

Graduating a V.C.; Benson on Super Circuits

Radio Digest

EVERY WEEK **Illustrated** TEN CENTS

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No. 3

PROMISE "SILENT" CODE



AUSTRALIA HEARS AMERICAN "BUGS"

SIGNALS, CLEAR AND SHARP, CROSS PACIFIC

News of Receipt Causes Flurry Among Operators on West Coast

SAN FRANCISCO.—The first successful spanning of the Pacific Ocean on schedule has been demonstrated according to reports that American amateur Radio signals have been heard in Australia.

This news in the form of a cablegram from H. K. Love of the Wireless Institute of Australia caused a flurry of excitement among operators in California and other western states many of whom made enviable records in the transatlantic tests of last year.

Reception of amateur signals have been reported from time to time by operators on ships off the coast of Australia and China, one of these vessels having been at anchor in a Chinese port. Never until recently has there been any organized effort to transmit signals across the Pacific Ocean on a definitely arranged schedule.

Australians Suggest Test

The tests were made at the suggestion of Australian amateurs, who, hearing of American DX records, desired to demonstrate that they were able to receive signals from western members of the American Radio Relay League. America was to send, Australia to listen.

Although no long distance records were broken, it is significant that American signals were heard clearly and consistently and complete information from the receiving end may show that some amateurs east of the Rockies may have got their signals over unawares.

U. S. ARMY DEVELOPING EQUIPMENT

Frees Air for Broadcasts

Squier's Sine Wave Alphabet and Bruce Relay to Be Used

By Evans E. Plummer

CHICAGO.—Interference to broadcasting by code stations may soon be eliminated by the development of "silent" Radio telegraphy, Major Joseph O. Mauborgne, signal officer of the Sixth Army Corps area with headquarters here, announced in an interview before his departure to Washington, D. C. The silent telegraphy development is the occasion of the Major's call to Washington, where he has been placed in charge of the U. S. Army Radio laboratory of the Bureau of Standards.

Ear Can't Hear Code

The principle behind the "silent" system is that of sending the code signals on a wave frequency below that of sounds audible to the human ear. Thus it will be possible for as many code stations as desire to send at the same time as broadcasting is being done, without the code being heard by the broadcast listeners in. In fact no one will be able to hear the code signals, as these will be sent at a frequency below that possible for the human ear to hear, and it is planned to make use of special relays and tape or page printers in the reception of messages under the new system. The human ear mechanism at its best cannot register sounds with vibration (Turn to page 2)

FAMOUS PEGGY HOPKINS JOYCE AND "VANITIES OF 1923" ON AIR

Station WOR, Newark, Broadcasts Earl Carroll's Production—Joe Cook Invents "Visual" Radio

NEWARK, N. J.—A special Radio matinee was given by the internationally famous Peggy Hopkins Joyce and the others stars of her latest and greatest success, Earl Carroll's "Vanities of 1923," at Station WOR, L. Bamberger & Co, here recently. The performance ran a full hour and a half.

The program was made up of selections from the sensational revue and several "surprise numbers," especially

written for the occasion.

Joe Cook, principal comedian, who admitted that he is "The World's Greatest Inventor," told how he happened to perfect the Radiophone and introduced his very latest Radio device by which he enables the listeners in to "see" the show. He was especially anxious to give the Radiophans a view of "Pretty Peggy," her \$20,000 Chin-chilla gown and Mr. Carroll's much talked of beauty chorus.



Carol Dempster (left above), well-known star of the silver sheet, has had her innings of broadcasting as well. Picture below (not Miss Dempster) was snapped to illustrate a new heach alhi for keeping the hathing suit dry Lower Photo © U. & U.

INTEREST IN PARTS OFFER STILL RISES

NUMBER OF INQUIRIES CONTINUES TO GROW

New List of Accessories Printed Here Shows Why Radio Fans Are Attracted

SPECIAL REWARD OFFER
Coupon Number 9

This Special Reward Coupon appears each issue in Radio Digest until further notice. When sent in, accompanied by necessary remittance, according to the rules governing same, apparatus can be secured. See apparatus list and rules of offer below.

Save Me—I Am Valuable

Interest continues to grow in the Radio Digest's special offer. The number of series submitted by readers desiring parts for the construction of sets, constantly increases.

There is no limit to the number of series you may send to this office but be sure that your coupon numbers run in order. They need not begin with number one but they must be consecutive.

You may send as many coupons as you want. Choose the parts you want and send the list with the coupons and the money.

The parts will be sent to you as soon as we receive your letter.

Rules to Remember

One point must be emphasized to those contemplating taking advantage of the special offer; that is, that the coupons turned in for any item must be numbered consecutively, as for example, 1, 2, 3, and 4 or 3, 4, 5 and 6. The number of coupons necessary and the cash remittance, of course, depend on the item sought by the reader. There is no limit to the number of series turned in by any one reader.

Another point to remember is that cash, checks and money orders but no postage stamps will be accepted.

To make selection more simple the items have been divided into eight classes, each class depending on the number of consecutive coupons and amount of cash remittance necessary. The eight classes of items follow:

Class A Articles

For two consecutively numbered coupons and thirty cents (\$0.30) any one of the following articles will be sent: 1 Carter Imp Jack and Plug; 1 Carter 15-Ohm Resistance Unit; 1 Schindler .0025 mfd. Build-up Mica Condenser; 1 Schindler .001 mfd. Build-Up Mica Condenser; 1 Schindler .002 mfd. Build-Up Mica Condenser; 1 Schindler .0025 mfd. Build-Up Mica Condenser; 1 Martin-Copeland Sta Put Plug; Walnart Standard Tube Socket; Walnart UV-199 Socket; Ray-O-Vac Dry Battery, 1 1/2 volts; Dubilier Micadons Type 601 (.001, .0025, .005, .01, .02, .025, .03 or .04 mfd.); Premier Grid Condenser (.0025 or .005 mfd.); Premier Variable Resistance; 1 Carter 25-ohm Resistance Unit; Standard Socket Adapter for Delta Midget Tube; Electrad Grid Leak (1, 1.5 and 2 megohms, with clips); Amco 3-inch Dial; Amco Inductance Switch; Freshman Micon Condensers (.0005, .0025, .0035, .005, .01, .015, .02, .025, or .03 mfd.); Teleradio V. T. Socket; B-Metal Mounted Crystal; Aerovox Lightning Switch; Aerovox Series Parallel Switch; Aerovox Contact Lever; Na-Ald Small Space Socket; Se-Ar-De Vernier Adjuster.

Class B Articles

For four consecutively numbered coupons and sixty cents (\$0.60) any one of the following articles will be sent: 1 Carter .04 mfd. Special Fixed Condenser; 1 Carter Jack Switch; 1 Carter Hold-Tite Jack, One Spring Open Circuit; 1 Carter Hold-Tite Jack, Two Spring Closed Circuit; 1 Carter Hold-Tite Jack, Three Spring Filament Control; 1 Carter Hold-Tite Jack, Four Spring Closed Circuit; 1 Carter Hold-Tite Jack, Five Spring Filament Control; 1 Pudiin Variable Grid Leak with .0025 mfd. Condenser; 1 Federal Universal Phone Plug; 1 Federal Open Circuit Jack; 1 Federal Closed Circuit Jack; 1 Federal Double Circuit Jack; 1 Martin-Copeland Sbur Grip Plug; 1 Martin-Copeland WD-11 Socket; 1 Martin-Copeland WD-11 Adapter; 1 Martin-Copeland UV-199 Socket; 1 Martin-Copeland UV-199 Adapter 1 Martin-Copeland Pull Switch; 1 Martin-Copeland 5-point Inductance Switch; 1 Martin-Copeland Variable Grid Leak; 1 Martin-Copeland SPST Knife Switch 1 Martin-Copeland SPDT Knife Switch; 1 Martin-Copeland DPST Knife Switch; 1 Martin-Copeland DPDT Knife Switch; Walnart Variable Grid Leak; Walnart Inductance Switch; Dubilier Micadons Type 600 (.001, .0025, .005, .01, .02, .025, .03, .04, or .05 mfd.); Dubilier Micadons Type 610 (.001, .0025, .005, .01, or .05 mfd.); Dubilier Micadons Type 621 (.005 mfd.); Dubilier By-Laws Condenser (.1, .25, or 5 mfd.); Premier Universal Tube Socket; Premier Radio Dial (3/16, 1/4, or 5/16 in. black or white face); Premier Universal Radio Jack, Open Circuit; Premier Universal Radio Jack, Two-Circuit Three Spring; Premier Universal Radio Jack, Two-Circuit Four Spring; Premier Universal Radio Jack, Filament Control Three Spring; Premier Switch Lever and 10 Points; Turney Spider Web Coil (SW-10 with .038 milhenry inductance, SW-15 with .066 MH., or SW-20 with .300 MH.); Amco 6-Ohm Rheostat; Freshman Fix-O Grid Leak and Condenser; Freshman Variable Resistance Leak (with or without condenser); Freshman Micon Condensers (.006 or .005 mfd.); Teleradio 6-Ohm Rheostat; Teleradio 30-Ohm Rheostat; Teleradio Lightning Arrester; B-Metal Crystal Tube Detector Type A; B-Metal Adjustable Detector Type D; Aerovox Rheostat; Se-Ar-De Vacuum Tube Socket.

Class C Articles

For six consecutively numbered coupons and ninety cents (\$0.90) any one of the following articles will be sent: 1 Carter 6-Ohm Vernier Control Rheostat; 1 Carter "Tu-Way" Plug; 1 Federal Panel Mount Socket; 1 Federal 6-Ohm Rheostat; 1 Federal 3-Ohm (Power) Rheostat; 1 Amperite Automatic Filament Control (with mounting); 1 Martin-Copeland Marco Rheostat; 1 Martin-Copeland Series Parallel Switch; 1 Martin-Copeland DPDT Panel Switch; 1 Martin-Copeland 7-Point Inductance Switch; 1 Martin-Copeland 9-Point Inductance Switch; 1 Martin-Copeland 11-Point Inductance Switch; Walnart Variable Grid Leak with .0025 mfd. Condenser; Walnart Variable Condenser (3-plate .0006 mfd.); Ray-O-Vac Dry Battery, 2 cells 1 1/2 volts; Dubilier Ducon; Dubilier Micadon Type 600 (.006 mfd.); Dubilier Micadon Type 610 (.01 or .02 mfd.); Dubilier

By-Pass Condenser (1 mfd.), Premier Universal Radio Jack, Filament Control Five Spring; CRL Variable Grid Leak, without condenser; Premier No. 250 Variable Resistance, panel mounting; Thordarson Vernier Rheostat; Ritter Loop Aerial; Martin Copeland Variable Grid Leak; Amco Multiple Point Inductance Switch; Amco 20-Ohm Rheostat; Amco 50-Ohm Rheostat; Freshman Antenna; Freshman Micon Condenser, .01 mfd.; Teleradio Variable Condensers, (3-plate or 11-plate); Set "Read EM" Binding Posts (9); B-Metal Crystal Tube Detector Type B; Illinois Cushion Resilient Socket; Aerovox Antenna Plug; Aerovox Potentiometer; Aerovox Crystal Detector; Se-Ar-De Adjustable Vernier Condenser.

Class D Articles

For eight consecutive coupons and one dollar and twenty cents (\$1.20) any one of the following articles will be sent: 1 Carter 20-Ohm Vernier Control Rheostat; 1 Schindler Radio Frequency Transformer; 1 Martin-Copeland 13-Point Inductance Switch; 1 Martin-Copeland 19-Point Inductance Switch; Walnart Variable Condenser (5-Plate .0001 mfd.); Ray-O-Vac No. 4151 B Battery, 2 1/2 volts; Ray-O-Vac Dry Battery, 3 cells 4 1/2 volts; Electrad Variomh, with mica condenser; Dubilier By-Pass Condenser (2 mfd.); CRL Variable Grid Leak with Condenser; Resistorometer (Type A or 2A); Thordarson Variable Condenser, .00025 mfd.; Amco 300-Ohm Potentiometer; Freshman Micon Condenser, .015 mfd.; Teleradio Variable Condenser, 23-plate; Aerovox Crystal Detector and Condenser, mounted; Se-Ar-De Variable Grid Leak, with condenser mounting.

Class E Articles

For ten consecutively numbered coupons and one dollar and fifty cents (\$1.50) any one of the following articles will be sent: 1 Carter 6-Ohm Automatic Control Rheostat; 1 Carter 20 Ohm Automatic Control Rheostat; 1 Demcal 3-Plate Variable Condenser; Walnart Variable Condenser (13-Plate .00025 mfd.); Ray-O-Vac Dry Battery, 4 cells 1 1/2 volts; Dubilier Variodon (.0004 or .0006 mfd.); Resistorometer (Type B); Delta Midget Tube and Socket; Thordarson Variable Condenser, .0005 mfd.; Freshman Micon Condenser, .02 mfd.; B-Metal Crystal Tube Detector Type C; Aerovox 3-Gang Socket; Aerovox Double Slide Tuning Coil; Na-Ald 3-Plate Vernier Condenser, with dial.

Class F Articles

For twelve consecutively numbered coupons and one dollar and eighty cents (\$1.80) the following will be sent: 1 Acme Pot-Rboe (potentiometer and rheostat); Walnart Variable Condenser (23-Plate .0005 mfd.); Ray-O-Vac No. 2151 B Battery, 2 1/2 volts; Dubilier By-Pass Condenser (3 mfd.); Premier Variable Condenser without dial (.00039 mfd.); Thordarson Variable Condenser, .001 mfd.; Amco Compensating Grid Condenser; Freshman Micon Condenser, 0.25 mfd.; Teleradio Variable Condenser, 43-plate; Se-Ar-De 3-Plate Condenser.

Class G Articles

For fourteen consecutively numbered coupons and two dollars and forty cents (\$2.40) any one of the following articles will be sent: 1 Federal 7-Plate Variable Condenser; 1 Federal 11-Plate Variable Condenser; 1 Federal 21-Plate Variable Condenser; 1 Federal Anti-capacity Switch; 1 Demcal Variable Condenser 11-Plate; Walnart Variable Condenser (43-Plate .001 mfd.); Dubilier Variodon (.001 mfd.); Dubilier By-Pass Condenser (4 mfd.); Premier Variable Condenser with dial (.00078 mfd.); Premier Hegehog A. F. Transformer, 4 to 1 Ratio; Thordason A. F. Transformer, 3.5 to 1 Ratio; Thordason Variable Condenser, with vernier, knob and dial (.0005 mfd.); Thordason Variable Condenser, with vernier, knob and dial (.00025 mfd.); Ritter Grand Crystal Set; Amco Double H. C. Coil Mounting; Na-Ald 13-Plate Precision Condenser, with dial (.000297 mfd.); Na-Ald 23-Plate Precision Condenser, with dial (.000523 mfd.); Se-Ar-De 9-Plate Condenser; Se-Ar-De 17-Plate Condenser.

dial (.0005 mfd.); Thordason Variable Condenser, with vernier, knob and dial (.00025 mfd.); Ritter Grand Crystal Set; Amco Double H. C. Coil Mounting; Na-Ald 13-Plate Precision Condenser, with dial (.000297 mfd.); Na-Ald 23-Plate Precision Condenser, with dial (.000523 mfd.); Se-Ar-De 9-Plate Condenser; Se-Ar-De 17-Plate Condenser.

Class H Articles

For sixteen consecutively numbered coupons and three dollars (\$3.00) any one of the following articles will be sent: 1 Federal Audio Frequency Transformer No. 228 W; 1 Demcal 23-Plate Variable Condenser; 1 Acme Audio Frequency Transformer; 1 Acme Radio Frequency Transformer (R-2, R-3, or R-4); Walnart Variable Condenser (13-Plate vernier; Walnart Variable Condenser (23-Plate vernier); Ray-O-Vac No. 2301 "B" Battery 45 volts; Ray-O-Vac Dry Battery, 6 cells 1 1/2 volts; Dubilier Duratran (B. F. transformer); Premier Micrometer Variocoupler with dial; Premier Variable Condenser with dial (.0015 mfd.); Premier Variable Condenser with vernier (.0004 mfd.); Premier Hegehog A. F. Transformer, 10 to 1 Ratio; Premier Hegehog A. F. Transformer, Tube Socket Type, 4 to 1 Ratio; Turney Spider Web Coil Mount, Type B; Thordarson A. F. Transformer, 6 to 1 Ratio; Thordarson Variable Condenser, with vernier, knob and dial (.001 mfd.); T. B. H. Radio Heat Set, 2,000 ohms; Tulip Loud Speaker, 15-inch, white; Teleradio Vernier Condenser, 23-plate; Teleradio 2,000-Ohm Head Set; Na-Ald Tuned R. F. Transformer, one stage; Na-Ald 43-Plate Precision Condenser, with dial (.001 mfd.); Se-Ar-De 35-Plate Condenser.

Synchronizes Airls from Two Stations

Fan Tunes in Same Piece at Same Time from Two Plants

SCHENECTADY, N. Y.—With nearly 600 broadcasting stations in the air, many of them at the same time, it is not unusual for an operator to pick up two or three stations at the same time. Then begins the delicate task of tuning out all but the desired station, a task frequently impossible and always trying to the temper.

It is most unusual, however, for a fan to secure dual reception and discover that both stations are playing the same tune in the same key and tempo.

This occurred recently. A Providence, R. I., Radiophan recently wrote WGY, local station of the General Electric Company that he had heard the Radio Four sing "Dixie" from WGY at the same time that WEAN, station of the Shepard Company in Providence, was sending out a phonograph record of "Dixie," a banjo solo with piano accompaniment.

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Looking Ahead

How to Make a Good Single Tube Super—will take up most of Part II of Thomas W. Benson's Chapter next week, concluding his discussion on super-regeneration. He will also analyze the principles of the Flewwelling circuit.

A Discussion of the Mutual Conductance, Amplification Constants and Output Impedance Values of Vacuum Tubes—and their effects on efficiency of tube operation, is the topic to be handled by H. J. Marx in the issue of August 4. A simplification of the technical terms and formulas will be made for the benefit of fans anxious to learn the theory of tube operation in Radio circuits.

Away up North with Capt. McMillan—Next issue of the Digest will contain cooling pictures of the Captain and his Radio-equipped ship, the Bowdoin. The famous explorer will endeavor to find out all about static while hovering on the roof of the earth.

R. D. Diagram 91—a Different Development of the Ultra Reinartz—will appear next week. The hook-up uses the same tuning unit as was described several months past in the Ultra Reinartz series.

Conclusion of John B. Brady's Patent Survey—Part IV, the end of Mr. Brady's interesting survey of the Radio patent tangle, will be contained in the issue of August 4.

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PROMISES "SILENT" CODE

(Continued from page 1)

frequencies of sixteen or less per second. With this fact as a basis of the plan, the telegraphy will be done on these low frequencies, which will in turn be impressed on a carrier wave of any Radio frequency. The first experiments will in all likelihood, according to Major Mauborgne, be done using carrier waves with frequencies of from 600 to 857 kilocycles per second (500 to 350 meters wave length).

Using one carrier wave it will also be possible to modulate this by several different "silent" code bearing frequencies. Thus one station's equipment could be used to handle a number of different messages simultaneously. This system is known as the "multiplex" and sending several messages at once by multiplex is known as multiplexing.

Will Help Crowded Ether

The successful establishment of the system of multiplex silent telegraphy will mean the opening for Radiophone broadcasting use of every practical wave band now set aside for the use of Radio telegraphy only. Conversely, it will also mean that wave lengths now reserved and used for broadcasting only, will be open to use by Radio telegraph stations.

The latter significance is of much more importance inasmuch as thousands of telegraph stations are crowding one another in the limited range of useful wave frequency bands. This added advantage of the silent system will undoubtedly cause it to be very popular and applied to use quickly, once developed and proven, at the commercial stations.

To Use Squier Sine Wave Alphabet

The new code signal system invented and recently introduced by Major General George O. Squier, chief signal officer of the U. S. Army, known as the sine wave alphabet, and by means of which it is possible to send at a terrific rate of speed, will be applied to the silent system Major Mauborgne will develop. The sine wave system has already been successfully applied to cable work, permitting an increase in cable speed of 150 per cent.

The Squier sine wave alphabet, explained previously in Radio Digest, is based on the height or amplitude of the sine wave transmitting the signal. For dots the amplitude of the emitted sine wave is less than for dashes. Word and letter spaces, ordinarily consuming much valuable time, can be done away with by Major General Squier's sine system.

Employ Automatic Receiving Printer

As was explained above, the silent telegraphy will also be silent so far as an operator with a headset is concerned, so that it will be necessary to use an automatic receiver and printer. Relays and printers for this work can receive at from five to ten times as fast as it is possible for an operator to "read." There is also a great decrease in the number of errors with the elimination of the human element.

William B. Bruce, Jr., Springfield, Ohio, well known for his inventions in the submarine cable field, is responsible for the invention of an alternating current operated relay which, Major Mauborgne says, will very likely be employed to operate the printer of the automatic receiver. The Bruce relay will take the sine wave alphabet and is really a very remarkable application of the use of the triode tube, so familiar to Radiophans for its rectifying and amplifying powers in the Radio receiving set. Mr. Bruce will have charge of the experimental work in developing the relay purely as a relay. Its application to the silent sine wave telegraphy will be developed in Major Mauborgne's laboratory.

Perfecting Static Eliminated

Associated with Major Mauborgne at Washington will be Dr. Louis Cohen, civilian consulting engineer of the U. S. Signal Corps. The two have done much Radio research together, one of their inventions being the static eliminating device already described twice previously in Radio Digest. The experimental work on the static eliminator will be continued at Washington. Although proven to be practical and a desirable addition to receiving sets where atmospheric are especially bothersome, the device is still undergoing refinements and simplification so that the novice can handle it without difficulty.

Plans for marketing the static eliminator, Major Mauborgne says, are not yet definitely completed.

Lieutenant Colonel Alfred T. Clifton, formerly signal officer of the Second Army Corps area, headquarters at Boston, will succeed Major Mauborgne as signal officer of the Sixth Army Corps area, headquarters Chicago.

Two Broadcasting Stations Recently Opened in Chile

WASHINGTON, D. C.—Reports recently received from Chili state that two new broadcasting stations have been opened in this South American country. One station is located at Santiago de Chile and more recently one was installed in Vina del Mar by an ambitious amateur who sends out regular programs. Both of these stations do not start until the Buenos Aires stations have closed down for the night, there being a difference of one hour in time between the coast and the interior.

Ex-President Wilson has a supersensitive Radio receiving set installed in his home in Washington, D. C.

RADIO DEVICE AIDS DEAF, TESTS SHOW

MICROPHONE AND VACUUM TUBES HELP EAR DRUM

Chicago Experimenter Reports Success in Treating Latent Muscles with Speech Amplifier

CHICAGO.—Great success in applying Radio to teaching the deaf to use their vocal chords and even in the reduction of deafness has rewarded the work of B. K. Ford, 8 South Austin Boulevard, this city. The apparatus used in the experiments consists of a microphone connected to a vacuum tube speech amplifier, the output of which is run into an ordinary Radio headset. A milliammeter in the plate circuit of the last tube of the speech amplifier tells how much current is used to make a deaf subject hear.

