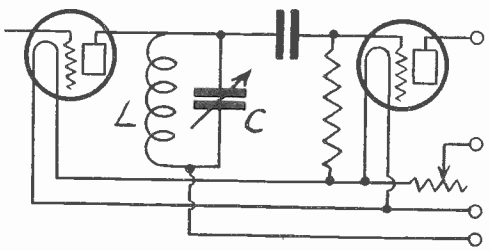


Fig. 4

TUNED primary and secondary (left) and impedance coupling.

tuning condenser is of the rated value of .0005 mfd., then it is probable that no condenser will be so greatly overrated that the circuit will not tune up to at least 550 meters. In case the condenser has been underrated, that is, if its actual capacity is a little higher than .0005, the circuit will tune above the 560 mark.

Let us assume then that the condenser has a capacity of .0005 mfd. and that the upper tuning limit of the circuit is to be 560 meters. For purposes of design it may be assumed that the distributed capacity is 50 micro-microfarads. This is about the correct value in an average circuit when the zero setting capacity of the condenser (plates all out) is added to the distributed capacity of the coil and the capacity of the associated parts. With these assumptions the maximum capacity in the tuned circuit is 550 micro-microfarads. It is required to determine what value the inductance coil must have to tune up to 560 meters. An application of the formula connecting wavelength, capacity, and inductance gives the required inductance as 160 microhenries. It is best to work on the safe side, and hence any value of inductance lying between 160 and 170 microhenries may be considered satisfactory and 167.4 is a likely choice.

Sizes of Tubings Used

The sizes of tubings used in the tests were 2½", 3", 3½" and 4" in diameter, because these are the usual available sizes. For the 2½" diameter tubing the wire sizes used were No. 24 DCC, DSC, SCC, SSC and No. 26 DCC and DSC. For the larger sizes of tubing only double silk and cotton insulations have been used but the three sizes of wire (No. 24, No. 22, and No. 20) were used for all. Wire sizes not considered suitable for a given size of tubing have not been included.

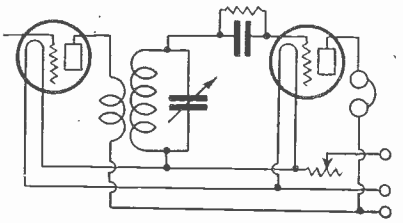
The inductance required in a circuit depends on the position and manner of use of the coil and also on the coupling between the primary and secondary circuits in a tuned radio-frequency transformer. Let us consider some of the more common cases.

In Fig. 1 is shown a single-circuit tuner in which the detector is coupled directly across the tuning coil and the tuning condenser is connected in series with the antenna lead. The capacity of the antenna depends on the condenser's size and position. This type of circuit should not be used unless a very large antenna is used, and then only if taps and switches in the tuned circuit are not objectional. While this circuit gives very loud signals, it is so broad of tuning as to render it useless in most cases, hence it was ruled out of consideration.

Impedance Coupling

Another type of coupling is shown in Fig. 2, sometimes known as the tuned impedance coupling of the antenna. It is involved because the capacity and inductance of the antenna are effectively connected in series, while the tuning coil L and the tuning condenser C are both in parallel with the series-connected antenna values. Fig. 2b gives an idea of what the circuit really looks like. Suppose that the inductance Lo of the antenna is neglected. The circuit then is a simple series-tuned circuit in which the capacity is the sum of the two capacities Co and C and the inductance is that of the coil L.

Suppose a large antenna is used, one which has a capacity of .0005 microfarad. Also suppose that the desired tuning condenser has the same maximum value. The total capacity in the circuit then is .001 microfarad. This requires an inductance of about 90 microhenries so that the wavelength 560 meters be reached. The minimum capacity in this circuit cannot be less than the capacity of the antenna, in fact it will always be greater than that. But with a capacity of .0005 mfd. and an inductance of 90 microhenries the circuit will tune to about 400 meters. The circuit will not even reach this wave as a minimum. Hence it is impracticable. If the antenna had been smaller, a larger coil could have been employed and the variation in capacity that could have been effected with a 23-plate condenser would have been a larger percentage of the total. This would have widened the tuning range.



TUNED transformer coupling is best (Fig. 5).

Impedance Difficulty

Suppose a small indoor open circuit antenna is used with this type of coupling, one that has a capacity of only 30 micro-microfarads. Suppose further that the distributed capacity of the coil and the zero capacity of the condenser add up to 70 mmfd., so that the total minimum capacity is 100 mmfd. The maximum capacity may be taken as 580 mmfd. This value requires that the inductance of the coil be 152 microhenries. With this inductance and 100 mmfd. as the minimum capacity, the minimum wavelength of the circuit will be 230 meters. This is at least near the lower end of the broadcast range, and it is possible that the distributed capacities may be reduced so that the lower limit may be reached. A coil having an inductance of about 160 microhenries may be taken for this purpose.

The Impedance Coil

The nearest approach to the ideal for a coil used in this circuit (Figs. 2a and 2b) is one wound with No. 24 DCC wire, 43 turns being put on a 3" diameter tubing, the shape factor then being 2.37, the inductance 160.1.

[*Part II, the conclusion of J. E. Anderson's valuable contribution to coil literature, will be published next week, issue of March 14. Inductance tables and other ready reference data will be published in that instalment.*]

How to Wind RF Transformer

FOR a radio-frequency transformer, to be tuned by a .0005 mfd. variable condenser, wind 10 turns of No. 20 double silk covered wire on a 3½" diameter tubing, terminate; leave ¼" space and wind 41 turns of the same kind of wire in the same direction. The tubing should be about 4" high. The inductance of the secondary is 167.4 microhenries, which is just right. The diameter is 2.3 times the axial length of the winding. The Bureau of Standards considers a coil having a shape ratio of 2.3 to be near the ideal."—Anderson.

Tuned RF Is Best Form of Coupling

THE most satisfactory form of coupling between two high-frequency tubes is a tuned radio-frequency transformer. The number of turns on the primary is of no importance, except that it must be at least half the number on the secondary, for voltage step-up. A good rule is to have ¼ the number of turns on the primary as is on the secondary.—Anderson.

The Tuned Impedance Coil

FOR an impedance-tuned circuit, using a .0005 mfd. variable condenser, use a 3" diameter tubing about 3" high and wind thereon 43 turns of No. 24 double cotton covered wire. The shape factor is 2.37, or only .07 above the requirement, and the nearest possible. The inductance is 160.1, or .1 microhenry above the requirement, the nearest possible inductance where full turns are used.—Anderson.

How the Number of Turns Affects Coupling

THE effect of loose coupling, or a wide separation between the primary and secondary coil of a regenerative tuner is to increase the distance range, make the set more selective, decrease distortion and diminish radiation.

When the primary is wound close to the secondary the regenerative effect cannot rise beyond a point limited by the absorption of the aerial. In this way much of the energy that should go to produce a signal in the telephones is fed back into the aerial and is wasted. The energy that returns to the aerial is radiated in the form of a feeble wave which causes interference to nearby receivers.

Loose couplings must be obtained by experiment. The space separation of the coils is not in itself a standard, because the length of the aerial and the number of turns in the primary and also in the secondary are governing factors.

Much unsatisfactory operation of receivers is due to this failure to recognize the factors that determine coupling. To say that a separation of one-half inch between the coils produces tight or loose coupling is not correct, because of the other limiting conditions.

Two tuners, one having a twenty-turn primary and another a ten-turn primary, separated one-half inch, have different coupling. The former has a tight and the latter a loose coupling.

One tuner using a fifty-turn secondary and another a seventy-turn secondary will also have different coupling at the primary, assuming that the distances and number of turns are equal on the primary side.

Increasing the number of turns in one of the linking coils has the effect of tightening the coupling.

Another feature of coupling not generally recognized by the amateur builder is the difference that occurs with a change of wavelength. If the primary coil is small it will have greater effective coupling to the secondary on the shorter waves. This condition is that is frequently reported from stations below four hundred meters.

How to Improve Set

The set building trend toward simplicity has caused the elimination of some controls that are essential to efficient tuning, among which are the vario-coupler and tapped primary. The tapped primary, of five turns each, is a simple solution of much of the trouble, and is a compromise between unwise simplicity and the other extreme of the too many controls.

Any set that produces interference can be improved by separating the primary from the secondary. The coil should be moved until the signal drops, when a new adjustment should be made on the secondary condenser; then the coil is moved again, and another adjustment made, continuing this until a point is reached just before where the signal becomes weak.

Superdyne Laudation Almost Taxes Credulity

SUPERDYNE EDITOR:

I HAVE built RADIO WORLD'S 1925 Model Superdyne, as described by Herman Bernard, and it certainly is a wonder.

JOHN KIRK,
1467 Gerrard St., East.,
Toronto, Canada.

* * *

SUPERDYNE EDITOR:

I HAVE built the 1925 Model Superdyne and there is not a better set in town.

NICHOLAS F. HABELKA.
Watertown, Conn.

* * *

SUPERDYNE EDITOR:

MY RADIO WORLD Superdyne is my favorite receiver.

CYRIL C. HALL,
1402 St. Germain St.,
St. Cloud, Minn.

SUPERDYNE EDITOR:

I CONSTRUCTED RADIO WORLD'S 1925 Model DX Superdyne for a friend and like it so much better than my $200 set that I am going to build one for myself.

FRANCIS A. SURFACE,
RF2, Lebanon, Ohio.

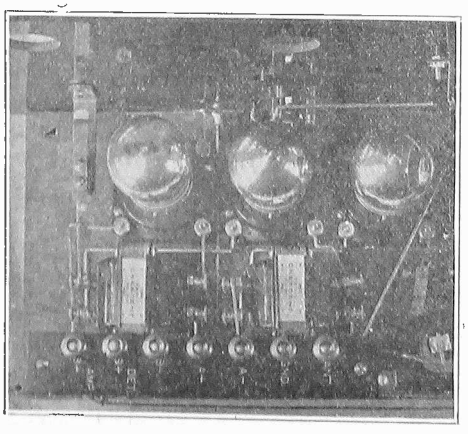
* * *

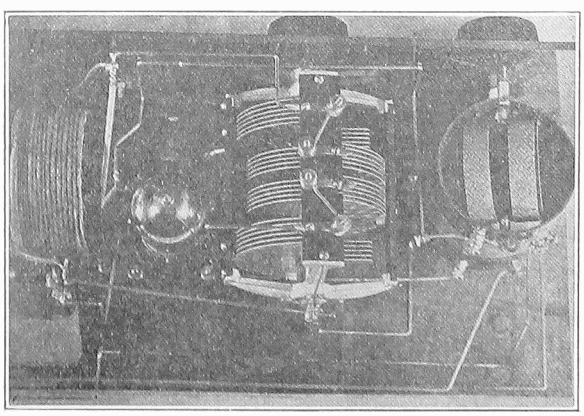
SUPERDYNE EDITOR:

A FRIEND and I each have completed a 1925 Model Superdyne and with sets proving satisfactory beyond our expectations. I have built several circuits but this one beats them all for selectivity, volume and distance. I would recommend this set highly to any one who wants real results.

HAROLD WILSON,
1019 Perry St.,
Davenport, Iowa.

"1925 Model Superdyne My Favorite," Says Another Fan





SECTION photo of the 1925 Model Superdyne constructed by Bertram Reinitz, of 127A Woodruff Avenue, Brooklyn, N. Y. He incorporated a few personal preferences, but stuck to the hookup published in the January 10, 17 and 24 issues. "It's my favorite receiver," he writes. He used an ARC coupling Bruno condenser and wound his own RFT.

Benson's Super-Heterodyne

BENSON'S set solves the problems of audio-frequency feedback, low amplification and too high noise level. Read this absorbing article by the noted Engineer.

By Thomas W. Benson
Noted Radio Engineer

PART II

THE wiring of the 6-tube reflexed Super-Heterodyne is simple enough, if a system is used, as I pointed out in last week's instalment. Many novices may be tempted to construct this circuit, because of the successful combination of the Super-Heterodyne with the reflex principle and the consequent economy of tubes. Therefore, the wiring diagram is presented this week in picture form and also the wiring directions are given textually.

I have not specified the location of the second single-circuit jack (J2), which may be placed on the panel at any point found most convenient. This is the jack for plugging in the speaker. There is another single-circuit jack used for connecting the loop to the .0005 mfd. variable condenser tuning the loop. In Fig. 1, published last week, the loop jack was shown, and the third audio output was represented by phones. But a jack will be used by most constructors for the audio output and may be placed to the right of the last rheostat in Fig. 2 of last week's issue, that is, under the panel-mounted crystal detector.

The use of a switch to cut off the A battery current is optional. It may be placed either in the negative or positive A lead, but I prefer the positive, and the switch so appears in Fig. 4, the picture diagram of the wiring.

Theory of the Circuit

As explained last week, this circuit uses the plate modulation system, in Ultradyne fashion, the heterodyned note being at 600 meters, which enables successful reflexing because a higher intermediate wavelength would cause a feedback of audio currents through the intermdeiate transformers, due to the large windings. In the present case the intermediate transformers are of a type used in broadcast reception, as part of a combination of short-wave RFT whose peaks are at varying wavelengths. However, only the one type of RFT is used whose peak is at the highest of this combination, and the efficiency of the Super-Heterodyne principle is preserved. The list of parts identifies these.

Wiring Directions

Most of the wiring is done before the baseboard is affixed to the panel. Such connections as are to be made from baseboard-mounted parts to panel parts are provided with bus bar leads which may be soldered to the panel parts after panel and baseboard are joined.

1. CONNECT the positive A battery to one side of the switch S, the other side of the switch to the filament plus posts of all six sockets, also to one side of the potentiometer and to B minus. The negative A battery is joined to one side of each of the two rheostats (R2 and R3 in Fig. 4) and to the remaining terminal of the potentiometer. This leaves the movable arm of the potentiometer still unconnected. One of the rheostats controls the amplifier tubes and has a resistance of 6 ohms (R3). The remaining unconnected side of this rheostat goes to the filament minus posts of the five tubes other than the oscillator. The tubes to which this connection is made are numbered 2, 3, 4, 5 and 6 in Fig. 4. The remaining unconnected side of the oscillator rheostat goes to the filament minus post of the oscillator tube socket, No. 1 in Fig. 4. The oscillator rheostat is 30 ohms, if UV199 or C299 tubes are used, as in the original model. This completes the filament wiring. It will be noted that most of this wiring is done on the baseboard, but that actually the connections to where made from the terminal block to the rheostat and from the baseboard filament leads to the rheostat are completed after the panel is mounted to the baseboard.

2. The positive B connection is now made. There is only one B plus lead, 90 volts. This goes to the right angle of the single-circuit jack J, in Fig. 4, also to the B posts of two of the audio transformers, AFT2 and AFT3, to the B post of the one of the RFT (No. 2 in Fig. 4), to the end of L2, the small plate coil of the oscillator, and to one side of C1, a .001 mfd. fixed condenser.

3. The C battery is mounted inside the set and requires no binding posts. C plus connects to the F minus post of the oscillator tube (No. 1 in Fig. 4), while C minus goes to the B post of the first audio transformer (AFT1), to the F post of the same audio transformer, to one side of the .00025 mfd. fixed grid condenser, on which the gridleak is mounted. This same C minus lead is connected further to the F post of the AFT2, one side of the .00025 mfd. fixed condenser C2, and to the F posts of RFT4 and AFT3.

4. The loop terminals are inserted in a jack plug. The right angle of the loop jack connects to the stator plates of the modulator tuning condenser and to the grid of the modulator tube socket, No. 2. The jack spring connects to the rotor plates of this variable condenser and to F—. The plate of the modulator tube connects to the P post of RFT1, whose B post goes to the grid of the oscillator tube and to the END of L1, the grid coil of the oscillator. Actually this grid coil is on top of the form or tubing on which the two coils are wound, but for physical convenience and clarity it is shown on bottom in Fig. 4. The lead common to the B post, grid and end of L1 also goes to the stator plates of the oscillator tuning condenser. The other side of that condenser (rotor plates) connects to the negative filament lead, also to the beginning of the grid coil L1, and to the remaining unconnected side of the fixed condenser C1, whose other side went to the beginning of the plate coil. Again, for convenience, the plate coil L2 is shown on top of the form in Fig. 4, although actually it is on bottom. The BOTTOM terminal of the plate coil, you will please verify, goes to the plate of the oscillator tube and the TOP terminal to B plus and to one side of the fixed condenser C1 whose other side has been joined to the filament minus.

5. F on RFT1 goes to the midpoint or movable arm of the potentiometer, hitherto unconnected and G on RFT1 goes to the grid of tube No. 3. The plate of this tube is connected to the P post of RFT2, whose B post already was joined to B plus. The F post of RFT2 goes to the remaining unconnected side of the grid condenser and leak and to the G post of AFT1. The plate of tube No. 4 joins the P post of RFT3, whose B post goes to P of AFT2. The end or B of AFT2 goes to B+. The F post of RFT3 is connected to the G post of AFT2 and to the remaining side of C2, the .00025mfd. fixed condenser bridging the secondary (G and F) of AFT2. The grid of tube No. 5 joins the G post of RFT3. The plate of this tube goes to the P post of RFT4, whose B post is connected to P on AFT3 and to one side of C3, a .002 mfd. fixed condenser. The other side of this fixed condenser goes to the B plus lead, which was connected to B of AFT3. The F of RFT4 goes to C minus, and also goes to one side of a fixed condenser, C3, .002 mfd. The G of RFT4 connects to one side of the Brownlie crystal detector, the other side of the crystal joining to the P post of AFT1. C3, fixed .002 mfd. condenser, connects between F of RFT4 and F of AFT1. The G post of socket 6 goes to G on AFT3, whose F goes to C minus. The plate of tube No. 6 goes to the spring of the single-circuit jack used in the output (J2 in Fig. 4) and the right angle of the jack, as explained, was connected to B plus. The fixed condenser C4, .005 mfd., bridges the jack, that is, one side of the condenser goes to one side of the jack, the other side of the condenser to the other side of the jack. As will be seen, this is a bypass condenser between the plate of the last tube and B plus.

