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52 Numbers

RADIO

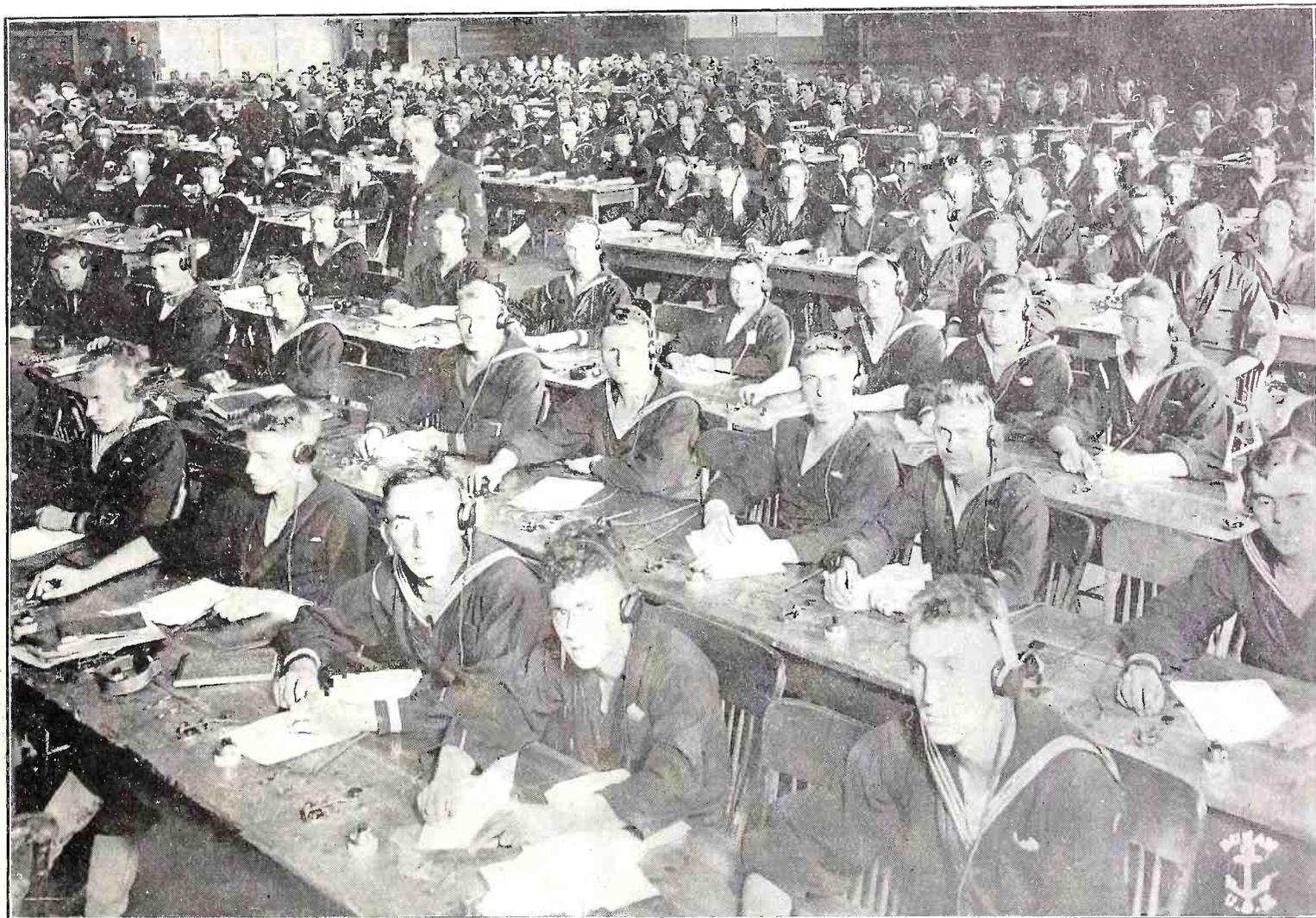
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WORLD

ILLUSTRATED

EVERY WEEK

RADIO PERSONNEL IN U. S. NAVY TOTALS 2,419



(U. S. Navy Official Photograph)

A class in radio at the Great Lakes, Mich., Naval Training Station. These alert young men take their instruction seriously and have developed many experts from among their number. See article by Carl H. Butman, on page 10 of this issue.

Second District Wave Lengths Assigned (See Inside)

Cockaday Circuit

The newest and the most startling development in radio.

Exceedingly Selective. Simple to Operate. Highly Sensitive. Verified C.W. Range of 3200 Miles. Telephone Range of 2400 Miles.

Complete Parts for This Circuit.

\$12.71

Include the following:

1 Special Coil	\$3.25
2 Variable Condensers (Bakelite Ends)	5.00
1 Socket (Genuine Condensite)	.50
1 Vernier Rheostat (Cutler-Hammer)	1.30
1 Panel (Genuine Bakelite) 7 x 18	2.50
1 Grid Condenser, Mica Dubbler .0025	.35
1 Switch Lever, 7 Points, 2 Steps	.31
8 Binding Posts	.40
1 Grid Leak (Cartridge Type) and Bakelite Holder	.80
2 Dials, 3 inch	.50
Total	\$12.71

One Stage Amplifying Unit to This Set, Additional \$5.00
Two Stages, Additional 11.00

Cabinets, Piano Mahogany Finish, One Bulb Set \$3.75
Two and Three Bulb Set 4.75

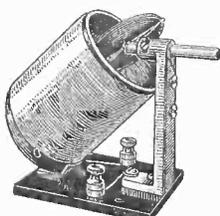
Complete Parts for Flewelling and Reflex Circuits.

U. V. 200 Tubes	\$3.95
DeForest DV6A. Wonderful as an amplifying tube	6.00
22½ Volt "B" Battery	.89
Nathaniel Baldwin Type C, Double Phones	5.50
Nathaniel Baldwin Type C, Single Phones	4.50
Brandes (Superior) Phones	5.95
45 V. "B" Batteries (each)	2.25

All orders must be accompanied with a money order, postage included.

GRAND RADIO CO.

1789 Third Ave. 1714 Second Ave.
NEW YORK CITY



SELECTO-Jr.

180° Variocoupler
Built for Results

Has no solid dielectric in Rotor.

Rotor built of self-supporting pancake coils. Lowest possible resistance, resulting in increased selectivity.

Requires only 2 1/4" width on panel, no more than dial. Range, 200-700 meters.

\$4.00 each, postpaid

Send P. O. or Express Money Order

J. E. TAYLOR

202 N. Calvert St., Baltimore, Md.

"RADION" PANELS

DIALS
V. T. SOCKETS
TUBING

Black and Mahogany "Radion" Panels
20 Stock Sizes and Also

CUT TO ANY SIZE REQUIRED

Prices on Application

"Radion" Tubing: 2", 2 1/2", 3", 3 1/4", 3 1/2", 4", 5"

Cut to Any Length
Special Parts Experimental Work
Made to Order

N. Y. Hard Rubber Turning Co.
212 CENTRE STREET NEW YORK

We Advertise Only the Best Tubes Made

GUAR. 1 1/2 VOLT TUBES

\$6.50 Detector and Amplifier for dry cells.

Fits standard socket \$4.75

5.00 Detector Tubes, 6-Volt, guar. 2.75

6.00 Amplifier Tubes, 6-Volt 3.50

1.50 22 1/2 Volt B Battery .79

Dealers—Write for Attractive Discounts on Above

B. B. RADIO COMPANY

2202 Mermald Ave., Dept. W.4, Brooklyn, N. Y.
All Deliveries Made Within Two Days.

VACATION PORTABLE SET

CONTAINS EVERYTHING INSIDE, WORKS ANYWHERE WITHOUT AERIAL

Editorially described by the Radio Globe on Saturday, April 28 (3rd page)

Wave band from 200 to 600 meters. Extremely selective. Will cost you about \$16, including nice typewriter cabinet.

You can make yours in an evening. Get my complete set of instructions, patterns, list of parts, etc. Price \$1

Apply to the originator CHARLES A. PEZET
46 W. 65th, N. Y. City. (Discount to Dealers)

General Electric Making Collection of Vacuum Tubes

DURING an address on "Radiotrons" by W. C. White, of the General Electric Company's Research Laboratory, which recently was broadcast from WGY, Mr. White made the following interesting appeal to radio fans:

"For some time past, we have been making a collection of vacuum tubes to illustrate the development of this interesting art. A number of years from now such a collection will be of great interest and of considerable historical value.

"We would like to ask radio fans to assist us in making more complete this vacuum tube collection.

"It is natural, however, that we are only desirous of obtaining additions to this collection and, therefore, are interested only in tubes of other than General Electric manufacture. What we desire to obtain are tubes of very early manufacture, tubes of unusual design and those of other countries, particularly Italian, Japanese and German. It is not essential that these tubes be in operating condition. The filament may be burned out or the vacuum impaired, but they should be in satisfactory mechanical condition.

"If any radio fans have such vacuum tubes I shall be very glad to have them write me, describing their tubes briefly and if they form an addition to our collection we will write their present owners offering them on receipt of their tubes to send them in exchange for each one of interest to us, one of the new UV-199 radiotron tubes. We will also include a socket for each tube and complete operating instructions. Address all communication relative to tubes of possible interest to us for this collection to WGY, General Electric Company, Schenectady, New York.

"It is particularly requested that any who have such tubes should write first and wait for a letter from us before shipping their tubes to us to learn whether they have any historical interest as an addition to our collection."

Newspaper Publishers Appoint Radio Committee

AT the recent annual convention of the American Newspaper Publishers' Association, held in New York City, a committee was appointed to study the radio questions which had been discussed by the convention, such as whether radio broadcasting programs in news columns are not free advertising, and to report at the 1924 convention. C. P. J. Mooney, of the Memphis, Tenn., *Commercial Appeal*, was named as chairman. The other members are: W. A. Strong, *Chicago Daily News*; E. B. Piper, *Portland, Oregon, Oregonian*; Daniel Nicoll, *New York Mail*; Louis Hannoeh, *Newark Sunday Call*; Harry Chandler, *Los Angeles Times*; Elzey Roberts, *St. Louis Star*; Rowe Stewart, *Philadelphia Record*; Amon G. Carter, *Fort Worth, Texas, Star-Telegram*, and H. S. Scott, *Detroit News*.

Holland Opens Powerful Radio Stations

WHAT are claimed to be two of the most powerful radio stations in the world have just been opened at Kootwyk, Holland, and at Bandoeng, Java, in the Dutch East Indies. They are 7,500 miles apart and each occupies an area of 750 acres. The most satisfactory wave length so far determined by experiment is 8,400 meters for use after sundown. During the day better results were obtained on 16,800 meters. The stations were built by the Telefunken Company after the plans of the big wireless plant at Nauen, Germany. Politically considered, Holland may now communicate with her distant colonies independently of foreign cable connection in case of war.



The Height of Efficiency Crosley Model X—Price \$55

Clearly, distinctly, as though given in the same room, messages from W. L. W. Broadcasting Station, Crosley Mfg. Co., Cincinnati, are heard in all parts of America if a Crosley Model X—a four-tube radio frequency set—is used. This remarkable instrument, very easy to tune, simple and beautiful in construction, has repeatedly brought in messages over 4,900 miles away.

Write for Catalog Showing Complete Crosley Line

For Sale by Best Dealers Everywhere

Besides a complete assortment of receivers, Crosley manufactures parts for replacement or home construction.

Jobbers and Dealers will be interested in the Crosley Proposition.

New York Office: C. B. Cooper, 1803 Tribuna Bldg., 154 Nassau St.

Boston Office: B. H. Smith, 929 Blue Hill Ave., Dorchester.

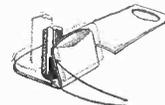
Chicago Office: 1311 Steger Bldg., 28 E. Jackson Blvd.—R. A. Stemm, Mgr.

Crosley Manufacturing Co.

5403 ALFRED ST. CINCINNATI, OHIO



Na-aid Special Socket No. 499



Na-aid De Luxe No. 400

It's the contact that counts

The dual-wipe contact strips of the Na-aid De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties this socket keeps plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

Price 75 cents

The Na-aid Special Socket No. 499 is a sturdy little socket for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect these sockets.

Price 50 cents

Booklet with wiring design and instructions for Hazeltine's Neutrodyne circuit, together with other selected circuits, packed with each Na-aid product or sent in exchange for cover taken from any Na-aid carton.

Alden Manufacturing Co.

Dept. L 52 Willow St. Springfield, Mass.

Cockaday Circuit TUNER COILS

Complete as per specifications

No. 18 Wire Used—D Coil Bankwound. Price, \$2.75

Dealers, Communicate

Eastern Radio Mfg. Co.
22 Warren St., New York, N. Y.

Barclay 6807

Guaranteed—1/2 and 6 Volt Detector and Amplifier Tubes. Best makes at lowest prices, \$2.00 up. Wholesale and Retail. Goods shipped same day order received.

PAULA RADIO COMPANY

233 W. 34th St. New York City

VOLUME THREE OF
RADIO WORLD

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

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May 19, 1923

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From Nova Scotia to Los Angeles with This Two Tube Set

By A. D. Turnbull

SEEING various diagrams and circuits that many of your readers send in I thought perhaps they would be interested in my two tube receiver with which I have done some very fine work. It is simple and very selective and besides being sensitive, it does not need an electrical engineer to figure it out or work it.

It can be seen from the illustration that it is a combination of the single circuit regenerative circuit with one stage of tuned radio-frequency. The variable condenser in the antenna circuit is an A. B. C. 23 plate, but any other good one will do. The tuning inductance in my set is a variometer with 50 turns on both stator and rotor. This variometer is split using the unit as a coupler, the rotor being used as a tickler and the stator as antenna inductance, the fine tuning being accomplished by means of the antenna condenser. I have found that it is best to buy the variometer and then separate the connections between the rotor and stator, rather than make your own as besides being a hard job, the variometers you purchase are always more reliable as to workmanship—that is unless you have a lathe, can turn your stator out and make a former to wind the wire on.

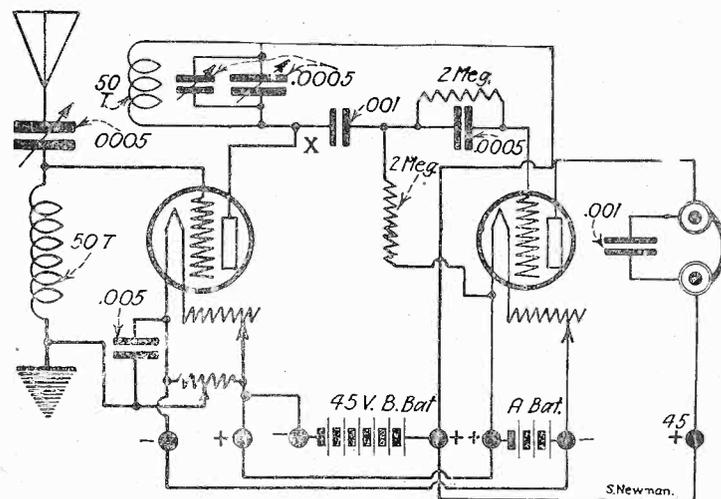
A Canadian R-215A dry cell tube is used, with a Klosner 200 ohm potentiometer across the filament lead of the first tube. I have experimented with both the common A leads, and separate batteries for each tube, and find that the difference is so slight that it does not matter. I advise using one battery so as to save both trouble in wiring and also the expense of a separate set of batteries. For good work a very fine control rheostat should be used, preferably one of the carbon unit type, such as the Bradleystat. This is one of the most important controls of the entire circuit and it is absolutely necessary to good work that fine control of the filament current be had.

Although this circuit will give wonderful results on 45, I have found it necessary to use higher voltage, especially when doing real distance work. Then sixty volts should be used on the plate.

The fixed condensers are all mica insulated and should be the best you can buy as you will benefit much more by using good apparatus in this circuit as well as any other.

The values of the different condensers are as follows: Phone condenser .001mfd.; grid, .0002mfd.; potentiometer-filament condenser, .005mfd.; condenser in plate circuit of first tube (critical) .001mfd. The grid leaks are not at all critical, but I have found that by using the popular variable type, the best capacity can very easily be found and once found will remain constant for a given tube. This eliminates considerable tuning.

When the set is wired trace your connections and see that they are all O. K. before turning on the tubes. Then, turning the potentiometer to the negative side of the filament circuit, turn on the filaments and if oscillations are not immediately noticed reverse your rotor leads. Place your plate condenser at approximately 90°, and tune in with the antenna condenser. Outside of tuning the plate coil (rotor) to resonance by means of the condenser, the tuning on this circuit is exactly the same as any other



Two-tube circuit designed by A. D. Turnbull. It is one stage of tuned radio-frequency, in combination with a single circuit regenerative, and is remarkably selective and sensitive.

single circuit regenerative. In tuning the plate coil first get your station in and then bring it in louder with your condenser and vernier, keeping constant watch on the filament current and turning it down if the set oscillates too violently, which will destroy the brilliance and tone of the signals.

With this circuit and two dry cell tubes I have copied the following stations from Sydney, N. S., Canada:

When I say copied, I do not mean simply hearing the call, but either the whole, or part of a program. KHJ Los Angeles and 2LO London, England, are the two extremes. In between these I have copied: WOAI, WFAA, WBAP, WPA, Texas; WKAF, Denver, Colo.; WSB, Atlanta, Ga.; PWX, Havana, Cuba.

I think that with this set working properly and using the best apparatus obtainable anyone who constructs it will be pleasantly surprised at the distance he can get and the selectivity and freedom from noise which is one of the noticeable features of this little circuit.

Radiophone Broadcasting Committee, Second District, Decides on Wave Lengths Effective May 15

THE conference, composed of the members of the Radiophone Broadcasting Committee, was held at the U. S. Custom House, New York City, to inform the broadcasting interests concerning the new classifications of broadcasting stations to be hereinafter known as Classes A, B and C. The necessary requirements, together with a resume of the new plans governing broadcasting stations in the Second District was carefully gone into, and a new time schedule of operation established. The following representatives were present:

American Telephone & Telegraph Co.—A. H. Griswold, W. E. Harkness, E. Miller, R. Brown; L. Bamberger & Co.—Edgar Bamberger, W. S. Moler, J. R. Poppele; Calvary Baptist Church—George F. Koster; De Forest Radio Tel. & Tel. Co.—G. C. Crom; General Electric Co.—M. P. Rice, Harry Sadenwater; D. W. May & Co.—D. W. May, William Brough; I. R. Nelson & Co.—I. R. Nelson, Jr., R. H. Horning; New York Police Department—M. R. Brennan; Radio Corporation of America—Dr. Alfred J. Goldsmith, J. Weinberger, W. A. Graham; Westinghouse Elec. & Mfg. Co.—W. H. Easton, C. W. Horn, Charles B. Popenoe; New York City (Municipality)—R. Atchison; Peoples' Pulpit Association—H. C. Kuser; Radio Shop of Newark—H. Lubinsky; Rensselaer Polytechnic Institute—Prof. W. J. Williams; Ridgewood Times Publishing Co.—George Schubel, William Boettcher; Seventh Day Adventist Church—Dr. C. B. Haynes, L. K. Dickson; Ship Owners' Radio Service—J. B. Ferguson, D. M. Kendall; H. C. Spratley Radio Co.—H. C. Spratley; Tarrytown Radio Research Laboratory—Frederick Koenig; Union College—M. P. Rice; Wireless Phone Corporation—J. O'Connor; Western Electric Co.—O. M. Glunt, N. H. Slaughter. Observers: E. N. Davis, United Press; O. E. Dunlop, Radio Editor, New York Times; F. P. Guthrie, U. S. Shipping Board, Washington, D. C.; C. B. Cooper, C. B. Cooper Co.

The following articles of agreement were drawn up:

1. That the committee, known as the Inter-Company Radiophone Broadcastingcasting Committee of the Second District, continue its activities and that Arthur Batcheller, United States Supervisor of Radio, in charge of the Second District, remain as chairman.

2. That the hours most suitable for broadcasting are those between 9:00 a. m. and 12:00 midnight daily.

3. No experimental transmission work on radiating antennae on wave lengths between 200 and 1,000 meters will be permitted between the hours of 11:30 a. m. and 12:00 midnight, local standard time.

4. It was agreed that where a number of Class "A" stations could operate simultaneously on the same wave length without causing interference, that this practice should be permitted.

The following resolution, introduced by M. P. Rice, of the General Electric Company, seconded by Dr. Alfred N. Goldsmith, of the Radio Corporation of America, was unanimously adopted:

RESOLVED: In the judgment of the Radiophone Broadcasting Committee of the Second District, the useful operating time on all Class "B" waves is so fully occupied by suitable broadcasting station schedules that the committee respectfully petitions the Secretary of Commerce, in the public interest, that no further licenses on these wave lengths, during the time mentioned, be granted.

The following resolution introduced by W. S. Moler, of L. Bamberger & Company, seconded by A. H. Griswold, of the American Telephone & Telegraph Company, was unanimously adopted:

RESOLVED: That this conference go on record

with a rising vote of appreciation to Secretary Hoover for his efforts and the co-operation extended by Arthur Batcheller, U. S. Supervisor of Radio, in charge of the Second District, in effecting an amicable adjustment of the broadcasting situation in this district, and that a copy of this resolution be forwarded to the Secretary of Commerce and to the press.

The following time schedules of radiophone broadcasting stations was adopted:

CLASS "A" STATIONS—233 METERS

Assigned to the Radio Shop of Newark, 76 Springfield Ave., Newark, N. J., station not in operation at the present time; call letters not yet assigned.

CLASS "A" STATIONS—244 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
9:00 ¹ —11:30 ¹	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	
12:30 ² —5:30 ²	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	
10:00 ¹ —12:00 ²							WBAN
2:00 ² —5:00 ²							WBAN
7:00 ² —10:30 ²							WBAN
7:15 ² —10:45 ²	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	

CLASS "A" STATIONS—263 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
11:00 ¹ —12:45 ²							WSAP
11:00 ¹ —2:00 ²	WAAM	WAAM	WAAM	WAAM	WAAM		
12:45 ² —2:00 ²							WAAM
7:45 ² —9:30 ²						WSAP	WSAP
8:00 ² —10:30 ²	WAAM	WAAM	WAAM	WAAM		WAAM	

CLASS "A" STATIONS—273 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
11:00 ¹ —12:00 ²							WFAF
7:30 ² —9:00 ²							WRW
8:00 ² —10:00 ²		WFAF	WFAF		WFAF	WFAF	
8:00 ² —11:00 ²	WRW			WRW			

CLASS "B" STATIONS—380 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
10:25 ¹ —12:30 ²							WGY
11:55 ¹ —12:00 ²	WGY	WGY	WGY	WGY	WGY	WGY	
12:30 ² —12:50 ²	WGY	WGY	WGY	WGY	WGY	WGY	
2:00 ² —2:30 ²	WGY	WGY					
4:00 ² —5:30 ²							WGY
6:00 ² —6:30 ²	WGY	WGY	WGY	WGY			
6:00 ² —6:45 ²					WGY		
7:30 ² —9:30 ²						WGY	WGY
7:40 ² —9:45 ²						WGY	
7:40 ² —10:00 ²		WGY					
7:45 ² —9:00 ²	WGY						
7:45 ² —10:00 ²				WGY			
9:00 ² —10:30 ²	WHAZ						
9:00 ² —11:00 ²							WGY
10:30 ² —12:00 ⁴					WGY		WGY

CLASS "B" STATIONS—405 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
11:55 ¹ —12:15 ²	WDT	WDT	WDT	WDT	WDT	WDT	
2:30 ² —4:00 ²	WOR	WOR	WOR	WOR	WOR	WOR	
2:30 ² —5:00 ²							WJY
4:00 ² —6:00 ²	WJY	WJY	WJY	WJY	WJY	WJY	
6:00 ² —6:30 ²							WJY
6:15 ² —7:00 ²			WOR				
6:15 ² —7:30 ²	WOR	WOR		WOR	WOR	WOR	
7:00 ² —8:00 ²			WDT				
7:30 ² —11:00 ²					WJY		
7:30 ² —11:30 ²		WJY		WJY			
8:00 ² —11:00 ²	WOR		WOR				WOR
11:00 ² —12:00 ⁴	WDT				WDT		

CLASS "B" STATIONS—455 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
10:30 ¹ —1:00 ²							WJZ
3:00 ² —5:00 ²	Peoples' Pulpit Association—Sunday Only.						
3:00 ² —6:30 ²	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	
7:30 ² —11:30 ²	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	
8:00 ² —10:30 ²	6:30 ² —7:30 ² —Peoples' Pulpit Association—Mon. to Sat. Incl.						