Once the correct amplification for the subject is established the problem becomes simple. Some deaf persons require great amplification while others require very little. The milliammeter therefore allows grading of the subjects so that classes of the same degree of deafness can be taught by the same apparatus at one time.

No Lip Reading Allowed

No lip expressions are used by this method in teaching the deaf to speak. The back of the instructor is even turned to the patient so that he cannot be led to read the former's lips. Much patience and care are necessary to induce the deaf patient to learn the sounds that make words.

Henry Heinz, 2027 Bingham street, twenty-one years old, Chicago, was deafened by scarlet fever at the age of six. Four hours of constantly increased amplification were necessary before Mr. Heinz evinced reaction to sound. He is now able to distinguish piano, vocal and violin tones and is being taught to use his voice.

Harry Allen, 2132 Milwaukee avenue, Chicago, fifteen years old, after four hours' work was taught to say, "Hello," "Yes" and "No," and to count from one to ten. The counting was not consecutive; the boy learned the numerals and their value not merely their order.

Decreased Power Strengthens Hearing

By gradually decreasing the power of the amplifier the deaf subjects soon are enabled to hear much better. The process really is based on the strengthening of the latent muscles of the delicate ear mechanism. The experiments are a revelation in the teaching of the deaf. Normal hearing may be restored in rare cases. Practically every subject treated thus far has shown improvement.

Mr. Ford does not declare that the procedure is a panacea for the deaf nor does he assure improvement in every instance. There are deaf persons whose aural mechanism is hopelessly underdeveloped or crippled.

The value of the method in teaching the deaf to speak and in further educating them is attracting the attention of many.

BELLEVILLE, ONT.—A deaf and dumb boy first heard sound over a Radio set recently during an experiment at the convention of American instructors of the deaf in session at the Ontario school. The lad, using sign language, told delegates he heard voices of singers at a broadcasting station.

NASHVILLE, TENN.—Piano music over a receiving set brought a revelation of hearing facilities recently to Berinth Hudgins, life-long deaf mute, of Trezevant, Tenn., near here, when he applied a receiver to his ear and listened in on a concert. A smile brought the first indication from Hudgins that he could hear.

Weekly Bible Class Increasing

FORT WORTH, Texas.—The Saturday evening WBAP Bible Class, conducted by Mrs. W. F. Barnum, leader of the Barnum Bible Class of First Methodist Church, is increasing weekly. The enrollment is now over 1,000, the largest Sunday school in the Southwest.

"HAVE ONE ON ME"—RADIO TREAT AT SEA

NEW YORK.—The first box of cigars ever delivered by means of Radio was sent recently by L. M. Boomer to General T. Coleman du Pont, a passenger on board the Leviathan at sea. It inaugurated the Radio smokers' service instituted by the firm operating the cigar department on board the new vessel.

PLANE BREMEN-BOUND MAKES PHONE RECORD

LONDON.—A Daimler air express, flying from here to Berlin, recently, conversed with the London air station while approaching Bremen, more than 400 miles distant. The distance is a new record for plane-to-ground phone transmission. The plane used a 400-watt transmitter and was piloted by Captain W. R. Hinchcliffe.

"OGN" OF WJZ EXPLAINS "BOTTLE"



"OGN" of Station WJZ, New York City, explains to Miss Rose Bower, WJZ listener in, how a five-kilowatt transmitting vacuum tube or "bottle" works. From the expression on her face one can tell that Miss Bower knows less about it now since "OGN" has explained. "OGN" is no other than Raymond F. Guy, well-known announcer at the big metropolitan station © K. & H.

SING TABOO SONGS IN FIREMEN'S CONCERT

Program Attracts Wives, Sweeties to Laddies' Stations

BOSTON.—A surprise program broadcast recently from Station WNAC here direct from the Mason street fire headquarters, proved a treat for listening in firemen and other Radiophans all over New

England. An all-star program of theatrical talent from the various theaters sang a large number of popular songs that have been tabooed by Radio lately. Special permission had been secured from the American Society of Composers, Authors and Publishers for this occasion. There were also short talks by Fire Commissioner Glynn and Chief Taber.

At several fire stations in surrounding towns, where the Radio sets have loud speaker equipment, there was quite a gathering of wives and sweethearts of the fire laddies to hear the concert.

14 MORE WEEKS OF STANDARD WAVES

WASHINGTON HEEDS CALL FOR SERIES OF SIGNALS

Bureau of Standards to Broadcast Adjustment During August, September and October

WASHINGTON, D. C.—The popularity of the standard wave frequency signals transmitted by the Bureau of Standards station, WWV, during the last six months is such that the series will be continued in August, September, and October, it has been announced here. The accuracy of the waves is more than three-tenths of one per cent. They are thus ideal for checking wavemeters and adjusting transmitting and receiving apparatus.

The power of the transmitter at WWV enables the station to be heard anywhere east of the Mississippi River, provided sensitive receiving apparatus is used. The schedule follows:

Schedule of Transmissions

The time used is Eastern Standard. The hours for transmissions August 15, September 13, and September 28 are similar. Different time periods are used, however, in the October 7 transmissions—

10:55 to 11:11 p. m., Aug. 15 and Sept. 13, 705 meters; Sept. 28, 600 meters. 11:15 to 11:26 p. m., Aug. 15 and Sept. 13, 600 meters; Sept. 28, 428 meters. 11:30 to 11:41 p. m.; Aug. 15 and Sept. 13, 450 meters; Sept. 28, 333 meters. 11:45 to 11:56 p. m.; Aug. 15 and Sept. 13, 352 meters; Sept. 28, 273 meters. 12 to 12:11 a. m.; Aug. 16 and Sept. 14, 300 meters; Sept. 29, 231 meters. 12:15 to 12:28 a. m.; Aug. 16 and Sept. 14, 240 meters; Sept. 29, 200 meters. 12:30 to 12:41 a. m.; Aug. 16 and Sept. 14, 200 meters; Sept. 29, 176 meters.

On October 7, the schedule is: 1:55 to 2:11 a. m., 222 meters; 2:15 to 2:26 a. m., 200 meters; 2:30 to 2:41 a. m., 187 meters; 2:45 to 2:56 a. m., 176 meters; 3 to 3:11 a. m., 167 meters; 3:15 to 3:26 a. m., 158 meters; 3:30 to 3:41 a. m., 150 meters.

Details of System

For each transmission of a standard wave frequency a general call is given by voice first then it is repeated in code. Next the standard frequency signals are given. These consist of the station's call, WWV (- - - - -), repeated with very long dashes intervening and are transmitted by undamped continuous waves. After the standard signals, special announcements are made.

The general call and the announcements are made with the same frequency as the standard signals between but it is recommended that only the standard signals be used for measurement purposes by those listening in.

U. S. OFFERS CRYSTAL DETECTOR TEST DATA

Bureau of Standards Information Aid to Manufacturers

WASHINGTON, D. C.—The results of tests of Radio receiving sets by the Bureau of Standards are given in a series of letter circulars of which the first (No. 90) was issued some time ago. This paper dealt with tests of electron tube sets. The second circular of this series (No. 93), ready for distribution, gives the results of tests on crystal detector sets.

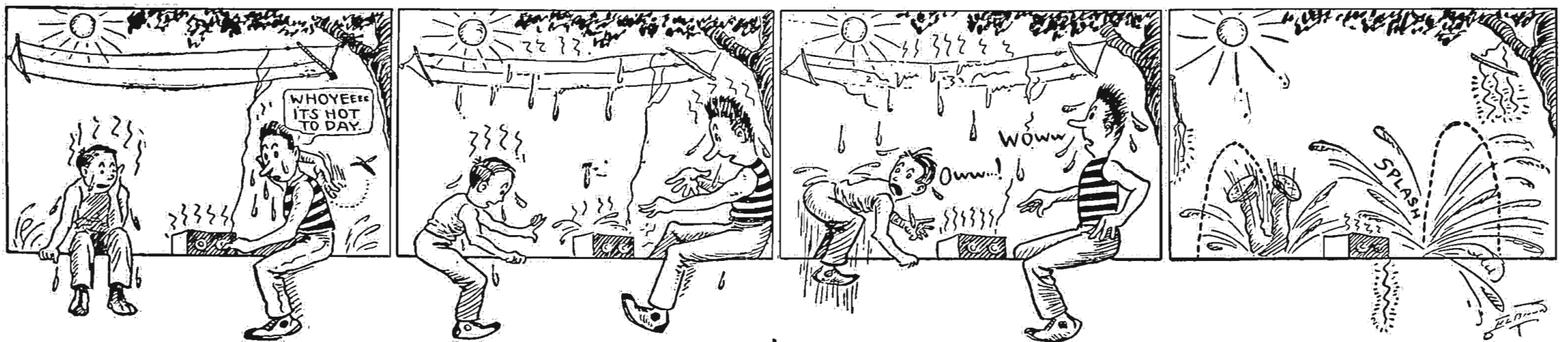
It is believed that the methods followed and the examples given in these reports will be of assistance to manufacturers in the development of methods of testing, besides aiding them to describe properly and to improve their products.

The receiving sets are referred to by arbitrary reference numbers rather than by manufacturer's name, type and model numbers. These circulars are available only in mimeographed form and the supply is limited but copies may be obtained by those directly concerned with the testing of receiving sets by addressing the United States Bureau of Standards.

THE ANTENNA BROTHERS

Spir L. and Lew P.

A Word to the Wise, Etc.



SURVEYS INDUSTRY'S TANGLE OF PATENTS

"Cooperative Competition" Leaves Maze of Stumbling Blocks for Independent Manufacturer

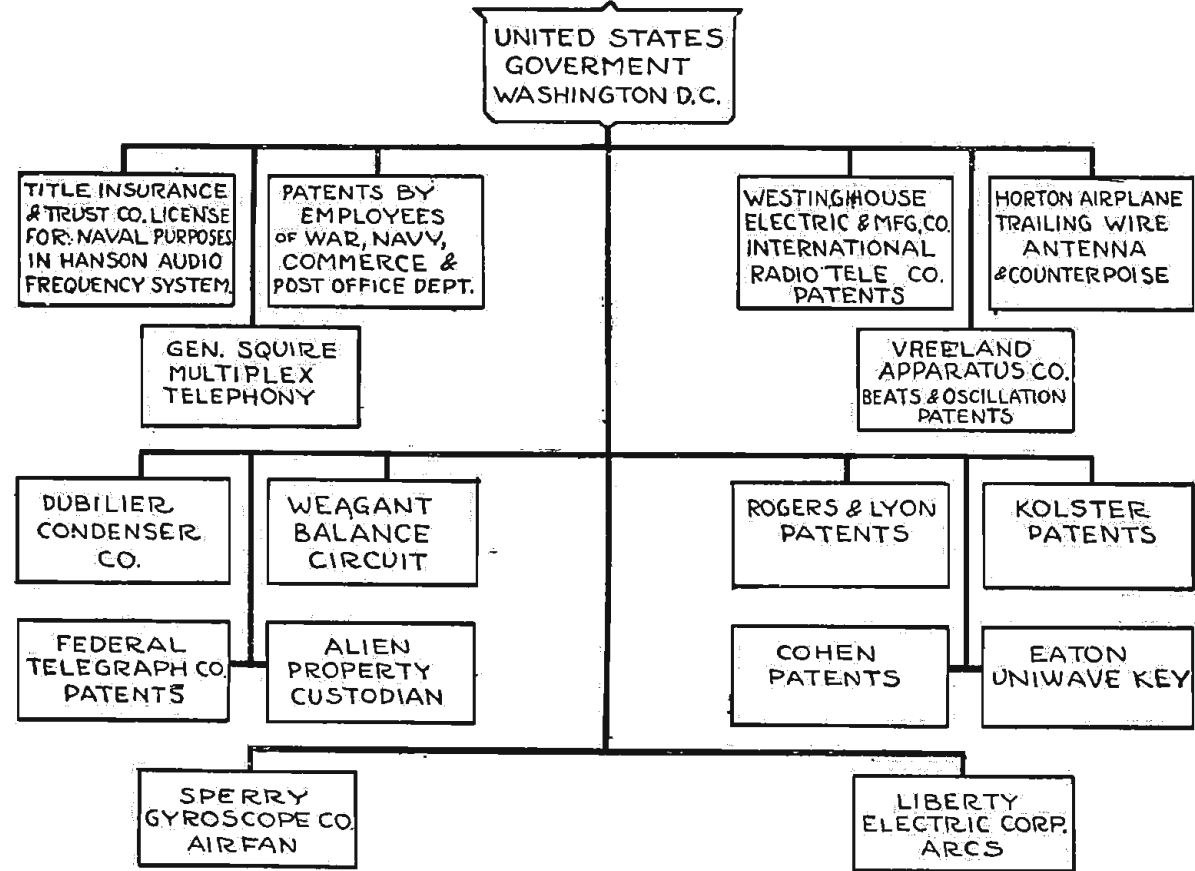
By John B. Brady

(Editor's Note.—Mr. Brady, a patent attorney of Radio repute, has achieved a remarkable survey of the network of patents, locking and interlocking the Radio industry in a veritable Gordian knot. His serial treatise on the patent situation started July 14 issue.)

PART III

ON THE signing of the Armistice, however, this condition no longer continued and the patent monopoly heretofore existing returned with all of its legal aspect and effect. The cir-

not practical and convenient for the Radio Corporation without the infringement of the heterodyne patents and the Armstrong patent of the Westinghouse Electric & Manufacturing Co., while on the other hand the Radio Corporation's combine of patents offered serious difficulties in the way of tube patents for the commercial operations of the Westinghouse Company, and with this problem existing the great combine of patents became established, including the Westinghouse Electric & Man-



Radio Patent Organization Chart

stances were such that no one of the companies working in the art were in a position to sell Radio apparatus without infringing some patents controlled by a competitor. The Westinghouse Electric and Manufacturing Company in gaining a foothold in the commercial Radio field, secured rights under the patents of the International Radio Telegraph Company, including the Fessenden patents, and then under the inventions of Pupin and Armstrong, including the famous Armstrong regenerative circuit.

They had secured certain rights under Hutin and LeBlanc multiplex wire telephony patents, also certain rights by negotiation with the government under the patents of the Federal Telegraph Company, The Atlantic Communication Company, and the invention of Lieutenant Eaton, U. S. N., covering the uniwave arc signaling key.

Form Radio Corporation

The Radio Corporation was formed, including the patent holdings of the General Electric Company, the Marconi Company, the American Telephone & Telegraph Co., and Western Electric Company, with certain reciprocal license rights designating the fields of operation for each of the several companies, and the heretofore deadlocked patent situation then somewhat relieved. Continuous wave reception was

manufacturing Co. as a part of the Radio Corporation as represented by the chart given last week.

To Decide if Combine Is Legal

Whether such a combine of patents is in violation of the Sherman Anti-Trust Law, in unlawful and unfair restricting of trade, was the subject matter of a bill for investigation introduced in the House of Representatives by Congressman Fred A. Britten of Illinois. This question is being investigated by the Federal Trade Commission at Washington under a resolution offered by Congressman White of Maine just before Congress adjourned its last session.

The Wireless Specialty Apparatus Company during the war had manufactured for the government certain constructions of



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Replaces crystal and cat whisker. Always set and alive, loud and clear. No more fishing for live spots. Guaranteed to detect perfectly. Simple to connect—full instructions. Needs no batteries and never burns out. Made of the famous B-Metal. Sold by all live dealers or can be ordered from

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mica condensers alleged by the Dubilier Condenser Company to be infringements of their patents. Suit was initiated by the Dubilier Company but settlement arrived upon early in the proceedings, wherein the Wireless Specialty Apparatus Company secured certain rights under the patents of the Dubilier Condenser Company.

Wireless Specialty Invited in

Professor Pickard, associated with the Wireless Specialty Apparatus Company, had been an early and creditable worker in the Radio art and had secured many patents upon the crystal detector. A mutual agreement was reached between the Wireless Specialty Apparatus Company with its associated company, the Tropical Wireless Company, suppliers of Radio apparatus for steamers of the United Fruit Company, and the Radio Corporation, designating the fields of operation of the several companies wherein the Specialty Company became substantially a part of the Radio Corporation. The Radio Corporation finally purchased the Vreeland oscillator patents containing claims which appeared to offer difficulties in operation of thermionic tube oscillators.

(TO BE CONCLUDED)

PRIZES TO TEMPT RADARIO WRITERS

Cincinnati Publisher Offers \$100 for Three Best Air-Borne Plots

CINCINNATI, O.—A Cincinnati magazine published in the interests of writers, "The Writer's Digest," announces a prize contest in which \$100 will be given for the three best Radarios. The prizes are: First, \$50; second, \$30, and third, \$20.

The three winning Radarios will be broadcast from Station WLW, Crosley Radio Manufacturing company, here. The contest, open to all, will close September 15, 1923.

Judges in the contest are James Knapp Reeve, writer; Howard T. Dimick, author of several books on photoplay writing, and Fred Smith, studio director of Station WLW.

The Radario, a new dramatic form, offers an interesting field to writers. The contest is intended to impress on them the significance of the new form and to familiarize them with its technique.

Will Broadcast Lectures Along Educational Lines

DAYTON, O.—Listeners in within a radius of 300 miles of Dayton were able to hear the first program broadcast recently from the new \$3,000 station, WABD, located at Parker high school, this city.

According to G. A. Morris, principal of the school, programs to be broadcast from the station will be along educational lines.



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Reviews of Books

Vacuum Tube Receivers. By O. F. Hessler. A book that tells how to make a simple set. How to make the cabinet. It includes a 27 by 36-inch layout blue print. Price, 75 cents.

How to Retail Radio. A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store equipment and arrangement. Price, \$2.00.

An Introduction to Radio. A real book for the amateur. This treatise comes in two volumes. 96 pages in each volume, fully illustrated with flexible leather covers. Price two volumes, \$1.

Experimental Wireless Stations. By P. E. Edelman. Simple directions are given in this book for making Radio equipment for the transmission of messages over long distances. Price, \$3.

Radio Telephony. By Alfred N. Goldsmith, Ph. D. This book is intended for Radio engineers, operators and experimenters. Students and other who desire to be clearly informed concerning Radio need this book. It is written in a clear style, fully illustrated with wiring diagrams and photographs of Radio apparatus. Price, \$2.50.

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payment for books not accepted. Send money order or check. Radio Book Department, Radio Digest, 123 W. Madison St., Chicago, Ill.

Alabama Hams Quizzed

BIRMINGHAM, ALA.—Theodore G. Deller, superintendent of Radio for the fifth district was recently in Birmingham and inspecting all Radio stations in Birmingham and vicinity.

While here Mr. Deller addressed the Birmingham Wireless Association, concerning both broadcast listeners and amateur operators, explaining the position of the government in its relation to amateurs and broadcasting stations.



How to Make a Flewelling Receiver

BLUE PRINTS

for the construction of a Flewelling Receiving Unit and two step amplifier.

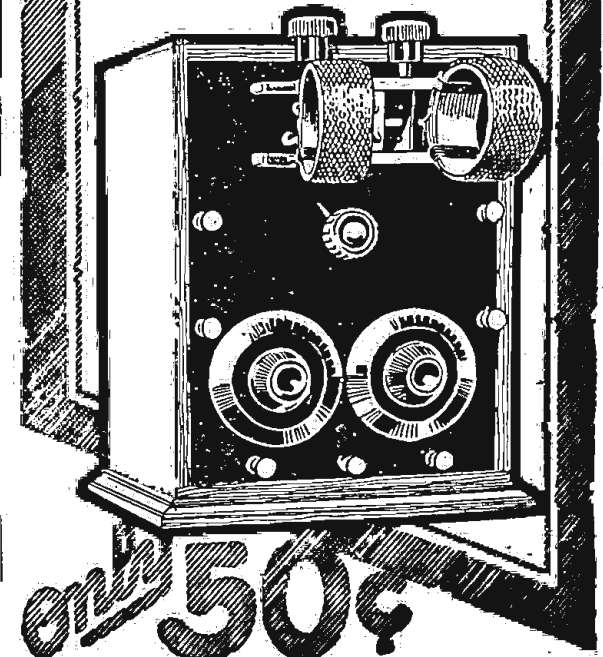
ALL DETAILS FOR ASSEMBLY

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Radio Digest 123 W. Madison St., Chicago, Ill.



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and improves range clearness and selectivity wonderfully. Covers new broadcasting wave lengths. Also a wonder-worker in practically all the older circuits, including reflex. Price, from your dealer or postpaid, \$5.00. Hookup diagrams free.

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The New Grebe Broadcast Receiver



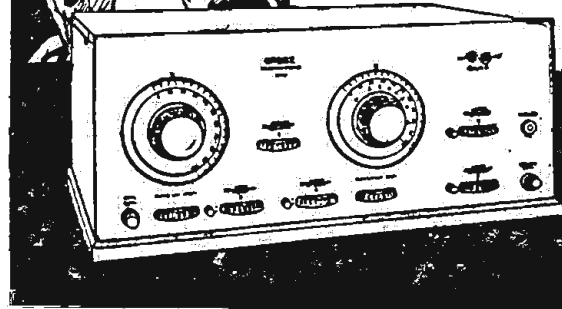
Point No. 6 This Receiver may be set up in a moment, and successfully operated anywhere—by anyone.