The directions for making the terminal block, so that it will fit over two of the audio transformers, were given in last week's installment.

THIS set is extremely selective and gives tremendous volume, due to the great audio-frequency amplification, while the range is all that could be wished for.—Benson.

Tubes

The set is designed for dry-cell operation. UV199 or C299 tubes should be used throughout. Six 4½-volt C batteries are connected in parallel to constitute the A battery. In other words, seven C batteries are needed, one of which is used as a C battery, the others as the A battery. UV201A or C301A tubes, fed by a storage battery, may be used, but in that case both rheostats would be 6 ohms.

When everything appears clear the tubes may be inserted and the batteries connected up, connecting the phones to the two right-hand posts of the terminal strip. Switch on the tubes, turn the potentiometer all the way to negative and with the catwhisker of the detector touching the crystal rotate the oscillator condenser. A series of whistles should be heard indicating the oscillator is working. Turn back on the potentiometer until the whistles stop and plug in the loop. Try to tune in locals.

The operation of this receiver is

Concluded on page 24)

Picture Diagram of Benson's 6-Tube Super-Heterodyne

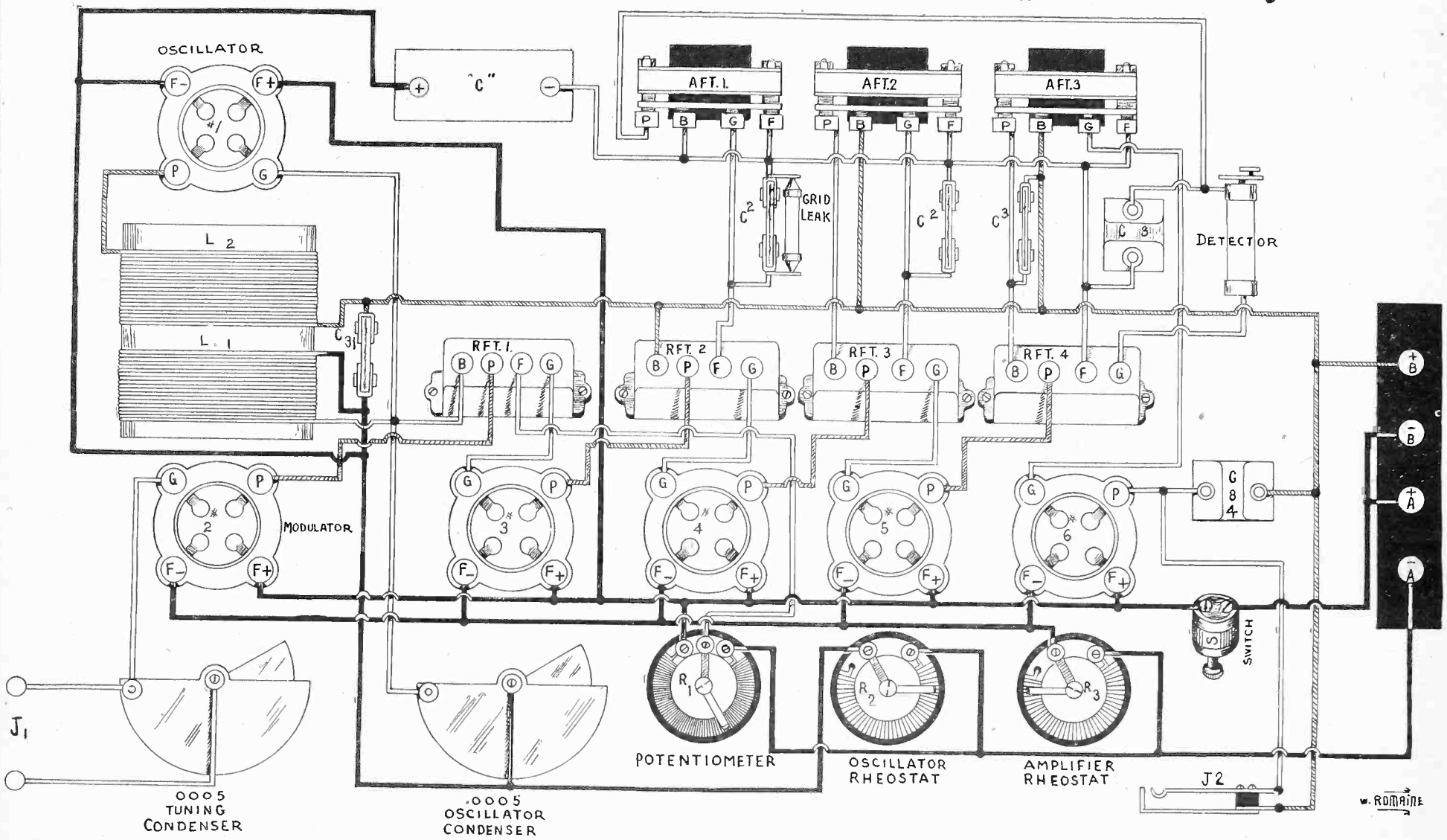
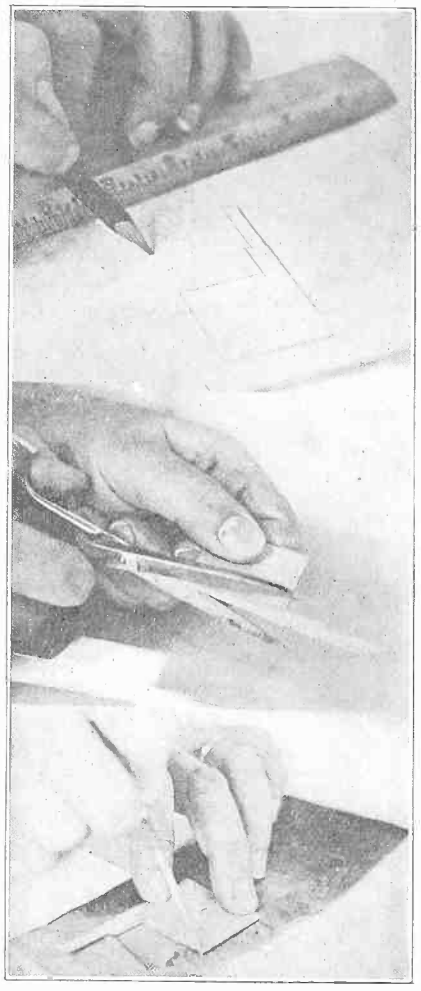


FIG. 4—The 6-tube Reflexed Super-Hetero dyne, with six stages of amplification, as designed by Thomas W. Benson. This corresponds with the schematic circuit published last week (Fig. 1). The grid return of L1 to F minus (shown above) worked better than to F+, as shown last week.

Making a Storage B Battery



HOW the cardboard pattern is made for the lead or tin plate that is to be drilled is shown in Fig. 1, top, where the measurements have been made and the shape of the plate determined. The cardboard is cut (Fig. 2, middle photo), and next a scriber is used to scratch the design on the plate (Fig. 3, bottom photo).

By Herbert E. Hayden

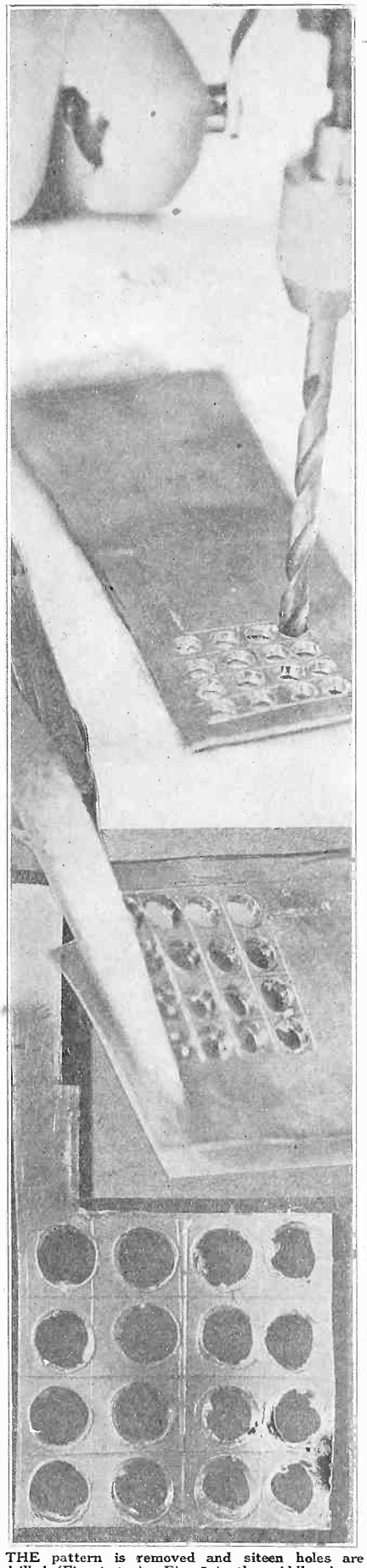
Illustrations by the Author

A STORAGE B battery that I made myself, as shown by the accompanying photographs, is working so well in my laboratory that I believe that many another fan would like to make one of these B batteries. The battery has to be recharged, of course, like any other storage battery, but if you do not send it out for recharging you can use one of the devices on the market that enables the use of the same charger that replenishes the storage A battery.

HERBERT E. HAYDEN

How to Cut the Pattern

To begin operations, draw a 1¼" square, as shown in Fig. 1, with a strip extending therefrom. The extra strip is ¼ x 1½". For this purpose cardboard is used. The cardboard, when cut, will be a pattern for cutting ⅛" thick the sheet lead plates. The resulting pattern is then placed on the piece of sheet lead (Fig. 3). The pattern is then removed (but kept safe for future use) and sixteen holes are drilled. I used a ¼" drill.



THE pattern is removed and siteen holes are drilled (Fig. 4, top). Fig. 5 is the middle photo. Fig. 6 the bottom one.

FOR the positive plates a paste is prepared of the ingredients shown in Fig. 7, top photo, and a knife is used (Fig. 8, lower) to press the paste into the drilled holes.

Fig. 4 shows how these holes were arranged by dividing the square into four equal parts on each side and drawing the intersecting lines. The centers for drill holes were determined by tri-square measurement. A pair of snips are used, or old scissors, for cutting the sheet lead plate accordingly (Fig. 5). The net result is depicted in Fig. 6. The drill holes have rough edges. Let them stay rough. They serve a purpose that way, as I shall show presently.

Preparation of Paste

Next a paste is prepared, using red lead and a very dilute, say 20-to-1, solution of sulphuric acid. This paste is for the positive plates. The ingredients are shown in their respective bottles in Fig. 7, while Fig. 8 shows how the paste is to be spread over the plate. A springy knife serves the purpose very handily. The rough edges of the drill holes are thus put to advantageous use, since they facilitate the adhesion of the paste to the lead (Fig. 8). The plate with the paste on it is shown in the close-up photo, Fig. 9.

Different Chemical for Negative

Now that the making of the positive plate is understood, let us consider the negative plate. It is made in exactly the same way. But when it comes to spreading a paste over the negative plate a different chemical is used. It is known as litharge, and comes in powdered form, purchasable in a drug store. The powdered litharge is grey. It is substituted for the red lead used in making the positive plate paste. Do not forget, however, that the dilute solution of sulphuric acid plays an equal part in making the paste for both positive and negative plates. The alternative chemicals are, red lead for positive, litharge for negative.

How to Cut the Wood

Thin wood is now cut into 1½" squares. Such wood is easily obtainable. It is the kind used for berry boxes, egg crates and the like. One piece of wood, cut to size, is placed between the two plates, that is, the wood is like the meat in a sandwich, with the plates representing the two pieces of bread. The pasty side faces the wood. Two more similar squares are used, to constitute the cover on the outside. Fig. 10 shows one piece of wood in center, another on outside, in back, and the third one lying on the table, ready for its important use.

A piece of soft rubber is cut to fit the glass container into which the product is to be put. Although the actual glass container I used is not visible in the photo, Fig. 11, the rubber cap gives a good idea of the form and shape of the top of the container,

How to Use Jar or Tumbler

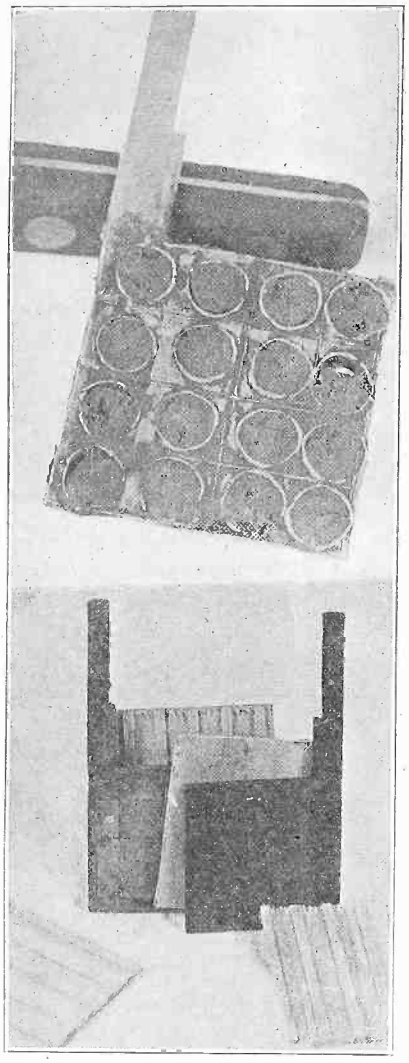


FIG. 9, top, shows a close-up of the plate holes plugged up with the paste. Small pieces of thin wood are cut and placed between the plates. These pieces of wood are shown in the lower photo, Fig. 10.

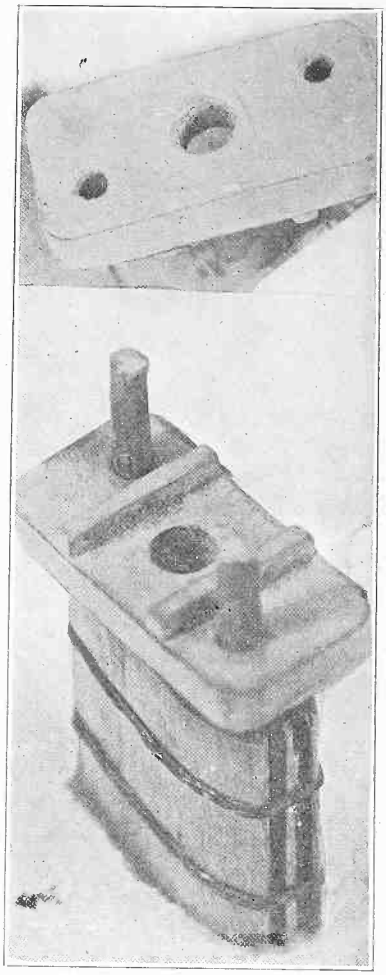


FIG. 11 (top) shows a piece of soft rubber, cut to fit the outside container. Details of the container are shown in subsequent photos. Fig. 12, lower, shows a close-up of the completed elements.

THE solution is made next, distilled water being one ingredient, sulphuric acid the other (Fig. 13, top). The plates and rubber top are shown next to the jar in which they are to be placed (Fig. 14, middle photo). The bottom photo shows an ordinary tumbler used as the outside container (Fig. 15). In such a case the soft rubber cap would have to be cut to fit the top of the tumbler. An elliptical jar was used by the author, as shown in Fig. 12 in the column to the left of this one. There the rubber cap has the three holes in it, two for the positive and negative poles, the other for access to the electrolyte. The electrolyte hole should be provided with a cork. The two rods fit snugly into the other holes, requiring no extra sealing.

and Fig. 12 gives the proportions, with the resilient wood on the outside, bound with rubber bands. Figs. 13 and 14 show a glass container used for mixing the solutions.

Fig. 12 in particular shows the risers from the plates. These are the protrusions provided in cutting the plates, and the two side holes in the rubber cap permit these poles of the cell to protrude. Mark the positive, preferably red, so you will easily know which is which. The center hole is a vent, left open during the "charging" operation. A small rubber cork is fitted into this hole after the "charging" is completed.

Fig. 12 shows the completed elements, rubber top, plate separators and rubber bands.

Preparation of Solution

The solution is now prepared. Use distilled water. Just ordinary water will not do. Distilled water is purchasable in a drug store. Chemically pure sulphuric acid is mixed with the water. Using a hydrometer, the reading should be 1.210 when just enough acid has been added. If there is a garage handy you probably will be able to buy there a bottle of standard electrolytic, which is the correct acid and water combination. If you prepare your own electrolytic, always pour the acid into the water. Never pour the water into the acid.

The plates and rubber top are placed in the jar and the solution added through the vent hole. Use a medicine dropper and be sure not to get any of the solution on your clothes or on the floor or carpet. The solution will cause a blue-pink stain difficult if not impossible to remove. If you spill some acid on your clothes, etc., neutralize the acid at once. A solution of ammonia and baking powder serves this purpose very nicely.

Fig. 14 shows the medicine dropper and the assembled elements. Note that a connecting rod is included. I used this to facilitate series connection of the cells to form the battery.

If a tumbler or the like is used, having a round top, be sure to cut the soft rubber round, snugly to fit this top.

The cell will furnish a 4-volt current supply. Therefore, by series connection, that is, joining the positive of one cell to the negative of another, the voltage is brought up to the desired amount, and of course taps may be taken for intermediate voltages in units of 2 volts. The cells in B batteries normally have 2 volts or so. You continue making cells until you have just the requisite number for your demands.

Controversy Between WLW and WMH Settled

WASHINGTON.

OFFICIALS of the Department of Commerce are very much gratified at the settlement of the controversy which developed at Cincinnati when stations WLW and WMH went on the air simultaneously on the same wave length on different evenings.

Commissioner Carson and Chief Radio Supervisor Terrell went to Cincinnati and succeeded in having the participants sign an agreement in regard to a division of time which, it is believed, will prevent future outbreaks.

"We are very much pleased at the settlement of what might have been a very unpleasant situation," says Judge S. B. Davis, Acting Solicitor.