CLASS "B" STATIONS—492 METERS

To be used jointly by the American Telephone & Telegraph Company Station WFAF, New York City, and Western Electric Company Station WBAY, New York City.

CLASS "C" STATIONS—360 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
9:00 ¹ —9:30 ¹	WLAW	WLAW	WLAW	WLAW	WLAW	WLAW	
9:30 ¹ —11:00 ¹	WHN	WHN	WHN	WHN	WHN	WHN	
10:30 ¹ —12:30 ²							
11:00 ¹ —12:00 ²	WBS	WBS	WBS	WBS	WBS	WBS	
12:00 ² —1:00 ²	WHN	WHN	WHN	WHN	WHN	WHN	
12:30 ² —3:00 ²							WBS
1:00 ² —2:15 ²	WBS	WBS	WBS	WBS	WBS	WBS	
2:15 ² —3:15 ²	WHN	WHN	WHN	WHN	WHN	WHN	
3:00 ² —5:00 ²							WHN
3:15 ² —3:45 ²	WLAW	WLAW	WLAW	WLAW	WLAW	WLAW	
3:45 ² —5:30 ²	WHN	WHN	WHN	WHN	WHN	WHN	
7:00 ² —7:30 ²	WLAW	WLAW	WLAW	WLAW	WLAW	WLAW	
7:30 ² —9:30 ²	WHN	WBS	WHN	WBS	WBS	WHN	
8:00 ² —9:30 ²							WQAO
8:15 ² —10:30 ²			WNJ				
9:30 ² —12:00 ⁴	WHN	WHN	WHN	WHN	WHN	WHN	WHN

NOTE: 1 means A.M.; 2 means P.M.; 3 means Noon; 4 means Midnight.

(Continued on next page)

This Compact Receiver Gets What Others Miss

By Loring Coes

IN RADIO WORLD for April 28 I notice an article on "A Compact Universal Receiver." I am enclosing two photos showing a small set employing the same circuit, which I have been using for nearly a year. It is the most consistent performer and the simplest set to operate that I have ever seen. I keep the set on the desk and when I want to find out what the other sets are missing I hook it up.

The case is an old medical vibrator case, and the panel is $4\frac{3}{4} \times 7$. Six cord jacks and two leads (A battery) make the connections. I decided to use a separate terminal for each battery connection, because the switching of polarity, especially on long waves, is sometimes a great help. I do not use a phone condenser, and no leak on broadcast stations. Over 2,000 meters call for a one meg. leak.

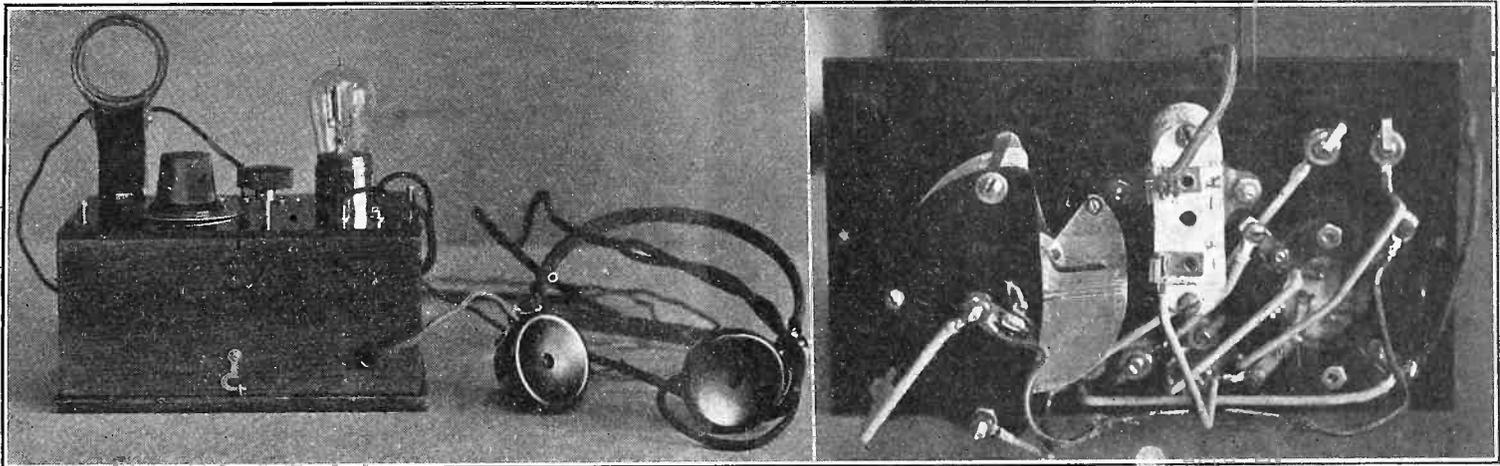
The grid condenser is mounted on the case and in

the photo the two free wires at the bottom are the connections for the leak. The rheostat is the vital factor and the connections to the honeycomb must be right.

Since the photos were made I have lined the case with 40 gauge and grounded it, which effectively kills all capacity effects.

With an aerial 110 feet long I have heard stations up to 1,800 miles distant, including WKAQ at San Juan and PWX at Havana. Kansas City, Atlanta and Chicago stations are heard regularly. Recently I constructed a similar set adding two stages AF, and the results are more than satisfactory.

I have rewired this set three times, trying each time to cut down the footage, and have finally got it down to 31 inches of bus bar without the external battery leads. I hope this may interest someone planning a similar set.



Two views of Mr. Coes's compact, simple and efficient receiving set.

Radio Makes Every Sea Captain Own Forecaster

WITHIN a short time "skippers" of ocean going vessels equipped with radio will be making their own forecasts and weather maps daily, according to Chief Forecaster Edward H. Bowie, of the U. S. Weather Bureau. This is due primarily to efficient and immediate radio service.

Since his return from a long trip on the Atlantic ocean in the French ship "Jacques Cartier," Mr. Bowie is very enthusiastic over the prospects of forecasting at sea, and urges its practice on American vessels. With the vast amount of meteorological information broadcast today from practically all large radio sta-

tions and many ships it is possible, he says, for masters of vessels to make their own forecasts and even make a daily plot of weather conditions, just as is done in the Weather Bureau in Washington. The Naval radio station at Arlington sends out daily a general report from North America and in return receives a similar report from Paris on European conditions.

Since most storms journey eastward, a "skipper" in the Atlantic knows generally what is coming' and by keeping in touch with vessels west of him he can do his own forecasting. In turn, he keeps other ships posted as to conditions in his location.

(Concluded from preceding page)

KEY TO CALL LETTERS

CLASS "A" STATIONS

- WAAM—I. R. Nelson & Company, Newark, N. Y.
- Radio Shop of Newark, Newark, N. J.
- WSAP—Seventh Day Adventist Church, New York City, N. Y.
- WFAF—H. C. Spratley Radio Company, Poughkeepsie, N. Y.
- WRW—Tarrytown Radio Research Laboratory, Tarrytown, N. Y.
- WBAN—Wireless Phone Corporation, Paterson, N. J.

CLASS "B" STATIONS

- WEAF—American Telephone and Telegraph Co., New York City, N. Y.
- WOR—L. Bamberger & Company, Newark, N. J.
- WGY—General Electric Company, Schenectady, N. Y.
- Peoples' Pulpit Association, Richmond, S. I., N. Y.
- WJZ—Radio Corp. of Amer. (Aeolian Hall), New York City, N. Y.

- WJY—Radio Corp. of Amer. (Aeolian Hall), New York City, N. Y.

- WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.
- WDT—Ship Owners' Radio Service, New York City, N. Y.
- WBAY—Western Electric Company, New York City, N. Y.

CLASS "C" STATIONS

- WQAO—Calvary Baptist Church, New York City, N. Y.
- WBS—D. W. May & Company, Newark, N. J.
- WLAW—New York Police Department, New York City, N. Y.
- WHN—Ridgewood Times Publishing Co., Brooklyn, N. Y.
- WJN—Shotton Radio Manufacturing Co., Albany, N. Y.

STATIONS TEMPORARILY OUT OF COMMISSION, THEREFORE NOT INCLUDED IN THE TIME SCHEDULE

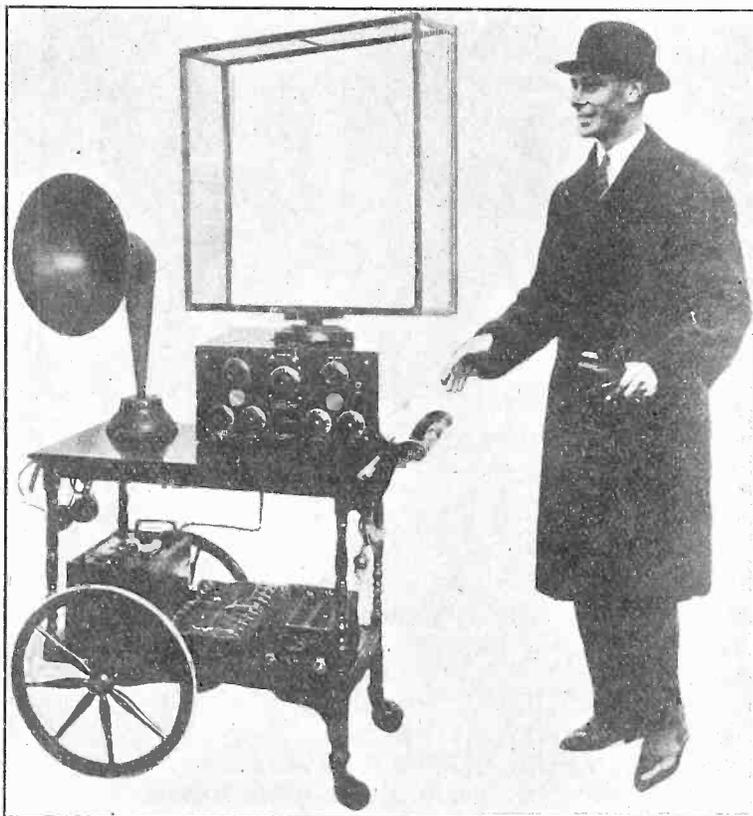
- De Forest Radio Tel. & Tel. Co., Jersey City, N. J.
- WCAB—Newburgh Daily News, Newburgh, N. Y.
- New York City (Municipality), Elmhurst, L. I., N. Y.
- WRL—Union College, Schenectady, N. Y.
- WWZ—John Wanamaker, New York City, N. Y.

Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained
in Plain Language for the New
Radio Enthusiast

By Lynn Brooks

AUDIO-FREQUENCY TRANSFORMER: A transformer used to step up the small amounts of current flowing in the detector circuit. It consists of an iron or steel core, generally taking the shape of a square and surrounding the coil entirely, with a center bar of laminated iron or steel running through the winding. The primary is wound



(C. Underwood and Underwood)

The Duke of York and the de luxe receiver he acquired as a wedding present from New York. The set is a portabloop receiver and all the trimmings are of gold. It is mounted on a mahogany teacart and is complete in all details even to having a charger for the storage battery underneath.

over this center core, using very fine wire and waxed or impregnated paper between layers. Then over this primary is wound the secondary. Upon the ratio depends the number of turns that are wound upon this coil. Most transformers run about five to one, meaning that there is a ratio of five turns on the secondary to one on the primary. Some transformers run lower than this, having a ratio of three to one, and some run as high as twelve to one. These high-ratio transformers are not used much in anything but the first step. A transformer of nine to one in the first step and then three to one in the second step is the usual method of procedure. This does not apply for all cases, as with some tubes better results are obtained if transformers of fairly low ratio are used through the entire circuit.

B BATTERY: In order properly to operate a tube detector, or amplifier, it is absolutely essential that there be some means of putting a fairly high positive potential on the plate. The most common and economical way of doing this is to supply the circuit with high voltage from a series of small cells hooked or connected in series. It is well known that when cells are hooked in series that the voltage (pressure) varies as the number of cells, but the amperage remains that of any one of the cells in the group. The most common method of dealing with the battery problem has been to connect in series a number (generally 15) of very small dry batteries, setting them in an impregnated cardboard box and pouring melted compound around them to make them solid. The life of such a battery is necessarily limited, but even at that it is surprisingly long, a series of cells often lasting from nine months to a year, using the set for a couple of hours per evening. This is easily understood, however, when it is stated that, for most tubes, the plate will not use more than .6 or .8 milliamperes at the most, which is a very small amount. In storage cells (which have the advantage of always being charged if a little care is taken) there are 10 or 20 cells hooked in series, depending upon the voltage desired. These cells are exact replicas of their larger and more powerful brothers, the only difference being the plate surface, which is the governing factor of a battery's amperage or power feature. With these batteries it is, of course, not necessary to throw the battery away when it is run down, but it is necessary to recharge it through the agency of a rectifier if A. C. current is used, or a bank of lamps if D. C. current is at hand.

A BATTERY. In order to heat the filament of a tube some method of bringing the filament to incandescence must be available. This is because of the fact that, when the filament is heated, it has the property of throwing off electrons, which, as stated in a previous issue, perform the action of taxis for the electrical impulses that are waiting to jump across to the plate. If the tube used is of the six-volt type you must use a battery that will furnish sufficient current to heat the filament, and at the same time use one that will last. That is the reason for using the storage battery. It will furnish the desired current and give better and longer service than the dry cell, although four dry cells in series will furnish the tube with sufficient current to light it. The determining factor in this case is time and expense. With a storage battery the initial expense is ten or fifteen times as great as the dry cells, but when it is considered that, with the dry cells, you would probably get about 25 or 30 active hours' service you can easily see that the constant replenishing of the cells would be of greater eventual expense than the original cost of the storage cell. With the popular dry cell, or 1½-volt tube, it is a much easier matter to supply the filament current. The most common method is to use three to six dry cells hooked in parallel, the voltage remaining constantly 1½, but having the advantage of heavy amperage and consequently longer use. The new tubes consume very little current, using from .2 to as low as .06 ampere on some of the tubes.

PORTABLE SETS: During the summer months the portable sets come into great use. Now that the small tubes have become popular and do not necessitate large batteries it is possible to incorporate tube sets where it was only possible to take crystal sets heretofore. The filament can be supplied from three flashlight cells in series, and the plate battery from a small bloc-type, high-voltage battery.

VARIOMETER: A continuous inductance, the tuning of which is accomplished by tuning a rotor inside of the stator. The principle on which this apparatus works is that with two coils, the windings of which run concentrically, the inductance effect is minimum, as the induction field in each helps the other. As the rotor is turned, this field in each coil interferes with the other and the wave length to which the coils will correspond is raised. When the induction fields of both coils directly oppose each other the maximum is reached.

A Radiophone and Receiving Set Combined

By Carl Masson

WHEN the wave of radiophone popularity swept the world a little over a year ago, many new radio amateurs were born. First they were content with simple crystal receiving sets, but every real radio bug soon outgrows his first set, and that is why radio dealers are finding a new demand for parts comprised in the advanced V. T. circuits.

No doubt many of the "new arrivals" are now "dyed in the wool" to such an extent that they are contem-

a radiophone is because of the great expense and complicated apparatus usually attached to it. I am sure that this article overcomes both of these objections.

The drawings show a radio telephone capable of transmitting the voice a distance of 5 miles under good conditions. This outfit also has another advantage: It also may be used as a receiving set without any changes. The operator can hear the incoming signals while talking. He also can tell when the transmitter is properly tuned, as he can hear his own voice in the phones.

Now to get to the constructional details of the outfit. The panel should be of bakelite, or some other insulating material that is equally as good, and should measure 12x12x3/16 inches. This is supported by a wooden base. A single slide tuner serves as the inductance although, if desired, the constructor can wind a coil, taking taps to a switch on the panel, which may be more convenient. The coil should be about 12 inches long, 5 inches in diameter and wound with No. 28 D. C. C. wire, taking taps at every tenth turn.

The microphone is of the ordinary type. If desired, the hand style may be supplemented in place of the mounted one. The variable condensers, as stated in the circuit, are .001 mfd. in capacity.

The grid leak can be easily home-made. A piece of thin cardboard, 2 inches long and 1/8 inch wide should be soaked in India ink and mounted on a small block, with binding posts at each end.

The rheostat is the 10 ohm filament type. The V. T. is one of the "hard" type. One of the amplifying type of standard makes will serve quite well.

The plate voltage is obtained by connecting six 22 1/2 volt "B" batteries in series, making a total of 135 volts. Although these "B" batteries are quite expensive, they will last a reasonable length of time. The filament

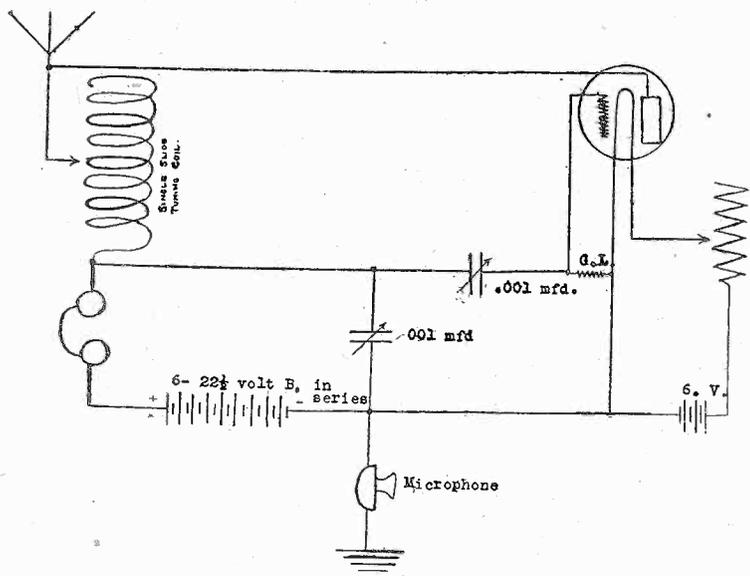


Fig. 1—Circuit diagram for a combined receiver and transmitter. When constructing this set it is best to use either a five-watt tube or one of the hard tubes, as better results will be secured.

plating the construction of a transmitting outfit. It is for the benefits of such amateurs that this article is written.

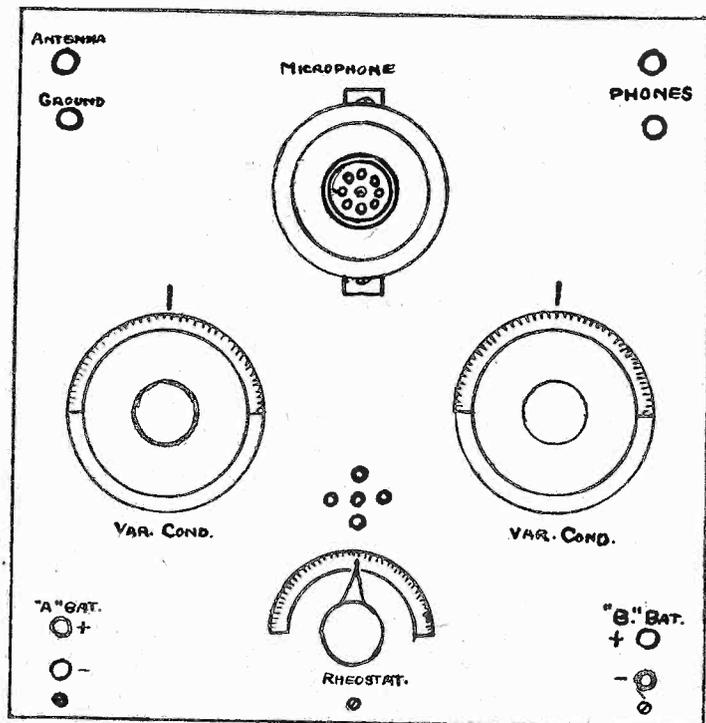


Fig. 2—Front and rear views of the panel, showing layout. The tuner is set because when transmitting a certain wave length is desired. For receiving, fine tuning can be accomplished with the condensers.

While many old timers may prefer the dot and dash method of ether communication, I believe the modern amateur who was born with the radiophone will naturally uphold it. The real reason why many amateur transmitters have turned their backs on constructing

voltage is the regular six volts—preferably from a storage battery.

The phones should always remain in the circuit while the outfit is in operation. They are connected between
(Concluded on page 14)

Broadcasters Number 590—Name Wave Assignments

By *Washington R. Service*

WASHINGTON—The process of allocating new wave lengths and re-classifying radio broadcasting stations is a slow one. Department of Commerce radio officials do not expect to be able to issue a complete list of the three classes of stations with their wave lengths after May 15.

On May 4 there was a total of 590 broadcasting stations, including 32 A, 30 B and 528 C stations. During the last month 23 new stations were licensed, 10 were transferred from Class C on 360 meters to Class A, and 14 were dropped from the department's lists.

Sixteen new stations in eleven different states were licensed during the past week. Among them were two churches, two colleges, a high school, a military unit and a newspaper.

16 New Class A Supplemental List of Limited Commercial Broadcasting Stations Licensed.

Call	Station	Frequency Kcs	Wave Length Meters	Power Watts
K F G M	Abilene Daily Reporter, Abilene, Texas.....	1290	233	100
K F H F	Central Christian Church, Shreveport, La.....	1130	266	150
K F G P	Cheney Radio Co., Cheney, Kansas	1310	229	10
K F H I	Dixon, Charles V., Wichita, Kansas	1340	224	20
K F G V	Heidbreder Radio Supply Co., Utica, Neb.....	1340	224	10
K F G C	Louisiana State University, Baton Rouge, La.....	1180	254	100
K F F X	McGraw Co., The, Omaha, Neb.	1080	278	250
K F G J	National Guard Missouri, 138th Infantry, St. Louis, Mo.	1130	266	100
K F H C	University of Oklahoma, Norman, Okla.....	1180	254	20
K F H D	Utz Electric Co., St. Joseph, Mo.	1130	226	10
W A B D	Parker High School, Dayton, Ohio.....	1060	286	10
K F G Q	Crary Hardware Co., Boone, Iowa	1330	226	20

Call	Station	Frequency Kcs	Wave Length Meters	Power Watts
K F G Z	Emanuel Missionary Co., Berrien Springs, Mich.....	1120	268	10
K F G X	First Presbyterian Church, Orange, Texas.....	1200	250	500
K F G Y	Gjelhaug's Radio Shop, Baudette, Minn.....	1340	224	20
K F I C	Laskowitz, Philip, Denver, Colo.	1340	224	15

Broadcasters Transferred from Class C to Class A.