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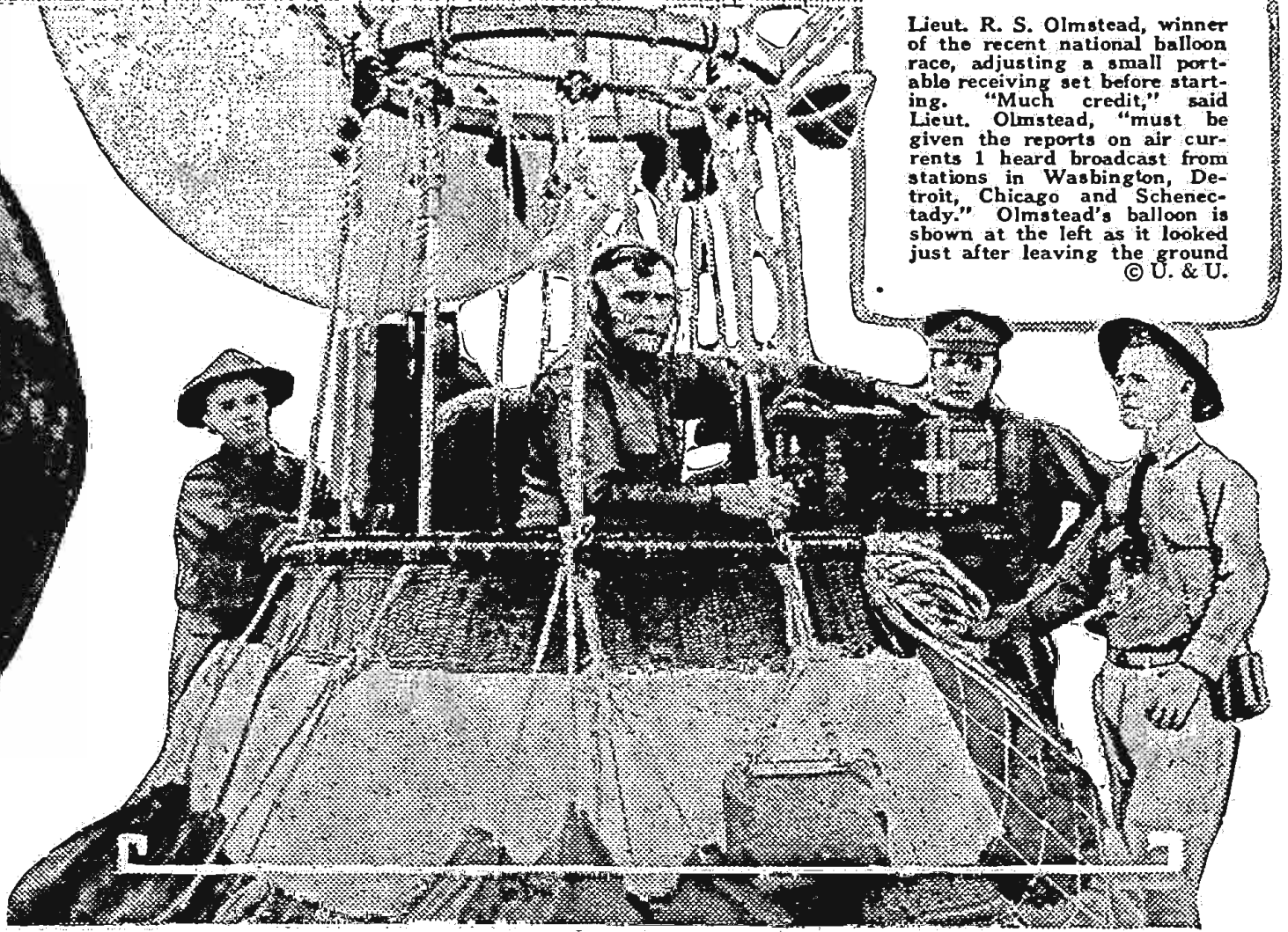
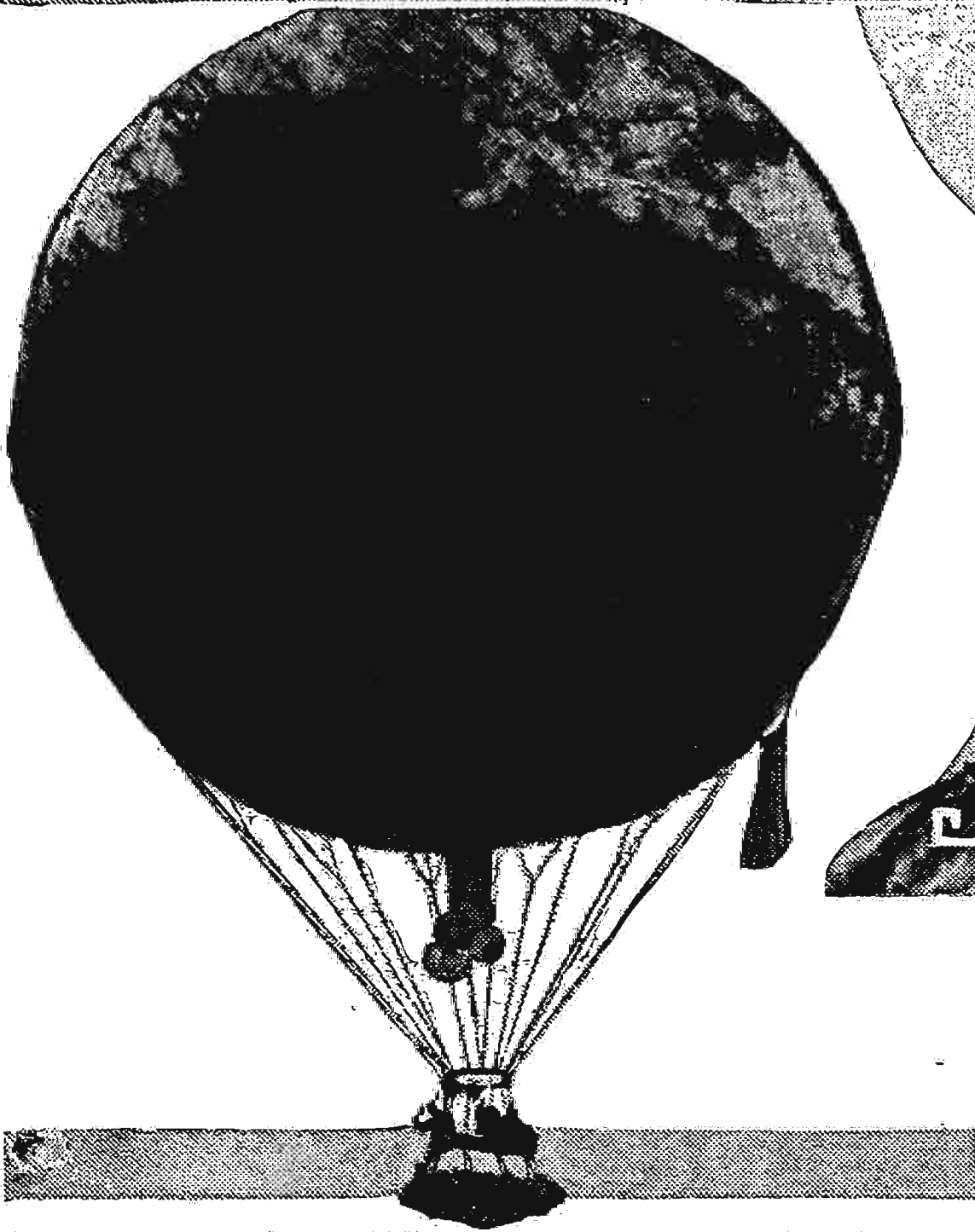
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BALLOONIST WITH RADIO WINS RACE



Lieut. R. S. Olmstead, winner of the recent national balloon race, adjusting a small portable receiving set before starting. "Much credit," said Lieut. Olmstead, "must be given the reports on air currents I heard broadcast from stations in Washington, Detroit, Chicago and Schenectady." Olmstead's balloon is shown at the left as it looked just after leaving the ground. © U. & U.

Five of the fourteen entrants in the recent national balloon race were equipped with lightweight, two tube, portable receiving sets for the purpose of receiving special weather reports giving the air currents at the various altitudes. These were broadcast by stations in Chicago, Detroit, Schenectady and Washington under the supervision of Prof. C. F. Marvin, chief of the U. S. weather bureau. Given above is the statement of Lieut. Olmstead, winner whose balloon was Radio-equipped, endorsing the value of the Radio reports. Last year Major Oscar Westover, winner of the National Balloon Derby, carried a set in his balloon and also gave particular credit to Radio in helping him to win. Another interesting sidelight on balloon Radio is the report of Ralph Upson, pilot of a second balloon equipped with a set. "One of the outstanding happenings in the use of Radio in the balloon race," said Upson, "was that at altitudes of 3,000 feet and above we observed absolutely no static whatever, although we could see lightning at various points on the horizon." Upson is no Radio newcomer, having experimented considerably with the popular pastime, and is thoroughly competent to judge the presence or absence of static noises.

TALKS TO WIFE WHILE DELIVERING LECTURE

Spouse, Listening In, Gets Personal Remarks in Sermon

BIRMINGHAM, ALA.—By the aid of Radio Rev. Alfred J. Dickinson, Jr., recently delivered a sermon here especially intended for his wife, which the wife heard without the invisible audience being wise. The audience didn't know the wife was listening in several hundred miles away at Tupelo, Miss.

Rev. J. R. Hobbs, pastor of the First Baptist church here, is in Europe, and Rev. Dickinson is filling the pulpit temporarily. When informed that a sermon of his would be broadcast by Station WSY, the Alabama Power Company here, the minister wired his wife to listen in. Mrs. Dickinson wrote her husband she heard every word spoken during the services.

After delivering the sermon the Rev. Dickinson admitted that all through the sermon he talked to his wife at their Tupelo home, but so carefully were his personal remarks to his wife interwoven with the words of his sermon that his congregation did not detect it, and his sermon was pronounced one of the strongest and most forceful ever delivered from a pulpit in Birmingham. "I had an inspiration while speaking, from my wife at our Mississippi home," the minister said.

Roller Skaters Roll 'Round Rink to Radio

"Aerial Hats" Pick Up Cincinnati Broadcast Music

CINCINNATI, O.—The engineers of Station WLW, Crosley Manufacturing Company here, recently took a receiving set and an amplifying horn to the Hill Top Rink and installed it to test out the possibilities of using broadcast music to roller skate. This is probably the first time roller skating has been done to Radio music.

One of the novelties of this skating and dancing carnival, was the Radio hats which the principal skaters used. They were equipped with a little aerial, and apparatus of the crystal variety was used to pick up the broadcast concert from WLW while the skaters were enabled to keep perfect roller time to the music.

The experiment was so successful that it will be used by the ice skaters at the Cincinnati Zoo, where a carnival is given twice a day.

AN EVENING AT HOME WITH THE LISTENER IN

(SEE NOTE BELOW FOR INSTRUCTIONS)

Station and City	Met.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
CFCB, Toronto, Ont.	400	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	6:45-7:45
CFGN, Calgary, Alta.	440	10:00-11:00				11:30-1:30	11:00-1:00	
CKAC, Montreal, Que.	430		6:00-9:00		6:00-9:00		6:00-9:00	3:00-4:30
KDKA, E. Pittsburgh, Pa.	326	5:00-9:00	5:00-9:00	5:00-9:00	5:00-9:00	5:00-9:00	5:00-9:00	6:30-7:30
KFAF, Denver, Colo.	360	9:00-10:00	9:00-10:00		9:00-10:00	9:00-10:00	9:00-10:00	
KFDB, San Francisco, Calif.	509	9:00-9:30	9:00-9:30	9:00-9:30	9:00-9:30	9:00-9:30	9:00-9:30	9:00-9:30
KFI, Los Angeles, Calif.	469	8:45-1:00	8:45-1:00	8:45-2:00	8:45-1:00	8:45-2:00	8:45-2:00	10:00-1:00
KGW, Portland, Ore.	492	9:30-2:00	12:00-1:00	10:00-11:00	12:00-1:00	9:00-2:00	12:00-1:00	9:00-10:00
KHJ, Los Angeles, Calif.	395	8:45-12:00	8:45-12:00	8:45-12:00	8:45-12:00	8:45-12:00	8:45-12:00	10:00-12:00
KPO, San Francisco, Calif.	423	10:00-12:00	10:00-12:00		10:00-12:00		10:00-2:00	10:00-12:00
KSD, St. Louis, Mo.	548	8:00-10:00	8:00-10:00	8:00-10:00		8:00-10:00	8:00-10:00	
KYW, Chicago, Ill.	345		7:00-9:00	7:00-9:00	7:00-9:00	7:00-9:00	7:00-9:00	6:00-7:00
NAA, Radio, Va.	435	5:45-7:20	6:05-7:20	6:25-8:40	5:45-7:40	7:00-7:40		
PWX, Havana, Cuba	400			8:00-10:30			8:00-10:30	
WBAP, Fort Worth, Texas	476	9:30-10:30	9:30-10:30	9:30-10:30	9:30-10:30	9:30-10:30	7:00-7:20	3:30-4:30
WBZ, Springfield, Mass.	337	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	7:00-8:00
WCX, Detroit, Mich.	517	7:00-10:00	7:00-12:00	7:00-10:00	7:00-10:00	7:00-10:00		4:00-5:00
WDAF, Kansas City, Mo.	411	6:00-1:00	6:00-1:00	6:00-1:00	6:00-1:00	6:00-1:00	6:00-1:00	11:45-1:00
WDAJ, College Park, Ga.	258	7:30-11:30	7:30-11:30	10:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30
WDAP, Chicago, Ill.	390		10:00-2:00		10:00-2:00		10:00-2:00	9:00-12:00
WDAR, Philadelphia, Pa.	395	5:30-6:00	5:30-6:00	5:30-6:00	5:30-6:00	6:00-1:00	5:30-6:00	
WEAF, New York, N. Y.	492		5:30-6:00	5:30-6:00	5:30-6:00	5:30-6:00	5:30-6:00	
WFAA, Dallas, Tex.	476	8:30-9:30	8:30-12:00	8:30-9:30	8:30-9:30	8:30-9:30	8:30-12:00	9:30-10:30
WFL, Philadelphia, Pa.	395	5:00-5:30	5:00-7:00	5:00-9:30	5:00-7:00	5:00-5:30		5:30-6:30
WGI, Medford, Mass.	360		6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	6:30-10:00
WGM, Atlanta, Ga.	429	9:30-10:30	9:30-10:30	12:00-1:00	9:30-10:30	9:30-10:30	9:30-10:30	7:30-8:00
WGR, Buffalo, N. Y.	319	6:00-8:00		6:00-8:00		6:00-8:00		
WGY, Schenectady, N. Y.	380	6:45-9:00	6:45-9:00		6:45-9:00	6:45-11:00		5:30-6:30
WHA, Madison, Wis.	360	7:30-8:30		7:30-8:30		7:30-8:30		
WHAS, Louisville, Ky.	400		7:30-9:00		7:30-9:00		7:30-9:00	
WHAZ, Troy, N. Y.	380	8:00-9:30						
WHB, Kansas City, Mo.	411		8:00-10:00		8:00-10:00			8:00-10:00
WHK, Cleveland, O.	360	5:00-5:30	5:00-5:30	7:00-8:55	5:00-5:30	5:00-5:30	5:00-5:30	7:00-8:55
WIP, Philadelphia, Pa.	509	4:00-5:30	5:00-10:00	5:00-5:30		5:00-5:30	6:00-10:00	
WJAX, Cleveland, O.	390		6:30-8:30		7:15-9:30			
WJY, New York, N. Y.	405		5:30-9:30		5:30-9:30	5:30-9:30		
WJZ, New York, N. Y.	455	5:30-9:30	5:30-9:30	5:30-9:30	6:30-9:30	5:30-9:30	5:30-9:30	6:30-8:30
WKAQ, San Juan, P. R.	360		6:30-8:00			6:30-8:00		
WLAG, Minneapolis, Minn.	417	6:30-10:30	6:30-10:30		5:30-10:30	6:30-10:30	6:30-10:30	7:30-8:30
WLW, Cincinnati, O.	309	7:00-9:00	9:00-11:00	7:00-9:00	9:00-11:00			
WMAO, Chicago, Ill.	448		7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00		
WMC, Memphis, Tenn.	500	8:00-9:30	8:00-12:00		8:00-9:30	8:00-12:00	8:00-9:30	
WQAI, San Antonio, Texas	385		9:30-10:30		7:30-8:30			9:30-10:30
WOAW, Omaha, Neb.	526	9:00-10:00	9:00-10:00		9:00-10:00	9:00-10:00	9:00-10:00	9:00-10:00
WOC, Davenport, Ia.	484	7:00-8:30		10:00-11:00	7:00-8:30	7:00-8:30	9:30-10:30	7:00-9:00
WOO, Philadelphia, Pa.	509	6:00-9:00			6:00-9:00			
WOR, Newark, N. J.	405	7:00-10:00	5:15-6:30	7:00-10:00	5:15-6:30		7:00-10:00	
WOS, Jefferson City, Mo.	441	8:00-9:30		8:00-9:30		8:00-9:30		
WSAI, Cincinnati, O.	309		7:00-9:00		7:00-9:00		9:00-11:00	
WSB, Atlanta, Ga.	429	10:45-12:00	10:45-12:00	10:45-12:00	10:45-12:00	10:45-12:00	10:45-12:00	7:30-9:00
WSY, Birmingham, Ala.	360	8:00-8:45		8:00-8:45		8:00-8:45		7:30-8:30
WWJ, Detroit, Mich.	517	6:00-7:30	8:00-7:30	6:00-7:30	6:00-7:30	6:00-7:30		4:30-5:30

Instructions for Use.—All the hours above are given in Central Standard Time. If your city uses Eastern Time, add one hour to each of the periods stated; if your city uses Mountain Time, subtract one hour; if your city uses Pacific Time, subtract two hours. If in addition your city is using Daylight Saving Time, add one hour to this result.

WMAK, Lockport, N. Y. Cuts Program During Remodeling

LOCKPORT, N. Y.—Station WMAK of this city has discontinued broadcasting during July and August excepting weather and crop reports, which will be given at 11 a. m. Eastern Standard time. The station will be remodeled and the transmitter will be altered. It is planned to operate as a Class B Station in September.

Bagpipes Give Scotch Treat

TACOMA, WASH.—An atmosphere of heather hills and bonnie lassies was broadcast from KGB recently when a trio from Tacoma Bagpipe Band played for Ledger Radiophans. Only three members of the originally announced sextette were able to play. Their numbers were "The Gordon Highlanders' March," "Sterlingshire Militia" and "The March Past of the Cameron Highlanders."

Daily "Time Ticks" Set Watches Right

New WBAP Service Proves Popular with Fans

FORT WORTH, Texas.—Time ticks sent out each morning, except Sunday, by WBAP, Star-Telegram, are proving very popular with Radiophans of the Southwest. The ticks are absolutely correct, being transmitted direct from Washington by wire to WBAP. Many jewelers use the time ticks to set their standard clocks.

The first tick begins at 10:55 (Central time) and continues for five minutes. Each tick is transmitted as a dot, omitting the twenty-ninth second of each minute, and the last five seconds of the first four minutes.

The last ten seconds of the last minute before 11 o'clock are omitted and then a dash is sent at exactly 11 o'clock when the time ball falls in the National Observatory at Washington.

RADIO TAKES PLACE IN "WELCOME-HOME"

Auto Set Greets Los Angeles Chief on Return to City

LOS ANGELES.—Radio has taken its place as part of the local reception committee to welcome new arrivals, guests and visitors, when recently it was given an important part in welcoming Louis D. Oaks, chief of police, upon his return to this city.

The Radio reception was extended over Station KHJ, the Los Angeles Times. Through arrangements and the courtesy of Major Frank Creswell, of the Western Radio Research Laboratories of this city, which placed a Radio-equipped automobile at the station entrance as Chief Oaks came through the station, he was greeted by Captain of Detectives George K. Home, who broadcast his welcome from The Times Building.

While awaiting the arrival of the train at the station the friends, citizens and representatives of the city, organizations and associations which made up the welcome, were entertained with concert selections, news events of the day and other features from the broadcasting plant.

Hawaii Hears Michigan "Bugs"

DETROIT.—Three men in Port Huron, Mich., have installed an amateur Radio broadcasting station which has been heard in Hawaii. Its call signal is 8AB.

WANT TO LISTEN TO EUROPE STATIONS?

OLD WORLD BECKONS WITH ELEVEN PLANTS

Six British Phone Broadcasters, Three French, One Belgian and One Dutch Operate Daily

Do you think your set will reach to Europe? If so the following information will be of use to you. At present there are eleven phone broadcasters on the continent and the British isles, ranging in wave length transmitted from 353 to 3,100 meters. Better buy some big duo-lateral coils before you start on the European DX hunt but, then, the hunt will be worth it!

Let's take them in turn. Now there's Great Britain for example. Six stations fill the air every evening. If we assume the evening hour to be 7:30 p. m. over there, the time expressed as Eastern Standard would be 2:30 in the afternoon or in Mountain time, 12:30 p. m. The plants and the wave lengths used in Great Britain are: 2L, London, 369 meters; 5IT, Birmingham, 420 meters; 2ZY, Manchester, 385 meters; 5NO, Newcastle, 400 meters; 5WA, Cardiff, 353 meters; 5SC, Glasgow, 415 meters.

Across the Channel

How about crossing the channel and tuning in France? Well there's FL, the Eiffel Tower, Paris, on 2,600 meters. If you use Eastern Standard time, you can hear him on the following schedule:

7:06 a. m., weather reports, ten minutes; 2:11 p. m., weather reports and concert, thirty minutes; 6:01 p. m., weather reports, ten minutes.

Then down on 1,780 meters there are the Radiola concerts in Paris every day, the schedule is: 1:00 p. m. (Eastern Standard time) news; 1:06 to 1:51 p. m., concert; 4:36 p. m., news; 4:51 to 5:51 p. m., concert.

Then still in Paris the station of L'Ecole Supérieure des Postes, Telegraphes et Telephones can be heard Tuesdays and Thursdays from 3:36 to 5:51 p. m., Eastern Standard time. The plant is also on the air Saturdays, 12:21 to 3:21 p. m.

Lyons, France, puts 1,500 good watts and phonograph records on the air daily except Sunday from 6:36 to 7:06 a. m. The wave length of Lyons, 3,100 meters, is the highest of any phone broadcaster in Europe.

Holland and Belgium at It Too

The little country you heard so much about in the world war, Belgium, also does its bit. Brussels, BAV, 1,300 meters, has 1,000 watts in its antenna. Its operating schedule is Tuesday and Thursday, 12:43 p. m., Eastern Standard time.

Then Belgium's equally famous neighbor, Holland, has a station at the Hague. The wave length is 1,050 meters. If you can reach the Hague, Station PCGG, you will hear him as follows: Sunday, 10:40 a. m. to 1:20 p. m. (Eastern Standard time), concert; Monday and Thursday, 4:20 to 5:20 p. m., concert. The Monday concerts are sometimes given on 1,300 meters, notice being given the previous Sunday (so you'll have to hear him both times.)

The time difference makes quite a peculiar situation. Concerts broadcast there in the evening are heard here in the early afternoon, while early morning European broadcasts (if there were any) would be heard here the evening before. But don't let the difference in time worry you. Just listen in regularly at the hours given above. Europe hears our big stations but the European broadcasting plants have been heard very few times in this country. Let's put them on our string of DX scalps.

FLEWELLING ANSWERS TO QUERIES

By E. T. Flewelling

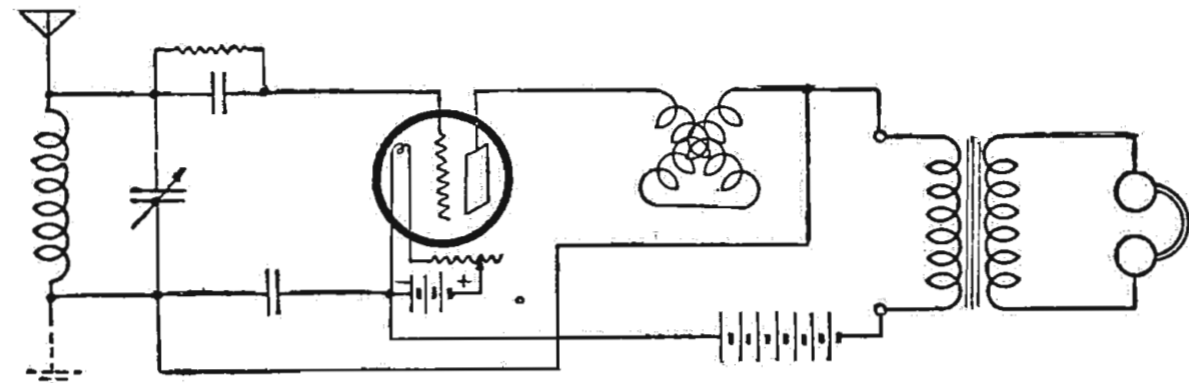
(Editor's Note.—This department is written by Mr. Flewelling, the inventor of the famous super circuit. From the questions sent him each week care of Radio Digest, he picks the one considered most informative for all and answers it in this column.)