Others echoed his sentiment.

BROADCAST PROGRAMS

Thursday, March 5

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., noonday concert. 1:30, business reports. 3, market reports. 4, French lesson; piano solos by Adelaide Apfel. 6, dinner hour concert, Selinsky instrumental quintet. 8, The Passion Play. 10, message from the Civil Service Department. 10:03, Cooper Corporation, The Cooper orch. and male quartet; solos and ensembles from the Cooper male quartet; selections by Larry Grueter, piano-accordian; popular program by The Doherty Melody Boys.

KGO, Oakland, Cal., 312 (P. S. T.)—10:40 A. M., classroom instruction. 11:30, luncheon concert. 1:30 P. M., N. Y. and S. F. stock reports; weather. 4, concert orch. 6:45, final reading, stock reports, weather, S. F. produce news, and news. 8, Arion trio; Winifred Hanlon, soprano; C. A. Harwell, whistler; Mrs. Cyril Roche, soprano; Hawaiian novelty three; Waldemar Engberg, bass; piano duets, William P. and Bonita Keasbey; address, "Music and Shirts," Rev. George W. Phillips; Joyce Holloway Barthelson, pianist; Josephine Holub, violinist. 10, Henry Halstead's orch.

WMAK, Lockport, N. Y., 265 (E. S. T.)—12 M., Murray Whiteman's midnight serenaders.

KFI, Los Angeles, 467 (P. S. T.)—5 P. M., Herald news. 5:30, Examiner news. 6:45, KFI radiotorial and Carlyle Stevenson's Bon Ton orch. 7:20, Y. M. C. A. speaker. 7:30, male quartet. 8, play with music. 9, Los Gatos trio, and Carol Blaine, contralto. 10, Examiner program.

WFAA, Dallas, Tex, 476 (C. S. T.)—12:30 P. M., Edmund F. Boettcher, singing; William H. McRaven, playing; DeWitt McMurray, speaking. 6:30, Lone Star Five's orch. 8:30, Miss Lucile Lechner, singing, and Mrs. Lillian T. Cummings, pianist. 11, violin recital by Edward Cramer, first violin in the orch.

WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M., horticultural program. 5:45, public news period. 6, every child's story hour. 6:20, to be announced. 6:45, dinner program, Randall's Royal Fontenelle orch. 9, program transmitted from WOAW. 10:30, Frank W. Hodek, Jr., and his Nightingale orch.

WEEI, Boston, 303 (E. S. T.)—1 P. M., assembly luncheon. 2, Eleanor Baldwin Cass, "Your Girl and the Movies." 3:15, Noah's Arkadians, Joe W. Rines, director. 6:30, Big Brother Club. 7:15, sport talk by Wm. E. Mullins. 7:25, program arranged by the Greater Boston Churches. 7:55, Pathe News flashes. 8, New York program, musical. 8:30, musical. 9, Atwater-Kent musical. 10, musical.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from Conservatory of Music; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market reports. 5, time. 7:30, concert under the auspices of Mrs. Robert K. Van Pelt; four-minute digest of Sunday school lesson; four-minute talk; late news; official time.

KOA, Denver, Colo., 323 (M. S. T.)—12:20 P. M., Rialto organ recital. 1, N. Y. stock reports, live stock, fruit, vegetable report, and weather. 3, half hour matinee for housewives. 6, final reading, N. Y. stock reports, live stock, vegetables, and late news.

WCAE, Pittsburgh, Pa., 462 (E. S. T.)—12:30 P. M., news; weather. 4:40, stock market; The Sunshine Girl. 6:30, dinner concert. 7:30, Uncle Kaybee. 7:45, special feature. 8, Moore's radio review. 9, Atwater-Kent radio artists.

WMC, Memphis, Tenn., 500 (E. S. T.)—8:30, P. M., Harry O. Nichols at the console of the Scottish Rite Cathedral organ.

WDAF, Kansas City, Mo., 365 (C. S. T.)—3:30 P. M., The Star's radio trio. 5:50, marketgram, weather, time and road. 6, Cecile Burton, from popular poems and essays; address, one of a series of book talks by Louis Mecker; The Tell-Me-a-Story Lady; music, Trianon ensemble. 11:45, Nighthawk Frolic.

WGN, Chicago, 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.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert by Rose City trio. 5, children's program. 7:15, markets, weather, and news bulletins 8, Oregonian concert orch. 10, Multnomah Hotel Strollers.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—9:45 A. M., stockman reports. 11:55, time. 12, weather, stockman reports. 12:20 P. M., Lenten services. 3:30, closing quotations on hay, grain and feed. 6:15, dinner concert by Broudy's orch. 7:15, stockman reports. 7:30, Daddy Winkum, the radio rhymster. 8, program arranged by the National Stockman and Farmer studio. 8:30, special program. 9:55, time, weather. 11, concert from the Pittsburgh Post.

KSD, St. Louis, Mo., 545 (C. S. T.)—8 P. M., recital by James R. Keyes, tenor; Paul Millstone, pianist. 10, special "request" program by Vin James, pianist.

WCCO, Minneapolis, Minn., 417 (C. S. T.)—10:45 A. M., Gold Medal Home Service Talk by Betty Crocker, "Suggestive Lenten Menus." 2 P. M., woman's hour, "The Popular Concert." 4, magazine hour, "In the Winter of War," by Her Majesty Marie. 5:30, children's hour, Mrs. Walter Stevens. 7, national program by Remote Control. 10, silent.

WEAF, New York City, 492 (E. S. T.)—11, A. M., musical program and talks to housewives, market and weather. 4, Helen Sherman Gue, contralto; dramatic readings by Beatrice Becker; "Needs of Our Youth," by Dr. Henry Newman. 6, dinner music; mid-week services; Art talk; James E. Phillips, basso; Paul Stoeving, violinist; lecture on English fiction; "Touring"; Atwater Kent Radio Artists; Vitali Koretsky, Russian tenor; Russian Ensemble; Vincent Lopez and his orch.

WGY, Screnectady, N. Y., 380 (E. S. T.)—2 P. M., music; one act play, "A Quiet Family," by William Suter. 2:30, organ recital by Stephen E. Boisclair. 6:30, dinner music by Hotel Ten Eyck trio. 7:30, "A Few Moments with New Books," by W. F. Jacob, librarian. 7:45, half hour of music by WGY orch. 8:15, drama, "The Turning Point," by Preston Gibson. 11:30, organ recital by Stephen E. Boisclair.

KHJ, Los Angeles, Cal., 404 (P. S. T.)—12:30 P. M., program through Loew's State Theatre. 2:30, Jose Arias and his Mexican orch. 5, Art Hickman's concert orch. 6:30, children's program. 7:30, "Art" talk by Harold Swartz. 7:45, talk on "Care of the Body," by Dr. Philip M. Lovell. 8, program presented through the courtesy of the Western Auto Supply Co., arranged by J. Howard Johnson. 10, Art Hickman's dance orch.

WNYC, New York City, 526 (E. S. T.)—7:20 P. M., sports analysis by Thornton Fisher. 7:30, police alarms. 7:35, Irving Bloom and his Club Tokio orch. 8:15, "Timely Topics" by Francis P. Bent. 8:30, Rita Rozada, dramatic soprano; Ambassador male quartet. 9:30, The Serenaders, Mandolin Club. 10:30, police alarms and weather.

WOR, Newark, N. J., 405 (E. S. T.)—7 A. M., gym class. 2:30 P. M., recital by Theophilus Alban, tenor. 2:45, Regina Wallace, "The Road to Stage Success." 3, Theophilus Alban, tenor. 3:15, Melody trio. 3:30, Edna Eckert, dramatic reader, "Alfred L. Tennyson." 3:45, Melody trio. 6:15, Jimmy Lent's Society orch.

WOO, Philadelphia, 508 (E. S. T.)—11 A. M., grand organ. 11:30, weather. 11:55, time. 12, police reports. 4:45, grand organ and trumpets. 9:55, time. 10:02, weather.

Friday, March 6

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., Ahaus Brunswick orch. 1:30, business reports.

KGO, Oakland, Cal., 312 (P. S. T.)—11:30 A. M., luncheon concert. 1:30 P. M., N. Y. and S. F. stock reports; weather. 3, studio musical program and speaker. 4, concert orch. 6:45, stock reports, weather, S. F. produce news, and news.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M., Herald news. 5:30, Examiner news. 6:54, KFI radiotorial. 7, Examiner program. 8, Aeolian organ recital, Dan McFarland at console. 9, Herald program. 10, Hollywood Girls quartet and soloists.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., address, Dr Robert Stewart Hyer. 4:30, Woman's Hour. 6:30, Honey Boys orch. 8:30, band and entertainers.

WEEI, Boston, 303 (E. S. T.)—2 P. M., Happy Hawkins and his orch. 6:30, Big Brother Club. 7:15, concert by the U. S. Army band. 8, program by Ice Cream Co. 8:30, The Gilchrist quartet. 9, Grindell's Colonial Club orch.

KFOA, Seattle, Wash., 455 (P. S. T.)—Times Studio program, by Mrs. H. C. Simpkin.

KHJ, Los Angeles, Cal., 404 (P. S. T.)—12:30 P. M., Santa Monica athletic club orch; R. M. Wright, baritone; Pathe News talks. 2:30, matinee musical. 6, Art Hickman's concert orch. 6:30, children's program. 7:30, better-speech talk. 7:45, Capt. John T. Riley, on "Income Tax." 8, program through Henley and Scott. 10, Art Hickman's dance orch.

WOAW, Omaha, Neb., 526 (C. S. T.)—4 P. M., program transmitted from WOAW's remote control. 5:45, public news period. 6, story hour. 6:20, to be announced. 6:30, Harry Brader, violinist-conductor, and Frank Strawn, pianist, of the Rialto Symphony orch. 7, to be announced. 7:15, current sport events by Ivan L. Gaddis. 9, program under auspices of Chicago, Burlington & Quincy Railroad Co.; address, "Seeing by Radio Territory Covered by the Burlington Route," Dr. G. E. Condra. 10:30, orchestra at Brandeis.

KOA, Denver, Colo., 323 (M. S. T.)—12:30 P. M., Rialto organ recital; N. Y. stock reports, livestock, fruit, vegetable report, and weather. 3, half hour matinee for housewives. 6, final reading N. Y. stock reports, livestock, vegetables, late news. 6:40, book of knowledge program. 8, ten minutes of music. 8:10, studio program, courtesy the Tuesday musical club.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from Louisville Conservatory of Music; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market. 5, time. 7:30, concert by Barney Rapp's orch.; thirty-minute concert.

WMC, Memphis, Tenn., 500 (E. S. T.)—8:30 P. M., to be announced. 11, midnight frolic.

WDAF, Kansas City, Mo., 365 (C. S. T.)—3:30 P. M., The Star's radio trio. 3:50, marketgram, weather, time and road. 6, address, speaker from Children's Bureau; The Tell-Me-a-Story Lady; the Trianon ensemble. 8, popular program. 11:45, Nighthawk Frolic.

WCAE, Pittsburgh, Pa., 462 (E. S. T.)—12:30 P. M., weather; news. 4:30, Sunshine Girl; stock market. 6:30, dinner concert. 7:30, Uncle Kaybee. 8:30, Apollo quartet. 9:30, Hampton S. Lundenstadt, baritone.

WGN, Chicago, 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.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert by Rose City trio; 5, children's program. 7:15, markets, weather, and news bulletins. 8, lecture. 10:30, Hoot Owls.

WGBS, New York City, 316 (E. S. T.)—6:30 P. M., Herman Bernard, managing editor of RADIO WORLD, "Radio Hookups, Questions and Answers." Mr. Bernard is on the air at this station every Friday at 6:30 P. M.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—7 A. M., morning exercises. 8, morning exercises. 9:45, stockman reports. 11:55, time. 12, weather, stockman reports. 12:25 P. M., Sunday school lesson. 3:30, closing quotations on hay, grain and feed. 6:15, concert by Charlie Gaylord's orch. 7:15, stockman reports. 7:30, a story by Uncle Ed. 8, concert by the American Legion. 8:15, "The College Student as Literary Material," by Thyrsa W. Amos. 8:30, American Legion. 9, time, weather. 10, basketball score.

WCCO, Minneapolis, Minn., 417 (C. S. T.)—10:45 A. M., Gold Medal Home Service Talk, Betty Crocker, "The diet for Early Spring." 2 P. M., woman's hour. 4, magazine hour, "The Celebrated Jumping Frog Calaveras County," by Mark Twain. 5:30, children's hour, Court of Gold Medal. 6, sport talk. 6:30, dinner concert, Minneapolis Athletic Club orch. 7:30, lecture. 7:45, lecture. 8, the Musical Millards of Worthington, Minn. 9, "The F. & R. Family." 11, dance program, Dick Long's Nankin Cafe orch.; Paul Davin, tenor.

WEAF, New York City, 492 (E. S. T.)—11 A. M., musical program; health talk; talk on "Styles of Country Homes," by Henry B. Humphrey; market and weather. 4 P. M., James Blauvelt, tenor; Elementary French lessons by William Doub-Kerr; children's stories; Matilda Durr Lindsay, soprano. 6, dinner music; Sylvia Buchman, pianist; Charles Mertens, baritone; Blanche Elizabeth Wade, story teller; duets by Adele Parkhurst, soprano, and Edna Indemauer, contralto; The Happiness Candy Boys; Spear and Company; entertainers; Elsie May Gordon, impersonator; Jascha Gurewich, saxophonist; Eleanor Starkey, soprano; Meyer Davis Lido-enice Orchestra, direct from the Lido-Venice, New York City.

WGY, Schenectady, N. Y., 380 (E. S. T.)—2 P. M., music; talk, "Good Taste in Home Decoration," Mildred Gapen Bowen. 6:30, International Sunday School lesson. 7, Mark Strand Theatre orch. 7:30, health talk. 7:35, program of Gounod compositions by WGY orch. 10:30, talk, "Manors of New York," Ernest C. Brown. 10:40, piano duets by Elsie Schillers and Elsie Firestone.

KHJ, Los Angeles, Cal., 404 (P. S. T.)—12:30 P. M., White's Californians. 2:30, program through Pacific States Electric Co. 6, Art Hickman's Concert orch. 6:30, children's program. 7:30, Gladys DeWitt on "The Santa Fe Trail." 8, program presenting the Piggly Wiggly Girls. 9, program through Rotary Club. 10, Art Hickman's dance orch.

WPG, Atlantic City, N. J., 296 (E. S. T.)—7 P. M., Hotel Traymore dinner music. 9, Ambassador concert orch. 10, studio recital; Helen Kennedy, soprano; Cecile Steiner, violinist; Anna Caster Heiss, pianist; L. Powell Evans, vocal students; Alice Warren Sachse, pianist.

WIP, Philadelphia, Pa., 509 (E. S. T.)—1 P. M., Gimbel Tea Room orch. 1:30, weather. 3, "A Diet for Anaemics," by Mrs. Anna B. Scott. 3:15, recital by Lillian Biddle Reader, Mathilda S. Eves, soprano; Mrs. Allen, contralto; Flora Ripka, accompanist. 4, "Present Conditions in the Balkans," a lecture by Dr. Michael M. Dorizas. 6, weather. 6:05, popular numbers by Mark Fisher and Joe Burke. 6:15, dinner music by Harvey Harburger and his vaudeville orch. 6:45, U. S. Department of Agriculture, livestock and produce market reports. 7, Uncle Wip's bedtime story, roll call and birthday list.

KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M., Seattle Chamber of Commerce program. 4, the Times, Wm. F. Hoffman's concert orch. 6:45, Sherman, Clay and Co. program. 8:15, weather. 8:35, the Times program, Credit Men's Glee Club. 10, Eddie Harkness and his orch.

WNYC, New York City, 526 (E. S. T.)—7:30 P. M., police alarms. 7:35, resume of meeting of the Board of Estimate and Opportionment. 7:45, dance program. Colonel James Churchward, geologist and traveler. 9, an hour of German music, Constance Scharpegge, contralto; Prof. Fuchs-Jerin, piano recital. 10:10, "Pickwick Papers," by Dickens, Prof. J. G. Carter. 10:30, police alarms. 10:35, Joseph M. White, tenor.

WOO, Philadelphia, 508 (E. S. T.)—11 A. M., grand organ. 11:30, weather. 11:55, time. 4:40 P. M., police reports. 4:45, grand organ and trumpets. 7:30, A. Candelori and his Hotel Adelphia orch. 8:30, "Christianity and Business," Samuel R. Boggs. 8:45, WOO orch. 9:55, time.

10:02, weather. 10:03, grand organ recital, Mary E. Vogt. 10:30, Vincent Rizzo and his Hotel Sylvania orch.

WOR, Newark, N. J., 405 (E. S. T.)—7 A. M., gym class. 2:30 P. M., henry Hull, "A Travesty on Leisure." 3:15, Harry Jentes and his entertainers. 6:15, Hotel Lorraine orch. 6:30, "Man in Moon" stories. 7, Hotel Lorraine orch.

Saturday, March 7

WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercises. 10:45, weather and business reports. 11:55, time. 1:30 P. M., business reports; stock quotations. 3, dance program and other features. 6, dinner hour concert; Lafafone by E. D. Leonard. 8:30, popular music presented symphonically by Henry Lange and his Hotel Sinton orch.

KGO, Oakland, Cal., 312 (P. S. T.)—11:30 A. M., luncheon concert. 12:30 P. M., final reading, stock reports; weather. 4, concert orch. 8, The Melody Maids; Elsa Behlow Trautner, soprano; Carey male quartet; concertina solos, Antone Tomsic; Eva Gruninger Atkinson, contralto; Ray Nealan, tenor; address, "The Sunny Side of the Street," Thomas A. Boyer. 10, Henry Halstead's orch.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M., Herald news. 5:30, Examiner news. 6:45, KFI radiotorial; Dr. Clyde Sheldon Shepherd. 7, Lake Arrowhead orch. 7:45, the book shelf. 8, Examiner program. 9, Classic instrumental trio, and vocalists. 10, Packard Radio Club; the Varsity trio. Barney Weber, Jean Shock, pianist.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., Alex Hughes, pianist. 8:30, Boy Scout program. 11, band recital by De Molay boys.