W N A X	Dakota Radio Apparatus Co., Yankton, S. D.....	1230	244	100
W K A W	Turner Cycle Co., Beloit, Wis.	1240	242	10
W J D	Howe, Richard Harris, Granville, Ohio.....	1310	229	50
W D A Y	Fargo Radio Service Co., Fargo, N. D.....	1230	244	50
W G A U	Limb, Marcus G., Wooster, Ohio	1330	226	20
W I A Y	Fox River Valley Radio Supply Co., Neenah, Wis.....	1340	224	100
W J A N	Peoria Star Co., Peoria, Ill.	1070	280	100
W R A N	Black Hawk Electrical Co., Waterloo, Iowa.....	1310	229	20
W T A S	Erbstein, Chas. E., Elgin, Ill.	1090	275	500
K F E R	Auto Electric Service Co., Ft. Dodge, Iowa.....	1300	231	10

List of 14 Broadcasting Stations Deleted.

Call	Station
W G A T	American Legion, Dept. of Neb., Lincoln, Neb.
K D Z A	Arizona Daily Star, Tucson, Ariz.
W F A Y	Daniels Radio Supply Co., Independence, Kan.
W B N G	Diamond State Fibre Co., Bridgeport, Pa.
K L B	Dunn, J. J. & Co., Pasadena, Calif.
W I A Z	Electrical Supply Sales Co., Miami, Fla.
K D Z Z	Kinney Bros. & Sipprell, Everett, Wash.
W G A K	Macon Elect. Co., Macon, Ga.
W N A K	Manhattan Radio Supply Co., Manhattan, Kan.
W O Z	Palladium Printing Co., Richmond, Ind.
K Z C	Public Market & Department Stores, Inc., Seattle, Wash.
W S A S	State of Nebraska, Dept. of Agri., Lincoln, Neb.
W P A X	S-W Radio Co., Thomasville, Ga.
W P A V	Tinetti & Sons, Paul, Laurium, Mich.

First Portable Radio Set Using Flashlight Batteries

A COMPACT, self-contained portable radio receiving set which can be carried as easily as a suit case, which requires only flashlight batteries for the filaments of the tubes and which weighs less than 18 pounds, has been perfected by the General Electric Company for the Radio Corporation of America. An outstanding feature of this set, adding to its portability and desirability for camping trips, is the fact that the new radiotrons UV-199 are used which require only 60 milliamperes (.06 amperes) filament current per tube.

This new outfit, known as the Radiola II, will receive radio messages over a range from 200 to 600 meters for a distance as great as any set having a detector and one stage of amplification. It is housed in a mahogany cabinet with hinged front and rear covers. Head telephones with plug attached are clamped on the in-

side of the front cover. Provision is made in the rear cover for batteries in such a way that they can be easily exchanged. The set is so designed as to make a neat appearance in the home. The front cover can be readily detached.

Radiola II comprises a regenerative receiver with a vacuum tube detector and one stage of audio frequency amplification. The circuit is very efficient and will operate a loud speaker on signals received from nearby stations. With an additional amplifier, it can be used to obtain loud speaker signals from distant stations.

For portable use the filament current is supplied from two 3-cell, 4½ volt flashlight batteries in parallel, and the plate or "B" battery current is supplied by two 22½ volt batteries connected in series. For home use, when weight and portability are not essential, larger batteries for filament and plate current can be used.

An Improved Grimes Reflex Circuit

By W. S. Thompson, E. E.

NOW that winter is over and summer nearly here the radio fan can expect that atmospheric conditions will make receiving difficult. In fact, the author has found that, even at present, disturbance is very noticeable at times, making the use of a loop for picking up signals necessary for good reception. The hook-up given in Fig. 1 is for a reflex circuit, which will enable the user to get a good range even when atmospheric conditions are at their worst.

Since writing the two articles on reflex circuits, published some time ago in RADIO WORLD, I have tried out several new ideas, which have been developed since that time, and have found that the set herein described gives the finest results, and to me is the best reflex I have ever heard. The main points wherein this hook-up differs from those previously described are: The order in which the tubes are used as audio-frequency amplifiers and the method of preventing the tubes from oscillating. It will be noticed that the third tube is used as the third stage of radio-frequency

leak through the detector are impressed upon the grid of the first or second tube and are again amplified at radio-frequency. This state of affairs causes the set to oscillate, making stabilization very difficult. It should also be noted that, in the Grimes method, the leakage radio-frequency waves go through only one stage of radio-frequency before going to the detector, thus eliminating a factor which tends to cause the tubes to oscillate, making the set very stable. A third advantage lies in the fact that the heaviest audio-frequency currents are impressed upon the grid of a tube which does not receive the heaviest radio-frequency currents. This equalizes the load carried by each tube, so there is no chance of one tube becoming paralyzed due to an overload.

Still another advantage lies in the way the by-pass condensers are connected, for they by-pass the radio-frequency waves around, not only the audio-frequency transformers, but also the "B" battery. This keeps the audio- and radio-frequency waves more completely separated, and again

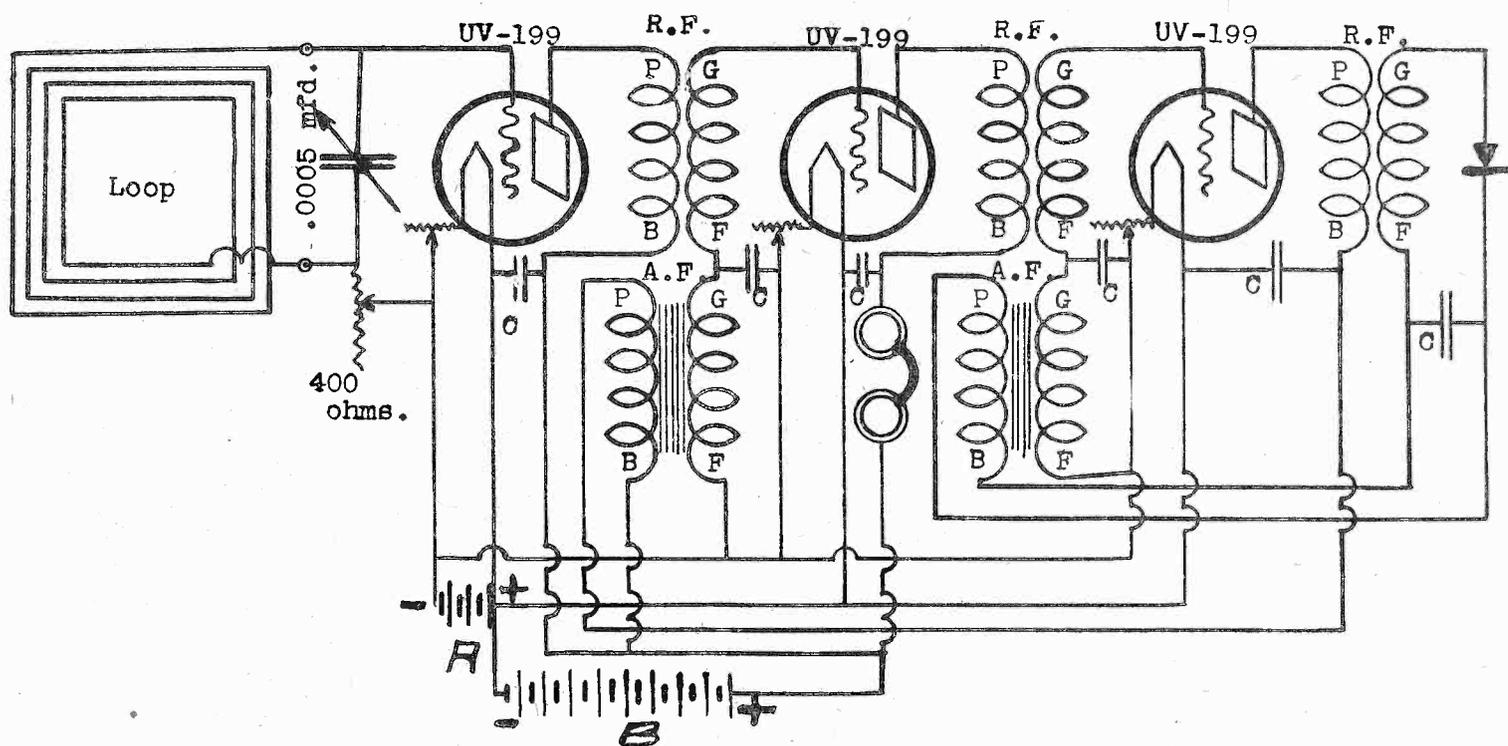


Fig. 1. Hook-up of Mr. Thompson's improved Grimes reflex circuit.

amplification and as the first stage of audio-frequency amplification, while the second tube is the second stage of both audio- and radio-frequency amplification. Credit for this arrangement is due to Mr. David Grimes, of Staten Island, New York, who has developed this method of reflexing signals.

The advantages of this new development are very important when the elimination of static and other forms of interference are considered. It should be noted that any outside noise, such as an induction hum from power lines, will be amplified in audio-frequency through several tubes and then go to the phones in the straight reflex circuit; while in this type there are no stages of audio-frequency amplification in cascade between the loop and the phones. In addition the first stages of radio-frequency amplification tend to strain out any 60-cycle hum which may be picked up by the loop. This fact in itself is a big advantage over the La Tour circuit; but, in addition, there are several other advantages which are equally important. In the previous hook-ups shown any radio-frequency waves which

reduces the tendency towards oscillating tubes. The stabilizer, which consists of a 400-ohm potentiometer connected in the grid circuit of the first tube, will allow the set to pick up local broadcasters without any difficulty, due to oscillating tubes. This means of stabilizing gives an undistorted amplification, which is sometimes difficult to obtain when stabilizing by changing the normal potential of the grid.

A disadvantage of the Grimes circuit, which has been overcome in the hook-up shown in Fig. 1, is that the maximum audio-frequency currents were impressed upon the grid of the first radio-frequency amplifying tube, thus making it less sensitive to weak radio-frequency waves. By placing one stage of pure radio-frequency amplification before the reflex tubes the second tube is better able to amplify both waves. Another advantage lies in replacing the tube detector with the crystal, for, in addition to the advantages of a crystal as a detector, it has a particular advantage in this circuit because the radio-frequency leak-

(Continued on next page)

Radio Personnel in Navy Totals 2,419

By Carl H. Butman

AN exhaustive study of the radio personnel situation in the Navy is now under way both afloat and ashore, in an effort to increase the efficiency of Naval Communications. Some of the less important shore establishments have been closed and the personnel sent to busy stations where shortages existed or to ships at sea which were in need of new operators and experienced radio men.

The training of radio men now in Naval schools is to be pushed, it is understood, with a hope of relieving all shortages by July 1. Previously all third class radio men were at once assigned to fleet work for military training, with the result that the ships-of-war were deprived of a number of higher rates, including first class men and chiefs. This matter is now being adjusted so that some third class men will be assigned to shore duty. In the near future many transfers will be made between the fleets and shore stations to adjust the situation.

On March 31 there were 2,419 radio men in the Naval service, 463 short of the full complement. They included 466 chiefs, 421 first class, 433 second class, and 1,099 third class radio men. In view of the fact that the shortages all occur in the higher rates, over 400 men are now in line for promotion to second class rates

or higher, and prospects for their advancement are said to be good. Third class men receive \$60 per month; second class, \$72; first class, \$84, and chiefs from \$99 to \$126.

At the Navy's five shore radio training stations, 612 men are now undergoing instruction. The largest training school is at Great Lakes, Mich., where over 400 men are studying, the balance of the students being distributed between Hampton Roads and San Francisco, while eight men specializing in sound work are at New London, Conn. The education of these men in modern radio operation and new developments goes on continually, even after they are rated. A recent report from the Charleston district states that study and training in communication instruction and regulations, traffic and text books on several phases of the radio telephone and telegraph arts is carried out daily.

Some idea of what the Navy is trying to achieve in efficiency is gained from a statement of "deficiencies" in communication, which relates that out of 130,942 official messages, not including routine broadcasts for other departments, 26 mistakes were charged to the Naval radio service. These included undue delays, incorrect routing and errors in coding and decoding over a period of eight months.

Catches a Stray Radio Concert

By Will M. Cressy

BEING probably the only he-human-being in the United States over six years old who is not an expert on radio, I do not know whether this happening possesses any interest to you or your readers; but it sure struck me as being strange, to say the least.

At the Orpheum Theatre, Des Moines, Ia., there is a telephone that runs from the stage to the box office. It

goes nowhere else; has no connection with any other wires running outside the building.

The other night I took the receiver down from the phone on the stage to call up the box office. And for the next ten minutes we listened to as fine a radio concert as one could wish.

I do not know where it came from, where it was going, or how it got on to that wire. Perhaps you do.

(Continued from preceding page)

age through the crystal is very much less than through a tube, hence making the circuit more stable. The advantages of reception in using a loop have been discussed previously, so it will be sufficient to say that static will not interfere with signals as much as when using an outdoor antenna. The loop recommended for this set consists of 20 turns of No. 18 wire wound on a two-foot loop, tuning with a .0005 mfd. condenser.

The best tube to use is the new U.V.-199, which has recently been released for sale. The internal grid-plate capacity of this tube is very small, hence making it well adapted for radio-frequency amplification, and having less tendency to oscillate. When using any tube as an amplifier the best results are usually obtained when the grid is kept negative with respect to the filament. This always holds true if a high plate potential is used, so the filament rheostat of each tube should be connected in the negative lead from the filament battery. By this means the resistance of the rheostat can be used to govern the potential of the grid. When using the U.V.-199 care should be taken that the filament rheostat has enough resistance to prevent excessive currents through the filament.

If a six-volt storage battery is to be used the resistance of the rheostats should be at least 60 ohms, although 30 ohms would be sufficient if three dry cells are used for filament lighting. In hooking up the set the experimenter

should note carefully the connections for the by-pass condensers, marked "C" in Fig. 1. These condensers should have a capacity of about .002 mfd. for best results. The correct voltage for the "B" battery is about 100 volts because the tube recommended will give very satisfactory results when this voltage is used. The potentiometer in the grid circuit of the first tube has one terminal connected to the tuning condenser and the other terminal left free, the movable blade being connected to the minus side of the "A" battery, as shown.

All tuning is done with the condenser shunted around the loop, although the 400-ohm potentiometer will have to be adjusted for each station, depending upon the strength of the signal received. The use of separate rheostats for each tube is recommended for two reasons—separate control of filament brilliancy helps to stabilize the set, and because the resistance of the rheostats keeps the grid of all tubes at the proper potential. It will be found that adjustment of the filament current will be more critical with the U.V.-199 than with other hard amplifying tubes, making the use of separate rheostats advisable. Care should be taken in purchasing radio transformers that the wave length range is broad enough to cover the new broadcasting wave lengths recently assigned. It is recommended that the interchangeable type transformer be used so that higher wave lengths can be reached by plugging in a different set of transformers.

The Radio Mother *By Henry Gillen*

(Courtesy of the Boston Post)

We never could educate mother
 To give up her old-fashioned way;
 A little black bonnet with lavender on it,
 And a shawl—she was dressed for the day;
 The movies she found too exciting
 And dances too fancy by far;
 She always contended the evening well ended
 In making a muffler for pa.

The folks looked too fine at the opera,
 The automobile was too fast;
 At every new wrinkle her bright eyes would twinkle—
 We knew that the die had been cast;

When every one else was out sporting,
 And dad had come home from the fights,
 We found her there "knittin'" and stroking the kitten,
 Until she had put out the lights.

But now when the house is all quiet,
 And sewing is hurting her eyes,
 She listens to singing the ether is flinging
 In mystical waves through the skies;
 The crystal receiver won't do her;
 She has passed to a triple-tube set,
 And has picked up Chicago, but that is not far though;
 She hopes to get Seattle yet.

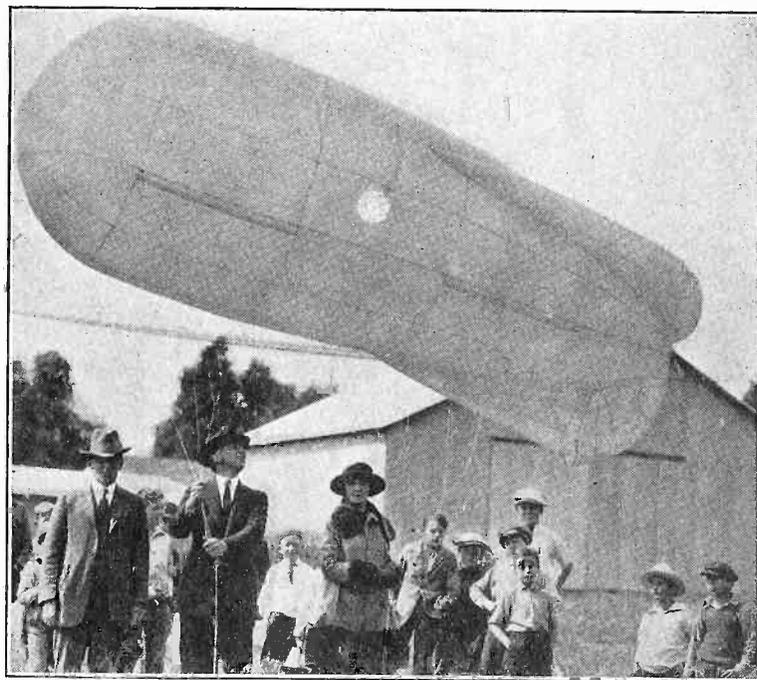
Standard Radio Waves To Be Transmitted from Washington, D. C.

THE Bureau of Standards at Washington, D. C., (Station WWV), transmitted radio signals of standard frequency on the evenings of May 1 and May 7, starting at 11:00 p. m., Eastern Standard Time. The range of frequencies was from 500 to 1,000 kilocycles, corresponding to 600 to 300 meters. It is expected that within the next few weeks higher frequencies will be transmitted to include the waves used by amateurs. These standard frequency signals are intended to be used for standardizing wave meters and adjusting transmitting and receiving apparatus. The proper adjustment of such apparatus is particularly important in connection with the re-allocation of waves as recommended by the Second Radio Conference held in Washington in March, 1923. Considerable interest has been shown in other schedules of such signals which have been transmitted recently from WWV. The schedule of the transmission for both evenings is given below:

Time	Signal	Frequency, Kilocycles per Second	Approximate Wave Length, Meters.
11:00 to 11:04 p.m.	General Call	500	600
11:04 to 11:08 p.m.	Standard Frequency		
11:08 to 11:11 p.m.	Announcement		
11:15 to 11:19 p.m.	General Call	600	500
11:19 to 11:23 p.m.	Standard Frequency		
11:23 to 11:26 p.m.	Announcement		
11:30 to 11:34 p.m.	General Call	700	428
11:34 to 11:38 p.m.	Standard Frequency		
11:38 to 11:41 p.m.	Announcements		
11:45 to 11:49 p.m.	General Call	800	375
11:49 to 11:53 p.m.	Standard Frequency		
11:53 to 11:56 p.m.	Announcement		
12:00 to 12:04 a.m.	General Call	900	333
12:04 to 12:08 a.m.	Standard Frequency		
12:08 to 12:11 a.m.	Announcement		
12:15 to 12:19 a.m.	General Call	1,000	300
12:19 to 12:23 a.m.	Standard Frequency		
12:23 to 12:26 a.m.	Announcement		

The "general call" was given by voice during the first half of the four minute period and by continuous wave telegraph during the second half. This was done to enable listeners to tune in WWV. The "standard frequency signals" consisted of the call letters WWV (. — — . — — . . . —) repeated with very long dashes intervening and were transmitted by unmodulated continuous waves. The "announcements" were made by

voice during the first half of the period and by CW telegraphy during the latter half. The general call and the announcements were on the same frequency as the standard frequency signals. Details regarding the utilization of these signals may be obtained upon application to the Bureau of Standards.



(C. P. and A. Photos)
 R. W. Coburn and Roy Knabenshue, the aeronautical expert, recently constructed a model balloon on which to suspend their antenna, thus eliminating many disturbances, they claim. The balloon is 14 feet long and holds 150 cubic feet of hydrogen gas.

Coming! New List of Broadcasters!

While the Department of Commerce has assigned wave lengths for each of the broadcasting zones established by the recent Second National Radio Conference, individual assignments of station wave lengths have not been completed. They are being arranged as rapidly as possible and as soon as finished **A COMPLETE, UP-TO-DATE LIST OF BROADCASTERS** will be published by **RADIO WORLD**.

The allocation of wave lengths for 16 new Class A stations appears in this issue of **RADIO WORLD**.

To Use Kilocycles For Designating Radio Waves

THE Second National Radio Conference, which met with Secretary Hoover in March, introduced a method of designating radio waves which is somewhat new to the radio public. This is the use of frequency in kilocycles (abbreviated kc) instead of wave length in meters. The advantages of this practice have been familiar to radio engineers for some time, and it is probable that it will eventually replace the use of wave length in meters. As a matter of fact, wave length is a somewhat artificial conception in the handling of radio apparatus and is one of the difficult things for the beginner to understand. The frequency of the radio wave is the same as the frequency of the alternating current which flows in the radio transmitting or receiving set.

As often happens in technical matters, the idea of "kilocycles" is simpler than the forbidding aspect of the

of wave lengths from 150 to 200 meters, but this is a frequency band from 2000 to 1500 kilocycles. This is an enormously wider band when considered from the viewpoint of kilocycles than, for example, the band having the same width in meters from 1000 to 1050 meters, which is 300 to 286 kilocycles. While it is possible to carry on fifty simultaneous radio telephone communications between 150 and 200 meters, only one could be carried on between 1000 and 1050 meters.