(Submitted by G. H. D., Ontario, Canada.)

Getting Rid of Body Capacity

Question. I am able to report very successful results with the Flewelling circuit so far as reception is concerned but find that hand capacity effects are terrific. Is there no way by which this trouble may be overcome?

Answer. Hand capacity effects with any Radio set seem to depend almost entirely



on the design of the apparatus used. It is the writer's opinion that the time has come when some manufacturers will awaken to the fact that we are still using approximately the designs and ideas in our Radio apparatus of today that were prevalent 15 to 20 years ago. One of the greatest offenders from most any angle is the interleaving plate condenser which is in such common use. One may say that this type of condenser is responsible for ninety per cent of our Radio sets failing to give us maximum results. This is because of hand capacity troubles and poor electrical efficiency. It is a great puzzle to the writer why so many of these condensers are in use when it is so easy to purchase a condenser of a type that will practically spell the elimination of hand capacity effects. One answer to this may be that the public finds it difficult to obtain a condenser of this type—one built mechanically good. Were our apparatus properly designed we would not be bothered in any way by hand capacity effects. This means that there would be no need to shield our sets, with the accompanying bother and trouble that this work entails. However, radio is traveling very fast indeed; it will be only a short time before very radical improvements will be offered by the manufacturers of sets and parts.

However, if we must use the interleaving plate condenser we are still able to eliminate hand capacity effects from the Flewelling circuit. Incidentally, it may be well to bear in mind that the more sensitive a Radio set the greater will be the hand capacity effects, dependent of course to an extent on the layout and design of the apparatus and set. If you

will take any type of Flewelling set in working condition, remove the phones and in their place connect the primary of any audio frequency transformer and connect the phones with the secondary posts of the transformer you will find that, with no other change, the capacity effects have been eliminated for all practical purposes. This helps to overcome even the trouble which is caused by the interleaving plate condensers.

I say connect the primary in place of the phones and the phones with the secondary of the audio transformer. Please remember that conditions have been noticed where the reverse gave better results;

that is, the secondary of the transformer was connected in the circuit and the phones were connected with the primary of the transformer. Note also that the use of a .001 mfd. stopping condenser may be used here in the usual manner depending on your own set. Sometimes it is better to leave it out. The transformer connection is shown in the accompanying diagram. It is often very handy but the writer prefers to use on his own set such apparatus by means of which the hand capacity effects are eliminated without the use of the audio transformer and the incidental expense, space in the set, and the like that its use means.

Rural Sections Look to WSY for Sunday Sermons

BIRMINGHAM, Ala.—One of the popular features of Station WSY, the Alabama Power Company, is the broadcasting of sermons and special church music. Small towns and rural sections, as well as the cities of Alabama, look for these sermons and musical programs with much regularity, from Birmingham's well known ministers of the various denominations.

Tells Kiddies by Air How to Swim

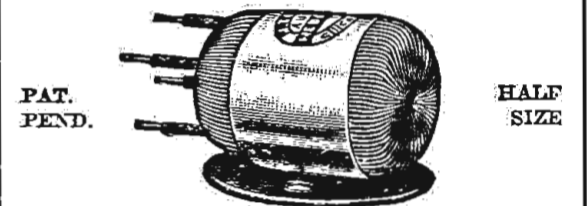
'Y' Instructor's Directions Broadcast to Pool

CINCINNATI, O.—Stanley Brauning recently completed his series of swimming lessons from Station WLW, Crosley Manufacturing Company here, by giving a practical demonstration of the use of Radio in teaching children how to enjoy the natatorial art. The children were in the pool at the workhouse and Mr. Brauning, swimming director of the Y.M.C.A., got the children to line up in the pool. By means of a Radio receiving set and an amplifying horn, he told them from WLW studio just what to do. This is the first time on record that swimming lessons have been given by Radio. The test was successful in every way.

All Lightships to Have Sets

DETROIT.—George H. Putman, local commissioner for lightships, states that all lightships and lighthouses in the near future will be equipped with apparatus. He has been particularly interested in the effort of WWJ, the Detroit News, along these lines.

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Western Electric.....	12.00	7.95	Mica Diaphragms.....	18.00	14.95
N. & K., 6000 Ohms.....	16.00	6.50	RHEOSTATS		
Rico, 3000 Ohms.....	6.50	3.95	Cutler Hammer.....	1.00	.85
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Ambassador, 3000 Ohms.....	6.50	3.98	C. H. Potentiometer.....	1.50	1.25
Nathaniel Baldwin, Original.....	12.00	8.75	Klesner Vernier.....	1.50	1.20
Nathaniel Baldwin, Single, with Cord.....	6.00	4.45	SETS		
Brandes Genuine.....	8.00	6.75	Aeriola Jr. (Westinghouse).....	18.00	3.95
VARIOCOUPERS & VARIOMETERS			Cutting & Washington 3-Tube Type II.....	125.00	55.00
Queens.....	5.00	1.95	Tuska Regenerative.....	35.00	22.50
Fisher.....	5.00	1.95	Crosley Regenerative.....		19.00
Raven.....	5.00	1.95	Crosley 2-Step Amplifier.....		17.00
Tuska with Dial.....	6.00	2.95	2-Step Amplifier, Assembled.....		11.95
Pathe.....	6.00	2.95	General Radio 1-Step Amplifier.....	8.00	6.95
Columbia.....	6.50	3.95	LOUD SPEAKERS		
Wetrite.....	6.00	2.95	Magnavox Type R3.....	35.00	24.95
Eagle Bakelite.....	8.50	4.95	Atlas.....	25.00	17.50
Fisher, Large.....	6.50	2.95	Western Electric.....	55.00	Special
Pearico Bakelite.....	6.50	4.45	Music Master.....	30.00	24.95
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3 Plate.....	2.00	1.25	Aluminum Horn.....	10.00	4.95
11 Plate.....	3.50	1.75	TUBES		
17 Plate.....	4.00	1.95	UV-199, UV-201-A, WD-12, WD-11, All Genuine.....		5.75
23 Plate.....	4.00	1.95	VT-2 Western Electric.....		7.95
43 Plate.....	5.00	2.25	De Forest DV-6.....		3.75
11 Plate Vernier.....	6.00	3.25	UV-200.....		4.50
17 Plate Vernier.....	6.00	3.25	De Forest DV-6A.....		4.75
23 Plate Vernier.....	6.00	3.50	COMPLETE PARTS FOR		
43 Plate Vernier.....	7.50	3.95	Flewelling Circuit.....		13.95
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Thordarson.....		2.95	2-Step Amplifier.....		9.95
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Armo Audio or Radio.....		3.75			
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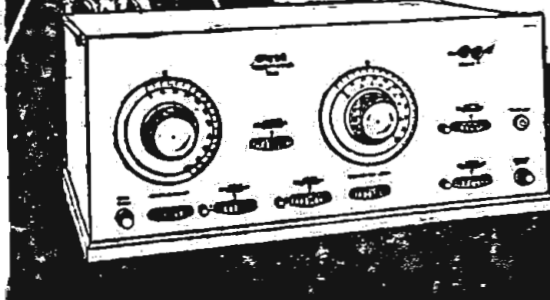


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Radiophone Broadcasting Stations

Corrected Every Week—Part II

(NOTE—The second part of the schedule list appears below. The first appeared last week and the third part will appear next week.)

KUS, Los Angeles, Calif. 360 meters. 300 mi. City Dye Works & Laundry Co. Daily ex Sun, 7-7:30 am, setting up exercises; 12-12:30 pm, concert, time. Mon, Thurs, Fri, 2-2:30 pm, features. Tues, Fri, 4-4:30 pm, code practice. Wed, Fri, 6-6:45 pm, concert. Pacific.

KUV, El Monte, Calif. 360 meters. 500 mi. Coast Radio Co. Wed, 4-4:30 pm, Sat, 3-4 pm, Pacific.

KWG, Stockton, Calif. 1,500 meters. Portablo Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, markets. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific.

KWH, Los Angeles, Calif. 360 meters. 250 mi. Examiner. Daily ex Sun, 1:30-1:40 pm, 5:30-6, 6-6:15, 8:20-9, reports, entertainment. Sun, 8:30-9 pm, church service. Pacific.

KXD, Modesto, Calif. 360 meters. 100 mi. Modesto Herald Pub. Co. Daily ex Sun, Mon, 6:30-7 pm. Mon, 7-9 pm, Sun 1-2 pm. Pacific.

KYQ, Honolulu, Hawaii. 360 meters. Electric Shop. No definite schedule.

KYW, Chicago, Ill. 345 meters. 2,000 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:30 am, 10-10:30, 11, markets; 11:05, weather; 11:30, news; 11:55, talk; 12:30, 1-1:20, 2:15, 2:30, markets; 3-3:30, 4:5, news; 5:30, 6, news; 6:30, markets; 6:50 bedtime story; 8, concert, 9, special. Sun, 11 am, 3:30 pm, 7, church services. Central. Daylight Saving.

KZM, Oakland, Calif. 360 meters. 200 mi. Western Radio Institute (Hotel Oakland). Daily ex Sun, 6:45-7 pm, news, Pacific.

KZN, Salt Lake City, Utah. 360 meters. 1,000 mi. Desert Slogan. "The Center of Scenic America." Daily ex Sun, 8-9:30 pm, music, news, bedtime stories, etc. Mountain.

KZV, Wenatchee, Wash. 360 meters. 200 mi. Wenatchee Battery & Motor Co. Daily ex Sun, 3:30-4:15 pm, weather. Mon, Wed, Fri, 1st to 15th each month, 8:45-9:30 pm; 15th to last each month, 8-8:45 pm, weather. Sun, 1st to 15th each month, 7:30-9 pm; 15th to last each month, 11 am-12:30 pm, church services. Eastern.

NAA, Radio, Va. 435 meters. 2,000 mi. U. S. Navy Dept. Daily ex Sun, 9:45-10:40 am, 12:25-12:40 pm, 1:45-2:20, markets, weather; 2:45-3 (Tues. only). Dept. Interior; 3:25-4:10, 5:05-5:20, markets, weather. 10:05-10:20, weather. Mon, 6:45-8:20 pm, Dept. programs. Tues, 7:05-8:20 pm, Dept. programs. Wed, 7:25-7:40 pm, Dept. programs; 8:05-9:40, Marine Band. Thurs, 8:45-8:40 pm, Dept. programs. Fri, 8:05-8:40 pm, band concert. Eastern.

OA, Ottawa, Ont., Can. Dept. of Marine & Fisheries.

PWX, Havana, Cuba. 400 meters. 1,500 mi. International Tel. & Teleg. Corp. Wed, Sat, 9-11:30 pm, music. Eastern.

WAAB, New Orleans, La. 268 meters. Valdemar Jensen.

WAAC, New Orleans, La. 360 meters. Tulane Univ. Mechanics Inst. No regular schedule.

WAAD, Cincinnati, O. 360 meters. 200 mi. Ohio Mechanics Inst. No regular schedule. Central. Daylight Saving.

WAAG, Chicago, Ill. 286 meters. 300 mi. Chicago Daily Drivers Journal. Daily ex Sun, 3:40 am, 10:30, 10:45, 12:30 pm, 12:45, 3, 4:30, live stock and weather reports. Central.

WAAN, St. Paul, Minn. 360 meters. 500 mi. Commonwealth Elec. Co. Slogan. "From the Land of Ten Thousand Lakes." Temporarily discontinued.

WAAK, Milwaukee, Wis. 280 meters. 300 mi. Gimbel Bros. Daily ex Sun, 10 am, 11:10, 12:10 pm, 1:25, 3. Daily ex Wed and Sat, 7:15, 7:30 pm. Central.

WAAM, Newark, N. J. 263 meters. 300 mi. I. R. Nelson Co. Daily ex Sun, 11 am-2 pm, 8-10:30, music. Eastern.

WAAN, Columbia, Mo. 250 meters. Univ. of Mo.

WAAP, Wichita, Kan. 360 meters. 500 mi. United Electric Co. Daily ex Sun, 12-12:30 pm, educational program; 10:30 pm, weather. Tues, Fri, 8 pm, entertainment. Central.

WAAW, Omaha, Neb. 278 meters. 500 Omaha Grain Exchange. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45, 12:15 pm, 12:45-1:15, 8, market reports; 8:15-9 pm, music. Central.

WAAZ, Emporia, Kans. 360 meters. 250 mi. Hollister-Miller Motor Co. Tues, Thurs, 7-8 pm, entertainment. Temporary schedule. Central.

WABA, Lake Forest, Ill. 266 meters. Lake Forest College.

WABB, Harrisburg, Pa. 266 meters. Dr. John B. Lawrence.

WABC, Anderson, Ind. 229 meters. Fulwider-Grimes Battery Co.

WABD, Dayton, O. 283 meters. Parker High School.

WABE, Washington, D. C. 360 meters. Y. M. C. A.

WABF, Marshall, Mo. 234 meters. Mt. Vernon Register-News Co.

WABG, Jacksonville, Fla. 248 meters. 50 mi. Arnold Edwards Piano Co. Daily ex Sun, Thurs, 3-4 pm, concert. Wed, Sat, 9-10:30 pm, music. Mon, Thurs, 8-10 pm, concert. Eastern.

WABH, Sandusky, O. 240 meters. Lake Shore Tire Co.

WABI, Bangor, Me. 240 meters. Bangor Ry. & Elec. Co.

WABJ, South Bend, Ind. 240 meters. The Radio Laboratories.

WABK, Worcester, Mass. 252 meters. First Baptist Church.

WABL, Storrs, Conn. 283 meters. Connecticut Agr. College.

WABM, Saginaw, Mich. 254 meters. F. E. Doherty.

WABN, La Crosse, Wis. 235 meters. Waldo C. Grover.

WABO, Rochester, N. Y. 252 meters. Lake Ave. Baptist Church.

WAI, Dayton, O. McCook Field, U. S. Army.

WAJT, Marshall, Mo. 360 meters. Kelly-Vawter Jewelry Co.

WAJU, Yankton, S. D. 360 meters. Yankton College.

WBAW, W. Lafayette, Ind. 360 meters. 100 mi. Purdue University. Irregular schedule.

WBAD, Minneapolis, Minn. 360 meters. Sterling Elec. Co.

WBAF, Moorestown, N. J. 360 meters. Fred M. Middleton.

WBAN, Minneapolis, Minn. 360 meters. 200 mi. The Dayton Co. Daily ex Sun, 1-1:30 pm, 3-3:30, 5-5:30, 9:30-10. Sat. 11-11:30 am, Wed, 8-10 pm. Central.

WBAP, Paterson, N. J. Wireless Phone Corp. Slogan. "The Silk City of America." 24 meters. 200 mi. Wireless Phone Corporation. Daily ex Sun, 9-11:30 am, 12:30-5:30 pm. Sat morn, only. Sun, 10-12 am, 2-5 pm, 7:30-10:30. Eastern.

WBAQ, Decatur, Ill. 360 meters. 100 mi. James Millikin Univ. University activities. No definite schedule. Central.

WBAP, Fort Worth, Tex. 476 meters. 1,500 mi. Fort Worth Star-Telegram Club. "Radio Truth League." Daily ex Sun, 9-9:15 am, 11-11:30, 12-12:15 pm, 1-1:15, 2-2:15, 3-3:30, 3:45-4, markets; 5:30-5:45, 8:30-6:45, 8, sports. Daily ex Sat, Sun, 9:30-10:30 pm, concerts. Sat, 7-7:20 pm, bible lesson. Sun, 11 am-12:15 pm, church; 3:30-4:30, concert. Central.

WBAU, Hamilton, O. 258 meters. Republican Pub. Co. Temporarily discontinued.

WBAV, Columbus, O. 390 meters. 500 mi. The Ernor Hopkins Co. Slogan. "We Broadcast a Variety." Daily ex Sun, 12:30-1 pm. Mon, 7-9 pm. Central.

WBAW, Marietta, O. 246 meters. Marietta College. Temporarily discontinued.

WBAX, Wilkes-Barre, Pa. 360 meters. 200 mi. John H. Stenger, Jr. Three nights of week, not regular.

WBAZ, Newark, N. Y. 492 meters. 1,500 mi. A. T. & T. Co. Experimental purposes only.

WBBA, Newark, O. 240 meters. Newark Radio Lab.

WBBC, Sterling, Ill. 229 meters. Sterling Radio Equipment Co.

WBBD, Reading, Pa. 224 meters. Barbey Battery Service.

WBL, Anthony, Kan. 261 meters. 200 mi. T & H Radio Co. Mon, Wed, Sat, 8-9 pm, concert, lecture. Sun, 9 am, church service. Central.

WBN, Newark, N. J. 360 meters. 200 mi. D. W. May, Inc. Daily ex Sun 11-12 am, music; 1-2:15 pm, reports; 2:15-2:30 pm, music, reports. Tues, Thurs, Sat, 7:30-9:30 pm, program. Sun, 9-10:30 am, sacred music; 1-3 pm, program. Eastern.

WBTC, Charlotte, N. C. 360 meters. 1,200 mi. Southern Radio Corp. Slogan. "Queen City of the South." Daily ex Sun, 11 am, 8 pm, weather, markets. Tues, 8:30 pm, music. Fri, 11 pm, entertainment. Sun, 8 pm, church services. Eastern.

WBU, Chicago, Ill. 286 meters. 100 mi. City of Chicago. Daily ex Sun, 10:15-10:30 am, 11:45-12 m, 4:15-4:30 pm, police reports. Mon, Wed, Fri, 3:30 pm, 7:30, speeches. Central Daylight Saving.

WBZ, Springfield, Mass. 337 meters. 1,000 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7:30 pm, children's hour; 7:45, markets, weather, lecture; 8-9, concert. Sun, 8 pm, church service. Eastern.

WCA, Fort Smith, Ark. 360 meters. John Fink Jewelry Co. Tests only.

WCAF, Canton, N. Y. 280 meters. 300 mi. St. Lawrence Univ. No regular schedule. Eastern.

WCAE, Pittsburgh, Pa. 326 meters. Kaufman & Baer Co.

WCAF, Rodgers, Mich. 360 meters. Michigan Limestone & Chem. Co.

WCAE, New Orleans, La. 268 meters. 200 mi. Clyde R. Randall. Mon, Thurs, 8-9 pm, concert. Central.

WCAH, Columbus, O. 286 meters. 500 mi. Eutrexin Elec. Slogan. "The Heart of Ohio." Daily ex Sun, 11:30-12:30 am, music, news, Tues, 7-9 pm, concert. Sun, 10-12:30, church service. Central Daylight Saving.

WCAJ, Univ. Place, Neb. 360 meters. 150 mi. Neb. Wesleyan Univ. Daily, 10:30 am, weather. Tues, 8 pm, Children's Hour. Thurs, 8 pm, music, lectures. Central.

WCAK, Houston, Tex. 360 meters. 100 mi. Alfred P. Daniel. Slogan. "Where Eight Railroads Meet the Sea." Daily ex Sun, 7-7:30 pm, music. Wed, 8-9 pm, concert. Sun, 3-4 pm, features. Central.

WCAI, Northfield, Minn. 360 meters. 500 mi. Dept. of Physics. St. Olaf College. No definite schedule.

WCAI, Villanova, Pa. 360 meters. Villanova College.

WCAI, Baltimore, Md. 360 meters. 100 mi. Sanders & Stayman Co. Daily ex Sun, 12-1 pm. Mon, Wed, 8 pm, Eastern.

WCAI, Washington, D. C. 469 meters. Chesapeake & Potomac Tel. Co.

WCAI, San Antonio, Tex. 360 meters. 1,500 mi. Alamo Radio Elec. Co. Mon, Thurs, Sat, 8:30-9:30 pm, concert. Central.

WCAI, Minneapolis, Minn. 360 meters. 500 mi. Wm. H. Dunwoody Industrial Inst. Slogan. "From the Flour City of the World." Mon, 9:30-11 pm, music, lectures. Wed, Thurs, Fri, 6:30-7 pm, code instruction. Central.

WCAI, Rapid City, S. D. 240 meters. 300 mi. S. D. State School of Mines. Daily ex Sun, 9:30 am, 12:30 pm, 3 pm, weather, reports. Wed, 7:15 pm, concert. Mountain.

WCAU, Philadelphia, Pa. 286 meters. 500 mi. Durham & Co. Daily 11:45 am. Tues, Fri, 7:30-8 pm, concert. Sun, 10:55 am, church services. Eastern Daylight Saving.

WCAV, Little Rock, Ark. 360 meters. J. C. Dice Elec. Co.

WCAV, Burlington, Vt. 360 meters. Univ. of Vt.

WCAV, Milwaukee, Wis. 261 meters. 500 mi. Kesselman-O'Driscoll Music House. Daily ex Sun, 11 am, reports. Mon, Tues, Thurs, Fri, 8:30-9:30 pm, music. Tues, 10:30-11:30 pm, dance music. Sun, 7:30-9 pm, church services. Central.

WCAZ, Carlisle, Ill. 360 meters. Carthage College.

WCB, Allentown, Pa. 280 meters. Chas. W. Haimbach. Wed, Sat, 2-12 pm. Sun, 2-4 pm, 8-10. Eastern.

WCB, Greenville, O. 240 meters. K. & K. Radio Supply Co.

WCB, Zion, Ill. 345 meters. 1,500 mi. Wilbur Glen. Slogan. "Where God Rules, Man Frowns." Mon, Fri, 8-10 pm, concert. Wed, Fri, 2:30-3:45 pm, concert. Sun, 9:45 am, Bible school; 2:30-5:30 pm, church services. Central daylight saving.

WCB, Minneapolis, Minn. 360 meters. Findley Elec. Co.

WCK, St. Louis, Mo. 360 meters. 300 mi. Stix, Baer & Fuller. Daily, 12-12:30 pm, 5-4, Mon, Wed, Fri, 6:45-8 pm, concert, lecture. Central.

WCM, Austin, Tex. 360 meters. Univ. of Tex.

WCK, Detroit, Mich. 517 meters. 1,000 mi. The Detroit Free Press. Slogan. "The Cat of the Motor City." Club. "Red Apple Club." Daily ex Sun, 2 pm, news; 2:15, stock reports; 2:50, weather, markets; 4:15, 4:30, 4:50, 6:15, markets, music. Daily ex Sat, 8:30-10 pm, week starting Dec. 11 and alternate weeks thereafter, concert, Tues, 10-12 pm, Club, Sun, 10:30 pm, 7:15 pm, church services. Central.

WDAC, Springfield, Ill. 360 meters. Illinois Watch Co. Time and weather, spark only.

WDAD, Lindborg, Kans. 360 meters. 200 mi. Wm. Louis Harris. Tues, Thurs, Fri, 9:30 pm, entertainment, weather. Sun, 3:30 pm, vesper services. Central.

WDAE, Tampa, Fla. 360 meters. 500 mi. Tampa Daily Times. Wed, Fri, 8-10 pm, music, lecture. Eastern.

WDAF, Kansas City, Mo. 411 meters. 2,000 mi. Kansas City Star. Club. "Nighthawks." Daily ex Sun, 3:30-4:30 pm, music; 6-7, educational, bedtime story, etc. 11:45 pm-1 am, Nighthawk Frolic. Mon, Wed, Fri, 8-10 pm, concert. Sun, 4-5 pm, music. Central.