KHJ, Los Angeles, Cal., 404 (P. S. T.)—10 A. M., weekly broadcasting class. 12:30 P. M., program by Hi Moulton and his orch. 2:30, Saturday afternoon frolic. 7:30, better-pseech talk. 7:45, Capt. John T. Riley, on "Income Tax." 8, program featuring a "Trip to Mt. Lowe." 12, pep program by the Lost Angels.

WOAW, Omaha, Neb., 526 (C. S. T.)—5:45 P. M., public news period. 6, dramatic hour, Davis Studio of Expression. 6:30, to be announced. 6:45, dinner program. 7:30, weekly address. 9, program under auspices of the Omaha Printing Co. 11, Frank W. Hodek, Jr., and his Nightingale orch. 11:30, organ music.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from Louisville Conservatory of Music; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market. 5, time. 7:30, concert under the auspices of Arthur Findling; news; time

KOA, Denver, Colo., 323 M. S. T.)—12:20 P. M., Rialto organ recital. 1, final reading. N. Y. stock reports, livestock, and weather 9, dance music program by Joe Mann and his Rainbow-Lane orch.

WCAE, Pittsburgh, Pa., 462 (E. S. T.)—12:30 P. M., news; weather. 2:30, tea-dansant music. 4:30, orchestral program. 6:30, dinner concert. 7:30, Uncle Kaybee. 7:45, special feature. 8:30, concert by artist-students.

WMC, Memphis, Tenn., 500 (E. S. T.)—8:30 P. M., program arranged by Mrs. Marie Worden.

WDAF, Kansas City, Mo., 365 (C. S. T.)—3:30 P. M., The Star's radio orch. 5:50, marketgram, weather, time and road. 6, piano tuning-in number; address, personal message from Roger W. Babson, statistical expert and "doctor of business"; The Tell-Me-a-Story Lady; music, the Trianon ensemble. 11:45, Nighthawk Frolic.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert by Rose City trio. 10, Colburn's Melody Men.

WGN, Chicago, 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.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—9:45 A. M., stockman reports. 11:55, time. 12, weather, reports. 12:20 P. M., Lenten service at Trinity Church. 1:30, concert by Daugherty's orch. 7:30, Wimble the Wanderer. 7:45, last minute helps to Bible School teachers. 8:30, concert by the Westinghouse band. 9:55, time, weather.

WCCO, Minneapolis, Minn., 417 (C. S. T.)—10:45 A. M., Gold Medal Service Talk. 2:30 P. M., matinee musical. 8, "Fireside Philosophies," Rev. Roy L. Smith, pastor. 8:30, diversified program. 10, dance program; the Lowry Male Quartet.

WEAF, New York City, 492 (E. S. T.)—4 P. M., Bud Fisher's Happy Players; Middlebury College Glee Club. 6, dinner music, Thuel Burnham and Agnes Brennan, pianists; Joseph Wilberscheid, violinist; "Trips and Adventures," by Fred J. Turner; special musical program to be announced; Vincent Lopez and his orch.

WGY, Schenectady, N. Y., 380 (E. S. T.)—9:30 P. M., dance music by Phil Romano's orch.

KPO, San Francisco, Cal., 423 (P. S. T.)—7 A. M., "Daily Dozen," by Bernard Drury. 10:30, "Ye Towne Cryer" News Bulletins. 10:40, "What is Playing at the Local Theatres." 11:50, market report. 12, time. 1 P.M. Rudy Seiger's Fairmont Hotel orch. 2:30, Mount Tamalpais Military Academy band. 3:30, Gene James's Rose Room Bowl orch. 6:20, garden hints. 6:30, "What is Playing at the Local theatres." 8, Art Weidner's Dance orch.

KHJ, Los Angeles, Cal., 404 (P. S. T.)—10 A. M., class in broadcasting. 12:30 P. M., news items and music. 2:30, Charlie Wellman and his Saturday Afternoon Frolic. 6, Art Hickman's concert orch. 6:30, children's program. 8, an evening of Chamber Music. 10, Art Hickman's Dance orch. 11, program presenting the Lost Angels.

WPG, Atlantic City, N. J., 295 (E. S. T.)—9 P. M., Governor Silzer banquet.

WIP, Phi'adelphia, 509 (E. S. T.)—1 P. M., organ recital by Karl Bonawitz. 1:30, weather. 3, Gerald O'Dell and his entertainers. 6, weather. 6:05 Charles Masters Hotel St. James orch. 6:45, U. S. Department of Agriculture, livestock and produce market reports. 7, Uncle Wip's bedtime stories and roll call; M. E. Junior Choir. 8, Lenten Meditations, E. A. E. Palmquist. 8:15, His Honor, Mayor W. Freeland Kendrick, presents a demonstration of "The Boy in Music." 10:05, dance music by Howard Lanin's orch. 11:05, organ recital by Karl Bonawitz.

KFOA, Seattle, Wash.. 455 (P. S. T.)—4 P. M., the Times, Wm. F. Hoffman's Concert orch. 6:45, Rhodes studio program. 8:30, the Times program; Rainier Serenaders. 10, Eddie Harkness and his orch.

WNYC, New York City, 526 (E. S. T.)—6:30 P. M., Sam Wooding and his Club Alabam' orch. 7:30, police alarms. 7:35, The Chateau Four. 8:15. Arthur S. Tuttle, chief engineer, "Work of the Traffic Commission." 8:30, James Brennan, cornet solos. 8:45, Police quartet. 9:15, Fred Bensen's Society orch. 10:10. "Alaska," by Maurius Hansome. 10:30, police alarms and weather.

WOR, Newark, N. J., 405 (E. S. T.)—7 A. M., gym class. 2:30 P. M., Marion Estelle Adams, contralto. 2:45, Mildred Frazee, soprano. 3, Dr. George Watson Little, canine specialist. 3:15, Mildred Frazee, soprano. 3:30, Marion Estelle Adams, contralto. 3:45, Louise Glaum, "Clothes for Girls." 6:15, Mabelle Cowan and her orch. 7:30, "The Commanders." 8, Harold Colonna, tenor. 8:15, Mme. Florence Wessell, pianist 8:30, Harold Colonna, tenor. 8:45, Mme. Florence Wessell, pianist, and Reba Dale Corder, dramatic soprano. 9, Robert Coleman, "Little Theatre Movement." 9:15, Mabel Thum, soprano; Serge Glemee, tenor and violinist; Maurice LaFarge, baritone and pianist. 10, Virginia State program. 11, Kalmar and Ruby and their playmates.

WOO, Philadelphia, 508 (E. S. T.)—11 A. M., grand organ. 11:30, weather. 11:55, time. 12, Golden's Crystal Tea Room orch. 4:40 P. M., police reports. 4:45, grand organ and trumpets 9:55, time. 10:02, weather.

Sunday, March 8

KSD, St. Louis, Mo., 545 (C. S. T.)—8 P. M., concert by St. Louis Symphony orch.

WEMC, Berrien Springs, Mich., 286 (C. S. T.)—11 A. M., sacred music by the Radio Lighthouse Choir. 11:40, sermon, Pastor W. R. French. 8:15 P. M., sacred music by the Radio Lighthouse Choir.

KPO, San Francisco, Cal., 423 (P. S. T.)—10:30 A. M., "What is Playing at the Local Theatres." 11, undenominational church services. 6:30 P.M., "What is Playing at the Local Theatres." 8:30, concert by Rudy Seiger's Fairmont Hotel orch.

KGW, Portland, Ore., 492, (P. S. T.)—10:30 A. M., services. 3 P. M., municipal concert. 6, church services. 7, Colburn Concert orch.

WIP, Philadelphia, 509 (E. S. T.)—3:15 P. M., Civic Junior Symphony orch. 4, services under the auspices of the Germantown Y. M. C. A. 7:15, evening service, broadcast direct from Holy Trinity church. 9:30, Germantown Theatre orch.

KTHS, Hot Springs, Ark., 375 (C. S. T.)—11 A. M., services, Rev. J. J. Stowe, pastor. 8:30, P. M., Meyer Davis-New Arlington orch. 10, dance concert and frolic by Phil Baxter's Singing orch.

WGN, Chicago, 370 (C. S. T.)—11 A. M., Uncle Walt reads the funnies to the children. 11:45, concert from Balaban & Katz Chicago Theatre. 2 P. M., Master Artists Recital, Lyon and Healy organ, and Chicago Musical College Concert. 9, concert specially directed by Charles H. Gabriel, Jr., with WGN singers and by Drake concert ensemble.

KOA, Denver. Colo., 323 (M. S. T.)—11 A. M., services. 7:50 P. M., service.

WLW, Cincinnati, O., 423 (C. S. T.)—9:30 A. M., school by the editorial staff of Sunday School Publications 11, services, Dr. Frank Stevenson, minister; organist, J. Warren Ritchey; mixed quartet: soprano, Charlotte Sandman Angert; alto, Louise Koetter; tenor, Erwin Meyer; bass, Edwin Weidinger. 7:30 P. M., services, Dr. E. P. Dannenfeldt, pastor. 8:30, concert by the Western and Southern orch; William Kopp, director; Bess Hall, soprano; Norma Maienchein, con-

Bori Ready to Repeat

LUCREZIA BORI, brilliant soprano of the Metropolitan Opera House, who suffered a little "microphone fright" at her radio debut on New Year's night, looks forward with pleasure to singing again for the radio audience. John McCormack, with whom she "duetted" that memorable holiday night, was first quoted as having said he sang for the first last time before the microphone, but later denial was made. Miss Bori is a Victor artist, by the way, and a charming beauty. She is shown wearing her pompously beautiful costume in "Tales of Hoffman."

Programs

(*Sunday, March 8, continued*)

tralto; Edward Durr, tenor; Charles Button, bass; Hazel Barnes, accompanist.

WOO, Philadelphia, 508 (E. S. T.)—2:30 P. M., musical exercises and Sunday school. 6, sacred recital on the Wanamaker grand organ, Clarence K. Bawden at the console. 7:30, evening services.

WGR, Buffalo, N. Y., 319 (E. S. T.)—3 P. M., Vesper services. 4, Randolph Maynard, organist. 7:15, pre-service organ recital. 7:30, evening service.

Monday, March 9

WEMC, Berrien Springs, Mich., 286 (C. S. T.)—8:15 P. M., "The Collegian String Trio" or Emmanuel College.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P.M., selections from the Louisville Conservatory of Music; selections played on the Alamo theatre organ; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market.

WWJ, Detroit, Mich., 353 (C. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, public health service bulletins. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's Hotel Statler orch. 3, news orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 8, News orch.; Stellar Quartet.

KPO, San Francisco, Cal., 423 (P. S. T.)—10:30 A. M., "Ye Towne Cryer" News Bulletins. 10:40, "What is Playing at the Local Theatres." 12, time. 1 P. M., Rudy Seiger's Fairmont Hotel orch. 4:30, Rudy Seiger's Fairmont Hotel orch. 5:30, children's hour stories by Big Brother of KPO. 7, Rudy Seiger's Fairmont Hotel orch. 8, organ recital by Theodore J. Irwin, official organist. 9, Pearl Hassock Whitcomb, soprano. 10, Gene James's Rose Room Bowl orch.

WPG, Atlantic City, N. J., 296 (E. S. T.)—3:15 P. M., organ recital. 10, studio concert by Galen Hall trio; Phyllis Herbine, violinist; Vera Chadsey, pianist; Adine Barrozzi, cellist; assisted by Madame Blanche Mazet, soprano; E. F. Gallapher, baritone; Alice Warren Sachse, pianist.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City Trio. 5, children's program. 7:15, markets, weather, news bulletins and police reports.

KTHS, Hot Springs, Ark., 375 (C. S. T.)—8:30 P. M., selections by members of the Conservatory of Music. 9, selections by the Meyer Davis Ensemble. 9:30, selections by artists of Henderson-Brown College. 10, dance frolic by the Charles L. Fischer orch.

KOA, Denver, Colo., 323 (M. S. T.)—12:20 P. M., Rialto organi recital. 1, N. Y. stock reports, live stock, fruit and vegetable report and weather. 6, N. Y. stock reports, live stock, vegetables and late news. 8, ten minutes of music by Fred Schmitt. 8:10, two-act comedy, "Safety First."

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather and business reports. 11:55, time. 12, physical exercises. 12:15 P. M., Lenten services. 1:30, business reports. 3, market reports. 4, Babson reports. 6, Selinsky Instrumental Quartet. 8, The Times-Star orch., Marjory Garrigus Smith, pianist; Howard Hafford, tenor; Joseph Vito, harpist.

WEEI, Boston, 303 (E. S. T.)—2 P. M., musicale. 6:30, Big Brother club. 7:15, Dok-Eisenbourg and his Sinfonians. 7:55, Pathe News flashes. 8, program by C. Leroy Lyon. 9, A. & P. Gypsies.

WMAQ, Chicago, 448 (C. S. T.)—4 P. M., mothers in council. 4:30, Chicago High School Teachers' Council. 6:30, Hotel LaSalle orch.

WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 P. M., Gold Medal home service talk. 6:30-7:30 P. M., Knell's Tokio orch. 8, recital by Bertha Drescher. 9, Robertson musical program. 10, concert by H. G. Boice.

WGN, Chicago, 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.

Tuesday, March 10

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from the Louisville Conservatory of Music; selections played on the Alamo Theatre organ; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market reports. 5, time. 7:30, concert by Eddie Rosson and his orch.; a chapter of the "Billy and Jane" stories; late news; time.

WWJ, Detroit, Mich., 353 (C. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's Hotel Statler orch. 3, News orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 8, concert from New York.

KPO, San Francisco, Cal., 423 (P. S. T.)—7 A. M., "Daily Dozen" by Bernard Drury. 10, chat for the housewives on "Home Making." 10:30, "Ye Towne Cryer" News Bulletins. 10:40, "What is Playing at the Local Theatres." 11:50, market report. 12 P. M., time. 1, Rudy Seiger's Fairmont Hotel orch. 2:30, matinee by Pavo Real orch. 4:30, Rudy Seiger's Fairmont Hotel orch. 5:30, children's hour stories. 6:30, garden hints; "What is Playing at the Local Theatres." 7, Rudy Seiger's Fairmont Hotel orch. 8, program by the San Francisco Music Society. 10, Gene James's Rose Room Bowl orch.

KTHS, Hot Springs, Ark., 375 (C. S. T.)—8:30 P. M., Old Southern Melodies Night. 9:45, Meyer Davis-New Arlington orch.

WREO, Lansing, Mich., 286 (C. S. T.)—8:15 P. M., musical program; Reo Broadcasting band; Reo Male Glee Club; local artists. 10, weather.

KOA, Denver, Colo., 323 (M. S. T.)—12:20 P. M., Rialto organ recital. 1, N. Y. stock reports (2 o'clock quotations); live stock; fruit and vegetable report and weather. 3, half hour matinee for housewives. 6, dinner music. 6:30, final reading, N. Y. stock reports; live stock; vegetables and late news bulletins.

WPG, Atlantic City, N. J., 296 (E. S. T.)—7 P. M., Hotel Ambassador dinner music. 9, Hotel Traymore Ensemble. 10, A. C. Kiwanis Club Night.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City Trio. 5, children's program. 7:15, markets, weather, news bulletins and police reports. 8, Oregon Agricultural College Extension Service. 8:30, concert. 10, Multnomah Hotel Strollers.

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather and business reports. 11:55, time. 12, setting-up exercises. 12:15 P. M., Delta Omicron Sorority program. 1:30, business reports. 3, market reports. 4, "Mah Jong" by Lucy Blackburn. 6, Selinsky Instrumental Quintet. 8, concert program; selections by Quartet of Brass; instrumental trio. 8:30, R. G. (Gregg) Henkle in "O'Gooferty and Goofus"; Adelaide Apfel, pianist; Earl Derbis, violinist; Edith MacDonald Taube Trio; violin, Edith MacDonald Taube; cello, Winifred Hazelwood; piano, Olive Terry. 9, entertainment by Higginbottom's orch.; popular piano numbers by Missouri Kenney; old time fiddlin' by Jake Rutz.

WEEI, Boston, 303 (E. S. T.)—1 P. M., Civitan club. 2, Napoli Four. 4, Shawmut Juvenile Syncopators. 6:30, Big Brother club, Uke band. 7:15, Dok-Eisenbourg and his Sinfonians. 8, musicale. 8:30, Gold Dust Twins. 9, Eveready hour. 10, Goodrich Cord orch.

WMAQ, Chicago, 448 (C. S. T.)—12 P. M., Illinois Manufacturers' association program. 4, American Red Cross talk by Dr. H. W. Gentles. 4:30, pupils of the Gunn School of Music. 6, Chicago theatre organ. 6:25, Hotel LaSalle orch. 6:50, "Daddy." 8, Harry Hansen, literary editor. 8:20, Clara E. Laughlin, travel talk. 8:40, weekly talk from the Association of Commerce. 8:55, lecture from the U. of C. 8:30, Jane Fitch, soprano. 9:15, program by Reform Church.

WGR, Buffalo, N. Y., 319 (E. S. T.)—11 A. M., Mrs. Katherine Norton Britt. 6 P. M., Hallpryd string trio. 8, joint broadcasting with WEAF.

WGN, Chicago, 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.

Wednesday, March 11

WEMC, Berrien Springs, Mich, 286 (C. S. T.)—8:15 P. M., Ardice Bentley, pianist. 8:30, Marguerite Bordeau, reader. 8:40, "The Cardinal Ladies' Quartet." 8:55, talk: "What Books Do You Enjoy?" Lyndon L. Skinner.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from the Louisville Conservatory of Music; weather; readings; late news. 4:55, livestock, produce and grain market reports. 5, time. 7:30, concert by the K. & L. Terminal Railroad orch.; selections by the String Division of the K. & I. Terminal Railroad orch.; late news; time.