In accordance with the recommendation of the Second National Radio Conference, the Department of Commerce and other Government departments will hereafter follow the practice of specifying in even values of kilocycles rather than meters. The conference recommended the practice of expressing wave frequency in kilocycles per second with wave length in meters in parentheses thereafter. The relation be-

KILOCYCLES TO METERS, OR METERS TO KILOCYCLES

10	29980	490	611.9	970	309.1	1450	206.8	1930	155.3	2410	124.4	2930	102.3	3900	76.82	4940	60.69	7450	40.24
20	14990	500	599.6	980	305.9	1460	205.4	1940	154.5	2420	123.9	2940	102.0	3920	76.46	4950	60.45	7500	39.98
30	9994	510	587.9	990	302.8	1470	204.0	1950	153.8	2430	123.4	2950	101.6	3940	76.10	4960	60.20	7550	39.71
40	7496	520	576.6	1000	299.8	1480	202.6	1960	153.0	2440	122.9	2960	101.3	3960	75.71	5000	59.96	7600	39.45
50	5996	530	565.7	1010	296.9	1490	201.2	1970	152.2	2450	122.4	2970	100.9	3980	75.32	5050	59.71	7650	39.19
60	4997	540	555.2	1020	295.9	1500	199.9	1980	151.4	2460	121.9	2980	100.6	4000	74.96	5100	59.46	7700	38.94
70	4233	550	545.1	1030	291.1	1510	198.6	1990	150.7	2470	121.4	2990	100.3	4020	74.58	5150	59.22	7750	38.69
80	3748	550	535.4	1040	288.3	1520	197.2	2000	149.9	2480	120.9	3000	99.94	4040	74.21	5200	58.97	7800	38.44
90	3331	570	526.0	1050	285.5	1530	196.0	2010	149.2	2490	120.4	3020	99.28	4060	73.85	5250	58.71	7850	38.19
100	2998	580	516.9	1060	282.8	1540	194.7	2020	148.4	2500	119.9	3040	98.62	4080	73.49	5300	58.46	7900	37.95
110	2726	590	508.2	1070	280.2	1550	193.4	2030	147.7	2510	119.5	3060	97.98	4100	73.13	5350	58.20	7950	37.71
120	2499	600	499.7	1080	277.6	1560	192.2	2040	147.0	2520	119.0	3080	97.34	4120	72.77	5400	57.95	8000	37.48
130	2306	610	491.5	1090	275.1	1570	191.0	2050	146.3	2530	118.5	3100	96.72	4140	72.42	5450	57.69	8050	37.25
140	2142	620	483.6	1100	272.6	1580	189.8	2060	145.5	2540	118.0	3120	96.10	4160	72.07	5500	57.44	8100	37.02
150	1999	630	475.9	1110	270.1	1590	188.6	2070	144.8	2550	117.6	3140	95.48	4180	71.73	5550	57.18	8150	36.79
160	1874	640	468.5	1120	267.7	1600	187.4	2080	144.1	2560	117.1	3160	94.88	4200	71.39	5600	56.93	8200	36.56
170	1764	650	461.3	1130	265.3	1610	186.2	2090	143.5	2570	116.7	3180	94.28	4220	71.05	5650	56.67	8250	36.34
180	1666	660	454.3	1140	263.0	1620	185.1	2100	142.8	2580	116.2	3200	93.69	4240	70.71	5700	56.42	8300	36.12
190	1578	670	447.5	1150	260.7	1630	183.9	2110	142.1	2590	115.8	3220	93.11	4260	70.38	5750	56.17	8350	35.91
200	1499	680	440.9	1160	258.5	1640	182.8	2120	141.4	2600	115.3	3240	92.54	4280	70.05	5800	55.92	8400	35.69
210	1428	690	434.5	1170	256.3	1650	181.7	2130	140.8	2610	114.9	3260	91.97	4300	69.73	5850	55.67	8450	35.48
220	1363	700	428.3	1180	254.1	1660	180.6	2140	140.1	2620	114.4	3280	91.41	4320	69.40	5900	55.42	8500	35.27
230	1304	710	422.3	1190	252.0	1670	179.5	2150	139.5	2630	113.9	3300	90.86	4340	69.08	5950	55.17	8550	35.07
240	1249	720	416.4	1200	249.9	1680	178.5	2160	138.8	2640	113.6	3320	90.31	4360	68.77	6000	54.92	8600	34.86
250	1199	730	410.7	1210	247.8	1690	177.4	2170	138.1	2650	113.1	3340	89.77	4380	68.45	6050	54.67	8650	34.66
260	1153	740	405.2	1220	245.8	1700	176.4	2180	137.5	2660	112.7	3360	89.23	4400	68.14	6100	54.42	8700	34.46
270	1110	750	399.8	1230	243.8	1710	175.3	2190	136.9	2670	112.3	3380	88.70	4420	67.83	6150	54.17	8750	34.27
280	1071	760	394.5	1240	241.8	1720	174.3	2200	136.3	2680	111.9	3400	88.17	4440	67.53	6200	53.92	8800	34.07
290	1034	770	389.4	1250	239.9	1730	173.3	2210	135.7	2690	111.5	3420	87.67	4460	67.22	6250	53.67	8850	33.88
300	999.4	780	384.4	1260	238.0	1740	172.3	2220	135.1	2700	111.0	3440	87.16	4480	66.91	6300	53.42	8900	33.69
310	967.2	790	379.5	1270	236.1	1750	171.3	2230	134.4	2710	110.6	3460	86.65	4500	66.63	6350	53.17	8950	33.50
320	936.9	800	374.8	1280	234.2	1760	170.4	2240	133.8	2720	110.2	3480	86.16	4520	66.33	6400	52.92	9000	33.31
330	908.6	810	370.2	1290	232.4	1770	169.4	2250	133.3	2730	109.8	3500	85.66	4540	66.04	6450	52.67	9050	33.13
340	881.8	820	365.6	1300	230.6	1780	168.4	2260	132.7	2740	109.4	3520	85.18	4560	65.75	6500	52.42	9100	32.95
350	856.6	830	361.2	1310	228.9	1790	167.5	2270	132.1	2750	109.0	3540	84.70	4580	65.46	6550	52.17	9150	32.77
360	832.8	840	356.9	1320	227.1	1800	166.6	2280	131.5	2760	108.6	3560	84.22	4600	65.18	6600	51.92	9200	32.59
370	810.3	850	352.7	1330	225.4	1810	165.6	2290	130.9	2770	108.2	3580	83.75	4620	64.90	6650	51.67	9250	32.41
380	789.0	860	348.6	1340	223.7	1820	164.7	2300	130.4	2780	107.8	3600	83.28	4640	64.62	6700	51.42	9300	32.24
390	768.8	870	344.6	1350	222.1	1830	163.8	2310	129.8	2790	107.5	3620	82.82	4660	64.34	6750	51.17	9350	32.07
400	749.6	880	340.7	1360	220.4	1840	162.9	2320	129.2	2800	107.1	3640	82.37	4680	64.06	6800	50.92	9400	31.90
410	731.3	890	336.9	1370	218.8	1850	162.1	2330	128.7	2810	106.7	3660	81.92	4700	63.79	6850	50.67	9450	31.73
420	713.9	900	333.1	1380	217.3	1860	161.2	2340	128.1	2820	106.3	3680	81.47	4720	63.52	6900	50.42	9500	31.56
430	697.3	910	329.5	1390	215.7	1870	160.3	2350	127.6	2830	105.9	3700	81.03	4740	63.25	6950	50.17	9550	31.39
440	681.4	920	325.9	1400	214.2	1880	159.5	2360	127.0	2840	105.6	3720	80.60	4760	62.99	7000	50.00	9600	31.23
450	666.3	930	322.4	1410	212.6	1890	158.6	2370	126.5	2850	105.2	3740	80.17	4780	62.72	7050	49.83	9650	31.07
460	651.8	940	319.0	1420	211.1	1900	157.8	2380	126.0	2860	104.8	3760	79.74	4800	62.46	7100	49.67	9700	30.91
470	637.9	950	315.6	1430	209.7	1910	157.0	2390	125.4	2870	104.5	3780	79.32	4820	62.20	7150	49.50	9750	30.75
480	624.6	960	312.3	1440	208.2	1920	156.2	2400	124.9	2880	104.1	3800	78.90	4840	61.95	7200	49.34	9800	30.59
										2890	103.7	3820	78.49	4860	61.69	7250	49.17	9850	30.44
										2900	103.4	3840	78.08	4880	61.44	7300	48.99	9900	30.28
										2910	103.0	3860	77.67	4900	61.19	7350	48.82	9950	30.13
										2920	102.7	3880	77.27	4920	60.94	7400	48.65	10000	29.98

Table giving translation of kilocycles into meters and meters into kilocycles.

word suggests. "Kilo" means a thousand, and "cycle" means one complete alternation. The number of kilocycles indicates the number of thousands of times that the rapidly alternating current repeats its flow in either direction in the antenna in one second. The smaller the wave length in meters, the larger is the frequency in kilocycles.

The reason that kilocycles are coming into use and displacing meters is that the necessary separation of the frequency of transmitting stations to prevent interference is the same, no matter what the frequency may be. This necessary separation is variable and quite misleading when expressed in meters. Thus the number of radio messages that can be transmitted simultaneously without interference can be correctly judged from the kilocycles but not from the meters. For example, the amateurs will in the future work in a band

tween the two is very simple. To obtain kilocycles, divide 300,000 by the number of meters; to obtain meters, divide 300,000 by the number of kilocycles. For example, 100 meters—approximately 3000 kilocycles, 300 meters—1000 kilocycles, 1000 meters—300 kilocycles, 3000 meters—100 kilocycles. The accompanying table may be used for rapid and accurate conversion either from kilocycles to meters or meters to kilocycles.

For highly accurate conversion the factor 299,820 should be used instead of 300,000. The table herewith gives accurate values of kilocycles corresponding to any number of meters and vice versa. It should be particularly noticed that the table is entirely reversible; that is, for example, 50 kilocycles is 5996 meters and also 50 meters is 5996 kilocycles. The range of the table is easily extended by shifting the decimal point.

New Tube Operates From a Flashlight Battery

By C. H. Huntley

A RADIO tube which is claimed to consume 70 per cent. less current than any of the small or so-called peanut variety now being sold and the first to operate with the filament current supplied from the ordinary flashlight battery, has been perfected by the General Electric Company. It will be known as the UV-199. This new type radiotron has the X-L tungsten filament. The filament wire is extremely small, being but one-fourth the diameter of an ordinary hair. This new filament is considered practically ideal. It has the high efficiency of electron production of the coated filament and the uniformity of operation and ruggedness of the tungsten filament. It has the quietness of operation of the coated filament and a lower operating temperature than the old tungsten filament. It has the long length of the coated filament and the long life of the tungsten filament.

The wattage consumed by the filament of this tube is .18, or approximately but 1/27 of the energy used in the UV-201 tube. Yet the characteristics when used in a radio set are slightly better. The filament runs at a temperature about 400 degrees cooler than the old type of radiotron tube.

This radiotron might almost be termed "the tube with nine lives" because if the filament is operated at too high a temperature the electron emission falls off and the tube becomes inoperative. However, by operation at rated voltage with the plate voltage off for a period of time normal electron emission can be regained. The length of time required to perfect this recovery is proportional to the length of time at which the tube was operated at abnormally high filament voltage. This does not mean that for uniformly satisfactory results careful adjustment of filament voltage is not essential. It does mean, however, that improper filament operation does not spoil the tube beyond recovery. This tube is an excellent radio-frequency amplifier, because the capacity between elements is lower than that of the UV-201-A tube.

Although the base is of the same general design as the standard four-prong base, it is of smaller diameter and the arrangement of the leads to the contact pins is different, the grid and plate contact pins being opposite rather than adjacent. This has been done to facilitate wiring and simplify connections in a multi-tube set.

This tube operates satisfactorily in all circuits which were used with the old UV-201 tube and should give slightly superior results, especially in radio-frequency amplification. Constant voltage operation of the filament is recommended. However, constant current operation does not entail the serious loss of life that followed constant current operation in the old tungsten filaments.

Work on the filament in the new tube has been going on in the Research Laboratory of the General Electric Company for more than eight years.

The UV-199 tube requires so little filament energy that the ordinary No. 6 dry cells give remarkably long service. For instance, three No. 6 dry cells in series will operate one of the UV-199 tubes one hour a day for a whole year. On a three-tube set three No. 6 dry cells will operate the tubes one hour per day for a period of over four months.

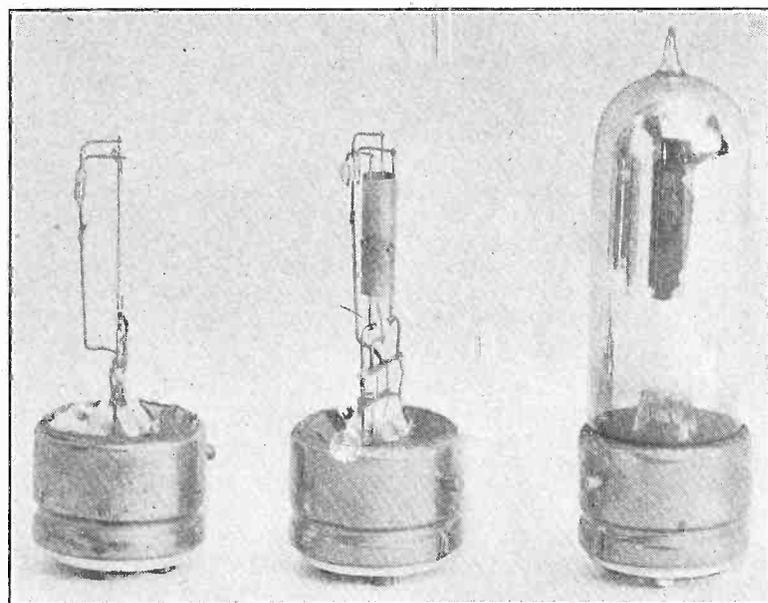
In the case of portable sets using three-cell flashlight batteries, it is recommended by the makers that one set of three flashlight cells be used for each tube in the set. It is immaterial whether each tube is wired separately to one of the batteries or whether they are

all placed in parallel, provided separate rheostat control is made for each tube. If this is not employed for each tube and only a common rheostat provided the batteries should be connected in parallel.

In common with all receiving tubes, there are certain precautions which should be observed in order to obtain satisfactory results.

The proper grid bias must be used, depending in amount upon the plate voltage employed. Under certain conditions of small interference, slight static and weak signals, a grid leak resistance as high as six to ten megohms can be employed with success. With strong signals and heavy interference a lower grid leak resistance down to possibly two megohms should be used.

It should be understood that this UV-199 tube will not deliver the energy as an amplifier that the UV-201-A will. The UV-201-A is a remarkably powerful tube and has electron emission, mutual conductance and amplification far above any other receiving tube. It



Details of new and efficient tube which operates from a flashlight battery.

must not be expected that with a filament expenditure of only .18 watt that as powerful results can be obtained as an amplifier as with the expenditure of 1.25 watts.

On account of the low filament current required by this tube it is essential to have the filament rheostat of sufficient resistance. For operation from three dry cells, the filament rheostat resistance should be at least thirty ohms per tube. If a six-volt storage battery is used, the resistance should be at least sixty ohms. In multi-tube sets the sockets for the tubes should be cushion mounted so as to minimize the effect of vibration.

With any vacuum tube, and particularly with the UV-199 tube, the changing of connections or adjustments of the wiring of the set is dangerous unless the tubes are removed from the sockets or the "B" batteries entirely disconnected. Inasmuch as many adjustments can most advantageously be made while the set is in operation, it is strongly recommended that a protective resistance be placed in one lead of the plate battery, preferably immediately next to one battery terminal. An almost ideal resistance for this purpose is a 10-watt 110-volt tungsten lamp. The UV-199 has just been placed on the market by the Radio Corporation of America.

Answers to Readers of Radio World

In regard to the reflex circuit described by Mr. C. White in RADIO WORLD for Feb. 17, will WD-11 tubes work satisfactorily in this set? What make audio-frequency transformer will work best?—Dr. J. T. Shadburne, Butler, Mo.

These tubes will work in the circuit you mention, but for volume would advise using a tube such as the U. V. 201 or U. V. 201A. Any good make of transformer will do. It is of the utmost importance in the construction of any set, and reflex sets especially, that only the best of material be incorporated. Cheap apparatus gives poor results.

* * *

When using the WD-11 as an amplifier is it necessary to put a protective fuse in the plate circuit? Will fuses in the phone lead prevent signals from coming through? Will they prevent the phones from burning out if I use 60 volts on my plate? Is 60 volts too much to use on these tubes?—Wm. Jackson, Charlotte, N. C.

It is not necessary to put protective fuses in the plate circuit as the current flowing is so small. Fuses in your phone leads should not stop you from hearing signals, but the fact that you are using 60 volts in the plate circuit should not cause you to put fuses in, unless you anticipate short circuiting your plate battery across the phones. These particular tubes will stand up to 100 volts on the plate without harming the tube. We do not understand why you want to use protective fuses in the plate circuit. They are used in the filament circuit to prevent the filament from burning out should you accidentally short circuit the B battery across the A battery leads.

* * *

I would like to get blue prints of several sets you have described in RADIO WORLD. Will you kindly advise me how I may do so?—Frank H. Dunster, 32 West 98th Street, New York City.

RADIO WORLD does not publish blue prints of sets, panel layouts or circuits, unless definitely so stated by the writer in the article. If the latter is the case, you may address a letter to him care of RADIO WORLD and it will reach him.

* * *

I have constructed the set described by

Arthur S. Gordon in RADIO WORLD for April 14 and cannot get anything outside of WEAFF, although with a Reinartz hook-up using Murdon 1½ volt tubes I get WOC. What can be the trouble?—Maurice C. Eddy, 2551 Bedford Ave., Brooklyn, N. Y.

There is no reason why if you have this set hooked up correctly you cannot get better results. This is not a new hook-up, but one that has been tested out. It is the single circuit regenerative using the rotor as a tickler. Go over your wiring very carefully, making sure of each connection. You should get as good results with this set as you do with your other. Make sure of your connections and examine your condensers and grid leak.

* * *

Can WD-11 tubes be repaired? Are there any good filament protectors on the market?—Henry Eisminger, Pulaski, Ia.

Yes, these tubes can be repaired. The best filament protectors are the small fuses, either the type that fit over the projecting lug of the tubes, or the telephone type. The last mentioned can be bought at any electrical supply store that deals in telephone parts. A good way in which to prevent trouble is to put an ordinary 60 or 75 watt electric lamp in series with the B battery leads as a ballast lamp. This will allow the B battery to operate the circuit, but will prevent the filament from burning out should your B leads accidentally cross the filament circuit.

* * *

I intend using the regular three circuit regenerative circuit with three steps of audio-frequency amplification. Is this too much, or could more be used?—R. L. Halman, 22 Lawrence St., Watervliet, N. Y.

You can use three steps of audio-frequency amplification, but the distortion and noise will be so great that it will hurt the signals more than help them. With the regular three circuit regenerative set, two steps of amplifications are generally sufficient for any one's needs. It is better to employ one stage of audio and a power amplifier, to obtain volume of signals than it is to use too many steps of single amplification.

* * *

In RADIO WORLD for Feb. 17 you published a circuit by G. W. May. How far

will I be able to receive on this set, using a 150 foot antenna, 50 ft. high?—Gene Ullemeyer, 1511 Ninth Ave., Rock Island, Ill.

It is impossible accurately to state the receiving range of any receiver, as there are too many other outside conditions upon which reception depends. However, it might be said that using a single circuit receiver of somewhat the same design, distances of 1,800 to 2,200 miles have been covered.

* * *

I recently built one of the three tube sets described by W. S. Thompson in his article entitled "Multi-tube Reflex Circuits" and had wonderful success with it until just last week, when it started in to get weaker and weaker, and finally hardly responded to the signals at all. I notice that it seems to work for a few minutes evenings, then stops, or rather slows down. I have been over the wiring and cannot find any trouble.—Jack Taylor, Jr., Winchester, Ky.

From your description it would seem that your B batteries are going dead and we advise that you put in new ones. If you are using a crystal detector, clean it with a stiff brush and carbon bi-sulphide (carbona) occasionally, as the dust lessens the efficiency of the crystal.

* * *

In RADIO WORLD for March 17 you published a hook-up for a one-tube super-regenerative set by W. S. Thompson. It works wonderfully, but I would like to increase the volume by the addition of amplification. What apparatus would I need to do it, and where could I obtain the diagram?—L. Roon, M. Sc., 1328 Broadway, New York City.

The easiest way in which to increase the volume of signals in this circuit will be by adding additional audio-frequency amplification. The apparatus necessary for two stages of amplification will be two transformers, two sockets and tubes, two rheostats, panel, double and single circuit jack, extra B batteries and filament batteries. The hook-up you should use was published in RADIO WORLD for March 31, page 26. You can experiment with the grid leak in this circuit as it is a super-regenerative circuit and you might use the leak to advantage in your tuning.

(Continued from page 7)

the end of the inductance coil and the positive terminal of the "B" batteries.

I have left the layout dimensions of the panel to the constructor, in view of the fact that there are many different types of instruments, each requiring different spacing and drilling. It is only a matter of good judgment.

The wiring of the outfit is exceedingly simple and the average amateur will have no difficulty. See the accompanying diagram.

In spite of the fact that the microphone is in the ground circuit it modulates quite well. If it should heat, remove the back part so as to allow air to pass on the diaphragm. With a little experimenting the tuning of the outfit will be found to be quite easy.

To beginners who decide to build this outfit, it might be well to mention some of Uncle Sam's requirements for radio transmitting outfits and their operators. In the first place, all operators must be licensed. These can be secured from the Radio Inspectors located at the Custom Houses in the following cities: Boston,

New York, Baltimore, Savannah, New Orleans, San Francisco, Seattle, Cleveland and Chicago. Write to your nearest inspector, who will send you the necessary papers.

To obtain a license the amateur must have a fair knowledge of the code, and must be familiar with the United States laws controlling radio.

Amateurs must not transmit on a wave length greater than 200 meters. The wave length of a transmitting outfit depends upon the antenna used. After you have constructed this outfit, if you do not know the wave length of your antenna, send its measurements (length, height, etc.), to the Editor of RADIO WORLD.

The simplicity in construction, the small cost, the simplicity and efficiency in operation, the compactness and neatness in appearance of this outfit, all make me feel confident that it will meet the approval of many fans. Of course, the advanced radio man might suggest several improvements, but simplicity was the author's object in designing this outfit for the radio-
phone beginner.

How to Obtain Vernier Control Using a 43-Plate Condenser

By J. E. Anderson

IT is not generally appreciated among amateurs and experimenters that an ordinary 23-plate or 43-plate condenser may be used as a vernier to obtain a very fine adjustment of capacity. But this may be done if two condensers are available, and the vernier action may be made extremely fine. It is based on the properties of two condensers connected in series, one of which is small in comparison with the other.

Suppose two condensers C_0 and C_1 , Fig. a in the accompanying drawing, are connected in series. The capacity of this series combination as measured across the terminals is given by the product of the two divided by their sum; or expressed algebraically,

$C = \frac{C_0 C_1}{C_0 + C_1}$, where C is the capacity of the two in series. The curve in the drawing shows how the value of C varies as the larger of the two is increased.

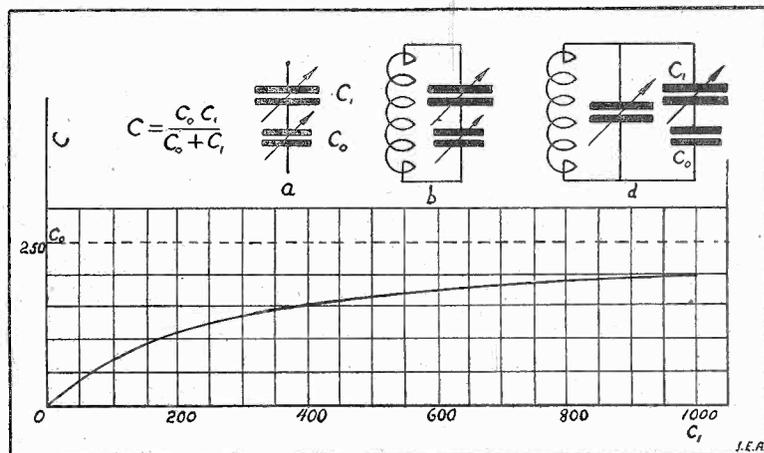
In this particular curve the value of C_0 is 250 micromicrofarads. It is seen that at first the value of C increases at a fairly rapid rate, but as C_1 becomes large in comparison with C_0 there is not much change in C for large changes in the large condenser. In fact the vernier action of the large condenser may be considered to start as soon as C_1 becomes equal to C_0 . The value of C is always less than the smaller of the two and approaches it asymptotically, as is shown by the dotted line in the drawing.