WDAG, Amarillo, Tex. 263 meters. J. Laurance Martin. No regular schedule.

WDAA, El Paso, Tex. 360 meters. Trinity Methodist Church. Sun, Wed, Thurs, Sun, 7:30-8:30 pm. Mountain.

WDAB, Syracuse, N. Y. 246 meters. 200 mi. Hughes Radio Corp. Daily ex Sun, 12 m, reports. Eastern.

WDAJ, College Park, Ga. 258 meters. 2,000 mi. A. & W. P. R. Co. Daily, 7:30-8:30 pm, 10:30-11:30 pm, concert. Wed, 10:30-11:30 pm, only. Central.

WDAK, Hartford, Conn. 261 meters. 150 mi. The Courant. Sat, 8 pm, concert. Eastern.

WDAL, Jacksonville, Fla. 360 meters. 250 mi. Florida Times Union. Daily, 11 am, weather; 4-4:30 pm, music; 8-9, entertainment; 9:30, reports. Eastern.

WDAD, Dallas, Tex. 360 meters. 300 mi. Automotive Elec. Co. Daily, 1-1:30 pm, 7:15-8. Central.

WDAP, Chicago, Ill. 390 meters. 2,000 mi. Drake Hotel. Daily ex Sun, every half hour from 9:30 am to 1:30 pm, quotations, reports; 6 pm, news. Tues, Thurs, Sat, 10 pm, concert. Sun, 9 pm, 10, concert. Central Daylight Saving.

WDAR, Philadelphia, Pa. 395 meters. Lit Bros. Club. Slogan. "Good Morning Glory." Daily ex Sun, 12-12:55 pm, music; 2-3 pm, 4:30-6, music, talks; 7:30-8 pm, Dream Daddy. Wed, 8-11 pm, entertainment. Fri, 8-10:50, entertainment; 1 am, Club. Eastern Daylight Saving.

WDAS, Worcester, Mass. 360 meters. Samuel A. Waite.

WDAU, New Bedford, Mass. 360 meters. 500 mi. A. H. Smith. Mon, Wed, Fri, 12:15-12:50 pm, Indiana trial reports; 7-8:10 pm, music. Sun, 11 am-12:30 pm, 7-8 pm, church services. Eastern Daylight Saving.

WDAX, Centerville, Iowa. 360 meters. 500 mi. First Nat'l Bank. Daily ex Sun, 11:30 am, reports, news. Mon, Thurs, 7:30-9 pm, concert. Central.

WDAY, Fargo, N. D. 244 meters. 300 mi. Fargo Radio Electric Co. Slogan. "The Biggest Little City in the World." Daily ex Sun, 9:30 am, weather, 6 pm, baseball. Tues, Thurs, Sat, 7:30-8:30 pm, concert. Sun, 10:30 am, church services. Central.

WDB, Lancaster, Pa. 258 meters. Kirk Johnson & Co. Inc.

WDBF, Youngstown, O. 261 meters. Robert G. Phillips.

WDM, Washington, D. C. 360 meters. 50 mi. Church of the Covenant. Sun, 11 am, church service; 8 pm, church service. Eastern.

WDT, New York City, N. Y. 405 meters. Ship Owners Radio Service.

WDZ, Tuscola, Ill. 278 meters. 100 mi. James L. Bush. Daily ex Sun, every half hour, 8:30 am-12:15 pm, Chicago Board of Trade quotations. Central.

WEAA, Flint, Mich. 280 meters. 200 mi. Fallain & Lathrop. Slogan. "The Vehicle City." No definite schedule.

WEAB, Fort Dodge, Ia. 360 meters. 600 mi. Standard Radio Equip. Co. Daily ex Sun, markets every 30 min. from 8:40 am-12:20 pm; 5:15 pm, 7-8 music. 9:45, weather. Sun, 10:30 am, 7:30 pm, church services. Central.

WEAD, Atwood, Kan. 268 meters. N. W. Kansas Radio Supply Co. Temporarily discontinued.

WEAF, Backus, Pa. 360 meters. Polytechnic Inst.

WEAF, New York City, N. Y. 492 meters. 1,500 mi. A. T. & T. Co. Slogan. "The Voice to the Millions." Tues, Wed, Thurs, Fri, 11-12 am, 4:30-5:30 pm, 7:30-10. Sun, 3:30-4:30 pm, 7:30-10. Eastern Daylight Saving.

WEAG, Edgewood, R. I. 231 meters. Nicholas-Hineline-Basset Lab.

WEAH, Wichita, Kan. 360 meters. 500 mi. Wichita Board of Trade. Daily ex Sun, 8:40 am, 9, 10, 11, 1 pm, 1, reports. Wed, Sat, 8 pm, concert. Every third

Sun, 8 pm, concert. Central.

WEA, Ithaca, N. Y. 286 meters. Cornell Univ.

WEA, Vermillion, S. D. 360 meters. Univ. of S. D. Temporarily discontinued.

WEAK, St. Joseph, Mo. 360 meters. 100 mi. Julius B. Abercrombie. Daily ex Sun, 5:15-6 pm. Central.

WEAM, North Plainfield, N. J. 252 meters. 75 mi. Borough of N. Plainfield. Daily, 7:30-8 pm, music, police news, etc. Eastern.

WEAN, Providence, R. I. 273 meters. 50 mi. The Shepherd Stores. Daily ex Sun, Mon, 12-1 pm, 4-5, 6-7, music, weather, concerts. Tues, Thurs, 8-15-10, concert. Wed, Sat, 7-8 pm, concert. Sun, 10:45-11:30 am, 7:30-8:45 pm, church service. Eastern Daylight Saving.

WEAO, Columbus, O. 360 meters. 500 mi. Ohio State Univ. Daily ex Sun, 1:30 pm, 4, reports, music. Thurs, 7-9 pm, lecture, concert. Eastern.

WEAP, Mobile, Ala. 360 meters. 50 mi. Mobile Radio Co. Daily ex Sun, 12 m, reports; 4-5 pm, music. Daily ex Sun, Mon, 7:45-8:45 pm, music. Sun, 3-3:30 pm, church service. First Mon of each month, 11 pm-1 am, concert. Central.

WEAR, Baltimore, Md. 360 meters. 200 mi. News & American Pub. Co. Daily ex Sun, 6:30-7, weather, music, news. Tues, Thurs, 7:30-9:30 pm, Eastern.

WEAS, Washington, D. C. 360 meters. 200 mi. The Hecht Co. Daily ex Sun, 3-4 pm. Wed, Fri, 7-8 pm, Eastern.

WEA, St. Louis, Mo. 360 meters. 300 mi. Davidson Bros. Co. Slogan. "The Heart of the Corn Belt." Daily ex Sun, Mon, 10, 11, 2 pm, 5, markets, news. Mon, Wed, Fri, 8-9 pm, concert. Sun, 7-9 pm. Central.

WEAY, Houston, Tex. 360 meters. 1,500 mi. Will Horwitz (Iris Theater). Slogan. "Where All the Oceans Meet All the Railroads." Daily ex Sun, 11 am, dinner hints, news; 12 m, music; 12:57-1 pm, time; 2:30 pm, music; 6 pm, news. Wed, Fri, 8-10 pm, concert. Sun, 11 am, 8 pm, church services; 9 pm, concert. Central.

WEB, St. Louis, Mo. 360 meters. 800 mi. The Benwood Co. Inc. Tues, 9-10:30 pm, Wed, 8-9:30 pm, Sat, 7:30-9 pm, 11-11 pm. Central.

WEV, Houston, Tex. 360 meters. 500 mi. Hurlburt-Still Elec. Co. Daily ex Sun, 10 am, 5:30 pm, weather, roads. Tues, Thurs, 8 pm, concert. Central.

WEW, St. Louis, Mo. 261 meters. 200 mi. St. Louis Univ. Daily ex Sun, 9 am, 10, 2, 5 pm, reports. Central.

WF, Dallas, Tex. 476 meters. 1,500 mi. Dallas News and Dallas Journal. Slogan. "Working For All Alike." Daily, 10 am, reports; 12:30-1 pm, address; 6:15-7, bedtime story; 8:30-9:30, music. Tues, Thurs, Sat, 11-12 pm, music. Sun, 2:30-3:30 pm, bible class; 9:30-10:30 pm, music. Central.

WF, Syracuse, N. Y. 234 meters. 100 mi. C. F. Wines. No definite schedule.

WF, Poughkeepsie, N. Y. 273 meters. H. C. Spratley Radio Co. Temporarily discontinued.

WFAG, Waterford, N. Y. 360 meters. 300 mi. Radio Engineering Lab. Wed, Sat, 7:45-10 pm, concert. Sun, 2-4 pm, church service. Eastern.

WFAH, Port Arthur, Tex. 360 meters. 100 mi. Elec. Supply Co. Tues, Thurs, 10-11 pm, concert. Central.

WFAJ, Asheville, N. C. Hi-Grade Wireless Instrument.

WFA, St. Cloud, Minn. 360 meters. 100 mi. Granite City Elec. Co. Daily ex Sun, 3:30-4 pm, markets. Mon, Wed, 7:30-9 pm, entertainment. Central.

WFAN, Hutchinson, Minn. 360 meters. 300 mi. Hutchinson Elec. Service Co. Slogan. "The Gateway to the Ten Thousand Lakes of Minn." Daily, 11:57-12:20, time, weather. Tues, Wed, 8:30 pm, concert. Sun, 2:30 pm. Central.

WFA, Cameron, Mo. 360 meters. 300 mi. Cameron Radio Co. and Mo. Wesleyan College.

WFA, Sioux Falls, S. D. 360 meters. 400 mi. Argus Leader. Daily ex Sun, 10:15 am, 12:15 pm, 1:30, 2:30, reports, music. Tues, Thurs, Fri, 8-9 pm, concert. Fri 11 pm, concert. Central.

WFAV, Lincoln, Neb. 360 meters. 300 mi. Univ. of Neb. Slogan. "The Home of the Cornhuskers." Daily ex Sun, 10 am, 12:40 pm, weather. Thurs, 8 pm, concert. Central.

WFI, Philadelphia, Pa. 395 meters. 1,000 mi. Strawbridge & Clothier. Daily ex Sat, Sun, 10 am, reports; 1 pm, news; 2, music; 3-4:30, concert; 7-7:30 children's hour. Tues, Thurs, 8 pm, concert. Wed, 10:30 pm, dance music. Sun, 9:30 pm, organ recital, alternating 10:30 am, 7:30, church services. Eastern Daylight Saving.

WGA, Tulsa, Okla. 360 meters. Goller Radio Service.

WAL, Lancaster, Pa. 248 meters. 36 mi. Lancaster Elec. Supply & Construction Co. Slogan. "Gardener Spot of U. S. A." Mon, Wed, Fri, 7:30-9 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.

WGAN, Pensacola, Fla. 360 meters. Cecil E. Lloyd.

WGAQ, Shreveport, La. 360 meters. 500 mi. Glenwood Radio Corp. Daily ex Sun, 5:30-6 pm, 8, music. Sun, 1 am, 7:30 pm, church service. Central.

WAR, Fort Smith, Ark. 360 meters. Southwest America.

WGAU, Wooster, O. 226 meters. Marcus G. Limb.

WGAW, Altoona, Pa. 261 meters. 300 mi. Ernest C. Albright. Slogan. "The home of the world's largest railroad shops." Tues, Wed, 9-11 pm, music. Sun, 9-10:30 pm, music. Eastern.

WGAX, Washington, C. H., O. 360 meters. 75 mi. Radio Elec. Co. Daily ex Sun, 12 m, music, news; 9:30 pm, concert, news. Sun, 10:30 pm, sermon. Central.

WGAZ, South Bend, Ind. 360 meters. 200 mi. South Bend Tribune. Daily ex Sun, 9-9:30 am, household hints, menus; 5-5:30 pm, music. Tues, Thurs, Sat, 8-9 pm, music. Central.

WGF, Des Moines, Iowa. 360 meters. Register and Tribune. Slogan. "The Convention City." Tues, Fri, 7:30 pm, entertainment. Sat, 10 pm, music. Sun, 5 pm, church service. Central.

WGI, Medford Hillside, Mass. 360 meters. 500 mi. Am. Radio & Research Corp. Slogan. "Amrad, the Voice of the Air." Daily, 5-6:45 pm, Children's Hour. Tues, Thurs, 8:30 pm, Mon, 8:30 pm, concert. Wed, Fri, 3 pm, Amrad Women's Club. Sun, 4-5 pm, 8:30, church services; 9, concert. Eastern Daylight Saving.

WGL, Philadelphia, Pa. 360 meters. 2,000 mi. Thos. F. J. Howlett. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern Daylight Saving.

WGM, Atlanta, Ga. 429 meters. 1,500 mi. The Atlanta Constitution. Daily ex Sun and Wed, 6-7 pm, orchestra concert; 9:30-10:30 pm, music. Sun, 3:30-4:30 pm, organ recital; 9:30-10:30 pm, music. Wed, 12-1 am, concert. Central.

WGR, Buffalo, N. Y. 319 meters. 1,000 mi. Federal Tel. & Telg. Co. Slogan. "The City of Opportunity." Daily ex Sat, 12:15 pm, weather; (Mon, Thurs, agrigrams); 2:30, 3:30, 5, music, reports; Mon, Wed, Fri, 8-10 pm, concert. Sun, 3 pm, vesper services. Eastern Daylight Saving.

WGW, New Orleans, La. 350 meters. 400 mi. Interstate Elec. Co. Slogan. "Where the Mighty Mississippi Makes a Crescent Near the Gulf." Mon, Wed, Sat, 8-9 pm, 12-1, music, talks. Sat, 7:30-8:30 pm. Central.

WGY, Schenectady, N. Y. 380 meters. 1,000 mi. General Elec. Co. Daily ex Sun, 11:30-12 m, 5, reports, time, sports. Mon, Tues, Thurs, Fri, 1-1:30 pm, 7:45, concert. Fri, 10:30 pm, special. Sun, 9:30 am, 6:30 pm, church service. Eastern.

WHA, Madison, Wis. 360 meters. 1,000 mi. Univ. of Wis. Daily ex Sun, 11:59-12 m, time signals, weather. Mon, Wed, Fri, 7:30 pm, lectures, news, agrigrams. Central.

WHAA, Iowa City, Ia. 263 meters. 200 mi. Univ. of Iowa. No regular schedule. Central.

WHAB, Galveston, Tex. 360 meters. 500 mi. Clark W. Thompson. Slogan. "Gateway to the South and Treasure Island of America." Daily ex Sun, 9:45 am, 11, 3:30 pm, 5, reports, music, news. Tues, Fri, 8 pm, entertainment. Sun, 11 am, 7:30 pm, church service. Central.

WHAC, Waterloo, Ia. 360 meters. 150 mi. Cole Bros. Elec. Co. Daily, 6 pm, news, sports. Mon, Wed, Fri, 9:30 pm, concert. Sun, 11 am, church services. Central.

WHAD, Milwaukee, Wis. 280 meters. 1,000 mi. Marquette Univ. Wed, 7:30-8:30 pm, music, entertainment. Central.

WHAG, Cincinnati, O. 222 meters. 100 mi. Univ. of Cincinnati. No definite schedule.

WHAI, Joplin, Mo. 360 meters. Hafer Supply Co.

WHAI, Davenport, Ia. 360 meters. 300 mi. Radio Equip. & Mfg. Co. Temporarily discontinued.

WHAK, Clarksburg, W. Va. 360 meters. Roberts Hdwe. Co. 50 mi. No definite schedule.

WHAL, Lansing, Mich. 248 meters. 200 mi. The Capital News. Daily ex Sun, 12:30 pm, 2:55, 4:30, Mon, Wed, Fri, 7:45 pm, Sat, 12 midnight. Sun, 2:30 pm, Central.

WHAM, Rochester, N. Y. 360 meters. Univ. of Rochester.

WHAP, Decatur, Ill. 360 meters. 100 mi. Otto & Kuhns. No definite schedule.

WHAQ, Washington, D. C. 242 meters. 75 mi. Semmes Motor Co. Mon, 7-8 pm, lecture on automobile upkeep, music. Eastern.

WHAR, Atlantic City, N. J. 231 meters. Paramount Radio & Elec. Co.

WHAS, Louisville, Ky. 400 meters. 1,500 mi. Courier Journal and Louisville Times Co. Daily ex Sun, 4-5 pm, 7:30-9. Sun, 9:57-10:45 am, 4-5 pm, church service. Mon night, silent. Central.

WHAV, Wilmington, Del. 360 meters. 200 mi. Wilmington Elec. Spec. Co. Slogan. "The First Broadcasting Station of the First City of the State." No definite schedule.

WHAY, Huntington, Ind. 360 meters. 75 mi. Huntington Pub. Co. Daily ex Sun, 12 m, 12-12:30, weather, 3 pm, music; 6 pm, markets, news, weather, sports. Mon, Wed, Fri, 8 pm, concert. Sun, 3 pm, sermon; 4 pm, concert. Central.

WHAZ, Troy, N. Y. 380 meters. 2,300 mi. Rensselaer Polytechnic Inst. Slogan. "Transcontinental and International Broadcasting Station Located at the Oldest School of Engineering." Club, R. P. I. Mon, 9-10:30 pm, music. Transcontinental second Monday of each month, 12-1:30 am, music. Eastern.

WHB, Kansas City, Mo. 411 meters. 1,000 mi. Sweeney Auto & Electric School. Slogan. "Heart of America." Daily ex Sun, 8:25 am, 9:25, 10:25, 11:25, 12:25 pm, 3, reports. Tues, Thurs, Sun, 8-10 pm, concert. Central.

WHC, Morgantown, W. Va. W. Va. University. Temporarily discontinued.

WHK, Cleveland, O. 360 meters. 300 mi. Warren R. Cox. Daily ex Sun, 8:30-9 am, test; 1:30 pm, 4-4:30, music; 6-6:30, news, music. Wed, Sun, 8-9:55 pm, sermon, concert. Eastern.

WHN, Brooklyn, N. Y. 360 meters. 250 mi. Associated Broadcasters, Inc. Slogan. Station of the Sunrise Trail." Daily ex Sun, 9:30-11 am, 12-1 pm, 2:15-3:15, 5:45-6:30, Mon, Wed, Sat, 1:30-12 pm, Tues, Thurs, Fri, 9:30-12:00 pm, Sun, 9:30-10:30 am, 3-6 pm, 9:30-12 pm. Eastern.

WHB, Rockford, Ill. 252 meters. 50 mi. Joslyn Automobile Co. Tues, Fri, 7:30-8:30 pm, music. Mon, Thurs, 8-9 pm, Sun, 12-1 pm, church services. Central.

WHG, Galveston, Tex. 360 meters. 200 mi. Galveston Radio. Daily ex Sun, 12-12:30 pm, reports. Tues, Sat, evening concert. Central.

WHI, Ocean City, N. J. 254 meters. 200 mi. Ocean City Yacht Club. Fri, Sat, Sun, 8-12 pm. Eastern.

WIAF, New Orleans, La. 234 meters. 300 mi. G. A. DeCortin. Tues, 8-9:30 pm. Sun

ADVANCE PROGRAMS

(Continued from page 7)

WMAQ (Central, Daylight Saving, 448), 7:00-8:00 P. M., Talk, Rockwell Stephens; Talk, "Circus Days," J. E. Cole; Talk, "China and the Chinese," W. K. Gilise; 9:00-10:00 P. M., Concert, LaSalle Orchestra; Dawn Hulbert, soprano; Jaroslav Gons, cellist.

Friday, July 27

CFCA (Eastern, Daylight Saving, 400), 8:00-9:00 P. M., Concert, "The Merry Wives of Windsor," Star Orchestra; "Tere Noia to Cal," Sydney Walsh, tenor; "Ave Maria," Maanilo Roth, violinist; "Beautiful Spring," Orchestra; "A Little Coon's Prayer," Sydney Walsh; "Sommell," Maanilo Roth; "A Ball Scene," Orchestra; "My World," Sydney Walsh; "Serenade," Orchestra.

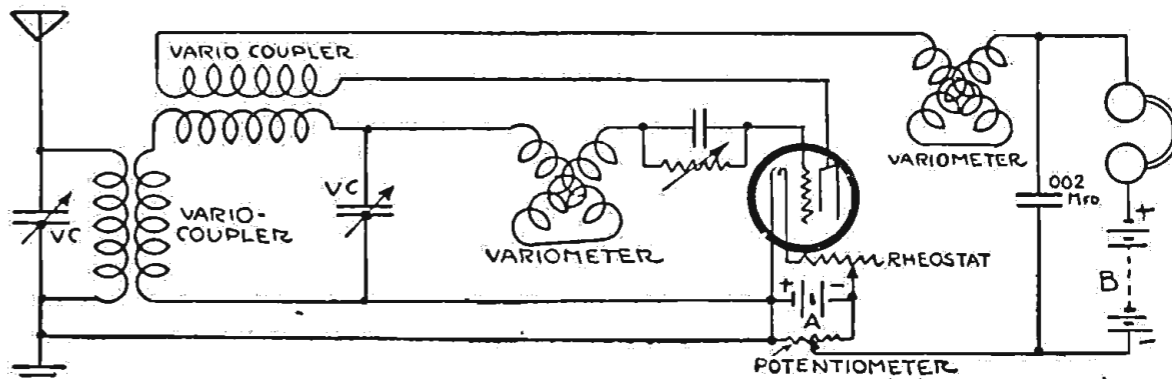
Sunday, July 29

WBZ (Eastern, 337), 7:30 P. M., Church services, Rev. W. H. Davenport, pastor East Longmeadow Baptist Church; 8:00 P. M., Church services, Rev. E. W. R. Taylor, St. George's Episcopal Church; 8:30 P. M., Church services, Rev. E. W. R. Taylor, St. George's Episcopal Church.

Monday, July 30

WDAR (Eastern, Daylight Saving, 395), 12:00-12:54 P. M., Organ recital, Stanley Theater; Dinner music, Arcadia Cafe Concert Orchestra; 2:00-3:00 P. M., Dinner music, Arcadia Cafe Concert Orchestra; 4:30-5:00 P. M., Concert, Mary Anderson Theater Orchestra; 7:30-9:00 P. M., Concert, Ray Pfaff's Orchestra; Reading, "An Interesting Historical Episode."

SELECTIVE DOUBLE REGENERATOR



A great many hook-ups are presented to the fan; unless he uses care and studies much in making a circuit, he will be disappointed with results. The diagram shows another circuit; it is not entirely new; however, if the fan who makes this exercise good judgment in the selection of apparatus, he will be surprised at the results. The set is very selective.

In addition, the usual plate variometer is used. Both the primary and secondary circuits use variable condensers for wave length tuning.—Edward Clein, Atlanta, Ga.