WWJ, Detroit, Mich., 353 (C. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletins. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's Hotel Statler orch. 3, News orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 8, News orch. 10, Jean Goldkette's Victor Recording orch.

KPO, San Francisco, Cal., 423 (P. S. T.)—7 A. M., "Daily Dozen" by Bernard Drury. 10:30, "Ye Towne Cryer." 10:40, "What is Playing at the Local Theatres. 11:50, market reports. 12 P. M., time. 1, Rudy Seiger's Fairmont Hotel orch. 2:30, dance music. 4:30, Rudy Seiger's Fairmont Hotel orch. 5:30, children's hour stories. 6:30, "What is Playing at the Local Theatres." 7, Rudy Seiger's Fairmont Hotel orch. 7:30, program by the Conn Band Instrument Co.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City Trio. 5, children's program. 7:15, markets, weather, news bulletins and police reports. 8, concert, arranged by Mrs. L. W. Waldorf. 10, Colburn's Melody Men of the Hotel Portland, and intermission numbers by Shefler's Novelty String Quartet.

KTHS, Hot Springs, Ark., 375 (C. S. T.)—8:30 P. M., Meyer Davis Trio. 9, concert by the Meyer Davis Ensemble. 10, dance frolic by Chas. L. Fischer's orch.

KOA, Denver, Colo., 323 (M. S. T.)—12:20 P. M., Rialto organ recital. 1, N. Y. stock reports (2 o'clock quotations); live stock; fruit and vegetable report; weather. 8, Fred Schmitt and his orch. 8:10, Men's Glee club; "The Florist Shop," KOA Studio players. 10, Joe Mann and his Rainbow-Lane orch.

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather and business reports. 11:55, time. 12, physical exercises. 12:15 P. M., program by Mu Phi Epsilon Sorority; Ahaus Brunswick orch. 1:30, business reports. 2:30, at Music Hall with the Radio Show. 4, "Shut In" program. 8, half hour programs at the Radio Show; The Milnor Instrumental Trio; Russian dances in costume with accordian accompaniments; Clifford Lang, pianist; Formica Entertainment; Walter Esberger's Instrumental Quartet; Lyric Male Quartet.

WGN, Chicago, 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.

WEEI, Boston, 303 (E. S. T.)—2 P. M., Frankie Ward and his Avalon orch. 6:30, Big Brother club. 7:25, Jack Griffin and Eddie McKinley. 7:50, Harry Einstein. 8, The Traveler Shoe orch. 8:30, M. B. Cohan's half-hour cusicale. 9, Gillette Safety Razor band.

WMAQ, Chicago, 448 (C. S. T.)—1 P. M., speeches from the weekly luncheon. 4, beauty talk by Mme. Grace Earl. 4:30, pupils of the Cosmopolitan School of Music. 6, Chicago theatre organ recital. 6:30, stories for the children by Georgene Faulkner. 6, lecture Northwestern University. 8:30, piano concerto. 9, WMAQ players, Carl Craven, tenor.

WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 A. M., Gold Medal home service. 8 P. M., recital by Ethyol McMullen. 9, Atwater-Kent radio artists. 10, recital by Mrs. Wm. J. Carpenter. 10:30, H. C. Weasner and friends.

Thursday, March 12

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from the Louisville Conservatory of Music; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market reports. 5, time. 7:30, concert under the auspices of Mrs. J. E. Harmon, Jr.; four-minute digest of International Sunday school lesson; four-minutes welfare talk; late news; time.

WWJ, Detroit, Mich., 353 (C. S. T.)—8 A. M., Setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletins. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's Hotel Statler orch. 3, News orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 8, concert from New York.

WPG, Atlantic City, N. J., 296 (E. S. T.)—10 P. M., studio concert, Edna Irene Peech, mezzo contralto; Evan Prosser, tenor; Hannah Shaeffer, pianist; Minnie Shaeffer, violiniste; Alice Warren Sachse and Joseph Lilly, pianists.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert by Rose City Trio. 5, children's program. 7:15, market, weather, news bulletins and police reports. 8, The Oregonian Concert orch. 10, Multnomah Hotel Strollers.

WREO, Lansing, Mich., 286 (C. S. T.)—8:15 P. M., musical program; Reo Broadcasting orch.; Reo Male Quartet; soloist. 10, weather.

KTHS, Hot Springs, Ark., 375 (C. S. T.)—8:30 P. M., organ concert by Lawson Reid. 12 midnight, Owl concert and dance frolic by the Meyer Davis orch.

WKAQ, Porto Rico, 341 (E. S. T.)—8:30 P. M., musical concert from restaurant "La Cafetera."

KFDY, Brookings, S. D., 273 (C. S. T.)—8 P. M., clarinet and saxophone solos by R. M. Endresen. 8:10, "Increased Returns Through Seed Treatment," by A. T. Evans. 8:20, vocal solos by Mrs. James Milne, soprano. 8:30, news and farm facts. 8:35, "Spring Care of Orchard" by G. T. Gilbertson. 8:45, Clarinet and saxophone solos. 8:50, soprano solos with guitar accompaniment.

KOA, Denver, Colo., 323 (M. S. T.)—12:20 P. M., Rialto organ recital. 1, N. Y. stock reports; live stock; fruit and vegetable report and weather. 3, half hour matinee for housewives. 6, final reading, N. Y. stock reports; live stock; vegetables and late news.

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather and business reports. 11:55, time. 12, physical exercises; William Stradtman, instructor. 12:15 P. M., noonday concert. 1:30, business reports. 3, market reports. 4, French lesson; piano recital by Adelaide Apfel. 6 P. M., Selinsky Instrumental Quintet. 10, three-minute message. 10:03, Cooper Corporation; Cooper Concert orch. and Male Quartet; Larry Grueter, piano accordian solos; Doherty Melody Boys.

WGN, Chicago, 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, 448 (C. S. T.)—4 P. M., household hour. 4:30, Illinois Federation. 6, organ recital. 6:25, Hotel LaSalle orch. 6:50, "Daddy." 8, garden talk, James H. Burdett. 8:15, Western Railways Commission. 8:30, Jane Fitch, soprano. 8:45, income tax. 8:50, University of Chicago lecture. 9:15, Edgewater Glee club.

WGR, Buffalo, N. Y., 319 (E. S. T.)—6 P. M.,

(*Continued on page 26*)

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 .....

Melbourne Lancaster, Lockhart, Tex.
Burton Anderson, Rt. 4, Box 44, Longmont, Col.
Clarena Hassler, Amherst, Col.
John J. Wise, Jr., 301 S. Court St., Crown Pt., Ind.
F. B. Bunch, Jr., Statesville, N. C.
Jos. D. Taboda, Sancto Spinetos, Cuba.
Eldren Farr, Rt. 2, Box 122, Tucson, Ariz.
J. T. Rand, 3040 Hull Ave., Cheviot, Cincinnati, Ohio.
Wm. Twyman, Petty, Tex.
S. J. Miller, Pen Argyl, Pa.
Charles Allison, Murray, Ia.
M. J. Wergis, Crosee, N. D.
Phillips Young, Slater, Mo.
J. H. Ayera, Grove City, Ohio.
Chas. Shoup, 204 Bronx Ave., W. View, Pittsburgh, Pa.
D. J. Fox, Peona, Ill.
C. D. Reynolds, Franklin, Ohio.
Harold Arnold, Kenmundy, Ill.
Lewis Gombert, 452 Linwood St., Brooklyn, N. Y.

Business Opportunities Radio and Electrical

Rates: 50c a line; Minimum, $1.00

RADIO CABINET FACTORY—Now operating profitably, capacity over 1,000 cabinets weekly, offers interest in business to successful set manufacturer as means of securing steady business and avoiding sales expense; in return furnishing cabinets at attractive prices possible under such arrangement. Box W. 1, RADIO WORLD.

ESTABLISHED RADIO jobbing corporation desires partner with $3,000; money needed for expansion. Box W. 2, RADIO WORLD.

PATENTS FINANCED—Electrical, mechanical, household; blue prints absolutely necessary; sale negotiated. Box W. 3, RADIO WORLD.

PIANO, RADIO AND MUSIC business, doing $17,000 year; sacrifice at $2,500; well stocked. Box W. 4, RADIO WORLD.

RADIO, ELECTRICAL—California representative; accounts and personal commissions solicited; leaving few days. Box W. 5, RADIO WORLD.

RADIO PRODUCTS—We are distributors of radio products in metropolitan territory; are interested in representation of additional items; if meritorious might carry accounts. Box W. 6, RADIO WORLD.

RADIO STORE, EXCELLENT BUSINESS section, East Bronx; have other business cannot attend to this store; will consider any reasonable offer. Box O5, Radio World.

RADIO STORE; good location, neighborhood and transient trade; owner's opportunity in making bigger connections reason for selling. Inquire 532 Nostrand Ave., cor. Fulton St., Brooklyn, N. Y.

RADIO STORE, located on one of the business corners of the downtown section; wonderful opportunity for one who desires to get into this fast growing business. Box O6, Radio World.

RADIO BUSINESS IN SUBURBS; bargain for quick buyer. Box O4, Radio World.

FRESHMAN MASTERPIECE, $46.00; Tirdyn, $46.00. F. J. Terry, Broadalbin, N. Y.

IF YOU WANT $96 A WEEK, a big permanent business, an honest company and an Essex coach without a cent of expense, write now. I need 100 men and women quick to take orders for Jennings hosiery. Don't delay. Send post card now for details. Jennings Mfg. Co., Dept., N-31, Dayton, Ohio.

FINANCING—Will negotiate with new enterprise, individual or established business needing capital. Incorporating attended to. Box 95, Wall Street Station, New York.

The Radio Trade

Grebe, Being Sued, Challenges Hazeltine's Right to Neutrodyne Patent

A SUIT charging infringement of patent has been brought in the Brooklyn Federal Court by the Hazeltine Corporation and the Independent Radio Manufacturers against A. H. Grebe & Co. The defendant company contends that the question of the validity of the Hazeltine patents is one for legal interpretation.

During the war Prof. Louis Hazeltine, of Stevens Institute of Technology, in the employ of the Navy Department, developed the Neutrodyne, for which a patent was granted. At that time, the Grebe company stated, the dedication act, which provided that the patent became public property, was effective.

Later, the defendant company claims, Hazeltine was allowed by the Patent Office to cancel the dedication clause. It is held that the question to be decided by the court is whether Hazeltine had the legal right to withdraw his dedication.

6-FOLD SALES INCREASE IN A YEAR IN SOUTH AFRICA

WASHINGTON.

IMPORTS of radio equipment in South Africa were more than six times greater during 1924 than the previous year, according to reports reaching the Department of Commerce. It is estimated that the 1924 imports were $820,390, compared to $137,352 for 1923.

UNITED SCIENTIFIC LABORATORIES REDUCES PRICES

DUE to the nation-wide demand for United Scientific Laboratory products, David Wald, president, has ordered a price reduction amounting in some instances to 25% on the famous line of Scientific low-loss condensers, rheostats and potentiometers. Increased facilities have also helped in the saving which is passed on to the consumer. This concern has also just brought out the new Scientific low-loss tuned radio-frequency kit which has made a hit with the set-builder on account of its distance-getting qualities.

BOB BARBLEY PERFECTS AMBASSADOR CIRCUIT

BOB BARBLEY, well known in the radio field as one of the original radio experts, has established radio laboratories and a factory at 135 Liberty Street, New York City, where he specializes on Super-Ambassador circuits. Complete kits for building the new low-loss 4-tube Ambassador and the Ambassador 3-tube deluxe are sold at lowest prices, or sets are built and wired for the follow who wants expert work. Only genuine low-loss Ambassador parts are used and panels, sub-panels and cabinets are the finest procurable. Blueprints for the Ambassador circuit are available and free advice is always on tap. The Ambassador is one of the best of the regenerative circuits, being remarkably selective and a consistent distance getter.

Coming Events

MARCH 7—End of Fifth Annual Radio Show and Convention, Hotel Pennsylvania, New York City. Executive Radio Council, Second District.
MARCH 7—End of Kansas City Radio Show, Convention Hall, Kansas City, Mo.
MARCH 4—Broadcasting of President Coolidge's inaugural speech.
MARCH 9 TO 14—Cincinnati Radio Show, Music Hall.
APRIL 19 TO 25—International Radio Exposition, Steel Pier, Atlantic City, N. J.
SEPT 12 TO 19—Fourth Annual National Radio Exposition, by American Radio Exposition Co., 522 Fifth Ave., N. Y. C., to be held in Grand Central Palace.
SEPT. 14 TO 19—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Rd. and Jerome Ave., New York City.
SEPT. 14 TO 19—Pittsburgh Radio Show, Motor Square Garden. (Postponed from Jan. 19.)
SEPT. 15 TO 19—Washington (D. C.) Radio Show.
SEPT. 23 TO Oct. 4—International Wireless Exhibition, Geneva, Switzerland.
NOV. 9 TO 15—Milwaukee Radio Exposition. Civic Auditorium.
NOV. 17 TO 22—Fourth Annual Chicago Radio Exposition; Coliseum.
DEC. 1 TO 6—Boston Radio Show, Mechanic's Hall.
Date not set yet for exposition, also to be held in Chicago, direction of Harold Bolster.

Canadian Business $7,000,000 in Year

WASHINGTON.

REPORTS reaching the Department of Commerce indicate that 1924 will prove to have been the biggest year yet for radio in Canada. In 1924, it is estimated, the sales of sets, loudspeakers, tubes and other radio apparatus in Canada totaled $7,000,000. A large part of it was American make.

SCHWAB UPHELD IN RIGHT TO USE THE NAME OF BRUNSWICK RADIO

SUPREME COURT JUSTICE BIJUR in New York City denied the application of the Brunswick Balke Collender Co., manufacturers of phonographs, to restrain Harold M. Schwab, manufacturer of Brunswick De Luxe Radio Receiving Sets, from manufacturing, advertising and merchandising radio sets and parts under the Brunswick De Luxe trade mark. Justice Bijur desided radio and phonographs were two separate industries and there was no intent to deceive or misrepresent or the part of Mr. Schwab in using the name of Brunswick De Luxe.

New Corporations

Heteroplex Radio Corp., apparatus, $1,500,000. F. Vondorn, Raymond G. Penglase, New York; E. C. Ballantyne, Jersey City, N. J. (Capital Trust Co., of Delaware.)

R. & L. Radio Corp., $15,000. E. T. LeBerthon, A. S. Robbins, A. E. Ruehe. (Atty., H. M. Bassett, 56 Wall St., New York City.)

Aircraft Industries, Radio and Printing, $10,000. M. E. Schecter, F. Arndt, E. Friberg. (Attys., Schecter & Letsch, 34 Wall St., New York City.)

Brainson Radio Corp., $10,000. C. H. Levitt, A. Dulak, H. H. Simon. (Attys., Perlman & Levitt, 1 Madison Ave., New York City.)

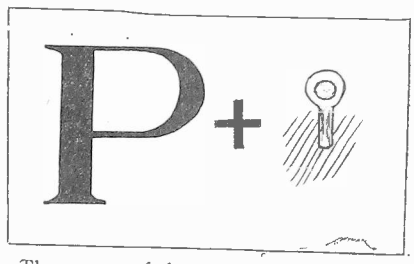
Durus Radio Corp., Wilmington, Del., $2,000,000. (Corporation Trust Co. of America.)

Lincoln Radio Research Laboratories, Wilmington, Del., $500,000. (Atty., Chas. G. Guyer, Wilmington, Del.

Renouned Elec. Products, Wilmington, Del., $300,000. (Colonial Charter Co.)

The Weekly Rebus

WHAT does this Rebus represent? Send answer to Rebus Editor, RADIO WORLD, 1493 Broadway, New York City.

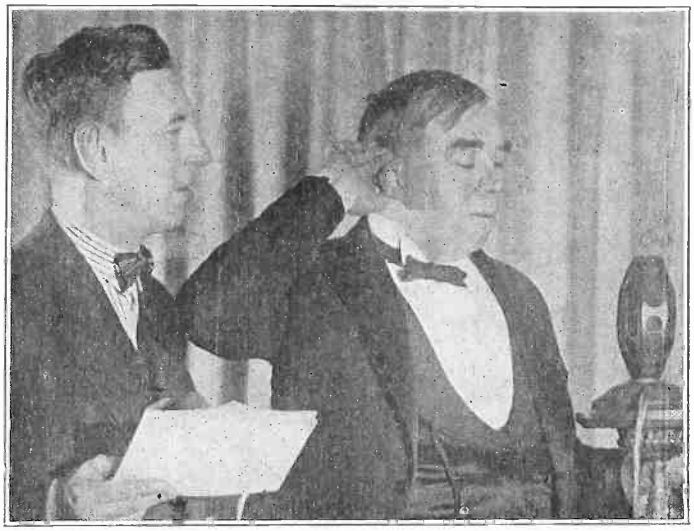


The names of those sending the solution will be published.

Recent Back Numbers of Radio World

may be obtained by sending 15 cents in stamps or coin for each issue desired. Address Circulation Manager, Radio World, 1493 Broadway, New York City.

13th New York Station



RUBE GOLDBERG, left, and Irwin S. Cobb at WMCA opening. (Foto Topics.)

By Sidney E. Finkelstein

THIRTEEN! Do you consider it unlucky? Anyway, Greater New York, as a radio entity, doesn't seem to think so. Its thirteenth station is on the air—WMCA, 428.6 meters, 500 watts, atop the Hotel McAlpin. On the opening night stars were introduced by four masters of ceremony, Irvin S. Cobb, journalist and author; Walter Catlett, star of "Lady Be Good"; Harry Herschfield, cartoonist, and Ed Squires, "the globe-trotting announcer."

SIDNEY E. FINKELSTEIN

Among the famous persons on the program were Cliff Edwards, comedian; Countess Peggy Hopkins Joyce Morner; Milton Sills and Madge Kennedy, screen stars; Rube Goldberg, cartoonist; Earl Carroll, theatrical producer, and Holbrook Blinn, actor.