This property of condensers connected in series is often encountered in single circuit tuners and is erroneously attributed to broad tuning. The statement that the tuning is so broad that the signals come in all over the condenser is often heard. The trouble is that the condenser is merely a vernier and the only remedy is to increase the antenna inductance. The self capacity of the antenna is effectively in series with the tuning condenser. As long as the capacity of the tuning condenser is smaller than the self capacity of the antenna it is effective in tuning, but as soon as it becomes larger than the antenna capacity the vernier action begins and the condenser becomes useless in tuning.

A method of making use of this vernier action for fine tuning in a selective circuit is shown in Fig. b of the drawing. The series combination is connected across the tuning coil. The condenser C_0 , which may have a capacity of 500 micromicrofarads, is used for approximate tuning and the larger condenser C_1 for

final adjustment. First set the large condenser on division 90, or thereabouts, and tune as near as possible with the other condenser. Then the large condenser may be used as a vernier for final tuning.

A better way is shown in Fig. d. The series combination is here connected in parallel with the main tuning condenser. This arrangement is capable of extremely fine adjustment. In this case condenser C_0 may be a small fixed condenser with either air or mica dielectric, and C_1 a variable condenser many times as large as C_0 when set for maximum capacity. The smaller C_0 is in comparison with C_1 the finer the adjustment will be. For instance if the value of C_0 is 50 micromicrofarads and the maximum value of C_1 is 1000, the maximum capacity of the series combination will be 47.6 micromicrofarads, while the change



Diagrams illustrating Mr. Anderson's methods of obtaining vernier control with a 43-plate condenser.

in this due to a change of one division of the large condenser will be .013 micromicrofarad. A finer variation will hardly ever be necessary in a radio receiving circuit. If the total capacity in the tuned circuit is 500 micromicrofarads this would represent a change in the frequency to which the circuit would respond of only 9.75 cycles per second, or a change in the wavelength of only half a centimeter. If such fine adjustment is not needed the variable condenser C_1 may be made smaller or the fixed condenser larger. A good combination would be an 11-plate variable and a fixed condenser of 50 micromicrofarads capacity.

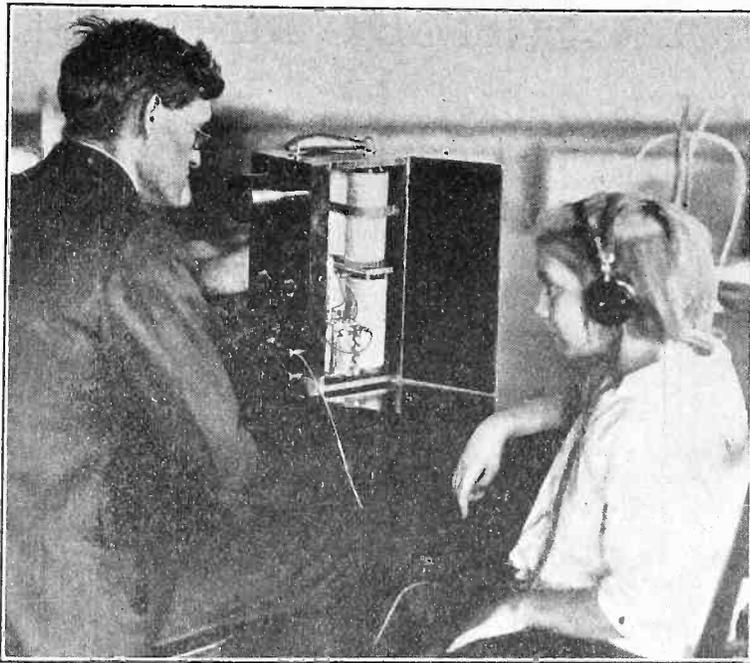
Watch Your Wave Length—The Inspector Does!

WHEN people mention casually to one another that WJZ's wave length is to be changed, they little realize that it means more than the mere turning of a switch, or increasing or decreasing of power.

When a station's wave is to be measured, there is one authority which the owner can consult. That is the radio inspector of the district. And who keeps check on the radio inspectors? Daily there is sent out from the Bureau of Standards, Washington, D. C., a series of standard waves, by which the inspectors' wave meters are accurately checked by the zero beat

method. The wave meters used are of the heterodyne type and the daily checking from Washington makes absolute accuracy possible.

Now that the broadcasting stations have received re-allocated wave lengths, there were many things that had to be considered. One of them was to see that the station's wave was sharp and did not slop over into the next wave length. Once the wave has been assigned and checked no deviation will be allowed, and if there is and no attention is paid to it, the station license will be revoked. Strict adherence to time schedule is also absolutely necessary.



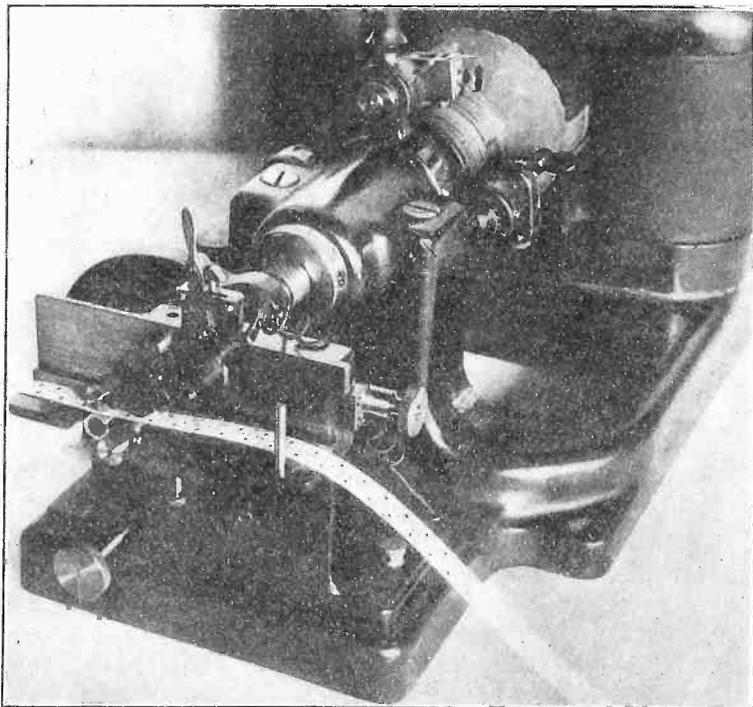
(C. Wide World Photos)

Nowadays they are employing audio-frequency amplifiers for many other things than radio. Besides using cascade amplification along long-distance lines, and power amplification in speeches, they are teaching the deaf to hear. The illustration shows Mr. Kilgour, radio expert, proving that by means of powerful amplifiers utilizing the radio principle he can make deaf children hear.



(C. Fotograms, N. Y.)

Now that they are building new ball parks and giving the mighty Yanks a chance to do some tall ball playing on their own grounds, they have to keep the public informed by radio as to the results, as even a ball park of 75,000 capacity won't allow a fan 100 miles away to come in every day.



(C. International Newsreel Photos)

Photo of Major General Squier's new code device by means of which the present Morse and International code is made faster and easier. In this new system dots, dashes and spaces are differentiated by varying intensities of the sinusoidal wave employed.

"They Can't Get Away, They Can't Get Away"

Captions by Robert L.

Radio Aids Army



(C. P. & A. Photos)

THE United States Army Recruiting Service recently hit on a novel and up-to-date method of recruiting men for the Signal Corps of the army. Three officers of the service set up the powerful receiving and transmitting equipment of station BG4 in Herald Square, 33rd Street and Broadway, New York City, and by its aid collected a goodly crowd in less than no time.

With the aid of this powerful apparatus, which included a fine loud speaker, a crowd quickly gathered and threatened to stop all traffic. The apparatus is the regulation Signal Corps field apparatus, which is



(C. Fotograms, N. Y.)

The latest development in radio occurred when a typewritten message was transmitted from a moving airplane to a receiving station below at Anacostia, Washington, D. C. The instrument uses the new "teletype" instrument, a device similar to that used in the line telegraph but necessarily accommodated to radio and thus modified for that purpose.

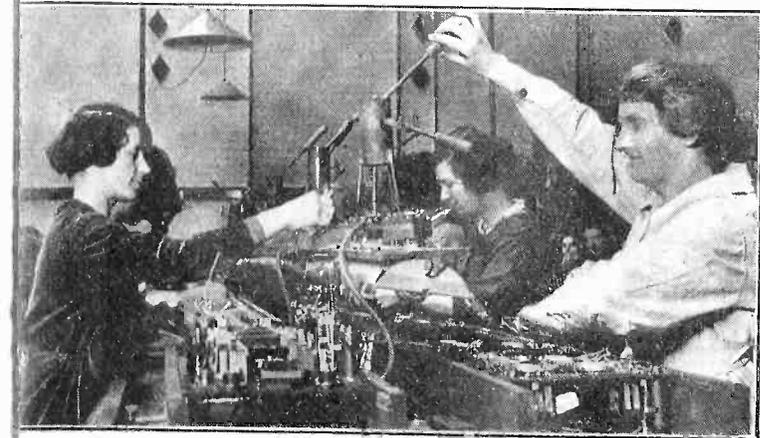
Get Away, From the Camera Men"

by L. Dougherty

My Recruiting



combined receiver and transmitter in a small cabinet. From the curious onlookers came several queries of "What is that thing?" When told they immediately became interested and many recruits enlisted. The use of radio to attract a crowd is not new, as many others have used it before, but the use of it to recruit men in this department of the army, is something that promises to be a big thing. People do not think of these things until they are forcibly brought to their attention and setting up a complete station in the midst of New York's busiest section is about the most forcible method that could be employed.



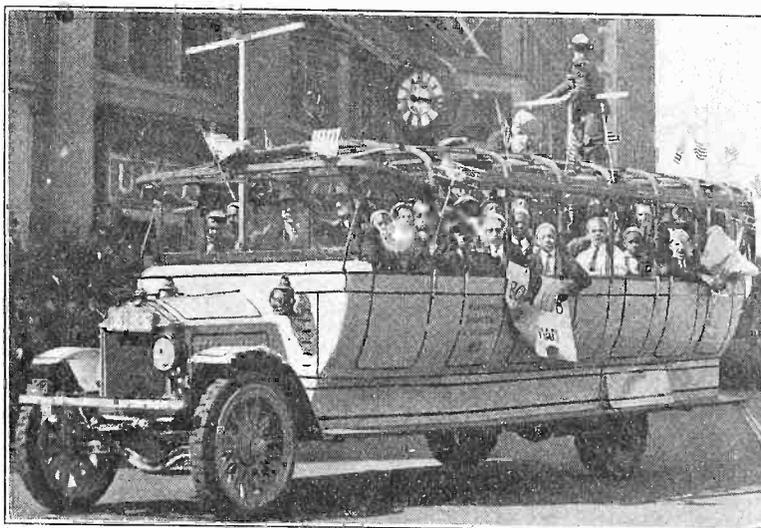
(C. Keystone View Co.)

The radio manufacturing industry is increasing by leaps and bounds in England. They employ girls to do the finer work as they do in America. The illustration shows a British factory at Chelmsford. The girls are soldering receiving equipment. Better send over a salesman for electric soldering irons, men.



(C. P. & A. Photos)

Six-year-old Verner Alexanderson, who was kidnapped and found within four days by the aid of radio, and his father, E. F. W. Alexanderson, chief engineer of the Radio Corporation of America. A nation-wide hunt was made for the boy by the aid of wireless. His frightened abductors abandoned him and the youngster was returned by the woman in whose care he had been left.



(C. Underwood and Underwood)

In the Boys' Parade down Fifth Avenue, New York City, last week, they equipped the buses with radio receiving sets. The illustration shows the boys of P. S. 5, Manhattan, and their radio equipped "touring car."



(C. Photonews)

In these days it is rather out of date to celebrate your birthday with cake and candles, especially when the cake would have to have 110 candles on it, so Alta Stirt, of the Brooklyn Home for the Aged, celebrated by listening to a radio concert, establishing a new fad for 110th birthdays.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR BUSY READERS

"The Radio Wave" is the name of a neat little monthly published by the Charleston, S. C., Radio Club. The editor is K. C. Parsons, who is also secretary of the club. His address is 278 King Street, Charleston, S. C.

* * *

A hit was made by the San Francisco electrical contractors recently when they staged an amateur play called "While There Is Credit There Is Hope." It was received enthusiastically—and there were radio men in the audience, too.

* * *

Radio standardization has been assigned by the American Engineering Standards Committee to the Institute of Radio Engineers and the American Institute of Electrical Engineers jointly. This is in accordance with the recommendations of the Bureau of Standards.

* * *

The Bureau of Standards has issued Circular No. 138 entitled "A Decimal Classification of Radio Subjects—an Extension of the Dewey System." The literature of radio has become so prolific that such a system of indexing seems to be a real necessity, especially for libraries.

* * *

The rate war now in progress between the cable companies and radio companies handling traffic across the Atlantic renders doubtful the consummation of the American plan for the allocation of the former German cables in the Atlantic. The situation has caused the cable companies to delay new construction.

* * *

Dr. A. S. W. Rosenbach, the noted authority, who spent \$1,250,000 for rare books abroad, returned to New York recently on the White Star liner "Olympic." On the way across Dr. Rosenbach said he evoked the medium of the radio to successfully negotiate the purchase of a Gutenberg Bible from James W. Ellsworth, of New York City.

* * *

Listening in on radio is now all the rage in France, and the ranks of the devotees are growing rapidly. Recently the broadcasting stations asked their listeners to send in their names, and the census showed more than 50,000 "fans" at 12,000 receiving posts. The production of wireless sets has developed greatly and the fine equipment produced in France is gaining renown.

The Fisheries Bureau of the Government issued a broadcast last week giving wholesale market prices on fish, together with the quantity of varieties available at New York, Boston, Norfolk, Jacksonville and Chicago. Each week on Tuesday evening NAA will carry similar broadcasts between 7:45 and 8 p. m.

* * *

Hiram Percy Maxim, president of the American Radio Relay League, has arranged to send an amateur radio operator with the Arctic expedition under Donald B. McMillan, which will sail from Boothbay, Me., about the middle of June. It is expected thus to provide entertainment for the long Arctic nights and enable members of the expedition to keep in touch with their families for the greater part of the distance to the pole.

* * *

An English radio enthusiast who thinks nothing of sitting up until 4 o'clock in the morning to get American broadcasting stations reports receiving the entire program of WGY, the Schenectady, N. Y., station of the General Electric Company on four different evenings. The most remarkable feature was his reception on a single tube or valve—as the English call it—home-made receiving set. He is J. H. Brittain, and lives at Eccles, Lancashire, England.

* * *

Hakon Jorgensen, of Copenhagen, Denmark's delegate to the recent International Police Conference in New York City, proposed the universal adoption of a system under which the fingerprints left by a criminal in a New York case could be indexed, coded and broadcast by wireless to Europe; and if the criminal had ever been caught before his past record could be forwarded to the scene of his newest crime all within a day. This system has been in successful use in Denmark.

* * *

Alfred Swan, a pioneer in the incandescent lamp industry, died recently at Upper Montclair, N. J., in the eighty-eighth year of his age. He was the inventor of the brass base used on incandescent lamps. He started in the lamp industry in England after the death of his brother, Sir Joseph Swan, who contributed to the practical development of the early electric incandescent lamp. In 1886 he came to the United States, where he associated himself with the lamp industry, in which he spent the remainder of his life.

Radio and the Woman By Crystal D. Tector

THE Schenectady broadcasting station of the General Electric Company, WGY, has been honored by a Wisconsin family. A brand new baby, according to the father, has been named after the Schenectady station. He is Wallace Gordon Yadon and he lives in Delavan, Wisconsin. M. E. Yadon, advertising manager for the Bradley Knitting Company wrote to WGY as follows: "We have a baby called the 'radio boy' because we have named this child after your station, which indicates that not only the child is a favorite but that your station is our favorite. We only hope that you will broadcast twenty-four hours daily. The boy's name is Wallace Gordon Yadon. The receiving set has been placed at the hospital for the past five weeks and even the little fellow is getting so he can recognize the announcer. We are proud of our son and trust that you will welcome what we think is your first namesake."

* * *

My cousin, whom I haven't seen in years, recently took it into her head to come to New York and knowing that we lived in the suburbs decided to come to us. She spoiled my entire day by telling us that her husband's nephew was the owner of a powerful broadcasting station and that she occasionally sang. "It is such a nuisance though, because I really enjoy the applause

of my listeners, and I can not hear them when I broadcast." Well, that surely is nice. Most people are satisfied knowing that hundreds of thousands are listening to them, but even at that you can not satisfy everybody and some people are just little piggies for praise. I would simply be delighted could I even talk into "those fearful black discs" without wanting to hear any applause at all.

* * *

Babies now cry for radio. The new national pastime has invaded the nursery and many mothers are adopting radio waves as pacifiers. A mother of six children, the oldest eleven years old, writes WGY, the Schenectady broadcasting station of the General Electric Company that her youngest child, aged fourteen months, is already a fan. Mrs. Robert Barbour of Rensselaer, N. Y., says: "I wonder if it would interest you to know that I think I have the youngest radio listener. My baby is fourteen months old and she walks to the desk where I have my crystal set and points for me to open it. When there is anything she sits with the ear phones just as nice as any large person but as soon as it stops she takes off the phones and starts to scold for more. I have six children and they all like to listen. I have two sets of phones and they separate them."

DX Nite Owls Records You Can Shoot At

He Calls It a Record—How About It?

From H. S. Fredrickson, 406 Howard Street, Charles City, Ia.

I HAVE what I call a record on the total number of broadcasting stations heard, and also on the largest number heard in one night. To date I have heard one hundred and seventy-nine different broadcasting stations with my set. The number includes stations on both coasts, Canada, all through the United States, and one—"PWX"—from Cuba. As a list of calls would take too much space I will give the number of stations from each state, as follows:

Alabama, 2; Arkansas, 1; California, 7; Colorado, 7; District of Columbia, 1; Georgia, 4; Idaho, 1; Illinois, 11; Indiana, 5; Iowa, 14; Kansas, 5; Kentucky, 2; Louisiana, 3; Massachusetts, 3; Michigan, 5; Minnesota, 9; Missouri, 11; Montana, 2; Nebraska, 6; New Jersey, 2; New York, 9; North Carolina, 1; North Dakota, 2; Ohio, 9; Oklahoma, 7; Pennsylvania, 10; South Dakota, 1; Tennessee, 5; Texas, 13; Utah, 2; Virginia, 1; Washington, 1; Wisconsin, 7; Canada, 9; Cuba, 1.

On Friday, March 9, 1923, during a period of only four hours (7:15 to 11:15), I copied forty different broadcasting stations—all DX boys—as follows:

WOC, Davenport, Ia.; CFCF*, Montreal, Canada; KYW, Chicago, Ill.; CJCG, Winnipeg, Canada; WCAE, Pittsburgh, Pa.; WHB, Kansas City, Mo.; WGY, Schenectady, N. Y.; WOR, Newark, N. J.; WBAA*, Lafayette, Ind.; WDAJ, College Park, Ga.; WDAO, Dallas, Texas; WGAQ, Shreveport, La.; KDYL*, Salt Lake City, Utah; KDKA, Pittsburgh, Pa.; WPAK*, Fargo, N. D.; WIAR, Paducah, Ky.; WJZ, Newark, N. J.; WOS, Jefferson City, Mo.; WHAS, Louisville, Ky.; WFAT, Sioux Falls, S. D.; WMC, Memphis, Tenn.; WDAF, Kansas City, Mo.; CKCK, Regina, Canada; WEAB, Fort Dodge, Ia.; WSY, Birmingham, Ala.; CJNC, Winnipeg, Canada; WAAC, New Orleans, La.; KFAF, Denver, Colo.; WLAG, Minneapolis, Minn.; WGM, Atlanta, Ga.; CFAC, Calgary, Canada; KHJ, Los Angeles, Cal.; WIP, Philadelphia, Pa.; WSB, Atlanta, Ga.; KFDL*, Denver, Colo.; KLS*, San Francisco, Cal.; WBL, Anthony, Kansas; WOAZ, Belvidere, Ill.; KLX*, Oakland, Cal.; WJAM, Cedar Rapids, Ia.

*New stations.

My set is home-made—detector and two stage; ultra-audion circuit. The second stage was added only the night before I received the forty stations, so 172 of the 179 stations were heard on one stage.

From the Lone Star State

From Kent Deckard, Rusk, Texas.

I AM a constant reader of RADIO WORLD and am interested in the DX records so I am going to submit a few of mine. I purchased my set on November 2, 1922, and have received 256 different stations, including about 50 amateur stations. Some of the most distant stations are: CFCN, Calgary, Canada; PWX, Havana, Cuba; 6KW, Tuinuco, Cuba; KDKA, East Pittsburgh, Pa.; KGW, Portland, Oregon; WGY, Schenectady, N. Y.; KHJ, KFI, Los Angeles, Cal. On April 18 between 6 and 1:15 o'clock I received 34 different stations. They are as follows: WEAY, WHB, WGAR, KDKA, WKY, WHAS, WBAP, WOC, WCX, KSD, WOS, WGV, WLAG, WSY, WEAH, WLW, KOB, KHJ, WMC, WPAD, WSB, KFFQ, 6KW, WRAL,

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

WDAJ, WQAO, WDAF, KWH, CFCN, WGM, KFI, 8XAW, 5XAJ.

I have a Tresco set with one stage of radio frequency. I work detector and amplifier on 22½ volt B battery and get better results and louder signals than if I use 45 volts for amplifier and 22½ volts for detector.

Just to Make It a Little Harder

From Jerome M. Freedman, 1333 Iranistan Avenue, Bridgeport, Conn. Radio I-AOE & I-CCR

I HAVE been reading your column which you have donated to the Nite Owl gang. I have never bothered with making out reports of the stations I have heard unless it was far enough to send a Q. S. L. card. But here I make my debut in the RADIO WORLD. The receiver at this station is a Reinartz tuner, and I'll say that this make of set is the rattlesnake's hips for long distance DX. It will be noticed in the hook-up that there is a choke coil in the plate

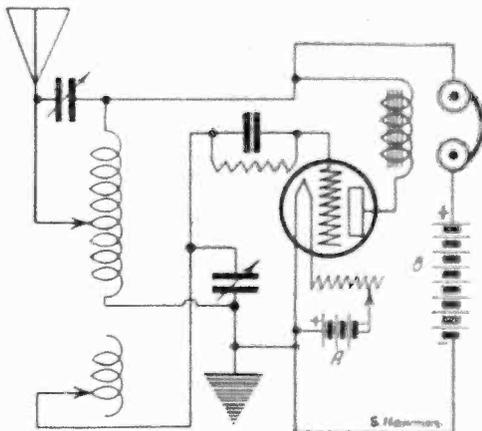


Diagram of improved Reinartz circuit as used by J. M. Freedman. The choke coil in the plate circuit is something radical in receiving circuits.

circuit. This choke is wound with about 75 turns of No. 22 B. & S. wire. Wind the coil in any zig-zag fashion and while it is on the coil tie threads of cotton in places and remove the wire from the coil. Don't be fancy when winding this coil. For audibility the wire that went to the plate switch goes to the stationary plates of the aerial condenser. Sometimes the set did not function or oscillate on 200 meters, so I found, by disconnecting the ground wire, she would then work fine. I used detector only to get these:

6-ZZ, Arizona; 6-XAD, St. Catalina Island, Cal.; 6-XJ, California; 6-CC, Colusa, Cal.; 7-GV, Seattle, Wash.; 7-ZU, Montana; 7-ZV, Wyoming; WHAD, WDAF, WMAQ, WEAS, KSD, KDKA, WJZ, WOR, WOS, WBT, WDAL, WDAP, WWJ, WLW (phone and code), WSB, WBAP, WHN, WFAS, WAAM, WBAM, WCAE, WEAH, WHAS, WHAV, WHAZ, CFCA, PWX, WKAQ, WGI, WGY, WGM, KYW. How about it, Eddie? Pretty good? I will answer any cards.