Ground Connections

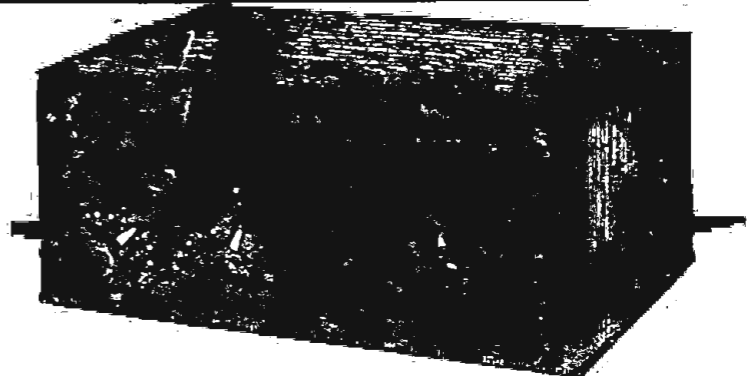
For the best results the ground connection should be made to some conducting area on about the same level as the receiver. A steam or hot water heating system give a good ground. Avoid a long ground wire, as this gives height and lack of selectivity without compensating additional signal strength. This is an important point when the receiver is installed in an upper floor of a building such as an apartment. In this latter case the piping system of the building will furnish a good ground. Never run a separate wire down to the ground floor. The wires from antenna and ground where they approach the receiver should be separated as much as possible and the receiver should be placed as near as possible to the point where the antenna wire enters the building.

Ampere Hours of Batteries

Storage battery capacities are rated by their manufacturers in ampere hours. Thus, theoretically, a 60-ampere-hour cell will supply 6 amperes of current for about 10 hours, three amperes for about 20 hours, or one ampere for about 60 hours. In practice, however, as the discharge rate is increased the capacity of a single charge is reduced, and a 60-ampere-hour battery would deliver 10 amperes for approximately only five hours instead of six.

SUMMER SAVING on Type 400 MELCO RECEIVER

at distributor's price of only \$17.50 Regular List Price \$35



Two-stage amplifying unit for use with the Melco-400, also regularly costing \$35, now only \$17.50

The Melco Type 400 Radio Receiver covers all broadcasting ranges thoroughly from 165 to 609 meters and assures a great degree of selectivity on the average small outdoor aerial. The Melco is the ideal summer set because it is least affected by electrical disturbances. Sold with our absolute money-back guarantee.

Shipped immediately on receipt of purchase price—F. O. B. N. Y.

WRITE FOR DESCRIPTIVE BOOKLET

AMSCO PRODUCTS, Inc.

Broome & Lafayette Street Fairbanks Building NEW YORK CITY

Advertisement for a Loud Speaker, featuring a 10-inch Bell with Standard Attachment, complete height 24 inches, and a price of \$5.00.

Advertisement for World Radio Batteries, offering a 2-Volt Storage Battery for \$5.00 with 200 hours of single charge.

Advertisement for Money Earning Opportunity, featuring a money bag icon and text about cashing in on spare time through a special offer.

Advertisement for FIL-KO-STAT vacuum tube, highlighting its proven efficiency and laboratory tests, with a price of \$2.00.

Radio Digest Illustrated

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Understand Your Set

To Know the Why of a Set Is Gratifying

ONE OF the foundation stones of this republic of ours is the broad principle that all men are created equal. It requires, however, but a few years of living to convince one that this principle, if it is to be accepted as true, must be subjected to several limitations. Similarly, it may be said that Radio broadcasting is intended for everybody, intended but not realized yet.

Now the thousands of Radiophans who listen with keen enjoyment nightly to the programs of their favorite stations may be surprised when they are told that the amount of pleasure they receive from their sets could be increased many times if only they would make the slight effort to understand something of the principles underlying the operation of their sets. Even a very slight knowledge of the whys and wherefores of tuning, for example, will place the possessor in a position superior to that of one who knows merely enough to turn the dials until he happens upon some station that he wants to hear.

Period of Poor Reception Passed

Stations Will Now Come in with Increasing Ease

GOOD news for Radiophans is the announcement by scientists that the period of poorest reception has just passed, and that from now on distant stations will come in with increasing ease and frequency.

The cycle of audibility, as scientific men designate the ability to receive Radio signals at different periods of the year, begins to drop during the month of March rather rapidly and reaches its lowest point during the middle of June. After June 15 reception begins to improve, until maximum audibility is reached in winter.

Reception of long distance stations during the remainder of the summer will be possible about twenty-five days each month. Toward the middle of October fans may figure on getting back to highest efficiency in tuning in the elusive far-away broadcasts.

Due to the use of better equipment and short aerials, very little interference has been noted by fans even during the period of lowest audibility, and Radio reception has been almost as good as during the winter. The broadcasting stations have suffered far more from the summer weather than have the owners of receiving sets. Most of the local stations have had to shut down occasionally because of heavy charges of electricity from the air getting into the transmitting tubes.

Sets for Outdoor Use

Improvements Make Summer Radio Possible

TWO ELEMENTS of Radio receiving sets which have been perfected during the last year or two have gone far to help in making it convenient and satisfactory to use Radio receiving sets outdoors. The first of these is the dry battery tube, that is, electron tube detectors and amplifiers which require only a small dry battery rather than a heavy storage battery to light the filaments. The second improvement is the development of more satisfactory loud speakers which furnish a considerable volume of sound without undesirable distortion. Thus it is possible now with small portable receiving sets which can be purchased or which can be fairly easily assembled, to receive satisfactory Radio broadcasting while camping, boating or motoring. It is a noteworthy fact that exploring parties now take Radio receiving sets with them for the dual purpose of furnishing amusement during the evening hours at camp and for receiving time signals with which to check their chronometers.

It must be recognized that Radio transmission conditions are not as good in the summer as in the winter. Transmission range is decreased so that it is not possible to hear the distant station which can be received in the winter. The presence of atmospheric disturbances or static often makes it difficult to hear weak signals; reliance must be placed on stations which are near and powerful enough to produce loud sounds from the receiving set. Fortunately it is not necessary to rely entirely on distant stations since there is now more than 300 licensed broadcasting stations in the United States.

RADIO INDI-GEST



Introducing Mike and Izzy

Friends and readers of Indi-Gest, meet Mike (left) and Izzy (right), trained antenna raiser chimpanzees, for the great nameless Walla Walla station of this Radio-knut column. Inasmuch as our contributors failed to contribute enough printable and sad jokes to fill the column this week, we were asked by Mike and Izzy if we would give them a little free publicity. As was remarked in an issue previously, they are very intelligent, both having been fired from the Harvard zoo on the same day, less than three feet apart.

After seeing the above picture they said indignantly, in chorus, "Why, you've made monkeys out of us!"

Another cute thing they do (see picture), is hang on the frame of their picture. Asked why they did this, Mike replied, "The matter has been called to my attention that you print your paper Indi-Gest on a rotary press and print over 100,000 copies, so I didn't want to fly off the roller." Izzy had a much more simple explanation. (He is very simple.) He answered, "I just had a temporary ether wave put in my tail, and I didn't want to change the wave length."

To prove their excellent education, listen in on the following conversation:

Mike: "Who invented Radio anyhow?"
Izzy: "Macaroni, but not anyhow. He just invented it anyway."
Mike: "Why, oh why did he do it?"
Izzy: "Because he had a corner on the spaghetti tubing market and wanted to round it off."

(Curtain.)

All of which goes to prove they don't know anything.

A-B-C Lessons for Indigest Beginners

Chapter VI—Such as Spark Amateurs, Etc.

BY GOSH

F IS for the filament,
A very useful toy,
And when it's awfully white and hot,
The things you hear—Oh joy!

They're Priceless and Not Mailable

Dear Indi: Please send me a special prize for NOT constructing the Stebbins Sooper. I won't try it for three reasons: (1) being a model young man, I don't want a Degenerative set; (2) I don't like soup; (3) I haven't got the parts. H. M. R.

(P. S.)—Where can I buy the parts?

Good Enough for Indi-Gestion

Dear Indi: Here's my contribution; hope I make the Column. Shoot this on your Chef:

RADIO BANQUET MENU
ENTREES
Socket Salad, Flewelling Dressing
Aerial Sauce with Browne Galena
DRINK
Drops from Grid-Leak, (99%)
MEAL
Boiled Variometers
Mashed Condensers
Fried Name Plates
Burned "E" Batteries
Hot Solder with Paste
DESSERT
Iced Binding Posts
TO ORDER
Hot Filaments on Toast
Potato Cord Chips

O. S. CILLATOR.

Resting here is John
McCutcheon Fast
Who made a high dive
From his antenna mast.

They Don't Grow Bananas in Alaska

Dear Indi: Please refer this missive to your R. E. I set up my Stebbins Degenerative set and had to erect an aerial. I hooked one end of the wire to the house and the other to a banana tree. (I live in Alaska.) The first music to come through was "Yes, we have no bananas today." Howcom? RITA M.

Looking Ahead

Awards in the Name Contest Next Week—Indi-Gest next issue will carry full, complete and total returns and awards in the Walla Walla broadcasting station call contest. The beautiful, brass, round, beveled edge switch point must be awarded as much of the lacquer is coming off. Who will obtain this super excellent accessory? Buy Indi-Gest next week from your most inconvenient newsdealer, 10c.

A Glimpse into the Future



Condensed

By DIELECTRIC

Adjust your headsets and then slip off into a sound sleep. "Sound" it will be. You may never have learned to speak French, Japanese or Russian during your waking moments, but just allow the subconscious mind to lay hold of addresses in these strange tongues and when you come to, your family will be amazed to find a linguist in their midst. Code is learned in a very short time, we are told, if we will only follow this course. Would it teach silent periods?

After reading Mr. Brady's articles in this paper on the present patent tangle, as applied to Radio, you will be convinced that the commercial phase needs some adjustment to prevent complete control by a single group. Not so much publicity has been given to this particular feature of late and it is well that some facts be brought to our attention. It is quite proper to refer to the difficulties met in the automobile industry and their subsequent solution. Much that applied there has equal concern with this newer industry; possibly may be corrected in the same manner.

We may find a great many uses for our receiving sets to yield saving of labor. It is reported that a Frenchman has invented an alarm clock which serves its evil purpose when a certain wave length leaves Eiffel tower. Why not have Radio open the drafts on your heater next winter in the early morning hours, so that the house will be warm when you wish to get dressed? Use it to put out the lights at night when Arlington warns your daughter's caller to be up and going! A Radio razor (safety) would be a valuable asset.

Station WRAD has indeed made a record of which it may be proud. Only a ten-watt station, yet it has been heard in thirteen states and in Canada. It is located at Marion, Kansas. It is one thing to be picked up at a great distance on rare occasions and quite another to be consistently heard in far states. A record of equal interest is that made by a station in California which was picked up through interference six thousand miles away, and only one-half kilowatt used. This latter may lead to important discoveries.

There are those who still contend that the broadcasting of church services has a tendency not for the best. They should not lose sight of the many instances where, except for Radio, there would be no chance to hear preaching. A new recruit to the ranks of listeners in to religious meetings is that lumberjack who is getting a loud speaker for the benefit of his fellows in camp. He had lived eleven years without hearing a single church service.

The matter of Radio broadcasting in Italy seems to be taking a turn for the better. Although much has been said of the desirability of having the Italian government look with favor on a plan to foster broadcasting stations, nothing came of it until the progressive Premier took charge of the case himself. It is hard to conceive of the nation which gave birth to Marconi holding back in anything pertaining to this great branch of scientific discovery.

Rules applying to the use of Radio during war time have been formulated and published. The Commission of Jurists at the Hague having this decision to make apparently covered every phase of the subject and produced regulations which it would be difficult to misinterpret. Rules of conduct by nations at war have been ignored, as all of us recall, but Radio has not reached the stage where it may operate without nearly everybody listening in, consequently the chances of avoiding detection when violating these rules are very slim. Efforts to perfect secret transmission will no doubt increase. There is much to learn in this broad field.

First Steps for Beginners in Radio

Chapter XI, Part I—Super Regeneration

By Thomas W. Benson, A. M. I. R. E.

BEGINNERS will find the accompanying series by Mr. Benson very helpful in learning the rudiments of the popular science of Radiotelephony. The articles yet to appear are:

- Chapter XI, Part II—Super Regeneration.
- Chapter XII—Reflex Circuit Operation.
- Chapter XIII—About Headsets and Loud Speakers.
- Chapter XIV—Batteries Used in Radiophony.

THE mere mention of the word super-regeneration gives rise to ideas and dreams of the Master Set that will eventually be evolved from the maze of circuits now in use and make possible the reception from every station on the face of the old world. And although it promised much, the three tube set as originally described by Armstrong seems to have fallen down when taken in hand by the amateur and even by the more experienced men in Radio. This is no reflection on the efficiency of the circuit, but simply means that much work must be done before the more complicated circuits are made simple enough for the average man to handle.

Theory of Super-Regeneration.

The theory of super-regeneration is so simple that it is strange it was not thought of long ago. Since the first days of regenerative receivers it was noticed that when the coupling between the tickler and the grid was made too close the set howled. This was due to the plate current feeding back into the grid, the added negative charge on the grid further varying the plate current, which again reacted on the grid more forcibly. In this manner the currents built up to such a strength that the tube went into self-oscillation and

modified circuit that can be readily assembled by the experimenter. The contents for the various parts are given in the illustration. It will be seen that the first tube is in a regenerative circuit, the plate being coupled to the grid circuit by a tickler coil.

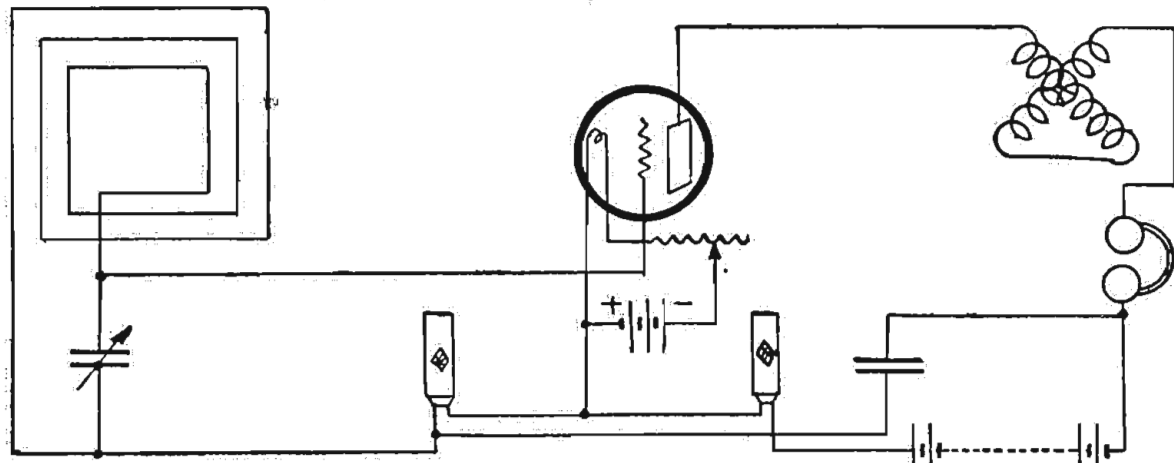


Figure 47—The one tube flivver that has given good results

The second tube is connected to form an oscillator, the plate being closely coupled to the grid with a condenser in the grid circuit to control the amount of energy reaching the grid and thus the intensity of the oscillations. The grid of the second tube is connected through a filter to the grid of the first tube. This filter keeps the received currents from reaching the grid of the oscillator tube.

The action can be described in this manner: When the tubes are lighted a high whistling note is heard in the receivers. This is due to the oscillations in the second tube taking place at audible frequency. On adjusting the variable condenser across the primary coil of the first tube a series of harmonic notes will be heard, due to the beat action between the oscillatory currents in both tubes.

we must make a compromise. It is logical that the longer the building-up process is allowed to go on the louder will be the signals, but since the checking point will then be further apart, they occur at an audible frequency. When we check them at a fre-

The circuit originally demonstrated by Armstrong employed one stage of audio frequency amplification, which introduced further difficulties. Realizing that the audio frequency amplifier would amplify the audible controlling current, it is necessary to filter this out before it reaches the amplifier, or it will reach an annoying volume.

We can then sum up super-regeneration as simply a regenerative circuit which is prevented from oscillating during one-half the cycle of the oscillation in a second tube and permitted to build up during the other half of the cycle. Therefore, any regenerative circuit that is subject to a checking potential on its grid at or near the highest range of audibility will function as a super-regenerator.

The One-Tube Flivver.

By combining the source of audio frequency, or, as it is often termed, the variation frequency, in the same circuit with the tuning inductance we have the one tube flivver super-regenerator that is making good. This circuit is shown in Figure 47 and consists of a tuned plate regenerative circuit using a loop aerial with honeycomb inductances connected in the plate and grid circuits. The coil in the grid circuit is a 1,250-turn coil, that in the plate being a 1,500-turn coil. The condenser across the B battery and coils serves to bypass the higher Radio frequency currents in the cir-

(Continued on page 14)

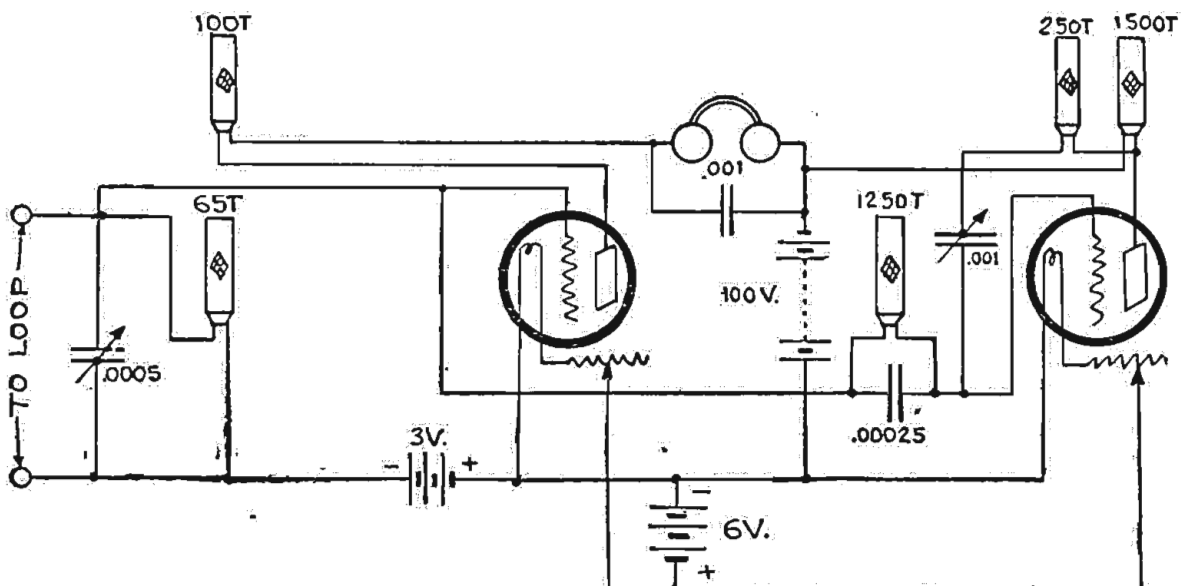


Figure 46—A super circuit using honeycomb coils, showing how one tube functions to control regeneration in other tube

howled or screamed. The intensity of this howling was many times that of any signal coming in on the set. And everyone would say, "Gee, if the stuff would only come in like that." And why not?

Since this building up of the currents in the tube is gradual, or step by step, taking only a very small interval of time, it is conceivable that we could permit the tube to build up the currents to a high value and then check the process and let the building up begin all over again. Were this checking to take place at a rate above audibility, the resultant sounds would be unbroken. And this is just what Armstrong did to produce the super-regenerative circuit.

Operation of the Circuit.

The operation of the circuit will be clear by considering Figure 46, which shows a

Now, when a signal is received and the circuits properly adjusted, the first tube will tend to regenerate and build up to a howl, but before the tube can start to howl the oscillations in the second tube make the grid too negative and the tube stops oscillating for an instant, when the current from the oscillating tube changes its polarity the first tube starts to build up again and is again checked. In this manner extremely loud signals can be obtained. But

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quency above audibility the first tube cannot build up as long, and a loss in signal strength results. The usual practice then is to have the checking occur at such a rate that a faint high pitched whistle is constantly heard in the receivers. By proper adjustment, this whistle is not annoying and does not interfere with the received signals.

Use of Power Tubes.

For the best results, it is necessary to use power tubes with high voltages on the plate, although the regular amplifying tubes can be used with some loss in signal strength. There is no doubt that this circuit does give excellent results when properly adjusted, but it takes infinite patience and many hours of testing before one gets the hang of making all the adjustments necessary to get results. The writer has worked for hours over such a circuit, pulled it apart in disgust and hooked it up again, determined to make it work before any results worthy of note were obtained.

Northern Electric
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Dry Cell with Rheostat Mounted on One Base

When the experimenter desires to keep his instruments separate, that is, not all sharing the same panel, but each instrument having an individual base and panel,

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RADIO KINKS DEPARTMENT,
Radio Digest
123 W. Madison St., Chicago

the following is a convenient assembly of the parts involved directly or indirectly with the filament-lighting circuit:

A base is made from 3/4-inch board, 6 inches long and 4 inches wide. A board 3/8 inch in thickness, 7 inches long and 4 inches wide will serve for a panel. These boards are finished smoothly with sandpaper. The panel is attached to the base with two screws, and holes are drilled for the rheostat and binding posts in the approximate positions shown in the sketch; screw holes are drilled in the base for semi-permanent mounting.

A cup for holding the dry cell in place is made from the lower end of a cylindrical cardboard box (such as a mailing tube, with bottom), which is screwed to the base, allowing sufficient space on the latter, next to the panel, to mount the tube-socket. The panel, base and cup are painted with a flat-black paint; when the paint is dry, shellac is applied.

The rheostat, grid condenser and leak, and the "antenna" and "plate" binding posts are mounted on the panel; the cup and tube socket are on the base. Connections are made as follows: From antenna binding post to GL and condenser, thence to grid terminal on socket; from one terminal of rheostat to one filament terminal on socket; from other terminal of rheostat to dry cell, thence to remaining filament terminal on socket; from plate terminal on socket to plate binding post on panel.—George Frederick, Washington, D. C.

Insulation Tube

A good insulation tube for Radio work can be made very cheaply by wrapping empire cloth around a cardboard tube. Shellac the cloth and when it becomes sticky, wrap it around the tube and smooth out the wrinkles with a cloth. This is very suitable for a CW transmitter inductance tube. A tube about 8 inches long and 5 inches in diameter can be made for about twenty cents.—Tecumseh Woodland, Baltimore, Md.

Loose Coupler Used with WD-11

The accompanying sketch shows design data and diagram of connections for an outfit which I have been using with great success. This hook-up is the result of my attempt to develop a WD-11 outfit which would give the maximum control with a minimum of instruments.

The primary of the loose coupler is made with 175 turns of No. 23 enameled wire with 195 turns of No. 22 sec wound in the opposite direction on the secondary. The diameter of the primary is 4 1/2 inches and the length of the coil is 6 1/2 inches. The diameter of the secondary is 3 3/4 inches and the length is 6 1/2 inches.