Eddie Squires is studio manager and chief of the announcers. He was formerly at WDAP, of Chicago; WLAG, of Minneapolis, and KDKA, of Pittsburgh. Ralph C. Powell, Jr., chief of the engineering staff, was operator and announcer at WAAM and later chief engineer at WGBS. Mr. Powell formerly was a contributor to RADIO WORLD.

Storage batteries are to be used almost exclusively in order to eliminate foreign noises from the wave 428.6 meters which has been assigned to the station. The antenna is one of the highest in the country, approximately 430 feet above the ground.

The transmitter employs the Meissner inductive coupled type of circuit, with Heising modulation. Power can be obtained from either storage battery or generator equipment. There are two 250-watt oscillator and two 250-watt modulator tubes, with all extra tubes and other equipment that may be needed to insure continuity of program.

Storage batteries will be used almost exclusively as the source of power, to eliminate hum or ripple.

The antenna is 430 feet from the ground. This extreme height, and the freedom of the antenna from the effects of surrounding structures, is doubtless responsible for the good results that have attended the test programs broadcast for the few weeks before the opening. The signals travel equally well in all directions, according to reports. The station during its testing period was heard regularly in the region extending from Iowa and North Dakota as far West as the Pacific Coast, with occasional reports from Northwestern Canada.

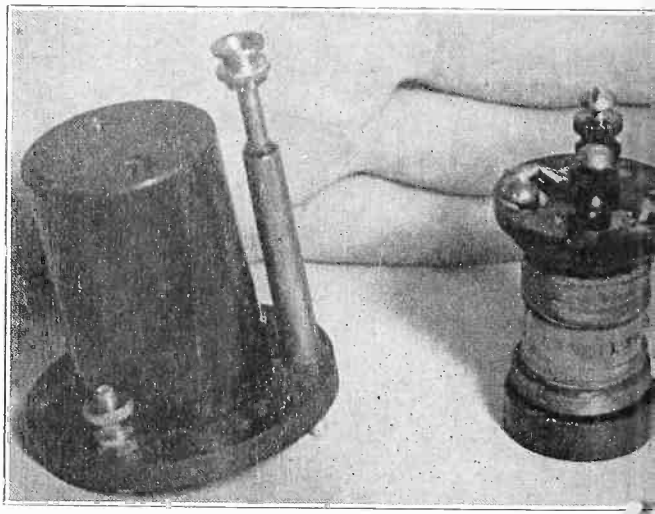
The antenna is of the sloping type, has four wires and is supported above the roof of the hotel by steel masts, with a lead connecting it to the transmitter on the top floor of the hotel. The hotel being of steel construction, serves as the ground.

WMCA will also be equipped to broadcast from numerous outside points.

Manager Director Arthur L. Lee is having his telephone engineer experiment with a plan to link up every room in the McAlpin and Martinique Hotels with the radio station on the roof, whereby any guest who wishes to hear the program may simply listen in at the telephone. Many hundreds of the guest rooms are already equipped with radio receiving sets, as almost every "permanent" guest of the hotels has such an outfit.

Mary Garden's Air Perso

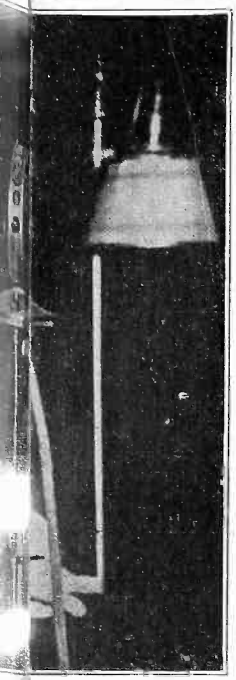
MARY GARDEN'S only radio appearance this season was at WGN, Ch Drake Hotel. The picturesque and gifted operatic character charmed he has an "air personality."



A DEVICE to prevent radiating receiving sets from sending their squeals neighbors has been just perfected, says Roy A. Weagant, vice-president and Forest Co. The device is very small. A choke coil is placed in series with circuit of the audio-frequency amplifier. A small condenser connects the pl tube to the grid of the regenerative tube. The condenser is made similar to t of neutrodyne sets. The photo shows the interior and exterior views of the

GRAHAM McNAMEE, guest; Eddie Squires, announcer; J. Andrew Whi guest, at WMCA.

...lity

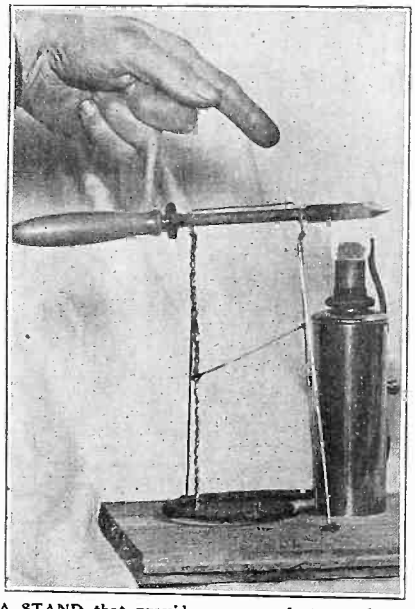


...Tribune station at the ...dience. She proved she

...the air to annoy the ...f engineer of the De ... telephones and plate ... the audio-frequency ...utralizing condensers ... anti-radiating device.

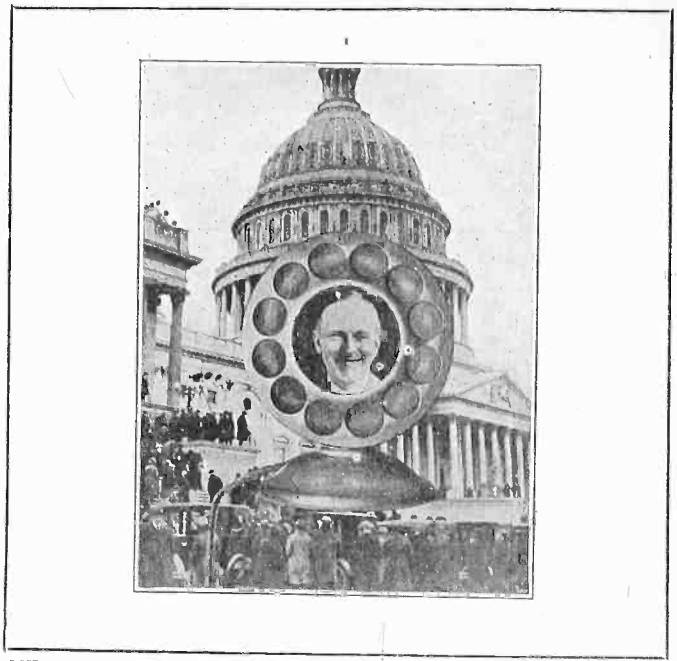
Two Lucky Girls

MISS RUTH BILGER (left) and Miss Margaret Butterfield won first honors by solving the cross-word puzzle of the Ponce de Leon Celebration Committee of St. Augustine, Fla. The problem of the puzzle was radioed from the committee's headquarters and as it came over the wire from the receiver was solved by the young women. (Underwood & Underwood)

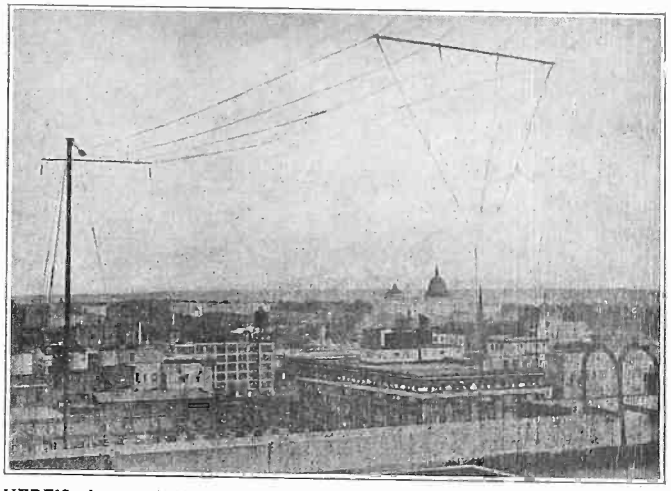


A STAND that provides a convenient rest for a soldering iron can be very easily made out of bus bar. It can be used for either electric or other type iron, but is especially convenient for the iron that has to be heated by some external means, as for instance an alcohol lamp. (Kadel & Herbert)

Inaugural Broadcast



MILLIONS heard President Coolidge's Inaugural address, thanks to multiple broadcasting. WCAP, Washington, D. C., broadcast it direct, by remote control, from Washington. Other stations rebroadcast it. Loudspeakers placed on the steps of the Capitol enabled the huge personal audience to catch every word that the President said. (Kadel & Herbert).



HERE'S the aerial of WCAP, Washington, D. C. This station that picked up the President's address, broadcast it on its own wave from this antenna and simultaneously transmitted via the land lines to WEAF, which in turn transmitted it to a net-work of broadcasting stations throughout the United States by its own land lines. (Kadel & Herbert).

YOUNG People's Choir, First M. E. Church, Atlantic City, N. J., broadcasting from WPG. (Foto Topics.)

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.

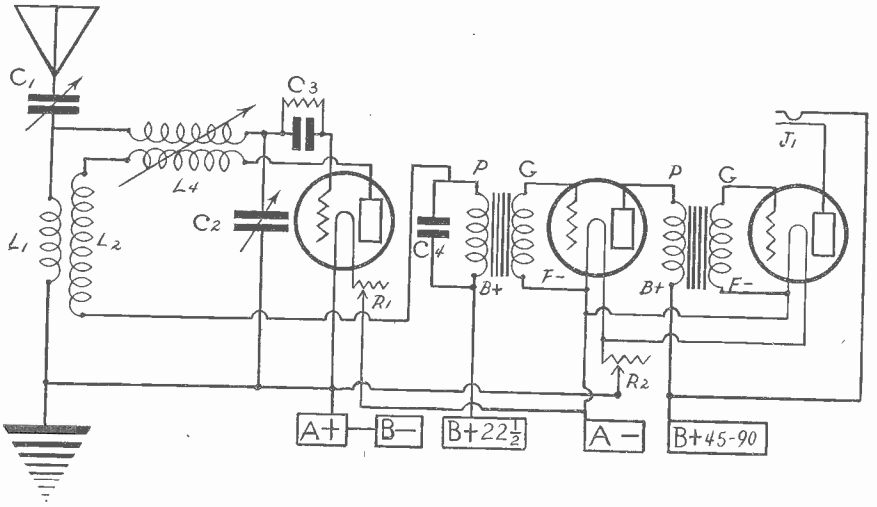


FIG. 100—A 3-tube regenerative set of excellent selectivity and very sensitive. On one spiderweb form having a core diameter of approximately 1" first wind the primary L1 of 40 turns with No. 22 DCC wire. Then wind the secondary L2 with the same gauge wire 60 turns. L4 is the split variometer, the rotor being in the plate lead. C1 is 23 plates, C2, 23 plates; C3, a .00025 mfd. grid condenser; C4, a .002 mfd. phone condenser.

HOW can I add a stage of fixed RF to my present regenerative set?—Harry Rose, 201 W. 79th St., New York City.

Fig. 100 is the circuit you request. The output is connected to the present aerial and ground posts of the set. New aerial ground connections are made as shown.

* * *

WHAT do you consider the best 3-tube set for DX using not more than three tubes? (2) Will the circuit operate a loudspeaker?—L. E. Bates, 3020 Louisiana St., Houston, Tex.

The circuit regenerative receiver using two stages of AF amplification. (2) Yes.

* * *

I CAN GET distant stations only by holding my hand around the leadin. As soon as I remove my hand I get only local stations. Can you tell me what I can do to equal the effect of my hand on the aerial? I have a 3-circuit regenerative set.—F. J. Van Derwerken, 497 7th Ave., No. Troy, N. Y.

Indications point to your having a poor ground connection. See that there are no breaks in the primary wire.

* * *

I BUILT the 1-tube set by Peter V. O'Rourke, in the issue of Jan. 24, but cannot get it to oscillate. I tried all sizes of grid leaks and condensers, but to no avail. Can you suggest anything that will clear up this trouble?—P. M. H., Harrisburg, Pa.

You state in your letter that you hear, faintly, the carrier waves of the various stations. This indicates that the set is oscillating. Couple the tickler with the secondary inductively, leaving the condenser across the tickler. This will make it oscillate and regenerate more powerfully. The condenser will control the oscillations. Should you find, after coupling, that the tube oscillates to the extent of being uncontrollable, increase the spacing between the plate coil and the secondary, with the condenser plates partly engaged, until oscillation ceases. This is the correct oscillating point. Then, by increasing the capacity of the condenser, you will find that oscillation will increase and can be controlled.

* * *

I BUILT the Superflex, as described by Abner J. Gelula in the issue of Dec. 27. I am using an indoor aerial in the attic of my home. The set is very selective, but I have not been able to get out-of-town on the loudspeaker. I have received Denver, Beaumont, Tex., Pittsburgh and Buffalo on the headphones. How can I operate this set on the loudspeaker? (2) What is meant by the beginning and end of a coil? Which is which? (3) Can another condenser be used to better control regeneration?—W. C. Unverfeith, 4812 Concord Pl., Chicago, Ill.

Considering that you are using an indoor aerial, it certainly proves the sensitivity of the set if you can get distance at all. You will be surprised over the additional DX this set can bring in if you can install an outdoor aerial, or you may add another step of audio. (2) The beginning of the coil is the terminal of the turn wound first, the end is the terminal of the final turn. (3) Yes, if you care to use another control, although it is not necessary. A 23-plate variable condenser may be used across the plate coil.

* * *

HOW do you match interfrequency transformers for the Super-Heterodyne?—W. S. Henderson, 5455 N. 11th St., Philadelphia, Pa.

The apparatus used is complicated. However, the following instructions will allow you to match the transformers fairly well. A high-frequency buzzer is connected to the primary of one of the transformers. Then each of the transformers to be matched is closely coupled with the connected coil and a pair of phones connected to the secondary of the transformer to be matched. You may connect the primary of the untested transformer to the secondary of the IFT connected to the buzzer. If you hear the high-pitched note, that transformer is all right. The proper procedure, however, is to use a 5-watt oscillator.

* * *

I PURCHASED the parts for the 4-tube Superdyne by mail-order and received a condenser and coils that are different than those pictured in RADIO WORLD. The condenser has one rotor and two stators and is a ball-bearing affair. Is this all right for the Superdyne? (2) The coils are of the basket-weave type. Are these all right? (3) How can I determine the resistance of a rheostat?—H. L. Fuller, Osseo, Mich.

It is the metric and is all right. (2) Yes, indeed. (3) It would be difficult without a Wheatstone Bridge. You may, with a little trouble, compare it with other rheostats of known resistance and then judge approximately its resistance.

* * *

WHAT is the highest and lowest wavelength that can be reached by the Freshman Masterpiece? (2) Would a C battery be of benefit in cutting down the drain on the B battery? (3) How is the C battery inserted in the circuit? (4) How does the tuned RF compare with the Neutrodyne in tone, volume and DX?—M. M. Sheard, Adel, Ga.

(1) 200 to 550 meters, approximately. (2) If you buy the commercial set don't monkey with it. (3) Take off the leads on the F posts of the AF transformers. Connect the two F posts together. The minus C connects to this lead, the plus C to the minus A. (4) About the same, if the tuned RF is successfully balanced.

* * *

I HAVE a 3-tube Reinartz regenerative set equipped with the finest instruments obtainable. When using all three tubes I get a continual howl and whistle. This is not audible except when two tubes are used.—E. N. Sheldon, 120 Brown St., Pittsfield, Mass.

Probably interaction between the AF transformers is the cause. Reverse the primary connections of both AFT and mount AFT at right angles and away from tuning coils. A C battery in circuit may stop the noise. If the transformers have a shielded casing, ground the casings, or the iron cores.

* * *

IN reference to Bernard's Superdyne, can it be operated on a loop in an attic 25 feet from the ground? (2) Would I be able to get WTAM, WEBH and WGY, 100 miles from Cleveland? (3) Does this set possess greater selectivity than the Neutrodyne and tuned RF sets? (4) If this set can be purchased in kit form, will you tell me where?—Martin Diefenlaugh, 303 E. 10th St., Dover, O.

(1) Yes, for local stations, but it is not advisable. (2) No. (3) At least as great as those named. (4) See advertising columns.

* * *

I AM interested in the set, Fig. 80, page 12, issue of Jan. 31. Can one amperite serve both AF tubes and which number of same should I use? (2) What size panel is required for this set? (3) What is meant by "L5 is a 50-turn coil in fixed inductive relationship to L3L4?"—Geo. M. Dunmire, Scotland, S. D.

(1) Yes; type D11. (2) 7x21". (3) If you intend using three honeycombs, L5 is the center fixed coil while L3L4 are two coils whose position is variable.

* * *

IN answer to a previous question of mine, I was instructed to wind 5 or 6 turns around my present plate coil to make the Anderson Superdyne coupling transformer. Should they be spread out or close together? (2) My second audio stage has a loud whistle and a tapping noise in the phones. When I place my finger on the secondary terminal this stops. I tried resistances across the secondary, tried shielding, etc., but to no avail.—Sol Michael, 842 Whitlock Ave., New York City.

(1) Either way will work; preferably spread them out. (2) Try placing lead from plus B to core of AF transformer; placing a lead from the ground on the secondary terminal. Before you do this be sure that the ground does not go to the filament from the aerial and ground coil. (primary).

* * *

IN reference to the Byit Caldwell circuit in the issue of Nov. 15: Which side of the variable condenser goes to the grid? (2) Can the coils be low-loss?—John Rivers, 202 19th St., E. Moline, Ill.

(1) Stator plates. (2) Yes.

* * *

I HAVE always associated reflex circuit with crystals, i.e., that reflex circuits require a crystal detector. I note that in Tim Turkey's 3-tube reflex as described in the issue of Feb. 14 there is no crystal. Will you kindly tell me whether one is required or not?—Frank Taylor, care Dallas Gas Co., 2016 Jackson Ave., Dallas, Tex.

No. A tube may be used for detector, as Mr. Turkey outlined.