The Pup Drags It In on an Indoor Aerial

From Robert N. King, 77 Mayo Avenue, Needham 92 Mass.

THIS is my list of stations that I have heard. I used the Stockelberg Pup Circuit and U.V.-201-A for detector and C301-A for amplification. I used an indoor aerial: DX—WGY, WRL, WRW, WHAZ, WHAM, WGR, WEAH, WMAC, WHN, WMAK, WJZ, WOR, WIP, WOO, WFI, WNAT, WGL, WJAR, WLAH, WWAD, KDKA, WCAE, WJAS, WHAF, WRAJ, WGAL, WQAA, WLAO, WSAJ, WBAK, KYW, WDAP, WMAQ, WJAZ, WPAD, WJAX, WEAO, WCAH, WLW, WDAK, WAAQ, WEAN, WJAR, WLAK, WWJ, KOP, WHAL, WHAS, WGAM, WSB, WGM, WHAO, WBL, WOC, WFAA, KSD, WMC, WNAV, WLAG, WBAH, NOF, WEAS, PWX, 5-KW, CFCF, CKAC, CHYC, CFCA, CJGC, CFCX, WLK, WOAW, WLAN, WSY, WCAT, KFCV.

Local—WNAC, WFAU, WAAJ, WGI, WQAS, WDAU, WBZ, WCN, WMAF.

Important! Verification Wanted! Who Knows?

From Kenneth M. Jones, 1646 Richmond Avenue, Columbus, Ohio

I HAVE a few new DX records I would like to enter in your DX page. I am using one radio and one audio. The set is a Grebe RORN tuned, radio-frequency, a detector and one stage of audio-frequency. CHB, Calgary, Canada; KGO, Alameda, Cal.; KNO, San Francisco, Cal.

On the night of March 14, 1923, between the hours of 9:45 and 9:58 p. m., I think I listened to a concert by a Brazilian orchestra and a talk by one of the officials of the Brazilian government (of course, in Spanish or Portuguese) from a station—SFC or SPE—at Rio De Janeiro, Brazil. I wrote for confirmation, but I did not get any reply at all, so I assume that my letter was never received by the right parties. This is not bad on two tubes, as no radio-frequency was being used at the time. The distance is about 5,900 miles air-line.

They Have Owls in Mexico Too

From S. A. Grogan, Apartado, Num. 186, Tampico Tampa, Mexico

I HAVE been reading some of the records of the DX "Nite Owls," and believe that my last night's listening period was worth while. My set consists of three stages of radio-frequency, detector and two steps of audio-frequency, using the ordinary regenerative circuit, rigged for using honeycomb coils, but am using a "Tunit."

WHB, Kansas City, Mo., 1,180 miles; WGY, Schenectady, N. Y., 1,990 miles; WBAP, Fort Worth, Texas, 740 miles; WFAA, Dallas, Texas, 750 miles; WMC, Memphis, Tenn., 1,000 miles; KSD, St. Louis, Mo., 1,220 miles; WSY, Birmingham, Ala., 1,030 miles; WOS, Jefferson City, Mo., 1,180 miles; WLAG, Minneapolis, Minn., 1,580 miles; KFI, Los Angeles, Cal., 1,490 miles; WSB, Atlanta, Ga., 1,140 miles; KFDB, San Francisco, Cal., 1,800 miles; WDAF, Kansas City, Mo., 1,180 miles; CFCN, Calgary, Alta., Canada, 2,175 miles Total, 18,455 miles.

If any one should wish to check me up on CFCN, will state that I heard a cabaret program being broadcast between 12 midnight and 1:00 a. m. I tuned them in at 12:15 a. m., Mountain Time, and kept them on until they signed off.

Teaching the Infant Radio to Walk

By Henry Ferris, Jr.

THE growth of Radio has been bewilderingly swift. Just when Father Business was about to offer it a bottle he found to his amazement that the infant was already in long pants and yelling for roast beef. The result has been confusion in the Radio household.

In this particular discussion we are principally interested in the "kitchen" of the Radio household—that is, those phases of Radio's problems which have to do with *marketing*.

Our object is, by observation and analysis, to point out certain fundamental weaknesses of Radio merchandising as it is now being done, and, by analogy with certain lines of business which have been much longer established, to point a way by which the infant Radio can be fed the same diet without getting indigestion. In fact, the precocious infant has already had its fingers in the jam jar, and therefore it is desirable to find a prescription for the indigestion that has already set in.

Just as a physician seeks *facts* as a basis for his diagnosis, the author went out and visited all the important factors in the trade in order to make a correct diagnosis of the current situation in Radio. These factors included:

1. "Consumers"—i. e., users of Radio apparatus.
2. Jobbers and dealers—i. e., sellers of Radio apparatus.
3. Broadcasters.

The result of this investigation was that certain conditions came definitely to light, and certain conclusions were reached as to the underlying causes of these conditions.

Everybody likes to read the back of the book first, so the causes will be stated first. They are many and diverse, but the principal causes can, by careful analysis, be boiled down to these:

1. The development of broadcasting.
2. The amazing progress of invention.
3. The equally amazing adaptability of the American Radio public.
4. The educational work done by the Radio press and the big daily newspapers.
5. The avid thirst of the American public for up-to-the-second information; its deep desire for all educational and enlightening influences, and its curiously mixed love of good music and passion for "jazz."
6. The fact that all of these benefits are, after a small first investment, available, *at will*, at any hour of the day or night, and absolutely free.
7. The need for a constructive and educational hobby, an outlet for excess energies, a refuge and change for tired brains, a fascinatingly interesting excursion into the mysteries of nature.
8. The tremendous fortunes made over night by youthful inventors.
9. Legal developments relative to "wave bands," restrictions on amateur sending and the classification of broadcasting stations.

With these causes the Radio public is largely familiar. They will not be enlarged upon for the reason that it is with *effects on the trade that we are* chiefly interested.

Broadcasting has increased enormously since April 1, 1922, when 137 broadcasting stations were sending, until now, when there are over 500 licensed stations in operation and, with the exception of one point in the southwestern section of the United States, there is no spot in this broad land of ours that is farther than 150 miles from some broadcasting station. The United States Bureau of Standards is authority for this statement.

Take a population map of the United States and spot these 500 stations and you will see that today *Radio broadcasting is available* to 98 per cent of our people, *territorially*. Financially, also, it has become available to anybody who can spend as little as \$15.00 for a simple, home-made set. From a merchandising viewpoint this means that small tradesmen everywhere are beginning to sell Radio apparatus. Cross-road general stores have added Radio to the multitude of things they "carry." Plumbers, tinsmiths, electricians, hardware and toy stores are installing loud-speakers in their windows or doors to draw the crowds—and *it does the trick*.

The points we are getting at are:

First, that the entire American public is becoming "Radio-conscious." The market is enormous and growing daily more complex.

Second, that Radio equipment is being sold in an unfortunately great number of instances by trade factors that are incapable of doing a good job. Ignorance, not only of the basic principles of Radio engineering, but, worse, a still deeper ignorance of the right way to conduct a retail Radio business, is resulting in a very high percentage of failures. These bankruptcies are one fertile source of the worst evil in Radio merchandising—price cutting. Bankrupt stocks sold for a song to "gyp" buyers are re-distributed at less than the cost of manufacture. Result: Manufacturers themselves "go broke" in the effort to sell to the trade against this type of competition, and then *their* inventories flood the market with disastrous

results; irresponsible buyers, fly-by-night Radio "stores," un-guaranteed, un-trade-marked, imperfect, out-of-date and shop-worn Radio products being sold to a "green" market—it's a true picture and a disheartening one.

What are the remedies? What medicine will cure this indigestion?

First, *education of the public*. This process is going on very rapidly, thanks to an enlightened Radio Press and the broad business knowledge of the big metropolitan daily newspapers.

Second, slowing down of the buying impulse to the point where the faculty of *judgment* rules trade and public alike.

Third, selective selling by manufacturers who will soon see the light and sacrifice immediate sales and immediate profits for the sake of a better knowledge of *just who is selling their goods and just how they are being sold*. The penalty for misrepresentation, price cutting or failure to give service to be a refusal to sell these outlets any more supplies. This process is going to hurt. There will be, and indeed now are, many complaints about "The Radio Trust" and the like. Most of it is pure bunk and self-deception. The big factors in the Radio industry want Radio apparatus *intelligently* sold; sold at a profit; sold under guarantees that mean something; sold with exact knowledge of the functions, capabilities and limits of each piece of apparatus; sold under a *true* representation of the result that the public may and *may not* expect from any given expenditure.

Fourth, governmental restriction and even licensing of trade-outlets. It's coming is sure as fate—watch for it.

The more or less trite aphorism, "Experience is a hard school but fools will learn in no other" is applicable to the man who thinks that, just because he has \$1,500 and a taste for fooling around with electricity, that he is fully qualified to sell Radio equipment to an even more gullible public.

The public learns *faster* than the dealer. Candid dealers will tell you that their most important merchandising lessons are learned by keeping their ears—and minds—open to the comments, criticisms, complaints and comparisons that drift in every day *across the counter*.

If we were asked to give advice to dealers we might offer this: Never expect *praise* from the public—just look for *familiar faces*. If you don't see them, your house is built on sand. If you *do* see them, *serve* them if it costs a fortune, and they will bring their friends. Then you will be building on rock.

A word of warning: Don't use the mystic power of advertising for purposes of *deception*. The writer knew of a case of a dealer who, during the recent shortage of tubes, thought it would be a clever idea to advertise that he had some. He is still in the hospital, but he is quite definitely *out* of the Radio business, to its everlasting betterment. Cynical "gyps" will curl the lip of scorn at this and call to mind the number of cases where they have misrepresented goods or otherwise transgressed the laws of good merchandising and "gotten away with it." To him we say: "Watch your balance sheet!" Transient trade *never* pays the best in any line of business. You pay out every nickel of profit you make on transient trade in the form of rent. Don't think that your landlord doesn't know how many people daily pass your door—he surely does, and you pay a proportionate rental. No, it's the steady customers that pay profits—and there's only one receipt for getting them and holding them. Here it is:

Treat every customer that comes in the front door as if your sole chance of staying in business depended upon retaining his goodwill.

Carry the *right* merchandise—*standard* goods built by real Radio engineers—not *thrown* together by some ex-amateur.

Know the *whole truth* about everything you sell and *tell it* to your customers.

Try to conduct your store in accordance with good business principles. Study the methods of successful druggists, grocers, hardwaremen—and *adapt* what you learn.

Last and most important—give *service*. We're not going to define it. If you don't know what it means, you don't belong in Radio.

Don't do anything for your own benefit that will hurt Radio as a whole.

We have not meant to sermonize. We started out to *paint* a picture of conditions as we actually saw them and we have rushed at the job of trying to reform the world with our usual enthusiasm.

But the job is too big for any one man. And the real fact is that the situation will *eventually* work itself out on sound economic lines. The truth needs no defense! Our only excuse for this article, then, is a more or less laudable desire to speed the process. With apologies to one of the really great merchandisers of the world, it might be put: "Eventually better Radio Merchandising—Why not *NOW*?"

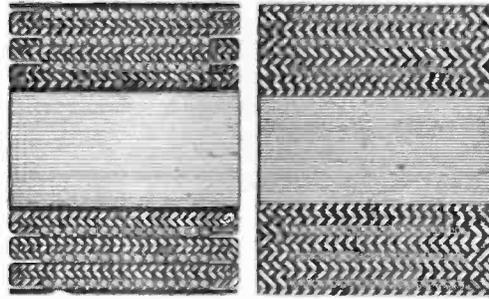
Latest Radio Patents

Method of Winding Electric Coils

No. 1,450,362: Patented April 3, 1923. Patentee: Philip Gilinson, Lowell, Mass.

THE object of the present invention is to overcome difficulties and to provide an electric coil which is much easier to wind, which has the spaces between successive layers of insulation substantially closed, which is much more effectively insulated than are ordinary coils, and which is generally superior. The invention comprises layers of insulation having ends of increased thickness, the ends being of sufficient thickness substantially to close the aforesaid spaces between the layers of insulation at the ends of the coil. This increased thickness is preferably produced by upturning the ends of the layers of insulation before the layers are applied to the coil, and the preferred way of upturning the ends of the layers of insulation is to fold the ends back into parallelism with the layers of insulation respectively. The layers of insulation may be made cylindrical, either circular or with flattened sides, in which case they are slipped on over the ends of the coil. However, the layers of insulation are preferably made of strips or ribbons, in which case a strip of sufficient length to encircle the coil and preferably overlap somewhat is wound upon the coil after each layer of winding has been applied. When making the insulation in the form of strips or ribbons, the edges of the ribbon are folded over before the ribbon is

wound on the coil and preferably at the time the ribbon is manufactured. When the ribbon is impregnated with varnish or the like the varnishes cause the folded edges to adhere to the main portion of the ribbon. In the preferred form of the invention the insulation between the winding of the coil is made up of two parts or strips, one part being narrower than the other. The narrow



Sectional views of a coil wound by Gilinson's method.

strip is placed on the wider, the ends of the latter being folded over and upon the former. The strips of insulation may be of the same thickness or of different thicknesses. Such a construction makes a long wearing coil in which the windings are not easily displaced and the danger of sparking between the windings is eliminated.

Apparatus for and Method of Electric Current Control

No. 1,450,749: Patented April 3, 1923. Patentee: George W. Pierce, Cambridge, Mass.

THIS invention relates to an apparatus for and a method of controlling electric currents. The object of the invention is the control of a comparatively strong electric current by means of a comparatively feeble expenditure of energy, and particularly the rapid and reliable control of a periodic current furnished by a comparatively strong local source of electro-motive force by means of comparatively feeble electrical

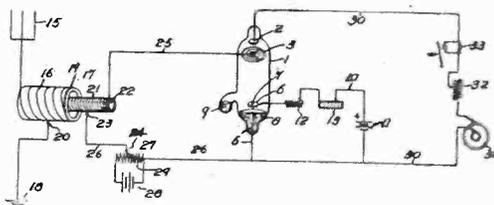


Diagram showing Pierce's method of electric current control.

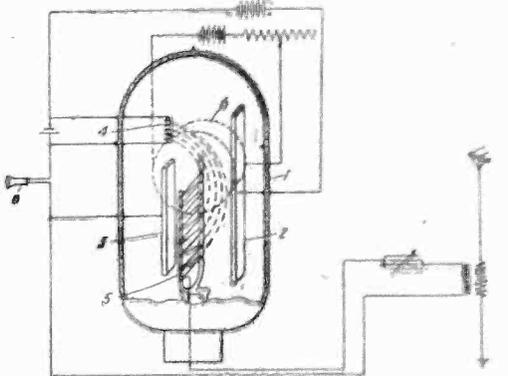
variations or impulses, or the control of a periodic current by another current or electro-motive force the character of which it is desired to alter. With the above object in view the present invention consists in the apparatus for and method of controlling electric currents hereinafter described and particularly pointed out in the claims. This invention is particularly applicable to apparatus employed for electric signalling in which it is desired to control a comparatively strong local current by means of comparatively feeble signal impulses. The present invention is, however, not limited to signalling apparatus, but may be employed wherever it is desired to effect a sensitive and reliable control of electric current where the energy available for effecting the control

is comparatively feeble, or is of a character which it is desirable to transform.

Wireless Amplifier

No. 1,450,275: Patented April 3, 1923. Patentee: Chester T. Allcutt, Pittsburgh, Pa.

THIS invention relates to vacuum apparatus of the type commonly employed for the amplification of impulses in the



Diagrammatic view of Allcutt's wireless amplifier.

transmission of intelligence, having particular reference to that type of apparatus wherein the flow of charged bodies from a hot electrode to a cold electrode is under the control of a grid electrode charged in accordance with the incoming impulses, the charged bodies being permitted to traverse said grid electrode to a greater or less degree, dependent upon the potential thereof. The invention has for its object to provide apparatus of the character designated that shall be simple and reliable in operation and more sensitive than the forms of apparatus commonly employed hitherto for this purpose.

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Advertising Rates: Display, \$5.00 an inch, \$100.00 a page. Classified Quick-Action Advertising, 5 cents a word.

Telephone Bryant 4704

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Frank J. Kerous, 1823 South Ashland Avenue, Chicago, Ill.
 Radio Service, C. H. Affeldt, 496 Provident Avenue, Winnetka, Ill.
 Morris Reeser, P. O. Box 2, Bakersfield, Cal.
 George C. Green, 401 Dryden Road, Ithaca, N. Y.
 John W. Bell, 141 Milk Street, Boston, Mass.
 B. M. Horton, 45 Coburn Street, East Lynn, Mass.
 R. August, Great Kills, Staten Island, N. Y.
 Rev. J. M. Le Guennec, Box C, Chisholm, Me.
 F. Renaud, 707 Laval Avenue, Montreal, P. Q., Canada. (Wants to build a one-tube set.)
 F. Charles Drew, 83 Walnut Street, Fitchburg, Mass.
 R. J. Allen, P. O. Box 825, Yarmouth, Nova Scotia, Canada.
 Fred J. Barnes, 18 East Cabarrus Street, Raleigh, N. C.
 Erickson & Marken, Watson, Minn. (Retailers.)
 J. Mulberg, 207 Duval Street, Key West Fla. (William Cox, manager, radio department.)
 Thomas F. Nalepinski, 3124 North Monticello Avenue, Chicago, Ill.
 Radio Parts Co., Frederick Willard, Box 56, Dunellen, New Jersey.
 Wm. Donaghy, 73 South Bend St., Pawtucket, Rhode Island.
 P. J. Larney, 304 Leonard St., Brooklyn, N. Y. (Retailer. Conducts radio department in hardware store and contemplates broadening line.)
 M. F. Buziak, 1211 Cedar Ave., Scranton, Pa.
 Harry C. Johnson, 61 Broadway, Arlington 74, Mass. (Builds radio sets.)
 Almus Pruitt, 147 South Central Ave., Medford, Oregon.
 Leo Westcott, Whipple, Arizona. (Retailer and state agent.)
 Dr. P. D. MacSweeney, 32 Sixth St., New Westminster, B. C., Canada.
 George E. Morris, Fort Fairfield, Me.
 Thomas Moriarty, 220 Pearl Street, Springfield, Mass.
 B. E. McCormack, 3018 Enoch Avenue, Zion, Ill.
 Harold F. Haggett, 20 Hamlet Place, Malden, Mass.
 Music House, B. A. Morris, 109 Spring Street, Newton, N. J.
 Morris Goldberg, 251 15th Street, S. E., Washington, D. C. (Is starting retail radio business.)
 Eagle Radio & Supply Stores, 49 Smith Street, Brooklyn, N. Y. (retailers and distributors).
 Oliver E. Rippel, 269 Sexton Street, Struthers, Ohio.
 Atlas Radio Company, 1479 Greene Avenue, Brooklyn, N. Y.
 Edgar Bicknell, Box 121, Carl Junction, Mo.
 D. B. Shanks, 914 Eleventh Avenue, East, Calgary, Alberta, Canada.
 Lawrence Quackenbush, Closter, N. J.
 John F. Rofe, 99 Pleasant Street, Cambridge, Mass.
 James F. McEvoy, 37 Fourth Street, New Brighton, Staten Island, N. Y.
 Richard Edsall, Butler, N. J.
 George B. Hostetter, Box 325, Freewater, Ore.
 B. Stump, 4980 Tennyson Street, Denver, Colo.
 Henry A. Westermeyer, Cleveland, Wis.
 G. M. Packard, 4142 Third Avenue, South, Minneapolis, Minn.
 Wilson S. Freesland, 77 Walnut Street, Berkley, Norfolk, Va. (distributor and retailer).
 Frank T. Walden, Soldiers' Home Hospital, Minneapolis, Minn.
 Thomas E. Miller, 729 Woodward Avenue, Nashville, Tenn. (consumer).
 H. M. Lawrence, 1610 Washington Avenue, Racine, Wis. (Wants a set or someone to assemble a set for him.)

WJZ Aerial Wrecked by Storm

THE aerial of WJZ, Westinghouse station at Newark, N. J., was carried away by a high wind during a storm on the night of May 7. The operators immediately stretched a temporary antenna but this also was dismantled by the wind. Permanent repairs were made the following day.

Radio Stocks

(Quotations as of May 9, 1923, furnished by Frank T. Stanton & Co., 15 Broad St., New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	15*
American Marconi, Unstamped	\$5	\$7
American Tel. & Tel.	122	122½
Canadian Marconi	2	3
De Forest Radio	7	10
Dubilier Condenser	9¼	9½
English Marconi com.....	10	15
English Marconi pfd.....	11	16
Federal Tel., Cal.....	478	5½
General Electric	175	176
Hennessy Radio Pub. 8% pfd.	10	12½
Mackay Companies com.....	111	113
Marconi Int. Marine.....	7	9
Manhattan Elec. Supply.....	54	55
Radio Corporation com.....	3½	3¾
Radio Corporation pfd.....	3½	3¾
Spanish Marconi	1½	3½
Western Union	110	110½
Westinghouse E. & M.....	55½	56

*Cents per share.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

NATIONAL ELECTRIC LIGHT ASSOCIATION, New York City, June 4-8, 1923; M. H. Aylesworth, executive manager, 29 West Thirty-ninth Street, New York.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Cal., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Cal.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, executive committee, The Homestead, Hot Springs, Va., May 21-22, 1923. General meeting, May 23-24, 1923; Franklin Overbagh, secretary, 411 South Clinton Street, Chicago, Ill.

Washington Y. M. C. A. Goes on Air

THE Washington, D. C., Y. M. C. A. has filed an application for a 50 watt Class A station with the Department of Commerce. A feature of the new transmitting set, located in the "Y" building on G Street, is that the plate voltage is derived from a 468 unit storage battery instead of the usual method of employing a direct current generator. This station will broadcast talks on religion, education and physical culture, paying especial attention to matters of interest to boys. The station has been inspected, and it is expected that a license will be issued to the Y. M. C. A. within a few days, assigning a wave length of 283 meters.

It Wasn't a "Mice" Condenser!

THE usually careful proof readers of RADIO WORLD made a slip in reading copy of the Arthur Pudlin Engineering Company's advertisement on page 30 of last week's issue. Reference was made to a "mice" condenser. This, of course, should have read "mica" condenser. The error is regretted.

New Radio and Electric Firms

Edward P. Fogarty Electrical Co., Cincinnati, Ohio; E. P. Fogarty, E. L. Conway, W. D. Murphy, M. M. McClelland and J. J. Geis.

C. B. Cooper Co., 154 Nassau St., New York City, Eastern representatives of Crosley Mfg. Co. and Precision Equipment Co., Cincinnati.

Duntley Radio Corp., Philadelphia, manufacturers; \$1,000,000. (Corporation Guarantee and Trust Co.)

Braender Rubber and Tire Co., Wallington, N. J., manufacture rubber products, \$265,000; Davis Z. Jeselsohn, Regina E. Donahue, Newark; Benjamin F. Teitelbaum, Jersey City.