TWO SUPERSENSITIVE CIRCUITS

(Both Copyrighted)

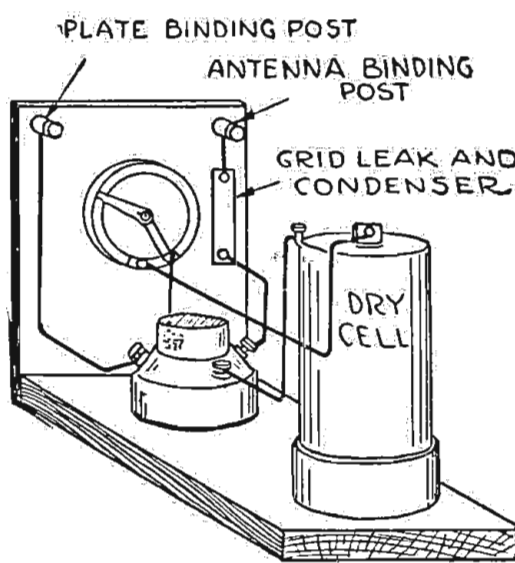
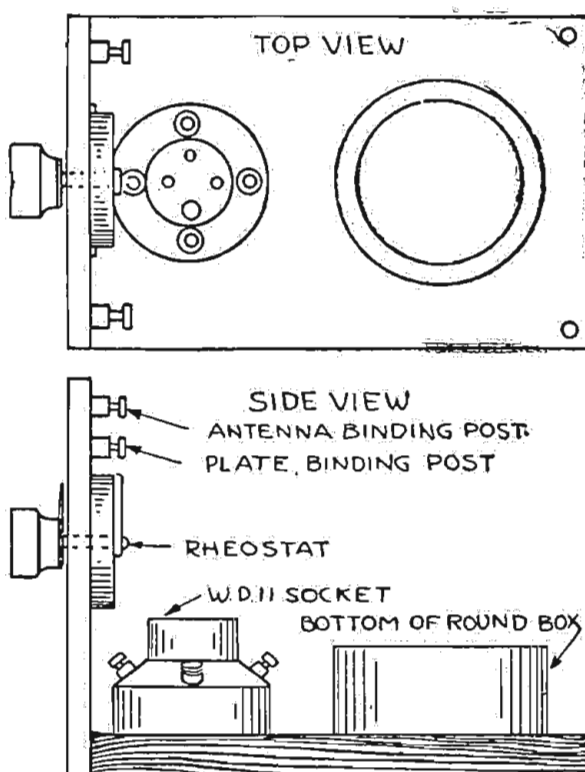
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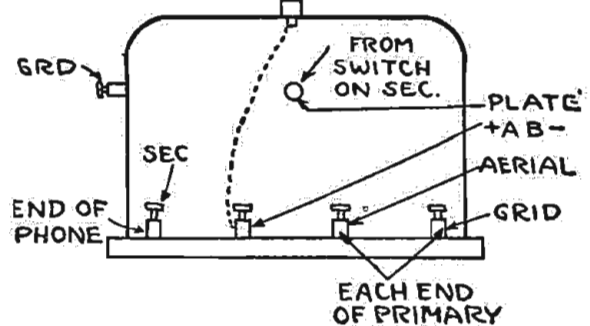
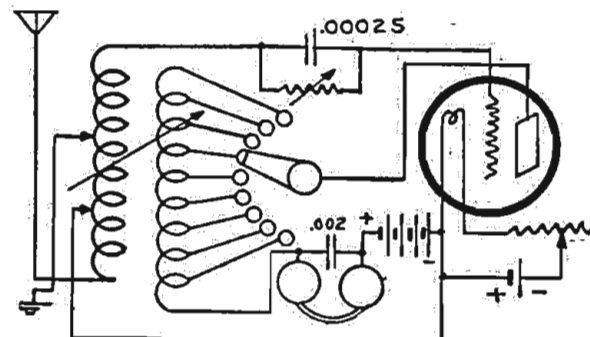
My W. D. 11 Circuit is especially designed for use with the "Pickle" tube and brings out the full value of that little tube as no other circuit can. Stations 1000 miles away come in clearly on one tube. This set is small, complete, portable. For the man who wishes the highest efficiency, this is the set to build. Price of blueprint and specifications, 50c, or with complete and perfect windings, \$3.00. Photo of set with every order.

Either set is easy to build, easy to operate. Everything clearly shown. Sets built from these plans will receive all broadcasting stations operating under the new laws. Their wave length range is from 140 to 670 meters.
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ALL PARTS NECESSARY IN UNIT



I am located about 1 1/2 miles from the broadcasting station WAAK (100 watts) and about 1 mile in the same direction from broadcasting station WCAY (250



watts). I had the good fortune one evening to pick up both stations at once and with the hook-up mentioned I could tune out either at will. I can also pick up DX within a thousand miles. Occasionally I have picked up NAA time signals without using loading coils.—Wm. Luetge, Milwaukee, Wis.

REFLEX

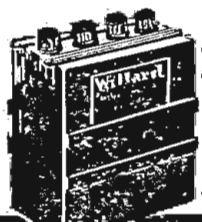
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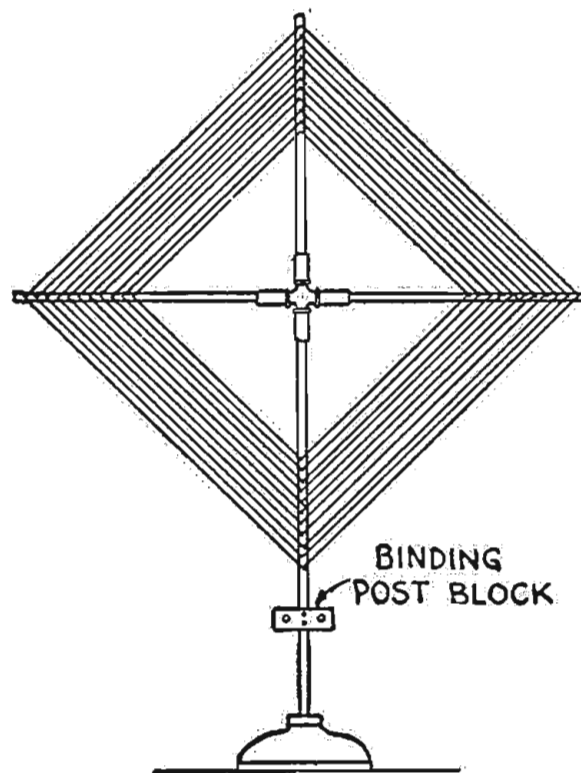
These same Willards can be adapted to deliver 8 volts for pure D. C. for C. W. Transmitters. Better than a generator because no filter is necessary. Much less expensive.

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Long Distance Received with Homemade Loop

A loop of good appearance can easily be made of the following materials: 1 polished brass 1/2-inch cross, 4 polished brass 3-inch nipples, 2 or 4 1/2-inch dowel rods, according to the size of the loop to be made, 1 piece of bakelite for a binding post block, 1 desk lamp base, small wood screws, stain and varnish. Cut the threads off from one end of the



Shielding Panels

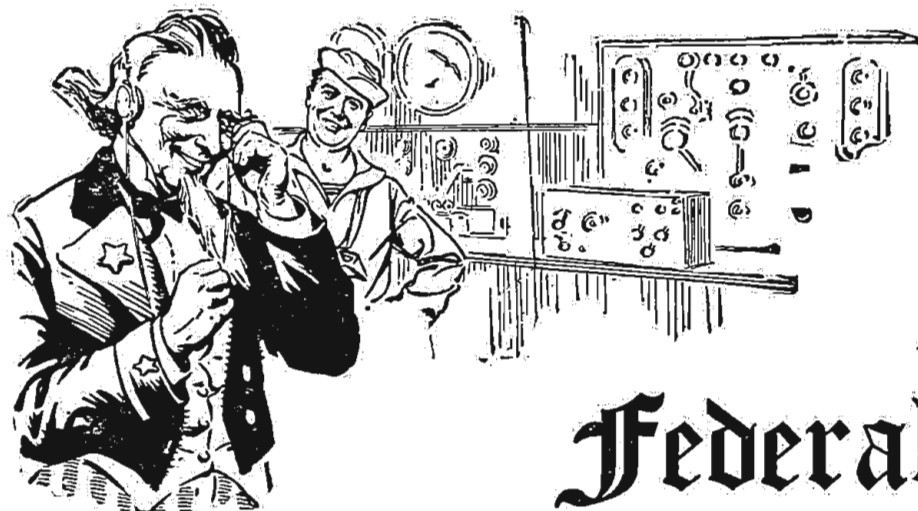
In making and operating a Radio set, I found the following plan to be of great help. After trying tinfoil, which did not give satisfactory results, either in operation or appearance, I painted the back of the panel with aluminum paint. I used an extra large brass washer to insure better connection between the paint and the binding post.

In painting the panel I place the front flat on the table, so that the paint will not run into the holes for the shafts of the instruments. As an added precaution, I use blotter washers for the shafts and glue them to the panel.

One of the good features is that the entire surface can be covered with the aluminum paint. Another advantage of the aluminum paint is the lower cost as compared with aluminum plates. I found that practically all body capacity was eliminated.—Frank Gavitt, Wichita, Kans.

nipples and turn the other ends into the cross. Cut the dowel rods to the size required and insert them into the nipples. The wire spacing should be marked on the rods and small brass wood screws may be used for attaching the wires, or holes may be drilled to receive them.

My present loop measures 18 inches diagonally and has 11 turns of 10-28 litz wire. With a .001 mfd. variable condenser I am receiving stations within a 1,500-mile radius.—Peter S. Schott, Perth Amboy, N. J.



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Condenser Dial Markings for Wave Lengths

Types of Condensers and Their Values

By H. J. Marx

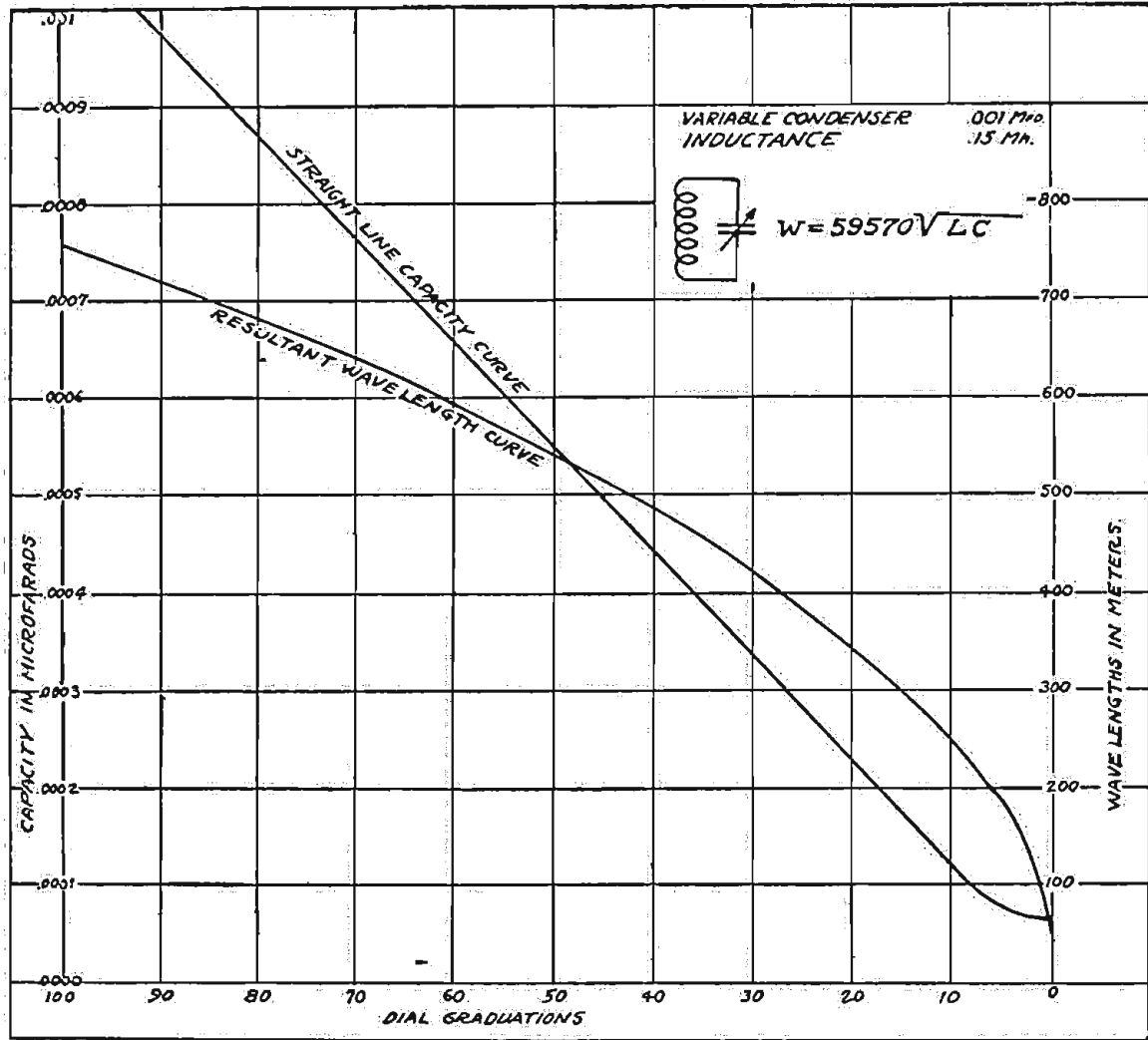


Figure 1

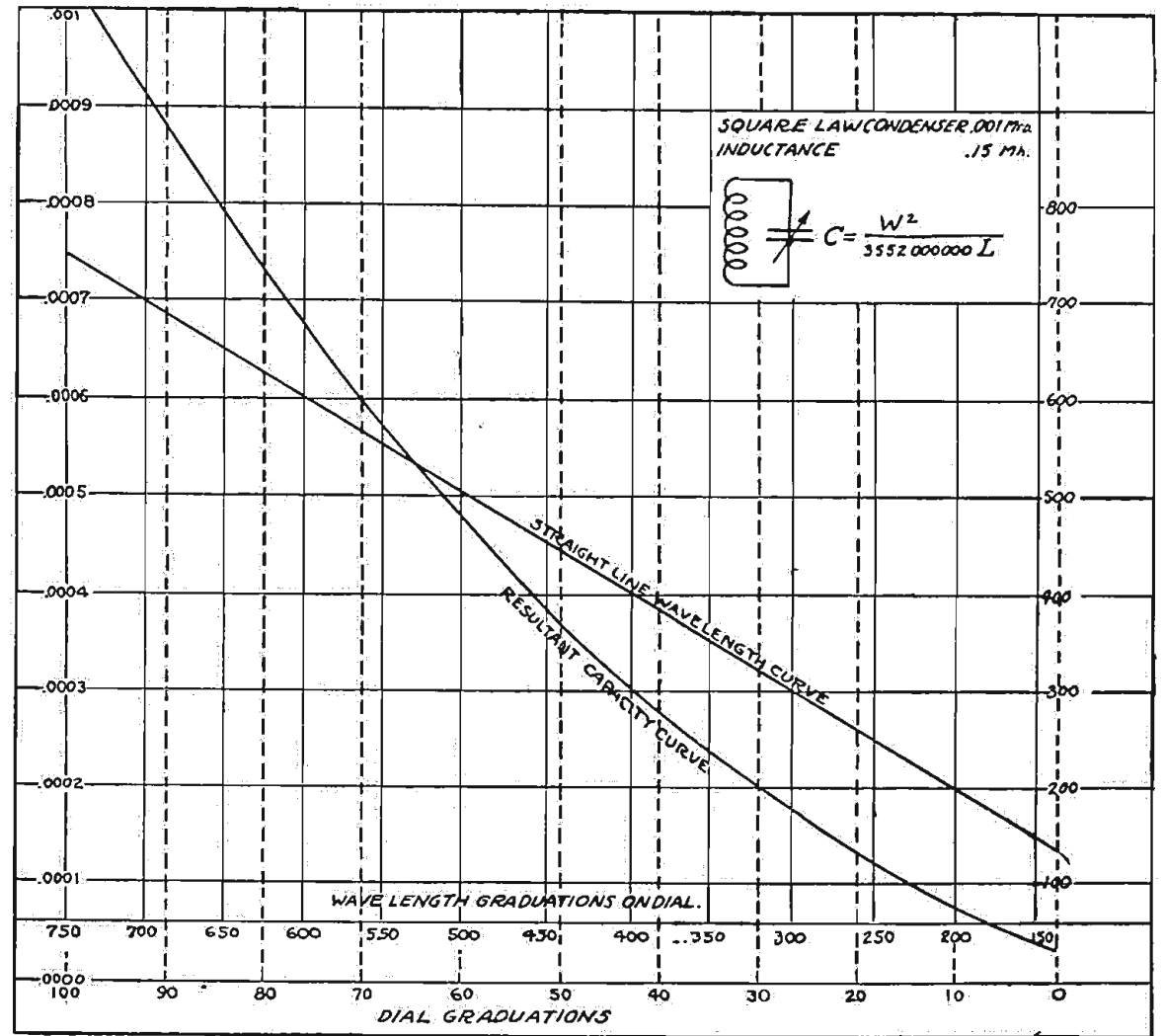


Figure 2

IT IS not unusual to receive a letter from some fan who wonders why the dials are not graduated in wave lengths. His idea is not unreasonable, and the time is not far off when sets will have wave length graduated dials instead of just the usual zero to one hundred or the angular degree graduations. There are, however, a number of factors which effect this, of which the fan usually does not know; it is these factors that will be discussed in this article.

First, we need not define wave length, but it is generally known that wave length is dependent upon the inductance and capacity of the circuit. Expressed in a formula, we have:

$$W = 59570 \sqrt{L \times C}$$

where W = wave length in meters.
L = inductance in milhenries.
C = capacity in microfarads.

Antenna or Primary Circuit
The antenna circuit includes the aerial and ground, with its capacity and inductance in addition to the tuning units. The antenna inductance and capacity are not necessarily fixed values. Both vary to a limited extent, depending on a number of conditions; then, again, one fan has an aerial 100 feet long and 40 feet high, while another has one 60 feet long and 50 feet high. It is, therefore, impossible to graduate a dial for wave lengths in the primary circuit. If, however, a loop aerial is used and its inductance determined, the dial of the usual tuning condenser can be graduated for wave lengths, but this condition is parallel to what is taken up under secondary circuits, and will be more fully discussed under that heading. All circuits operating without an aerial, usually a fixed or variable inductance incorporated in the circuit, can also be handled the same way.

Secondary Tuning Circuit
In the secondary circuit there would be little trouble in having the dials graduated for wave length. The main condition imposed would be the necessity of a fixed inductance value. Naturally, if the inductance is variable, every change in the inductance would alter the condenser setting

for the same wave length. This fixed inductance value is not unusual; for example, the rotor of a variocoupler has no taps, therefore, the inductance value is fixed. Similarly, the loop aerial, unless tapped, has a fixed inductance value.

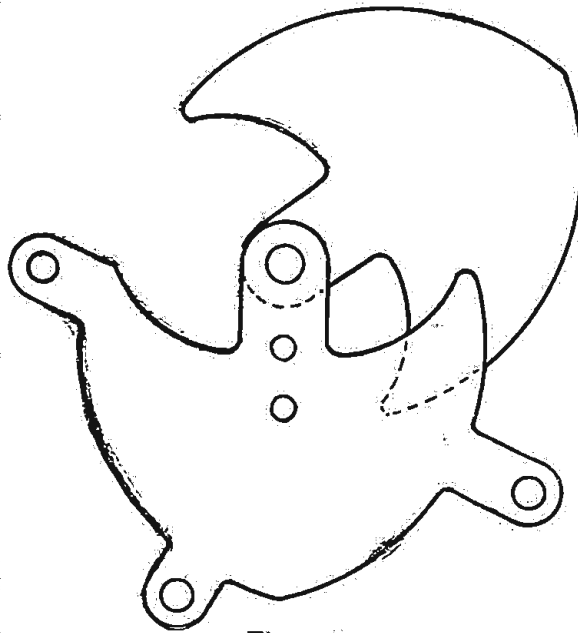


Figure 3

Where a double or even triple honeycomb coil circuit is used, the secondary circuit is tuned by means of the variable condenser shunted across the secondary honeycomb coil.

If, then, the inductance value is fixed,

the tuning control being centered in the variable condenser, it is the dial on this apparatus that can be used to indicate the wave length for its different positions. This naturally emphasizes the importance of accuracy and workmanship in its construction.

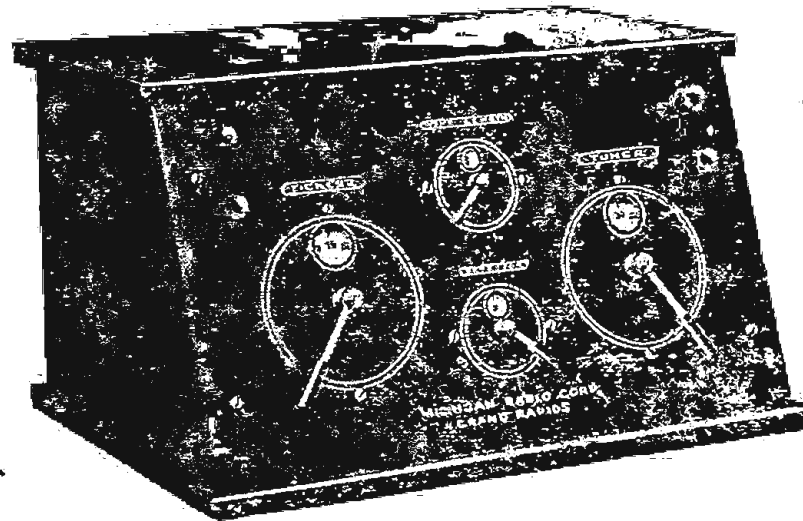
Variable Condenser

Up to this time there has been but limited development in condenser design. The present type of rotating plate condensers is seldom very accurate. Though spacing

may be fairly uniform when manufactured, handling soon changes positions of plates. Many of the plates are stamped out with rough edges. Unless the metal is carefully treated, temperature changes will produce warping of the plates. The plates may not be spaced, but there is no uniform capacity change. Gradually development and improvements in design will help eliminate these uncertain factors. The other types of construction, if efficient, are usually too

(Continued on page 14)

Our Latest Triumph



The Michigan
"Midget"
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Long-Distance Wonder Worker That Tunes Out Local Broadcasting

The most dependable long-distance Receiver ever assembled in so small space. Convenient for campers and tourists, yet equally suited to home use the year-round. Handsome mahogany finished cabinet 14 1/4 in. long, 7 7/8 in. high, 9 5/8 in. deep at base.

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Send for list of Michigan Quality Radio Receivers and Parts; variometers, variocouplers, all-range couplers, special rheostats—50c, potentiometers—200 ohm and 400 ohm—60c, etc.

Dealers, the set you have been waiting for to make complete package "over the counter sales."