* * *

DOES it make any difference in constructing the low-loss coils for the Superdyne that in the first tuner or grid circuit the primary winding

(*Continued on page 28*)

EFFICIENT!

Will do anything that any five-tube receiver has ever done under the same circumstances.

RECENTLY REGISTERED THE EUROPEAN STATIONS FIVE EVENINGS IN SUCCESSION!

A·I·R
AMERICAN INTERSTATE RADIO
SERVICE
NEW YORK

BEAUTIFUL!

The outward appearance is of an original, artistic design, usually classed as "handsome."

THE INTERIOR WORKMANSHIP AND DESIGN WILL PROVE A PLEASANT SURPRISE!

FIVE TUBE RADIO FREQUENCY TYPE 5-A

Specifications

LOW LOSS PRINCIPLE ADHERED TO THROUGHOUT:

TUBE SOCKETS: An original Low Loss design.

COILS: Of the Low Loss type mounted so as to be out of the electrical field of the condensers.

CONDENSERS: Strictly Low Loss. Designed for straight line reading. oN piling up of stations on the lower wave lengths.

AUDIO-TRANSFORMERS: This item and the variable condensers are manufactured by AIR SERVICE. We know they must be right.

DIALS: (Four inches in diameter.) The size of the dials permit a vernier control.

SUB-BASE: Mahoganite in color and of a high quality of insulating material.

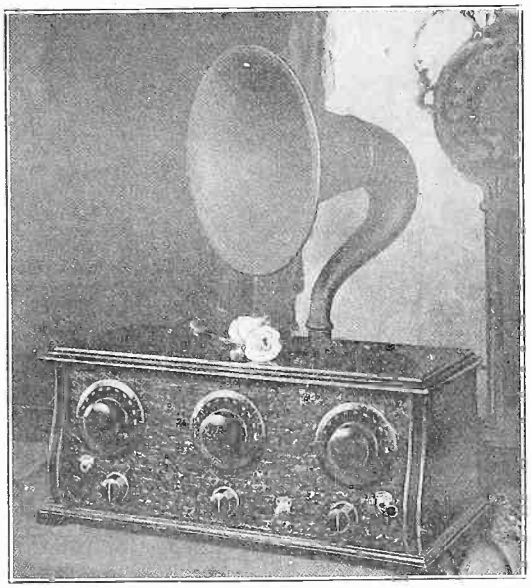
FRONT PANEL: Of the new frieze design. Adds to the beauty and general appearance of the receiver.

CABINET: Size 7 x 18 solid mahogany, of a high piano finish. Made of selected stock, ⅞ of an inch in thickness. (Note the difference between the quality of mahogany used in this cabinet and that of the type of so-called mahogany used in many cabinets of other makes.)

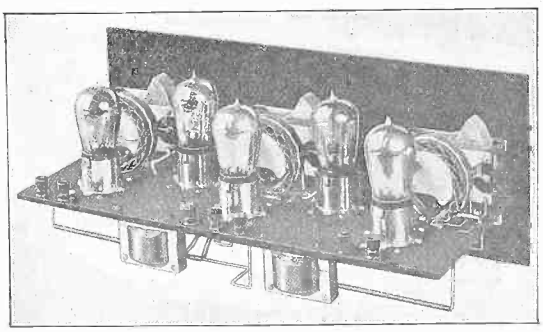
CIRCUIT DESIGN: The most advanced type of radio frequency circuit. Unnecessary to fuss with neutralization. Oscillations are controlled by a special knob termed the CLARITROL. This gives complete manipulation for clarity and volume.

TUNING: All tuning may be logged and the same station, when on the air, may be brought in at the same dial settings. Even a child can operate it.

WORKMANSHIP: It will be a revelation to anoyne who would care to remove the set from the cabinet and compare the careful workmanship with that of other receivers selling for more than $100.00.



CLARITY—VOLUME



This receiver has brought in the broadcasting from coast to coast. The most efficient type of receiver ever designed. 7x18 GENUINE MAHOGANY CABINET INCLUDED. (Not an imitation.) (Without tubes.)

$50

WITHOUT TUBES

COMPLETELY ASSEMBLED

YOU CAN PAY MORE FOR AN INFERIOR RECEIVER BUT YOU CANNOT BUY A BETTER ONE AT ANY PRICE.

All Shipments Made Within 24 Hours

Send us your name and those of your friends. We will place you on our mailing list and send you the PERRY WEEKLY RADIO TALKS. They are free and will be a liberal education in radio in the course of a few weeks.

MAKE US PROVE OUR CLAIMS SEND NO MONEY. PAY THE POSTMAN

If, after THREE DAYS, you decide that the receiver is not everything we claim, ship it right back to us.
WE WILL REFUND YOUR MONEY BY RETURN MAIL.

DEALERS AND REPRESENTATIVES SEND US YOUR NAMES AND ADDRESSES

AMERICAN INTERSTATE RADIO SERVICE

183-185 GREENWICH STREET NEW YORK

RADIO WORLD

The Link Connecting Radio Fan, Dealer Jobber, Distributor and Manufacturer

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 Representative: The International News Co., Breams Bldgs., Chancery Lane, London, Eng. Paris, France. Brentano's 38 Avenue de l'Opera.

EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard
TECHNICAL EDITOR, Abner J. Gelula

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, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	231 lines	150.00
¼ Page, 4½" D. C.	115 lines	75.00
1 Column, 2¼"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.

MARCH 7, 1925

? ? I Wonder ? ?

Sonny Made the Set

SONNY—Mother, this is music to my ears, if it isn't to yours.

Care Necessary in Adding RF Stage

UNLESS a radio-frequency amplifier is built correctly the signal delivered from the detector will be less in volume than if a detector alone were used.

Some five-tube sets, using two stages of radio-frequency, deliver a signal of little volume because of this condition. Because of the extra tuning condensers and coils such a set may be selective, but it is not as efficient as a good three-tube set.

Scrambled Like Eggs, Signals From Europe Are Renaturalized

THE fight against static and atmospheric disturbances has led to the building of a central receiving station at Riverhead, L. I., with a receiving system consisting of two antennae ten miles long.

This system, known as the Beverage-Rice method of reception, eliminates practically all static and intercepts on one antenna the signals from all the European stations. These waves are then automatically separated in more than a dozen receiving sets and sent by wire lines to the operating room in New York.

In an address before the American Institute of Electrical Engineers at Cleveland, E. F. W. Alexanderson, chief consulting engineer of the Radio Corporation of America, said:

"There is only one kind of disturbance that this system does not practically eliminate, and that is a thunderstorm in the neighborhood of the station right on the line from which the signals come. To insure service even in this contingency, a similar large antenna system has been built at Belfast, Me., which would be immune to a thunderstorm on Long Island, whereas a station on Long Island would be only slightly affected by a thunderstorm in Maine. But the problem was, how to get the signal down from Maine to Long Island.

"The signals from Europe are picked out of the ether in Maine, scrambled together and sent out by a single transmitter. This composite signal is then received on Long Island and unscrambled into a dozen signals, which are fed into the long-wave receiving sets, where they go through the usual process of detection and transmission to New York. The signals so reproduced are exact replicas of the original signals, so that the operators in New York do not know whether they have received the original signals or the scrambled and unscrambled signals via Belfast, Me."

Battery Voltage Drop Causes Fading

FADING of distant stations may be caused at the receiving end through a slight drop in the voltage of the A or B battery. This condition may be recognized by tuning when the signal begins to fail, indicating battery trouble if the signal can be brought back immediately. There are other causes of fading, many of them not understood.

A Tip About the Aerial

IN erecting an outdoor aerial it is important to keep the wire well away from other wires carrying current. It is dangerous to attach an aerial to a pole on which lightning transformers are mounted, or to run it over or under electric wires.

Radio Helps the Theatres

BROADCASTING parts of performances from theatres in England has prompted the British Broadcasting Company to make an official statement of policy in regard to theatrical programs sent into the air.

The statement in The Radio Times, the official organ of the Broadcasting Company, reads:

"We wish to make it clear, first of all, that we are not falling back on the theatres to help complete our programs. We have an abundance of good program material which we do not propose to displace or dislocate. Moreover, on the dramatic side, the possibilities of our medium are partly offset by limitations, notably the necessity to dispense with the assistance of the eye. The vast majority of theatrical performances depend on effects which can only be appreciated through the eye.

"It follows, therefore, that the proportion of theatrical performances which can be broadcast as integral items of our program is extremely small. The bulk of our dramatic work involves the creation of a new technique, and one which we believe will in no way prejudice the interests of the theatre industry.

"On the other hand, however, we have found it possible, without dislocating our programs, to introduce listeners to theatrical performances of merit. We are doing this by broadcasting from theatres single acts or selections. Judging from the correspondence we have received, there is no doubt whatever that listeners welcome these introductions to theatrical performances. Nor is there any doubt that the plays themselves have benefited very considerably from our efforts. It was proved that at least a thousand bookings were definitely due to the broadcasting of one act of a play. A musical comedy, selections from which were broadcast, has been playing to full houses ever since—a marked improvement on the pre-broadcast position.

"We shall continue to give these occasional introductions to theatrical programs. The managers of some of the theatres whose plays we introduced to listeners are being attacked and boycotted by certain theatrical associations, principally those which control theatres and music halls outside London."

New Broadcasters

WASHINGTON.

SIX new class A stations were licensed by the Department of Commerce during the past week while one station was transferred from class C to B. The new stations follow:

CLASS A

Call	Stations	Meters	Watts
KFVF	Clarence B. Juneau, 8091 Santa Monica St., Hollywood, Cal.	208.2	10
WAMD	Hubbard & Co., 1336 Nicolet Ave., Minneapolis, Minn...	244	100
WAFD	Albert B. Parfet Co., 1432 Military St., Port Huron, Mich.	233	250
WHBD	Chas. W. Howard, 110 Chillicothe St., Bellefontaine, Ohio	222	20
WHBC	Rev. E. P. Graham, 627 McKinley Ave., Canton, O.	254	10
WRAK	Economy Light Co., 1105 Ludington St., Escanaba, Mich.	256	100

TRANSFER FROM CLASS C TO CLASS B

WKAQ	Radio Corp. of Porto Rico, San Juan, Porto Rico.....	340.7	500

Magnetic Microphone Used at WGY

AT WGY has been developed the magnetic microphone or pick-up, which is fastened to the frame of the piano and gives the fine reproduction of piano tones for which the station is known.

WGY adopted the multiple tuned type of antenna, and this is now in use by all stations of the company. The condenser microphone did not originate at WGY, but it has undergone marked development there in the past two years. WGY was the first broadcasting station to use the water-cooled tube now in common use.

A $5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 issue. Send 15c for copy, 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. RADIO WORLD, 1493 Broadway, N. Y.

RESULTS

WHAT Results Did You Obtain from Constructing Sets or Parts Following Data Published in RADIO WORLD? *Write to Results Editor,* RADIO WORLD, 1493 *Broadway, New York City.*

RESULTS EDITOR:

IT gives me great pleasure to write that I constructed the loud speaker described by Herbert E. Hayden in the February 14 issue of the RADIO WORLD and have no kick

MRS. C. P. OLESON and the Hayden speaker her husband made.

at all. Results are fine. Instead of $5 the speaker (exclusive of unit) cost me about 25 cents. Beat that cost. The young lady who looks so satisfied is my wife. Acknowledge the introduction with a low bow.

C. P. OLESON,
Box 344, McGregor, Iowa.

Variometer Gives Fine Tuning Variation

THE variometer is made of two coils, one stationary and the other movable. The movable coil, called the rotor, is mounted to turn on an axis inside the fixed coil, called the stator. A terminal of each coil are connected, and the other two form the leads to the set.

Turning the rotor completely around varies the electrical length of the coil between minimum and maximum.

This instrument is used to tune the receiver and may be substited for the fixed coil and variable condenser.

Usually a variometer is connected in the plate circuit of the vacuum tube to control regeneration.

The variometer may be connected between the secondary and the grid of the detector tube, replacing the variable condenser. Using another variometer in the plate lead a circuit of this type is called a two-variometer receiver.

Tuning with a variometer is an efficient means of operating the set because wavelength changes can be made in extremely fine variation.

Announcing Taught by N. Y. University

"ANNOUNCING" has become so much of a profession that New York University has established a new course to give announcers the proper training. It is being offered by the Extramural Division, of which Professor James E. Lough is Dean.

Although announcers and lecturers have some problems in common with the platform speaker, such as audience psychology, those who "take the air" for their addresses must give special attention to voice training. The experience of New York University's "Air College" has been that the voice, rather than the subject, is more potent in attracting the radio audience.

Students will study the technique of good radio delivery, the construction and rhetoric of the radio speech, and the specialized vocabulary necessary for the radio speaker. Four college credits will be given to those who complete the course.

The course will be given in the laboratories of the National Radio Voice Service at University Heights. One feature of the laboratory equipment is a voice recording outfit, which sends back to the student his voice as it sounds to his radio audience. Students will spend much of their time speaking over the microphone under normal studio conditions.

Benson's Super-Heterodyne

(*Concluded from page 8*)

similar to the usual two-control Super-Heterodyne. The dial on the left controls the oscillator the other the wavelength selector. They will read very nearly alike but there will be two points at which any station can be heard on the oscillator dial. One point is usually clearer than the other and should be used.

There are several tests to determine if the set is working properly. The set will howl or whistle when the catwhisker is removed from the crystal. This is correct, but occasionally the signals will come in louder with the catswhisker raised. In this case reduce the biasing on the tubes. If an audio howl is noticed it may be due to an open grid return wire or capacity coupling between transformers. Try grounding the negative battery terminal and shunting the audio-transformer primaries with .001 mfd. fixed condensers. Radio-frequency howls that change when the radio-frequency transformers are touched may be eliminated by reversing leads on the transformers.

This set is extremely selective and gives tremendous volume, due to the great audio-amplification, while the range is all that could be wished for. It possesses all the advantages of both the reflex and the Super-Heterodyne and when working properly will surpass anything of its power consumption and number of tubes.

Index to February Issues

FEBRUARY 7

The Bluebird Reflex, by Lieut. Peter V. O'Rourke. A 2-tube set, one stage of tuned RF, crystal detector, one reflexed audio stage, one free audio stage. Loudspeaker service. Volume, selectivity, DX. Schematic and picture diagrams.

How to Make a Speaker for $5, excluding cost of the unit. By Herbert E. Hayden.

The Tuning and Operating Theory of the 1925 Model Superdyne, by Herman Bernard.

FEBRUARY 14

Tim Turkey's 3-Tube Reflex; one stage of tuned RF, tube detector, one reflexed AF stage, one free AF stage. Great on DX, very selective, ample volume. Schematic and picture diagrams.

How to Make a Honeycomb Radio-Frequency Transformer, by Herbert E. Hayden.

A Super-Sensitive Receiver, by Charles H. M. White, Consulting Engineer. A 5-tube loop set, with only the three tubes ahead of the audio shown. Two stages of tuned RF and regenerative detector. Set is neutralized.

Questions on the 1925 Model Superdyne answered by Herman Bernard.

The Factors that Put a Coil in the Low-Loss Aristocracy, by Abner J. Gelula.

Official Report of the Eclipse as it Affected Radio, by Dr. Alfred N. Goldsmith.

FEBRUARY 21

The Simplest 1-Tube Reflex, especially written for the novice by Feodor Rofpatkin. Schmetatic and picture diagrams. One stage of tuned RF and crystal detector. Sensitive, selective, good earphone volume and considerable DX (distance reception).

A Set for Professional Folk, by Lieut. Peter V. O'Rourke. One stage of tuned RF, tube detector and two transformer-coupled AF stages. A quality set that appeals to doctors, dentists, teachers, lawyers, etc. Schematic and picture diagrams.

A Honeycomb Crystal Set, by Raymond B. Wailes. One variable condenser and three honeycomb coils. Picture diagram and photo.

The 1925 Model Superdyne with Dry Cells, by Herman Bernard.

How to Operate the Freshman Masterpiece, by Brewster Lee. Valuable discussion by an expert of the tuning of this set for best results.

New Device Blocks Radiation, by Sidney E. Finkelstein. Discussion of invention announced by Roy A. Weagant, Chief Engineer, De Forest Co. Diagram of 3-tube circuit and constructional text.

Solution of various construction problems shown photographically in two-page display of RADIO WORLD staff photos.

FEBRUARY 28

A Super-Heterodyne that Does the Most Possible with 6 Tubes. Part I of a 2-part article by Thos. W. Benson. The incoming wave is heterodyned to 600 meters, instead of 6,000 or 10,000. Thus broadcast range "intermediate" transformers may be used. The set successfully embodies three reflexed audio stages in the three "intermediate" stages. The set comprises oscillator tube, modulator tube, filter tube, crystal detector and three reflexed audio-intermediate RF stages.

The 3-Tube Neutrodyne, by Lieut. Peter V. O'Rourke. The inverse duplex method of reflexing is used to obtain two tuned RF and two audio stages, the third tube being the detector. This is not a set for novices to attempt.

How to Avoid Putting the Grid Leak in the Wrong Place by Herbert E. Hayden.

Three Resistance Stages of AF Added to the 3-Circuit Tuner, making a 4-tube quality DX set. By Albert Edwin Sonn, Radio Engineer.

How to Make Sure that Your Superdyne is Neutralizing, by Herman Bernard.

Aerial Rules You Should Obey. AF, RF and Batteries also discussed in this article for beginners, by Abner J. Gelula.

Programs

(Continued from page 14)

Hallpryd string trio. 8, joint variety program. 9, Victor hour. 10, Goodrich Silvertown orch.

WEEI, Boston, 303 (E. S. T.)—2 P. M., Eleanor Baldwin Cass, "The Picture Houses; Their Management and the Patrons." 3:15, Noah's Arkadians, Joe W. Rines, director. 6:30, Big Brother club. 7:25, program by the Boston Churches. 7:55, Pathe News flashes. 8, musicale. 8:30, musicale. 9, Victor concert. 10, Goodrich Cord orch.