Orchestraphone Manufacturing Co., \$500,000; T. C. Egettell, J. Ralph Egettell, Lewis E. Harman, Philadelphia. (Capitol Trust Co. of Delaware.)

Bell Telephone Securities Co., Delaware, \$1,000,000. (A. A. Marsters, 195 Broadway, New York City.)

The Wireless Press, New York City, has increased its capital stock from \$10,000 to \$25,000.

Carpenter Automatic Electric Systems Co., Wilmington, Del., build switchboards, \$1,000,000. (Delaware Registration Trust Company.)

Borch Radio, Dover, Del., \$25,000. (Capital Trust Co.)

Walbat Radio Corp., New York City, supplies and equipment, \$5,000; J. R. Batt, W. Stein, S. Goldberg. (Attorney, L. Oppenheimer, 60 Wall St.)

Webster Radio Assembling Plant, 226 Main Street, Webster, Mass. Edward E. Hale, proprietor.

Hawkeye Radio & Supply Co., 505 Eighth Avenue, Des Moines, Ia; wholesale distributors; A. J. Tingley and M. C. Haigh.

The Tomadelli Corporation has changed its name to the Tomadelli Electronic Corporation, New York City.

Allied Dealers' Association, Jersey City, N. J., statistics concerning the standing of business firms, \$125,000; William F. Murray, George P. Alzamora, Plainfield; Wilbur S. Norton, New York.

Reco Radio Engineering Co., New Rochelle, N. Y., \$10,000; C. E. Munson, J. E. Neumann. (Attorney, J. S. Rustain, New Rochelle.)

Harvard Radio Laboratories Increase Their Facilities

THE Harvard Radio Laboratories, 261 Franklin street, Boston, Mass., announce that they have increased their equipment and facilities for the repair of vacuum tubes and now are in a position to make deliveries in about ten days. They have a strictly up-to-date laboratory and make a positive guarantee that owners of repaired tubes will be perfectly satisfied with the work they turn out. It also is interesting to note that they are making special prices for the summer months.

The Harvard Laboratories request RADIO WORLD to inform its readers that at present they are accepting for repair only five and six watt detector and amplifying tubes using a single tungsten wire filament.

Directors of Boys' and Girls' Summer Camps

FOLLOWING is a list of names and addresses of directors of boys' and girls' summer camps, each of whom should be a potential purchaser of radio sets for camp and vacation use. Additions to the list will be published in succeeding issues of RADIO WORLD:

- Mr. and Mrs. E. W. Sipple, 350 W. Duval St., Germantown, Pa.
 Miss Blanche D. Price, 404 W. School Lane, Philadelphia, Pa.
 Miss Maude Sanford, Y. W. C. A., Columbia, S. C.
 Miss Eliza E. Wardlaw, 1214 College St., Columbia, S. C.
 Col. L. L. Rice, Lebanon, Tenn.
 Mrs. T. F. Taylor, Mont Eagle, Tenn.
 Mrs. J. P. Keiser, Osceola, Ark.
 T. F. Taylor, M.D., Mont Eagle, Tenn.
 Mrs. J. V. Brown, Dean San Marcos (Tex.) Academy.
 Mrs. J. V. Brown, Dean San Marcos (Tex.) Academy.
 Mrs. Edward L. Gulick, 77 Addington Rd., Brookline, Mass.
 Miss Ellen Farnsworth, 77 Addington Rd., Brookline, Mass.
 Richard D. Currier, 35 East Park St., Newark, New Jersey.
 Miss Ethel J. McCoy, Virginia Interment College, Bristol, Va.
 Mrs. Jonathan C. Day, 790 Riverside Drive, New York.
 Miss Mary Huston Tark, 610 Lexington Ave., New York.
 Dr. Jonathan C. Day, 790 Riverside Drive, New York.
 Mrs. Belle A. Roxby, Bat Cover, N. C.
 Mrs. Henry N. Carrier, Brevard, N. C.
 Henry N. Carrier, Brevard, N. C.
 Alex H. Kizer, Brevard, N. C.
 Miss Mary L. Gilfillan, Paoli, Pa.
 Miss Sarah M. Hart, Glen Ridge, N. J.
 Miss Alice W. Hoskins, 1608 Chestnut St., Philadelphia.
 Wm. Mitchell, 920 Cauldwell Ave., New York.
 Harriett M. Mitchell, 920 Cauldwell Ave., New York.
 Mrs. Adle Currier, 35 East Park St., Newark, N. J.
 Henry F. Ballantine, Redding Ridge, Conn.
 James E. Mahan, Redding Ridge, Conn.
 Gabriel R. Mason, 2276 Creston Ave., New York.
 Harry Sperling, 391 Marlboro Rd., Brooklyn, N. Y.
 Andrew I. Albert, 1728 Crotona Park East, New York.
 Dana P. Vaughn, Chestnut Hill Academy, Pa.
 L. D. Roys, 10 Bowdoin St., Cambridge, Mass.
 C. A. Roys, 10 Bowdoin St., Cambridge, Mass.
 A. L. Hayden, 10 Bowdoin St., Cambridge, Mass.
 J. W. Hayden, 10 Bowdoin St., Cambridge, Mass.
 J. Franklin Pinceo, Y. M. C. A., Lawrence, Mass.
 T. J. B. Fisher, 65 E. 83d St., New York.
 Harry L. Hillman, Dartmouth College, Hanover, N. H.
 Hubert P. Colton, M.D., Woodberry Forest School, Virginia.
 Isaac Price, A.M., 72 E. 96th St., New York.
 Dr. Louis Pick, 78 West 119th St., New York.
 H. A. Gordon, Tuxedo, N. Y.
 Paul Kyle, Irvington, N. Y.
 Raymond W. Noon, St. Louis (Mo.) Country Day School.
 John E. Noon, 3628 Delmar Blvd., St. Louis, Mo.
 Chas. W. Yeager, 2624 Hurlburt Ave., Detroit, Mich.
 L. L. Touton, 435 W. 62d St. Ter., Kansas City, Mo.
 A. A. Mason, 2545 Valentine Ave., New York.
 E. P. Conlon, Concord, N. H.
 S. G. Davidson, Tamworth, N. H.
 Albert Loewinthan, 227 Audubon Ave., New York.
 Samuel Schlosberg, Lathers Pl., New Rochelle, N. Y.
 E. A. C. Murphy, 94 Prospect St., New Haven, Conn.
 Edward Goldwater, 701 West 177th St., New York.
 Gilbert G. Brinckerhoff, 1818 Topping Ave., New York.
 Ingo F. Hartmann, 1818 Topping Ave., New York.
 John A. Davis, Stevens Inst., Hoboken, N. J.
 Max Berg, 949 Broadway, New York.
 Ray W. Phillips, 949 Broadway, New York.
 A. M. Cowhey, 1061 St. Nicholas Ave., New York.
 Mr. Joseph Lowe, 13 Astor Place, New York.
 Colba F. Gucker, Lincoln School, 646 Park Ave., New York.
 Sidney Krantz, 745 Riverside Drive, New York.
 Alice A. Kranz, 745 Riverside Drive, New York.
 Col. G. F. Verbeck, Manlius, N. Y.
 L. H. Somers, Adirondack-Florida School, Onchiota.
 H. A. Swaffield, Montpelier (Vt.) H. S.
 Glenn A. Dowling, 10527 Lee Ave., Cleveland, O.
 Harold A. Stevens, Box 485 Rye, N. Y.
 Dr. Louis Rosenbaum, 545 West 111th St., New York.
 Nat. Holman, 371 Grand St., New York.
 Dr. I. S. Moses, Straus Bldg., 5th Ave., New York.
 Eugéné F. Moses, Straus Bldg., 5th Ave., New York.
 Robert L. Howard, 190a 3rd St., Jersey City, N. J.
 Capt. Lewis Till, Saugerties, N. Y.
 Walter C. Crouch, Swarthmore, Pa.
 Mrs. E. G. Brown, Glenburnie, N. Y.
 Chas. R. Powers, Wilmington, N. C.
 Jos. Edw. Eberly, 956 Leggett Ave., New York.
 Robert B. Gerstenzang, 956 Leggett Ave., New York.
 John F. Molloy, 956 Leggett Ave., New York.
 John C. Green, 544 West 157th St., New York.
 Julius Ritter, 553 West 141st St., New York.

- A. E. Loveland, 251 Maple St., Brooklyn, N. Y.
 E. L. Fisher, 24 North Terrace, Maplewood, N. J.
 Rev. R. F. Keegan, 480 Lexington Ave., New York.
 S. S. Lowenstein, 517 East 9th St., Brooklyn, N. Y.
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 Abraham Greenberg, 719 West 180th St., New York.
 Henry Squires, 656 West 171st St., New York.
 Frank F. Gray, Central Prim. School, Montclair, N. J.
 F. G. Anderson, Scout Headquarters, Montclair, N. J.
 C. T. Gordon, Y. M. C. A., Trenton, N. J.
 Charles R. Scott, 49 Halsey St., Newark, N. J.
 Leslie Deal, Y. M. C. A., Newark, N. J.
 G. A. Stokes, Y. M. C. A., Orange, N. J.
 Merritt L. Oxenham, Red Bank, N. J.
 Max Horowitz, 5000 15th Ave., Brooklyn, N. Y.
 H. C. Beckman, 2 West 45th St., New York.
 Joseph A. Ruddy, 178 E. 79th St., New York.
 A. G. Warren, 38 Birch Crescent, Rochester, N. Y.
 Mrs. Leah Gordon, 210 W. 107th St., New York.
 Charles Model, 992 Eastern Parkway, Brooklyn, N. Y.
 Jacob Theobald, 519 W. 143d St., New York.
 Wilfred C. Ackerly, 318 W. 57th St., New York.
 Dudley B. Reed, M.D., University of Chicago, Chicago, Ill.
 R. B. Mattern, Dobbs Ferry, N. Y.
 Eugene I. Smith, Conway, N. H.
 A. D. Thayer, Homecrest, Longmeadow, Mass.
 Alex Grant, Narberth, Pa.
 George W. Orton, 39 S. 10th St., Philadelphia, Pa.
 R. A. Watkins, 28 Frye St., Lewiston, Me.
 B. A. Hoban, Gilman Country School, Roland Park, Md.
 A. B. Sutherland, Plymouth, N. H.
 Edward Fast, 555 Edgecombe Ave., New York.
 Samuel E. Fast, 555 Edgecombe Ave., New York.
 Frederick S. Ernst, 15 Babcock St., Brookline, Mass.
 C. Wm. Prettyman, Ph.D., Carlisle, Pa.
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 Mr. and Mrs. Carroll N. Jones, West Swanzy, N. H.
 John C. Bucher, Peckskill, N. Y.
 W. E. Richmond, 77 Otis St., Newtonville, Mass.
 A. W. Dickinson, 16 Otis Pl., Newtonville, Mass.
 Edgar Fauver, M.D., Wesleyan University, Middletown, Conn.
 Edwin Fauver, M.D., University of Rochester, Rochester, N. Y.
 M. D. Sutherland, Plymouth, N. H.
 John B. May, Cohasset, Mass.
 Ezra Putnol, 269 E. 194th St., New York.
 Morris Klein, 617 W. 141st St., New York.
 I. S. Abrahams, 238 E. 8th St., Brooklyn, N. Y.
 Prof. Oliver L. Hebbert, 48 Boylston St., Boston, Mass.
 David Layton, 669 Dawson St., New York.
 Laura B. Garrett, 529 W. 138th St., New York.
 Miss Mary L. Jobe, 50 Morningside Drive, New York.
 Mr. and Mrs. Harry Davidson, 5333 Rising Sun Ave., Philadelphia, Pa.
 J. Wilford Allen, M.D., 117 W. 12th St., New York.
 G. D. Robins, The Hill School, Pottstown, Pa.
 J. D. Warnock, The Hill School, Pottstown, Pa.
 F. Fraser, The Hill School, Pottstown, Pa.
 E. C. Durfee, The Hill School Pottstown, Pa.
 W. H. Bentley, 14 Beacon St., Boston, Mass.
 Miss V. L. Pride, 1242 Elden Ave., Los Angeles, California.
 Miss Dorothy I. Bell, San Jose, Cal.
 Miss Portia M. Swett, (Summer) Steamboat Springs, Colo.
 Robert B. Brodie, 314 W. 17th St., New York.
 Miss Fernacia McCluney, College Industrial Arts, Denton, Tex.
 A. A. Jameson, 615 Chamber Com. Bldg., Atlanta, Georgia.
 Rev. C. W. Smith, Clayton, Ga.
 Miss Sara G. Holiday, Burlington, Iowa.
 Albert F. Ewers, St. Louis, Mo.

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| (Coils for long waves) | |
| "Regal" | Special, \$42.50 |
| (Manufacturers' price \$75.00) | |
| "Wintner" (with "B"-bat. & phones) | \$57.50 |
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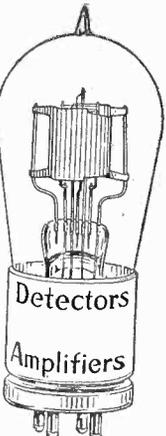
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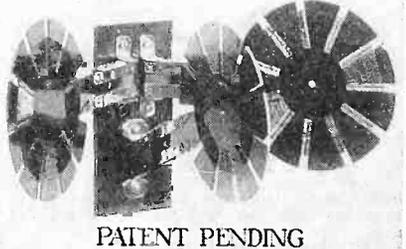
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Price \$3.75 C. O. D. or money order

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209 MARKET ST. NEWARK, N. J.
Salesmen wanted

PERSONAL STATIONERY

SEND ONLY \$1. Be distinctive—have your own stationery. Send cash or money order for 200 sheets, 100 envelopes, postpaid, printed in blue ink with name and address, not over 3 lines (or 50 characters), on good white bond, sheets 6x7. Personal Printing Co., Box 52557 Boston, Mass.

Reference: International Trust Co., Boston

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK) FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y. BY HENNESSY RADIO PUBLICATIONS CORPORATION

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New York—Arnold D. Friedman, W. H. Oke.
Chicago—Stevens & Baumann, Inc., First National Bank Building.
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San Francisco—Stevens & Baumann, Inc., Holbrook Bldg.

SUBSCRIPTION RATES

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

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—\$5.00. Per agate line \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.

Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

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

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Service Officers Form Radio Club

THE United Service Radio Association has been formally organized at the Army and Navy Club in Washington, D. C., by a group of officers from the Army, Navy and other uniformed services of the government. This club has for its objective the education of commissioned officers in the radio art and the fostering of radio development through lectures and experiments.

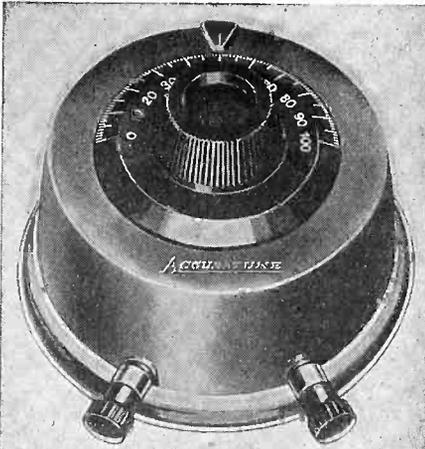
A lecture course by experts on radio was planned following the first practical talk given by Maj. Gen. Geo. O. Squier of the Signal Corps, a member of the association. To date about one hundred officers have joined, including some civilian experts admitted as associate members. At the second session, Capt. J. T. Tompkins spoke on the use of radio in the Navy.

Officers of the association are Lt. Col. F. P. Jackson, Q. M. C., president; Capt. J. T. Tompkins, U. S. N., vice-president, and Capt. R. B. Connor, U. S. A., secretary.

NAA Now Broadcasts on 435 Meters

ARLINGTON NAA will broadcast Governmental information on the 435 meter wave instead of 710. This change was made in connection with the Department of Commerce's new schedule. Talks on the standard radio frequency signals being transmitted by the Bureau of Standards from time to time from WWV, will be an added feature of the Commerce Department's broadcasting schedule from NAA, Tuesday evenings between 7:45 and 8:00 p. m.

AUXILIARY TUNER



Helps Cut Out Those Interfering Stations

Not a mere wave-trap, but a high-grade tuner which when connected in series with antenna will materially improve the selectivity of the average receiver.

One piece molded Condensite Case. Send Cash or Money Order.

Regular retail list, \$7.50. Special Introductory Price... **\$5.45** post paid

GUARANTEED TO IMPROVE YOUR SET OR MONEY REFUNDED.

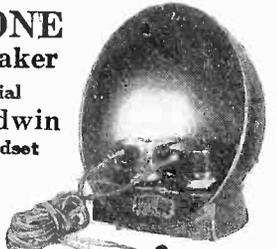
RADIO MULTI-PARTS

897 17th Street Newark, N. J.

SHELSTONE Loud Speaker

With Special Nath. Baldwin Type C Headset

Correct in PRINCIPLE PERFECT RESULTS



When you sit back to enjoy the broadcast program you want perfect reproduction. The band stand in your town, cathedrals, theatre stage, are all built like Shelstone. It is built like these to take advantage of the most correct acoustic principles and to reproduce music and speech perfectly. If your dealer cannot supply you order direct.

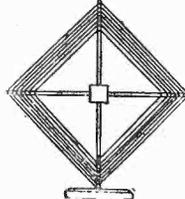
Loud Speaker, Complete... \$16.00 Postpaid
Loud Speaker, No Phones... \$4.00 Postpaid
C. O. D. or Cash with Order.

Dealers, Write for Discounts.

THE SHELSTONE CO.

68 HALSEY ST. NEWARK, N. J.

BITTER \$1 LOOP AERIAL



A knockdown aerial, including wire; can be assembled in 10 minutes. Endorsed by N. Y. Globe and Mail. Results guaranteed. Ritter loop reduces interference, static and lightning troubles. No outside aerial or ground needed. Sold direct from our factory. By mail 10c. extra.

We also manufacture the now famous **BITTER GRAND CRYSTAL SET, price \$3.50**

BITTER RADIO CO.

230 Canal Street New York City

\$25 A DAY Selling Shirts

Large shirt manufacturer wants agents to sell complete line of shirts, pajamas, and night shirts direct to wearer. Advertised brand—exclusive patterns—easy to sell. No experience or capital required. Entirely new proposition. Write for free samples. Madison Shirt Co., 503 Broadway, N.Y.C.

One Cure for the Re-radiation Evil

EDITOR, RADIO WORLD: The issue of RADIO WORLD for April 28 made mention of a certain apartment house with about a dozen aerials on the roof, all of which led to a regenerative set, save one. The owners of these sets, owing to the unfortunate situation the result of which is objectionable interference, must be somewhat disappointed with radio. Unfortunate this situation may be, yet with the increasing installation of regenerative outfit the situation is bound to become worse, especially in populated districts.

The broadcasting stations are certainly doing all in their power with the expenditure of large sums to perfect their apparatus to improve broadcast programs. To me, therefore, it seems unfair to spoil their efforts at the receiving end. The owner of the set is entitled to clear reception. Then he will boost radio instead of complaining about the squeals from his neighbor's set. In my opinion we must try to help the broadcaster, as he is trying to help us and thus play fair with him, with the other fellow who is "listening in" and with ourselves.

The problem of re-radiation was before me. My outfit gave the neighbors considerable trouble. Likewise in return they gave me trouble. Lately I constructed the Cockaday four-circuit tuner, and now I have no more re-radiating complaints. I am a believer in this circuit. It has volume, it gives truthful reproduction, it is exceedingly selective, and the interference is practically nothing. With two steps of audio I have found the circuit the best I have ever tried.

Any tube set can be easily converted to the Cockaday circuit and the expense would be very small. It might be well to state that WD-11 tubes give excellent results—at least I found it so.

Very truly yours,

L. E. LAMB.

1241 East Seventh St., Brooklyn, N. Y.

Solving an Aerial Problem

EDITOR, RADIO WORLD: In RADIO WORLD for April 28, 1923, there was an article, "An aerial problem to solve." My experience might be of help to many fellow fans not able to have an overhead aerial.

The fire escape proved to me a salvation, with which I received as far as WGY on one tube. My longest distance was Frank Jones, Cuba, on a 75-foot aerial and with a standard regenerative set, variocoupler, two variometers and two stages of audio-frequency. Without aerial, but using the grid variometer binding post as ground connection, I receive all local stations, and WGY, WJZ, WEA, WOR and other local stations I receive without aerial or ground.

If you publish this I wish to hear from fellow fans who try the grid connection scheme, and I will be glad to answer any questions regarding this.

In addition I wish to express my thanks to your publication as I find it very helpful to amateur radio fans.

686 Third Ave.,
New York City.

CHRIST FATSEAS.

Broadcasting Announcers, Attention!

EDITOR, RADIO WORLD: In regard to the kind of material for broadcasting, I think that, in fairness to all fans, a mixed program is best.

But, in my opinion, the worst feature of broadcasting is the fault of the announcer who gets his station letters thus: "ABC." The announcer should say: "A—B—C." We hear the program and don't get the stations letters, and consequently don't know who is broadcasting.

W. B. CHAMBERLAIN.

1207A Armstrong Ave.,
St. Louis, Mo.

A Cool Summer Predicted— Good News for Radio Dealers Dr. C. G. Abbot, Eminent Heliologer, Says the Sun Won't Be as Hot as Usual This Summer

THERE is one man at least who does not think that the coming summer is to be a hot one. He is Dr. C. G. Abbot. He knows all about the sun, moon, stars and other planets. He announces that the warming qualities of the sun during the months of 1923 already passed have been from 3% to 4% less than in former years.

He predicts that in all likelihood we will have an unusually cool summer and that folks will stay indoors more than ever before during this period.

All of which, of course, is glad news for the radio dealer.

WOC Assigned New Wave Length

In accordance with the provisions made at the radio conference recently held at Washington, Station WOC, Palmer School of Chiropractic, Davenport, Iowa, has been assigned a wave length of 484 meters. The Sunday afternoon concerts from 1:45 to 2:45 will be omitted until the first Sunday in September. All other schedules will be broadcast as usual during the summer.

CUT RATE PRICES

A Money-Back Guarantee Goes with Everything We Sell

Standard Parts at Lowest Prices

SPECIAL—\$12.00 GENUINE V. T. 2 TUBES..... **\$6.50**

- C-301-A \$6.50
- U. V. 199..... 6.50
- W. D. 11 or 12..... 6.50
- COCKADAY COIL 2.80
- 6.50 A. P. Detector Tubes..... 4.50
- 12.00 Nathaniel Baldwin Type C double 8.75
- Master Baldwin Type C double 8.25
- Baldwin Type C single..... 4.50
- 8.00 Brandes Head Sets..... 5.75
- 8.00 Federal Head Sets..... 4.95
- 7.50 Stromberg-Carlson Head Sets.. 5.75
- 10.00 N & K Head Sets..... 6.00
- 7.00 U. V. 712 Audio Transformers.. 5.75
- 7.00 Federal Transformers 4.75
- 5.00 Acme Transformers 3.75
- Rasla Radio Transformers..... 5.00

Atwater-Kent Apparatus—Full Line in Stock

COMPLETE STOCK—MANY OTHER BARGAINS—WRITE FOR PRICES

Send Money Order or Certified Check and include Postage.