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A Twist of the Wrist **IT'S SET**

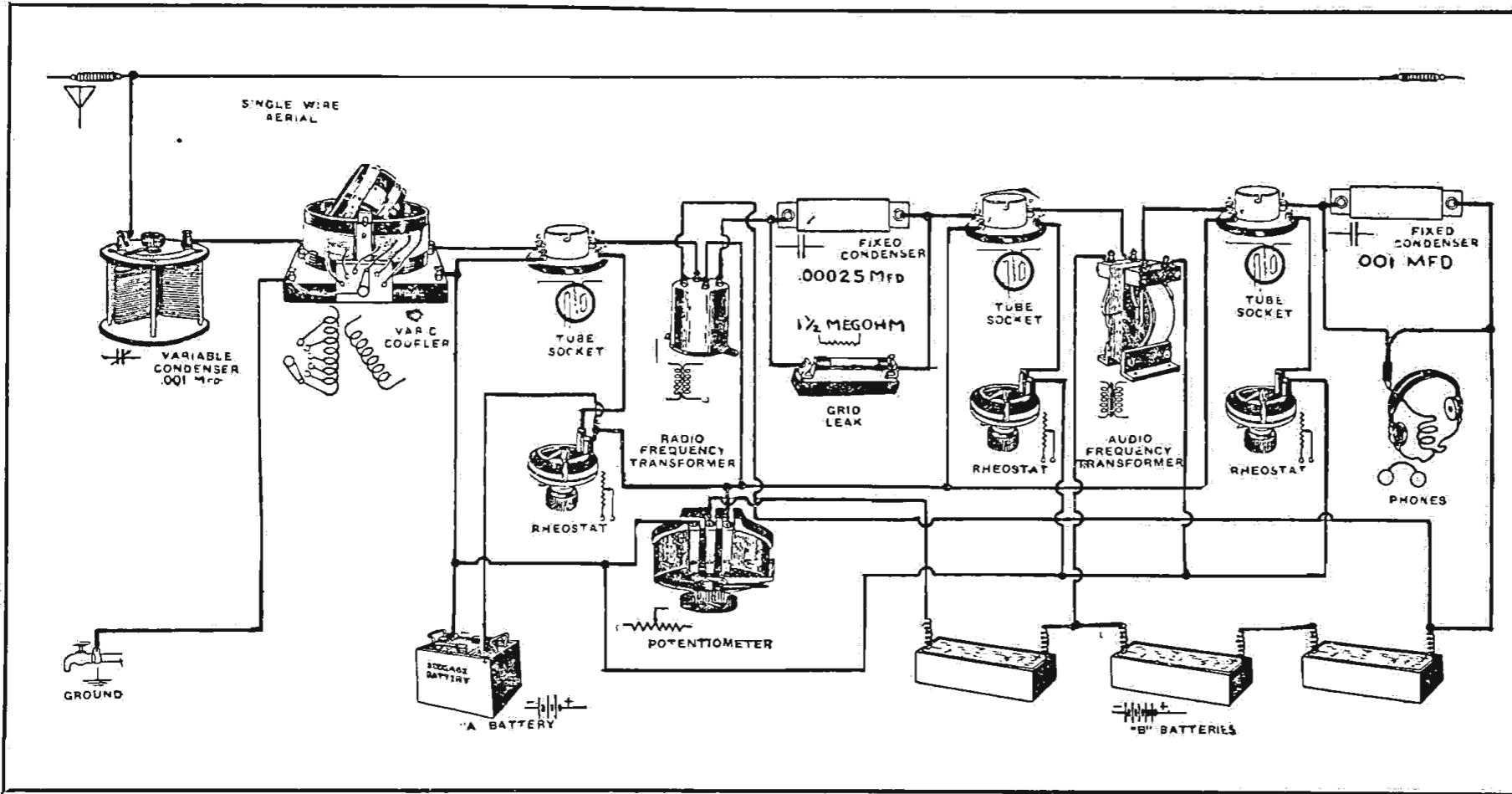
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ONE STAGE R. F., DETECTOR AND ONE STAGE A. F.



ONE stage of Radio frequency amplification, detector, and one stage of audio frequency amplification is the second of the simplex diagrams. As can be readily seen by examining the diagram, this circuit consists of a variocoupler, used as a simple tuning arrangement with a variable condenser of .001 mfd. capacity in the aerial lead. No regeneration is used. The variocoupler tunes the aerial circuit and then passes it on through the Radio frequency amplifier tube, a UV-201. The plate circuit of

this stage consists of a Radio frequency transformer, 67 1/2 volt B battery, and potentiometer. The potentiometer is very necessary if good results are to be obtained. The detector circuit is the usual conventional arrangement employing a fixed condenser of .00025 mfd. capacity and grid leak of 1 1/2 megohms resistance in the grid lead. A soft tube is used as a detector, preferably a UV-200. The plate circuit of the detector is completed with the primary of an audio frequency trans-

former and B battery of 22 1/2 volts. The single stage of audio frequency amplification employed is of the usual type, consisting of a UV-201 and B battery of the same strength as that of the Radio frequency amplifier. This arrangement may be used with any receiver where Radio frequency amplification may be advantageously employed and the usual results of such amplification obtained. Tuning is effected with the variocoupler, variable condenser, rheostats and potentiometer in the order listed.

more apparent when the other classes are analyzed.

The Straight Line Condenser.

The illustration, Figure 1, shows the straight line graph by plotting the capacity against the usual dial graduations. The markings on the dial are taken as zero to one hundred; some dials are graduated to 180; that would mean merely that the divisions on the bottom of the graph would cover 180 points in the same distance that the 100 are covered. Naturally, 180 degrees of rotation are assumed. Using the formula for wave length, the different wave lengths are calculated, assuming a 50-turn honeycomb coil (.15 millihenries) is used as the inductance. The illustration shows the resultant wave length curve. Since the curve is not a straight line, the dial graduations would be irregular.

For example, from graduations 42 to 100 the wave length would run from 500 to 750 meters, or a total of 250 meters range. But the lower part of the scale, 0 to 42, would cover a wave length range from 0 to 500. In other words, the lower half of the graduations, would cover over twice the range that the upper half does.

In order to remedy this difficulty, the third class of condensers, called the square law type, were developed. They are used mostly in wavemeter work and for laboratory testing.

The Square Law Condenser.

The wave length formula can be changed around to read:

$$C = \frac{W^2}{355200000 L}$$

using the same unit values as before.

This indicates that in a circuit with a fixed inductance value the capacity varies as the square of the wave length, divided by the product of a constant and the fixed inductance.

In Figure 2 the wave length is first plotted as a straight line, the necessary capacity values are calculated and the curve drawn in. The condenser is so designed that the plate areas required for the various dial settings check up with capacities as called for on the graph. The dial range in wave lengths would then run from about 150 to 750 meters. Naturally any change in the maximum capacity of the condenser or the inductance of the coil alters these dial values.

At the base of Figure 2 the wave length values at the different points of the dial graduations are marked in steps of 50 meters. This can be carried further and kept handy with a set, so that the dial graduations can readily be interpreted in terms of wave length.

The illustration Figure 3 shows the form of plate used in one of the square law type of condensers at present on the market.

With the new tubes just on the market, it is suggested that tube sockets be mounted on a cushion base to minimize vibration.

FIRST STEPS IN RADIO

(Continued from page 11)

cut and to increase the wave length of the coils so a longer period is obtained between checking points. The two coils need not be put in inductive relation to each other, the feedback being obtained through the capacity of the plate and grid, as described under tuned plate regenerative receivers.

The action of this circuit is identical to that using two tubes, but one tube functions as both oscillator and detector.

Oscillation in the Circuit.

When the tube is lighted the circuit begins to oscillate at a frequency determined by the values of the honeycomb coils and the capacity across them. This current will have a frequency between twenty and thirty thousand cycles per second, which is near the upper limit of audibility and a high pitched whistle will be heard in the receivers constantly. If annoying, the pitch of the whistle can be varied by changing the capacity across the battery and coils. If the whistle is pushed above audibility, the signal strength will be reduced, as mentioned previously because the tube is not allowed to build up as long. The grid circuit containing the loop aerial and condenser are tuned to the wave length to be received, and when the signals are heard the set is made to regenerate by adjusting the plate variometer. We find, however, that the regeneration can be carried to a point where the set will operate a loud

speaker nicely because the oscillations from the honeycomb coils only permit regeneration to occur during one-half the cycle, and thus the tube is not permitted to howl or squeal.

This little set is ideal for the man limited to one tube and desiring to work with a loop aerial. For the benefit of those who would care to build a set of this type, full details of construction will be given in the next chapter as well as the theory of operation of the Flewelling circuit, showing that the operation therein is very similar if not identical to that in the Armstrong super sets.

(TO BE CONTINUED)

DIAL MARKINGS FOR W. L.

(Continued from page 13)

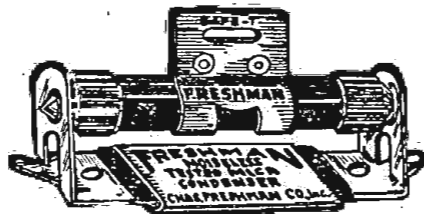
high priced, so for the present only the rotating plate type will be considered.

This type can be divided into three different classes, namely:

The semi-circular plate construction.

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The straight-line capacity type. The square-law type.

The average variable condenser that appears on the market falls in the first class. The second type are not so numerous, and as a rule are much larger in size, due to the contour and size of the plates. Of the third class, there are very few on the market.

The capacity curve of the condensers of the first class, based on the dial graduations, is very irregular; no two are alike. It is very difficult to graduate a dial in wave lengths because of the irregularity of such graduations. This will become

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Parts for TWO-STAGE AUDIO FREQUENCY AMPLIFIER, for either of above circuits, with drilled panel and book of instructions. \$11.00	

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3000 OHM TELEPHONE HEADSET, list \$8.00. 3.50	
AUDIO-FREQUENCY TRANSFORMER, designed for use with W. D. II tube, also excellent for all other tubes, list \$4.50. 2.75	
VARIOCOUPLER, Litz wire wound secondary, 150-600 meters, list \$4.50. 2.25	
Triple Coil Mounting. \$3.35. Double Coil Mounting. 2.45	
Multiple Point Inductance Switch with knob and dial (15 points) 1.45	
Reinartz coil, increased wave length. 1.55	

Honeycomb coil, mounted 50 turns. \$0.95	Ball bearing inductance switch. .25
Honeycomb coil, mounted 75 turns. 1.00	Single circuit jack, list 65c. .30
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Questions and Answers

Interference

(3603) KB, Wilkes-Barre, Pa.
I have a two-stage regenerative set which is the same as that used by my neighbors. When I am tuned in and they tune in it tunes me off and causes noise. Our aerials are about 20 feet apart; mine is about 5 feet lower than theirs. They have two wires about 125 feet long; mine is one wire, 160 feet long.

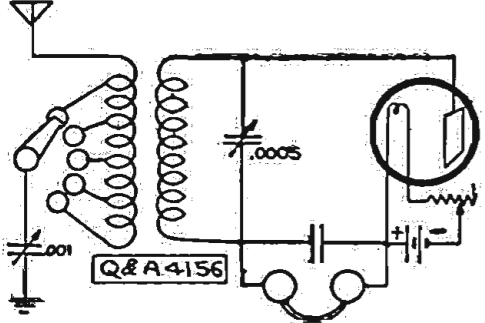
Will raising my wire have any effect?
A.—Noting difficulties occasioned by interference of regenerative circuit in proximity we are advising that two methods are suggested for overcoming the annoyance. Ask your neighbor to construct a single wire antenna which will in no way decrease the efficiency of his circuit but rather make it more selective, and construct your own of the same type at right angles and as far away as possible. This method should eliminate all conflicting operation.

If this plan is not possible it will be necessary for each of you to add Radio frequency amplification to your sets. The employment of one stage will prevent re-radiation from the receiver which is the cause of interference cited.

Diode Tube Circuit

(4156) JTL, Mt. Vernon, S. D.
Will you please publish a diagram of a hook-up consisting of a variocoupler and variable condenser for tuning in, using the two-element Diode tube?

How far will this tube receive broad-



casts and what will the wave lengths include, using a standard variocoupler? Will it be as sensitive as a crystal?

A.—A circuit employing the Diode tube accompanies this article. This will have a wave length from 200 to about 500 meters and a receiving range of about 150 miles, winter reception. It will be more sensitive than a crystal detector.

Super Heterodyne

(2858) HEP, Providence, R. I.
I have noted your article and diagram R. D. 73 on the Super Heterodyne on page 14 of the February 24 issue, but it is not plain enough for me, and I desire further information. Would you be so kind as to answer the following questions:

Should the inductance L2, which is shown in an upper and lower section, be wound one over the other or in two separate coils of 18 turns each, side by side? If two separate coils are used, is there a variable inductive relation to each other? You do not mention the inductances which are shunted by condensers C4 and C5. Of what are these composed and what is the size of each? Should they have a variable inductive relation?

Is it necessary to use separate A and B batteries, as shown, or can one A battery be used for the whole circuit, even if using separate B batteries?

Will this circuit function with the WD-11 tubes or DeForest 1 1/2 V tubes?

Should the two tubes composing the heterodyne (the first two on the left) be hard or soft tubes?

Does this super heterodyne require 4

stages of Radio frequency as shown or can it be operated on a lesser number, such as 2 or 3 stages?

Is this circuit as shown good for all wave lengths up to 20,000, and if so, would inductances mentioned in the second question remain the same for all waves?

A.—Inductance L2 consists of two sepa-

rate coils wound on the same tube but not over each other. The two coils are wound side by side with taps taken from the center, as per diagram.

Inductance shunted by condensers C4 and C5 may consist either of honeycomb coils or a variocoupler, and are variable in inductance relation.

One A battery may be used, but separate B batteries are advisable.

It is doubtful if 1 1/2-volt tubes will function as effectively as 6-volt tubes. Would advise 6-volt tubes for results desired.

Two tubes composing the heterodyne should be hard.

The circuit may be used with less stages of Radio frequency than designated, although volume will not be great with less than four.

By substituting the proper size inductances in the tuning controls this circuit will accomplish 20,000 meters wave length. Inductances mentioned will remain constant.

The Question and Answer department is purely a service department and the publishers would like to have your assistance in helping to keep it up to the highest standard, therefore when asking questions please make out your query on a separate piece of paper and written on one side only. Do not mix your questions with other material, write that on a separate piece of paper. Each one must go to a different department. Then, too, we have so many who fail to put their name and address on each sheet. Please remember this when you write your letters, and also to enclose a stamped self-addressed envelope. Unsigned letters are not answered.

Reinartz, or is there any way of making it more selective?

I am using 22 1/2 volts on the plate. Would more voltage have a beneficial effect? Is there any advantage in connecting two 6-volt filament batteries in parallel?

Can a Homecharger be used to charge B batteries?

Have received about 25 stations over one thousand miles distant. Are these good results?

A.—We are pleased to congratulate you upon your success with Reinartz circuit. That is as it should be, after careful construction.

The use of Radio frequency is highly desirable and does away with the bothersome feature of disturbing other sets in vicinity and also increased range of reception.

It is doubtful if phone condenser will afford any special advantage.

Would advise the use of cold water pipe as making the best ground.

Antenna is slightly directional off the lead-in end affording that advantage in direction from which reception is most desired. Combination of north, south, east and west directions would have a little advantage.

The circuit is fairly selective under

Reinartz Reception.

(2892) HCN, Rapid City, S. Dak.
I built a Reinartz set according to one of your hook-ups, and have received 155 stations in four weeks, but would like to ask a few questions on this hook-up.

Can you use Radio frequency on a Reinartz? Is it advisable? Will it cure the kick-back which bothers neighboring receivers?

I am not using a phone condenser. What advantage would it give me?

I have no amplification, but get some stations so loud can lay phones on table and hear words ten feet away. My ground wire is very long, about 35 feet. Would shortening it by burying copper plates or driving pipe into the ground help to bring

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proper skill in tuning. There is nothing we could suggest to increase its selectivity.

Twenty-two and one-half volts on the plate is sufficient. There would be no advantage in connecting two 6-volt A batteries in parallel, as suggested.

A Homecharger is effective in charging B batteries.

Static and Tube Noises

(3574) LCT, Jones, Ala.
I would like to ask you a few questions as to a "Flewelling" set which I am installing.

How may I keep down static tube noises and body capacity?

How may I increase the clearness and range of my set?

A.—Answering your inquiry with reference to disturbances encountered in the operation of the Flewelling circuit, we advise that tube noises should be eliminated by careful tuning, and body capacity effect by shielding the back of the panel with tin foil and a grounding shield. By skillful adjustment of the grid leak the signals should be clear. The circuit has a consistent range of one thousand miles which probably will not be materially increased by any method.

Static interference is not peculiar to any circuit; it is difficult to combat. However, with a selective circuit, of which the Flewelling is a type, it should be at a minimum. A short one wire antenna is advised for the circuit in question.

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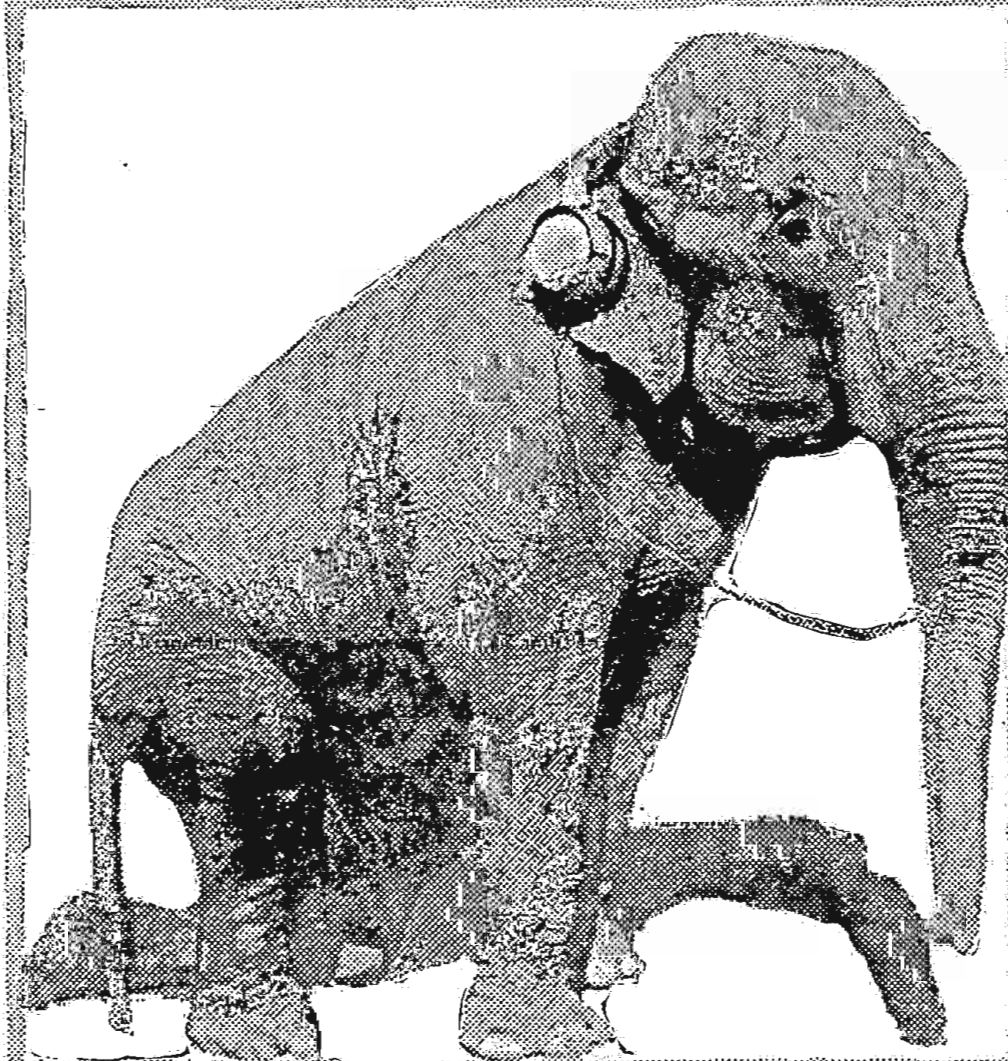
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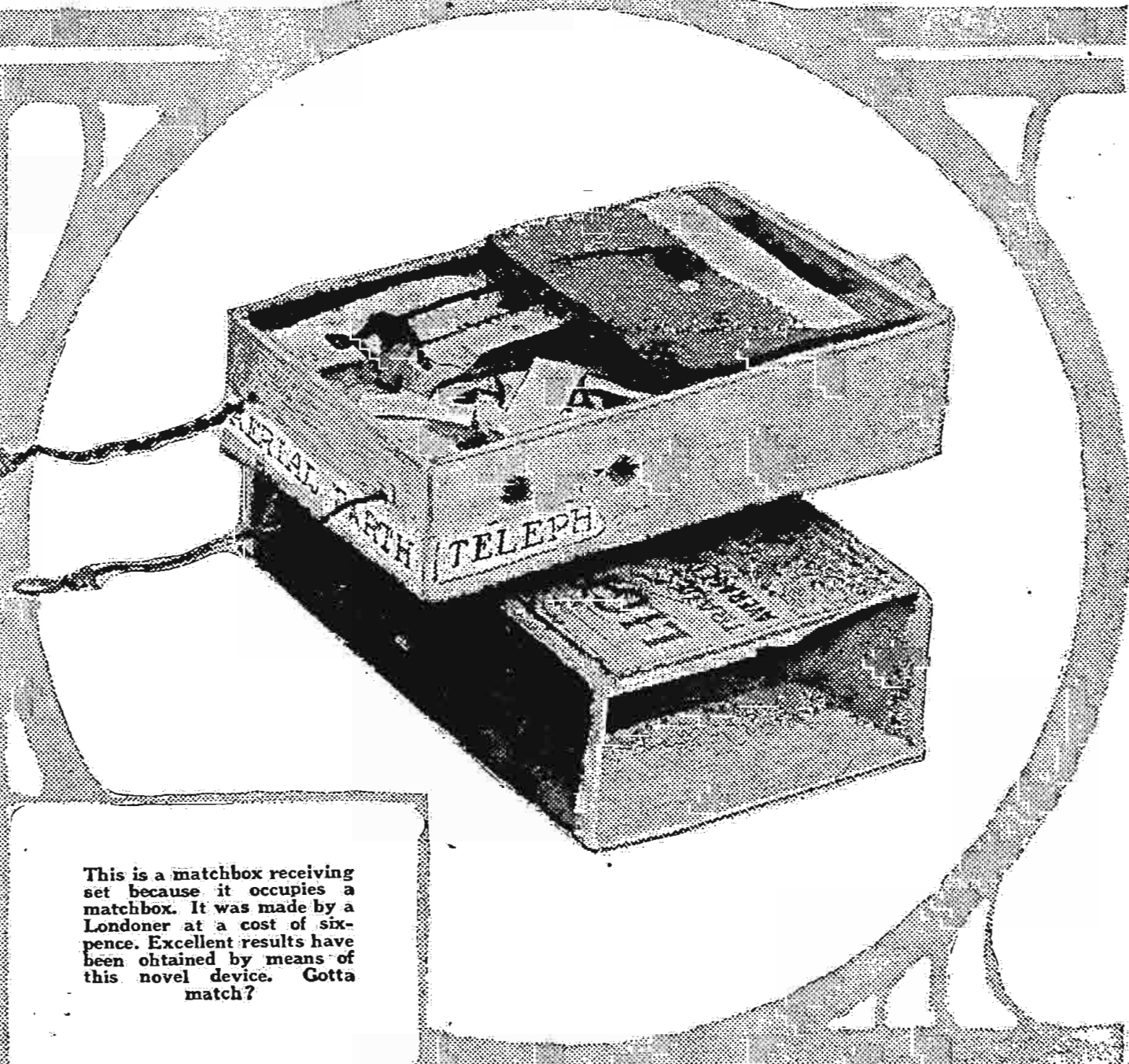
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