Friday, March 13

WEMC, Berrien Springs, Mich., 286 (C. S. T.)—9 P. M., Radio Lighthouse Choir. 9:20, program of negro spirituals by Mrs. Sidney A. Smith.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from the Louisville Conservatory of Music; selections played on the Alamo Theatre organ; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market reports. 5, time. 7:30, concert under the auspices of Kingswood Holiness College.

WWJ, Detroit, Mich., 353 (C. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletin. 10:25, weather. 11:55, time. 12:05 P. M., Hotel Statler orch. 3, News orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 8, concert from New York.

WPG, Atlantic City, N. J., 296 (E. S. T.)—7 P. M., Hotel Traymore Dinner music. 9, Ambassador Hotel concert orch. 10:45, Tau Epsilom Chi Sorority dance.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City Trio. 5, children's program. 7:15, market, weather, news bulletins, and police reports. 8, lecture by University of Oregon. 10:30, Hoot Owls.

WREO, Lansing, Mich., 286 (C. S. T.)—1 P. M., special orch. 10, weather.

KTHS, Hot Springs, 375 (C. S. T.)—8:30 P. M., specialty selections, violin and yodeling. 9, Meyer Davis-New Arlington orch.

KOA, Denver, Colo., 323 (M. S. T.)—12:20 P. M., Rialto organ recital. 1, N. Y. stock reports; live stock; fruit and vegetable report; weather. 3, half hour matinee for housewives. 6, N. Y. stock reports; live stock; vegetables and news bulletins. 6:40, Book of Knowledge program. 8, Fred Schmitt and his orch. 8:10, studio program.

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

WGBS, New York City, 316 (E. S. T.)—6:30 P. M., Herman Bernard, managing editor of RADIO WORLD, "Radio Hookups, Questions and Answers." Mr. Bernard is on the air at this station every Friday at 6:30 P. M.

WGN, Chicago, 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.

WEEI, Boston, 303 (E. S. T.)—2 P. M., Gene Wetmore and his Society orch. 6:30, Big Brother Club. 7:25, musicale. 8, program courtesy Neapolitan Ice Cream Company. 8:30, debate between Boston University and Dartmouth College.

WMAQ, Chicago, 448 (C. S. T.)—12:25 P. M., Y. M. C. A. forum. 4:30, pupils of Bush conserv-

(Concluded on next page)

Broadcast Music Lessons, Educator Advises

IF THE public, particularly parents and their children, desire the Board of Education to broadcast music from the educational standpoint, "we will give serious consideration to the request," said George J. Ryan, president of the New York City Board of Education.

The Board of Education has invited the United States School of Music, Mr. Ryan said, to assist in what may prove an interesting and profitable experiment with the radio.

"Already some of the colleges are instituting universities of the air," he added, "and why is it not possible to give music instruction by radio?

"I believe it is possible to have half an hour each evening, or occasionally, devoted entirely to the broadcasting that would enable the listeners to get a fundamental knowledge of music."

If The Cherry Tree Incident Had Happened Today

"GEORGIE, did you chop down that nice cherry tree?"

"Sure I did. The thing interfered with my radio aerial."—N. Y. "Sun."

Programs

(Concluded from preceding page)

atory. 5, fashion talk by Jan Mowat. 6, organ recital. 6:30, Hotel LaSalle orch. 8, weekly Wide-Awake club. 8:30, musical geography. 9, F. J. Bridgeman. 9:15, musical program, Mr. and Mrs. Tregillus.

WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 A. M., Gold Medal home service. 6:30 P. M., Buffalo Trust hour. 8, recital by Doris Wetmore and Marjorie Freeman. 9, B. Fischer and Company's dance orch. 10, Larkin string orch.

Saturday, March 14

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., selections from the Louisville Conservatory of music; selections played on the Alamo organ; police bulletins; weather; readings; late news. 4:55, local livestock, produce and grain market. 5, time. 7:30, concert by the Sylvian trio; late news; time.

WWJ, Detroit, Mich., 353 (C. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletin. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's Hotel Statler orch. 3, News orch. 3:50, weather. 3:55, markets.

WPG, Atlantic City, N. J., 296 (E. S. T.)—9 P. M., concert Hotel Traymore Ensemble. 10:30, dance music Chalfonte-Haddon Hall orch.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., Rose City Trio. 10, Colburn's Melody Men of the Hotel Portland, and solos.

WREO, Lansing, Mich., 286 (C. S. T.)—10 P. M., Frank Logan and his orch. 10, weather.

KTHS, Hot Springs, 375 (C. S. T.)—8:30 P. M., country concert, by singers. 9:45, dance program by the Meyer Davis orch.

KOA, Denver, Colo., 323, (M. S. T.)—12:20 P. M., Rialto organ recital. 1, final reading, N. Y. stock reports; live stock and weather. 9 to midnight, dance music program by Joe Mann and his Rainbow-Lane orch.

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather and business reports. 11, time. 1:30 P. M., stock quotations and business reports. 2:30, Music Hall program. 6, Selinsky Instrumental Quintet.

WMAQ, Chicago, 448 (C. S. T.)—6 P. M., "Daddy," program. 8, Russell Pratt and Fred Daw. 8:30, Radio photologue, "Russia." 9, Chicago theatre revue.

Radio University

(Continued from page 18)

of 15 turns was placed at the lower end of the combination and the secondary wound vertically above the winding, as a continuation of the primary. Should the primary winding be placed at the top of the coil form, so that the tickler may rotate? (2) What is the best lead in which to connect the filament rheostat? (3) For 201A amplifiers and the 200 detectors, from which pole should the grid return be taken?—V. R. Schmidt, Palestine, Tex.

(1) The tickler must be variable. Placement of primary is all right at lower end. (2) For 201A rheostat should be in the minus lead, grid return taken from the minus filament. For 200s, rheostat preferably in positive lead, grid return to the negative filament.

* * *

CONSIDERING in the tickler of the Superdyne that A is the beginning of the tickler and B the end, which goes to the primary of the coupling transformer? (2) What should the dial read when the coils are running parallel? (3) Are condensers supposed to be at any certain angle for best results? (4) What should the condenser read dial when plates are all the way in? (5) What should be the distance between primary and secondary of the RF transformer? (6) In Anderson's Superdyne (Nov. 22 and 29 issues) he has but one negative post. Is this A— or B—?—Robert J. Berglund, Univ. No. 10,046, 1520 16th Ave., Rockford, Ill.

(1) B, the end of the tickler, goes to the end of the RFT. (2) 100 or 180, according to the type dial you have. (3) No. (4) 100 or 180, according to the type dial you have. (5) As close as possible. (6) Common minus (B— and A—).

* * *

THE Harkness Counterflex calls for: First coil, 10 and 60 turns; second, 25 and 55 turns, with 17-plate condenser. How should the coils be wound for a 23-plate condenser?—H. Q. Ten Eyck, 215 W. Goepp St., Bethlehem, Pa.

First coil, 10 and 50 turns; second, 25 and 48 turns.

* * *

WHAT size honeycomb coil may I use to substitute for the coil in O'Rourke's 1-tube set of Dec. 13?—B. F. Goggan, Jr., Henderson, Tex.

A 50-turn honeycomb coil.

* * *

I AM building the 2-tube Transcontinental set, issue of Jan. 31. Can I use the 2-stage amplifier described in the issue of Feb. 7? (2) Is a potentiometer used in place of a rheostat on the amplifier?—Ernest Palmer, 410 Elizabeth Ave., Linden, N. J.

(1) Yes. (2) No potentiometer is used in the AF amplifier.

* * *

IN reference to Charles H. M. White's article on "A Super-Sensitive Set," issue of Feb. 14: Why are no transformers used? (2) What kind of tubes are Sodion Tubes? (3) May 201A tubes be used throughout?—Chas. D. Dennish, 65 Lafayette Ave., Trenton, N. J.

(1) There are two RF transformers in this circuit. Perhaps you have reference to AF transformers. You may add standard AF amplification to this set with very good results. (2) The Sodion tube is manufactured by the Connecticut Tel. & Tel. Co., of Meridan, Conn. The tube may be used only for detection. It is a very good detector, draws 25 ampere and takes a negative grid return. (3) Yes. Wire the grid return to the positive for this tube when used as detector.

* * *

I HAVE a Crosley 2-tube set. I cannot get below 280 meters. How can I get lower? (2) Where may I procure a transmitting license?—Arnold Austin, Milnor, N. Dak.

(1) Shorten the aerial ground. If this is not convenient or possible, you may place a 43-plate variable condenser in series with the aerial or ground. (2) From the Radio Inspector of your district, care Custom House.

* * *

WHERE can I obtain literature on the Phusiformer Set?—Wm. Van Houte, Twisp, Wash.

Write to the Cosmopolitan Radio Co., 15 W. 18th St., New York City.

* * *

CAN a C battery be connected in the Superdyne and if so, how should it be connected?—John Horsager, Berlin, N. D.

Yes: disconnect the lead from the two negative filament F posts on the AF transformers. Connect the two F posts together. The negative C battery goes to the F on the audio-frequency

Answers to Queries

(*Concluded from preceding page*)

transformer. Positive C goes to the negative A battery.

* * *

IS the plate coil on the 1924 Superdyne wound in the same direction as the aperiodic primary? (2) Can I use a 200 for detector and 201A for amplification?—J. Winn Smith, Box 12, Rockport, Ind.

(1) No, it is usually reverse-wound. (2) Yes; this is a fine combination.

* * *

I HAVE a single-circuit variocoupler whose rotor stands about half way out of the stator. If I rewind this instrument, could I use it for the Bernard Superdyne?—E. M. Cummings, Olathe, Kan.

Yes, for the three-circuit vario-coupler. The number of turns depends on the diameter of the tubings. See January 17 issue for full particulars.

* * *

HOW can I use a loop for local reception on the Superdyne so that by a switching arrangement I may use either the loop or aerial and ground?—B. H. Corbin, 964 Ashbury St., San Francisco, Cal.

You may use the loop on a plug and jack system. Place a double-circuit jack on the panel. The upper, outside prong of the jack goes to the grid of the first tube. The lower, outside prong goes to the negative filament. The upper inside prong goes to the beginning of the secondary, the remaining prong to the end of the secondary. Of course, before you begin wiring the jack, the lead between the beginning of the secondary winding to the grid and the end of the secondary to the negative filament must be removed.

* * *

I HAVE a 2-tube receiving set that creates much annoyance as it operates by spells.—H. L. Fuller, Osseo, Mich.

Indications point to too much voltage on the plate, an insufficient gridleak or poor tube.

* * *

IN the Superdyne if I use Acme transformers, what ratio should I use? (2) I have a 6-volt 90-amp. storage battery. Will this operate four tubes? (3) In the middle of the panel of one of the Superdynes there is a switch. Can you tell me what it is for?—Richard Nicholson, 2709 Mt. Elliot Ave., Detroit, Mich.

(1) 3½-to-1 will work well for both stages. (2) Yes. (3) For cutting off filament current.

* * *

IN reference to the Superdyne circuit, I find that the set works as well, if not better, without a gridleak. Is this as it should be? (2) I get interference from KDKA on waves below 326, but not when operating above 326. Can you tell me why?—Jno. G. Hopkins, Coal Center, Pa.

(1) Yes; this is often true when a UV200, C300 or Sodion D21 is used as detector. (2) To be correctly tuned to a station, you must be right in the middle of the wave. Considering this, stations of a high wavelength will cause more interference when you are on the higher side of this station to which you are listening, and vice versa. A wavetrap will help in eliminating undesirable reception.

* * *

I WISH to build a 5-tube Neutrodyne and will use Bremer-Tully low-loss neutroformers; 13-plate condensers are specified for these RFTs. Can I use 23-plate condensers that I now possess?—Fred W. Schoepf, 3433 Butler St., Pittsburgh, Pa.

Not without taking turns off the RFT, which you should not attempt with B.-T. Coils.

* * *

IN reference to the 1-tube set described by Abner J. Gelula in the issue of Jan. 17, are both coils wound on at once or is L2 wound first and L1 over it? (2) What is meant by the two turns of cord intervening between turns?—C. K. Leslie, 2115 Ashby Ave., Berkely, Cal.

(1) The coils are wound spiderweb, L1 is wound first, then wind two turns of cord, then L2. (2) After L1 has been wound, wind two turns of ordinary cord on the form as you would wind

(*Concluded on next page*)

Plan to Invade British Homes in Search of Unlicensed Sets Stirs Public

LONDON.

THERE are more than 2,500,000 "radio pirates" in England, the post office estimates in advocating Parliamentary action to punish those who have sets but no Government license.

If the post office has its way, possession of an unlicensed radio receiver will be punishable by twelve months' imprisonment or a fine of $500.

There are many objections to the proposed bill, especially to one clause which would give the police the right to search the house of any one suspected of violating the law. Should this clause be enacted, its opponents say, the old tradition that every Englishman's home is his castle would have to be modified.

ANSWERS TO QUESTIONS

(*Concluded from preceding page*)

two turns of wire. This is to obtain the proper spacing between turns.

* * *

I HAVE a 3-circuit set with an untuned primary of 15-turns, secondary 40 turns and 23-plate condenser across it. The above is wound on a 4" cylinder form, with No. 22 DCC wire. Can you tell me why I cannot tune out WOAX, 2 miles from my home?—Alfred H. Pick, 1204 Anderson St., Trenton, N. J.

Remove 7 turns from the untuned primary winding. This may decrease volume slightly but increase selectivity. However, two miles is indeed a short distance and the set itself may not be selective enough even with smaller primary.

* * *

HOW can I improve the selectivity of the DX Wiz published in Nov. 29 issue, and also tune below 326 meters?—L. F. Young, 434 23d Ave., Milwaukee, Wis.

Take the coil L1 just as it is and where it is. The beginning (top) is connected to aerial. Tap at the fourth or fifth turn, by scraping off insulation, and connect A— and ground to this tap. This is the lead that goes to the condenser rotor. The end of the winding goes to grid and stator. Note that L1 is preserved as a continuous winding and merely tapped.

* * *

WHAT is the difference between two stages of tuned radio-frequency and two stages of transformer radio-frequency? (2) Will two stages of radio frequency add much value to a set?—A. Oberender, 367 Seventy-fifth Street, Brooklyn, N. Y.

The frequency involved in the different wavelengths depends upon the length of the wave and the speed with which it travels. A transformer to work efficiently on all waves must be designed to meet the electrical requirements of all frequencies. Fixed radio-frequency transformers do not receive all wavelengths equally well. There is a peak with a narrow band on each side which favors stations operating on certain wavelengths. On either side of this band the efficiency is reduced. The advantage of tuned radio-frequency transformers is that they can be adjusted to receive all wavelengths equally good. Incidentally, this condition does not exist in audio-frequency transformers. They do not deal with high-frequency currents. By virtue of their position after the detector only currents rectified to low frequency reach the audio transformers. If an audio transformer is designed to handle frequencies within the audible band, roughly from 200 to 5,000 vibrations a second, it will work well with any set no matter how high or low the wavelength and the original frequency of the signal. (2) Yes; radio-frequency amplifiers will increase the range of the set. These amplifiers intensify weak impulses from distant stations and give them power enough to actuate the detector, otherwise they would not be heard. Another advantage of radio-frequency amplification is sharper tuning.

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FOR CRYSTAL SET OWNERS—Illustrated articles on the making and use of crystal sets appeared in Radio World dated Dec. 6, 20 and 27, 1924, and Jan. 24, 1925. 15c per copy, or the 4 copies for 60c. RADIO WORLD, 1493 Broadway, New York.

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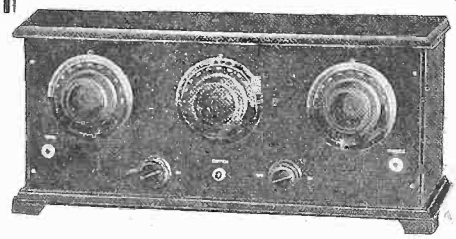

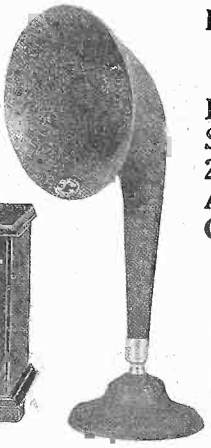

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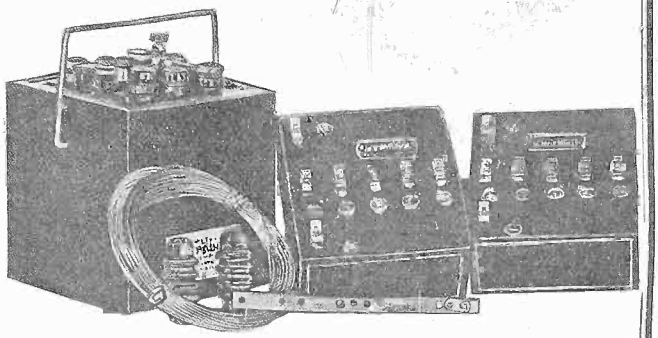

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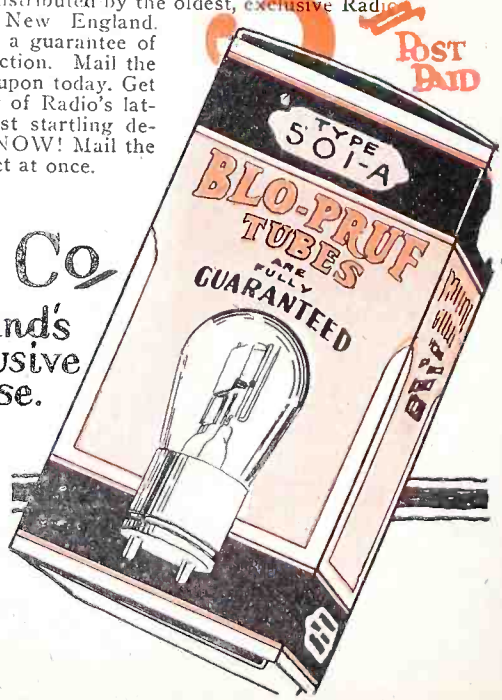

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