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115 West 23rd Street

New York

"GRANOLITE"

UNIVERSAL LOUD SPEAKER RADIO HORNS

THE ALL-WOOD, PERFECT REPRODUCING HORN YOU HAVE BEEN LOOKING FOR

They will not warp, crack or peel

"GRANOLITE" Universal Radio Horns are positively superior to all others because we have embodied in their construction perfect acoustic qualities, careful workmanship, high grade, carefully selected materials, strength and beauty of design. The base construction and equipment is universal, permitting the installation and use of any of the standard and well known loudspeakers and receivers.

LIST PRICES

- No. 1 Horn, 15" high..... **\$8.00**
- No. 2 Horn, 19" high..... **\$10.00**
- No. 3 Horn, 25" high..... **\$12.00**

Immediate Delivery Prepaid on Receipt of price. Above prices apply to horn and base only. If horn is wanted complete with receiver add \$6.00.

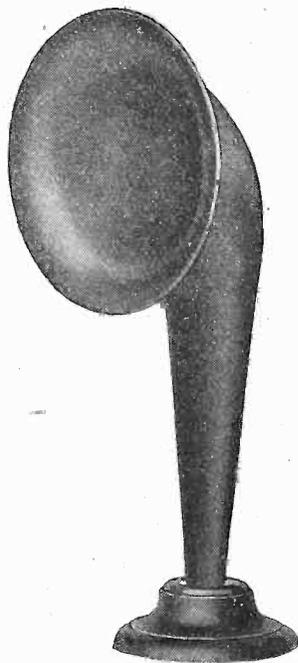
Dealers, write for own special trade proposition.

Granolite Horns Are Manufactured Solely by

Granolite Art Products Co.

222-224 4th STREET

MILWAUKEE, WIS.



"Granolite"

Made in three sizes.

- No. 1 with - 7 1/2 inch bell; height, 15 inches.
- No. 2 with - 9 1/2 inch bell; height, 19 inches.
- No. 3 with - 14 inch bell; height, 25 inches.

FILL OUT AND MAIL NOW

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RADIO WORLD

RADIO WORLD

1493 Broadway, New York City

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

SUBSCRIPTION RATES:

- Single Copy \$.15
- Three Months 1.50
- Six Months 3.00
- One Year, 52 Issues..... 6.00
- Add \$1.00 a Year to Foreign Postage; 50c for Canadian Post.

Makes Your Set Portable!



(Pat. Pending)

Replaces aerials, loops, electric light plugs, etc. Eliminates lightning dangers. Reduces STATIC and other interference. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.

Postpaid, Anywhere, for
\$5.00

*Satisfaction Guaranteed, or
Money Refunded.*

Dealers: Write for our proposition.

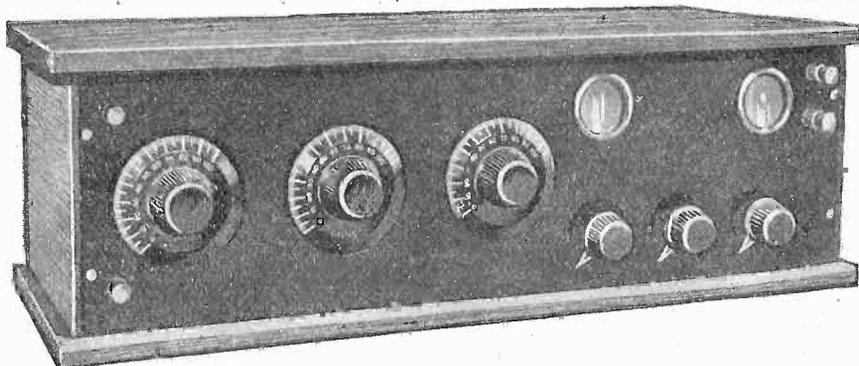
Short Cut Radio Corp.
243 West 54th St. New York

Radio Opportunity

High grade retail store, 42nd Street, Grand Central zone, will consider subletting space to Radio Expert (Capital \$15,000) or will consider commission basis. Address our advertising agents,

LEWIS ADVT. CORP.
220 Broadway

THE ANNIVERSARY NUMBER of Radio World was increased in size and is an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.



SPENCER SUPERIOR RECEIVER—PRICE \$69.50

INCORPORATING THE NEW SPENCER "EQUIDYNE" CIRCUIT.
The greatest of all radio frequency circuits, combining good selectivity, long range and wonderful volume without distortion, and with less static.
A four tube set that is a masterpiece in design and workmanship, setting a new standard for beauty and efficiency. Absolutely guaranteed.
Free literature upon request. Liberal proposition for dealers and jobbers.

SPENCER MFG. CO., AURORA, NEBR.

COMING SOON—Spencer Variable Condensers, Variable Grid Leaks, Rheostats and Potentiometers, containing no mechanical moving parts and with capacity and resistance chambers forever sealed against atmospheric changes.

WHAZ to Change Wave and Hours

BEGINNING with its weekly Monday evening program May 21, radiophone station WHAZ at Rensselaer Polytechnic Institute, Troy, N. Y., will broadcast on a 380-meter wave length as assigned by the United States Department of Commerce. At present this Class B station is broadcasting on a 400 meter wave. Coincident with the change in wave length, station WHAZ will change the hour of starting its broadcast programs Monday evenings from 8.15 to 9 o'clock, Eastern Standard Time (10 o'clock, daylight saving time), in order that its programs may be broadcast without interference and completed without interruption. Heretofore this station has been restricted to the period between 8:15 and 9:30 p. m. and frequently its programs have had to be curtailed. This change to a later hour will also meet the approval of the many listeners to WHAZ programs in the Middle and Far West and Western Canada.

Features of the Program from WGY

Miss Ethel Newcomb, nationally known concert pianist and probably the best known radio pianist, will be featured on the Monday evening program of WGY, the General Electric Company station at Schenectady, N. Y., May 21. On the same program will appear William Demorest, boy soprano, and Edward Rice, violinist.

As a result of a great many requests for another evening by the Georgia Minstrel Boys, the studio manager has prepared an entirely new program for these entertainers for Tuesday night, May 22. Wednesday night is "silent night" for WGY. Thursday evening, May 24, the WGY Players will produce the rollicking Broadhurst farce, "What Happened to Jones."

Major Edgar C. Leonard will deliver an address Friday night, May 25, on "The Citizens' Military Training Camp."

Special Licenses for Broadcasting Development

IN an effort to encourage the scientific development of broadcasting and apparatus for that purpose, the Department of Commerce has created a new form of special license known as the "Broadcasting Development Class." Licenses in this class will be issued to station owners having transmitting and receiving sets of their own design and manufacture, provided in duplicate where failure is likely to occur. These stations are to be used for the improvement of broadcasting and many special requirements are demanded by the Department. Detailed information will be given on application.

Some Especially Good Back Numbers of Radio World

DECEMBER 23, 1922

Bank Wound Coils and How to Wind Them, by R. L. Dougherty.

A Simple Inexpensive Receiver, by C. White.
Some New Applications for Your Power Amplifier, by F. W. Proctor.

New and Simple Hook-Up Keeps Table Clear, by A. Hennesly and J. Kent.

New Non-Oscillating Detector, by H. P. Donle.
Some New DX Hook-Ups, by Contributors.

DECEMBER 30, 1922

How to Make a Single Bladed Vernier Condenser, by Ortherus Gordon.

Prize Set Built on Kitchen Table, by John Kent.
Construction of a 1½-Volt Dry Cell, by R. L. Dougherty.

Peanut Tubes and Hook-Ups I Have Used Successfully, by P. F. Metzler.

JANUARY 6, 1923

How to Make a Variable Grid Leak, by Ortherus Gordon.

A New Game for Radio Listeners, by A. G. Shirt.

Get Radio Goods That Stand the Test, by C. White.

A New and Unusual Single Circuit for Radios, by C. White.

American Radio Exposition Gay with Radio Surprises.

JANUARY 13, 1923

Constructing a Simple Reflex Amplifier, by F. J. Rumford.

Some Notes for the Radio Amateur with Little Money, by C. White.

The Set That Works Without an Operator, by R. L. Dougherty.

A Panel Layout for a Regenerative Receiver, by C. Meyers.

Chief Characteristics of the New WD-11, by John Kent.

JANUARY 20, 1923

DX Work with a WD-11, a constructive article with all diagrams and a full page, full sized panel layout, by Ortherus Gordon.

How Radio Is Handled in Uncle Sam's Navy, by R. A. Bachman, U. S. N.

A Reflex Circuit with Crystal Detection, by C. White.

Some New DX Hook-Ups to Try Out, by readers of RADIO WORLD.

JANUARY 27, 1923

Single Circuit Regenerative Receivers, by C. White.

A Two Tube DX Set, for DX Nite Owls to Try, by John Kent.

The Rejector or Filter Circuit, by F. J. Rumford.

The Art of Proper Tuning, by K. M. Swezey.

The New Monster Radio Towers on the Roof of a New York Skyscraper, by R. L. Dougherty.

FEBRUARY 3, 1923

Radio Golf at 3,576 Miles Per Hour, by A. S. Gordon.

Wired Wireless to Insure Secrecy in Radio.

Various Filament Resistances and How to Make Them, by Marius Thouvais.

A New Amplifying Receiving Set Employing Satterlee's Circuit, by F. J. Rumford.

FEBRUARY 10, 1923

A New and Novel Spider Web Tuner, by A. S. Gordon.

Design of an Inexpensive Wavemeter, by C. White.

Hearing WGY in London on a Two-Foot Loop, by our London Correspondent.

Some Dope on the Reclamation of Dry Cells, by Arthur S. Gordon.

Using Two Generators for Supplying One Airplane Set, by S. R. Winters.

FEBRUARY 17, 1923

An Inexpensive Reflex Receiver Utilizing One Dry Cell Tube, by C. White.

The Farthest North Broadcasting Station, by J. L. Wilkie.

Radio Frequency vs. Audio Frequency, by M. C. Batsel.

A Hook-Up That's a Wonder for DX and Long Waves, by G. W. May.

WJZ Heard from Coast to Coast, by John Kent.

FEBRUARY 24, 1923

Fundamentals of Reflex Circuits and Three Hook-Ups, by W. S. Thompson.

Micro Variometer for Sharp Tuning, by J. E. Anderson.

The Flewelling Circuit, by R. L. Dougherty.

Mounting Crystal Detectors on a Panel, by T. W. Benson.

Building a Power Amplifier at Home, by C. White.

MARCH 3, 1923

Multi-Tube Reflex Circuits, by W. S. Thompson.

Perfect Broadcasting Now Possible Through the New Glow Discharge Transmitter, by P. A. Sensenig.

How I Received the American Amateur Signals in France, by Marius Thouvais.

A Simple and Improved WD-11 Receiver, by C. White.

An Efficient Single Tube Super-Regenerator, by F. J. Rumford.

Any single copy of RADIO WORLD mailed postpaid on receipt of 15 cents. Any seven issues for \$1.00. All the above 11 issues for \$1.50. Or send \$6 for 1 year (52 issues). RADIO WORLD, 1493 Broadway, New York.

The latest and most essential part of an efficient tube set



Variable Resistance Leaks for PANEL MOUNTING

Mounted on any panel in a few seconds—2 screws serving as connections behind panel.

Get stations you never heard before
No pencil markings—assure unbroken range of 180 degrees. Clarify signals—eliminate hissing.

Complete with either .00025 or .0005 mfd. Micon Condenser..... \$1.00
Without Condenser..... 75c

At your dealer—otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 Seventh Ave. New York

Thinks Radio Broadcasters Should Collect Royalties

A VALUED correspondent of RADIO WORLD imparts the following interesting information about the royalty dispute between composers and broadcasters.

"I have just read your article on 'The Broadcasters - Composers - Producers Middle' in RADIO WORLD for May 5. As the radio department of which I have charge in _____'s store is located right next to the phonograph department and also as the two departments have much in common, it has been very noticeable recently that a great many more calls for the old time records and songs have been made than for a long time. The saleswoman at the counter spoke to me about it and it occurred to me that this new demand might be the result of the fact that a local broadcasting station has been using lately nothing but old time melodies.

"If this is the case, it shows that radio has taken a decided grip on the advertising end of music. Personally, I believe this is so. I cannot understand why any fee should be paid to the composers—it should be vice versa."

State Control of Radio in Denmark Proposed

STATE control of radio telephony in Denmark is provided in a bill recently introduced in the Danish Rigsdag by the Minister of Traffic. Assistant Trade Commissioner H. Sorenson reports. It is proposed that the Minister of Public Works shall be authorized to grant concessions for installation of radio receiving sets and that the provisions of the law of April 19, 1907, concerning wireless telegraphy, shall also apply to wireless telephony. It is said that on account of the restricted wave band that will be assigned to Denmark under agreement with the Norwegian and Swedish Telegraph Services the Danish Government will exercise full control over transmitting stations.

British Radio Codes Stolen

Seven secret wireless code books have mysteriously disappeared from the British War Office. A flying squadron of secret service men has been sent into the foreign districts in an effort to apprehend the thieves. Meantime an entirely new official code is being drawn up.

A Five Year Guarantee

ARTHUR PUDLIN'S VARIABLE HIGH RESISTANCE LEAK

Eliminates the hissing and all other undesirable effects and enables you to hear all stations within 2000 miles.
We will at any time within a period of 5 years refund your money if you are not satisfied with this device and we will not ask for return of the device.



COMPLETE WITH BASE
Price with .00025 Micon Condenser, \$1.00
Price without Condenser 75c

It gives unapproached clarity and tone and every other quality that a radio set should have.

Arthur Pudlin Engineering Co.
Dept. 107 1540 Broadway, New York
We also manufacture

The Artmica Condenser

In all capacities etc.

For Immediate Delivery

MAIL ORDER SPECIALS

PHONES

Berwick Supreme—
3000 Ohms. List. \$4.50 Our Price, \$4.25

Radiocieve—
2200 Ohms. List. \$4.00 Our Price, \$4.25
(Loud Speaker Phones, better than Baldwins)

Lowest prices on all radio parts!
Write us your needs!
Our merchandise is guaranteed and post age prepaid anywhere in U. S.

Money Orders Only

MOGUL ELECTRIC CO.
236 Fulton St. New York City

Subscribe for RADIO WORLD, \$6.00 a year, \$3.00 six months, \$1.50 three months.

Same Volume as More Expensive Tubes

THE DELTA

A 2 amp 4-5 mill tube, with a 25% over R. R. Rating.
Can be used as a detector or as a modulated streamer.

\$2.50 Each
Consumption 2000 Watts, etc. with standard 5000 Volt Adapter. See spec.

DELTA MIDGET TUBE CO.
21 Market St. Newark, N. J.

Send 10c for a copy of the **FADA Handbook**—a real aid to your experimental work.

F. A. D. ANDREA, INC.
1881-W Jerome Ave., New York City

TO GET THAT DISTANT STATION

USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

- PWX, Havana, Cuba
- WWJ, Detroit, Mich.
- WSB, Atlanta, Ga.
- WDAP, Chicago, Ill.
- CFCN, Calgary, Can.
- WBAP, Ft. Worth, Texas



Our adaptation of a popular hook-up furnished with coupler. Coupler fully guaranteed when hooked up according to instructions.

Coupler and diagram, sold only under our money back guarantee. Mailed anywhere in the United States upon receipt of \$5.00. Post Office or Express money order.

COAST COUPLER COMPANY

321 WEST SEVENTH ST.

LONG BEACH, CALIFORNIA

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

Reinhold Radio Detector. A CHEMICAL DETECTOR. Every spot equally sensitive. Lasts indefinitely. Permanent graphite contact. Ideal for reflex circuits. \$1.50 prepaid. WARRENDARCY RADIO COMPANY, 1441 Broadway, N. Y.

VACUUM TUBE RESULTS FROM A CRYSTAL SET! A "PT" Ultra-Sensitive Contact will increase the range and audibility of your crystal set. We guarantee this wonderful Contact to be MORE SENSITIVE THAN ANY OTHER CAT-WHISKER MADE; and that IT WILL NOT JAR OUT. WITH A "PT" MYRLE WOOD HEARD 46 PHONE STATIONS, IN A THOUSAND-MILE RADIUS! Others likewise testify that the "PT" has given results equaling tube equipment. Simple to install in any crystal detector. Price only twenty-five cents coin. "PT" CRYSTAL CONTACT COMPANY, Box 1641, BOSTON.

A WONDERFUL CRYSTAL SET. Can hear all over Philadelphia, and sometimes outside of Philadelphia. Price with phones, \$12.00; without phones, \$6.00. Receiving sets, \$35 to \$200. Guaranteed or money back. Send Money Order or call. Williams Radio, 2339 N. 8th St., Philadelphia, Pa.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

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**Instruction By Radio
 from a Central
 "Professor's College"**

THE class that ran by itself" is the new
 name of the class in international law
 at Princeton, says the New York Times.
 A tardy professor gave it the opportunity,
 and the campus has given it the name. A
 few days ago the senior class in this course
 assembled at the regular time and place but
 found no instructor. After waiting the
 customary five minutes one member sug-
 gested the ordinary proceeding of depart-
 ing. He was voted down, and the class
 decided to conduct its exercises itself.

When the professor arrived he found
 things progressing so smoothly that he
 dropped down into a back seat and "listened
 in" for the remainder of the hour. The
 class has "run itself" twice since the acci-
 dental inauguration of the system.

This incident is heralded on the Princeton
 campus as the forerunner of Princeton's
 system of "self-education," which starts
 next Fall with the two upper classes.

In commenting on it, Professor Philip
 Marshall Brown said: "If this custom
 spreads, colleges will become non-pro-
 fessional institutions. Then we would prob-
 ably see a centrally located 'professors' col-
 lege' where lectures by the country's best
 authorities would be sent out by radio and
 questions proposed and answered by wireless
 telephone. This would also wipe out the al-
 ways pressing problem of teachers' salaries."

**Radio Will Herald
 Kiwanis Convention**

THE coming international Kiwanis con-
 vention in Atlanta, Ga., May 28-31, will
 be heralded in advance by several especially
 fine entertainments broadcast by the Atlanta
 Kiwanis Club from WSB, The Atlanta Jour-
 nal station.

Several thousand leading business and
 professional men from every State in the
 Union and Canadian provinces, who will as-
 semble in the Georgia capital for the annual
 meeting, will get advance tips on the hos-
 pitality awaiting them through the radio
 concerts, which will include some of the
 outstanding entertainment features planned
 for the Kiwanis conclave. More than 1,000
 clubs, with 100,000 members, will be of-
 ficially invited to listen in.

Tune in to
WDAP
 —the powerful broadcasting
 station at

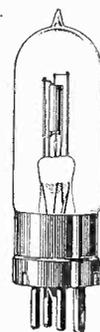
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From Porto Rico to lonely ranches in Alberta
 and Saskatchewan, from sunny San Diego to Que-
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 and Pacific Oceans, programs from **THE DRAKE**
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**Instruction By Radio
 from a Central
 "Professor's College"**

THE class that ran by itself" is the new name of the class in international law at Princeton, says the New York Times. A tardy professor gave it the opportunity, and the campus has given it the name. A few days ago the senior class in this course assembled at the regular time and place but found no instructor. After waiting the customary five minutes one member suggested the ordinary proceeding of departing. He was voted down, and the class decided to conduct its exercises itself.

When the professor arrived he found things progressing so smoothly that he dropped down into a back seat and "listened in" for the remainder of the hour. The class has "run itself" twice since the accidental inauguration of the system.

This incident is heralded on the Princeton campus as the forerunner of Princeton's system of "self-education," which starts next Fall with the two upper classes.

In commenting on it, Professor Philip Marshall Brown said: "If this custom spreads, colleges will become non-professional institutions. Then we would probably see a centrally located 'professors' college' where lectures by the country's best authorities would be sent out by radio and questions proposed and answered by wireless telephone. This would also wipe out the always pressing problem of teachers' salaries."

**Radio Will Herald
 Kiwanis Convention**

THE coming international Kiwanis convention in Atlanta, Ga., May 28-31, will be heralded in advance by several especially fine entertainments broadcast by the Atlanta Kiwanis Club from WSB, The Atlanta Journal station.

Several thousand leading business and professional men from every State in the Union and Canadian provinces, who will assemble in the Georgia capital for the annual meeting, will get advance tips on the hospitality awaiting them through the radio concerts, which will include some of the outstanding entertainment features planned for the Kiwanis conclave. More than 1,000 clubs, with 100,000 members, will be officially invited to listen in.

Tune in to
WDAP

—the powerful broadcasting
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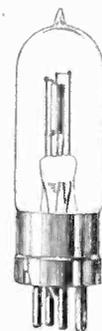
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WDAP Station is but a single interesting feature of THE DRAKE, Chicago's finest hotel. When in Chicago be sure to stop at THE DRAKE. See how concerts are broadcasted, and enjoy the world famous service and surroundings of this wonderful hotel. Information on request.

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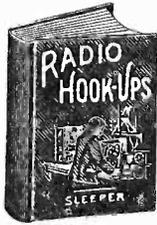
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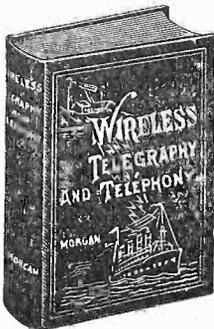
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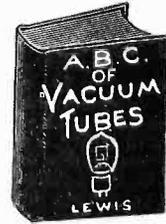
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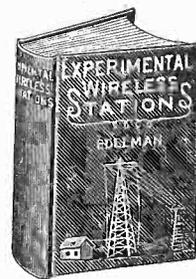
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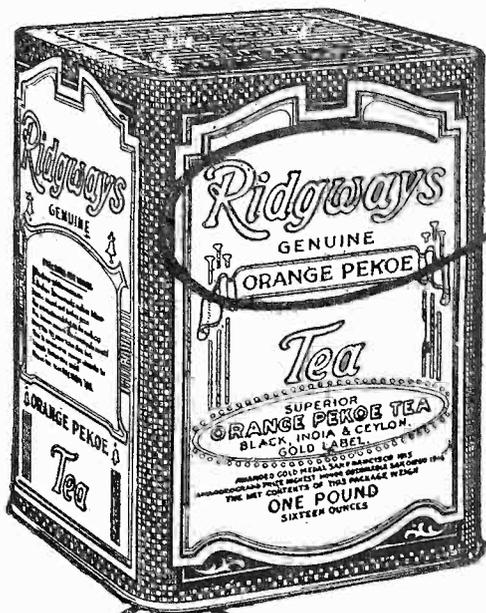
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FIL-KO-STAT

enables you to hear stations you've never heard before—

weeee-eeeeeeeee



Your receiving set is probably bringing in stations you never hear! You just get that faint mouse-like whistle. But you can't bring in the music because your rheostat does not properly control your filament action.

Then again, you hear stations that sound as though they were down a deep well. They come in weak and indistinct. Your tuning apparatus gets the wave length, but your wire rheostat or other so-called filament control can't do the rest of the job which is to adjust the electronic flow in the vacuum tube to meet the conditions under which the station is operating.

With the Fil-Ko-Stat you bring in the weak stations strong and clear.

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The Fil-Ko-Stat is the only instrument which permits that accurate control of "A" battery current necessary in using UV 199's and other dry cell tubes.

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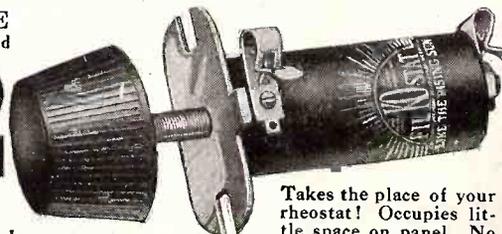
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