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52 Numbers

RADIO

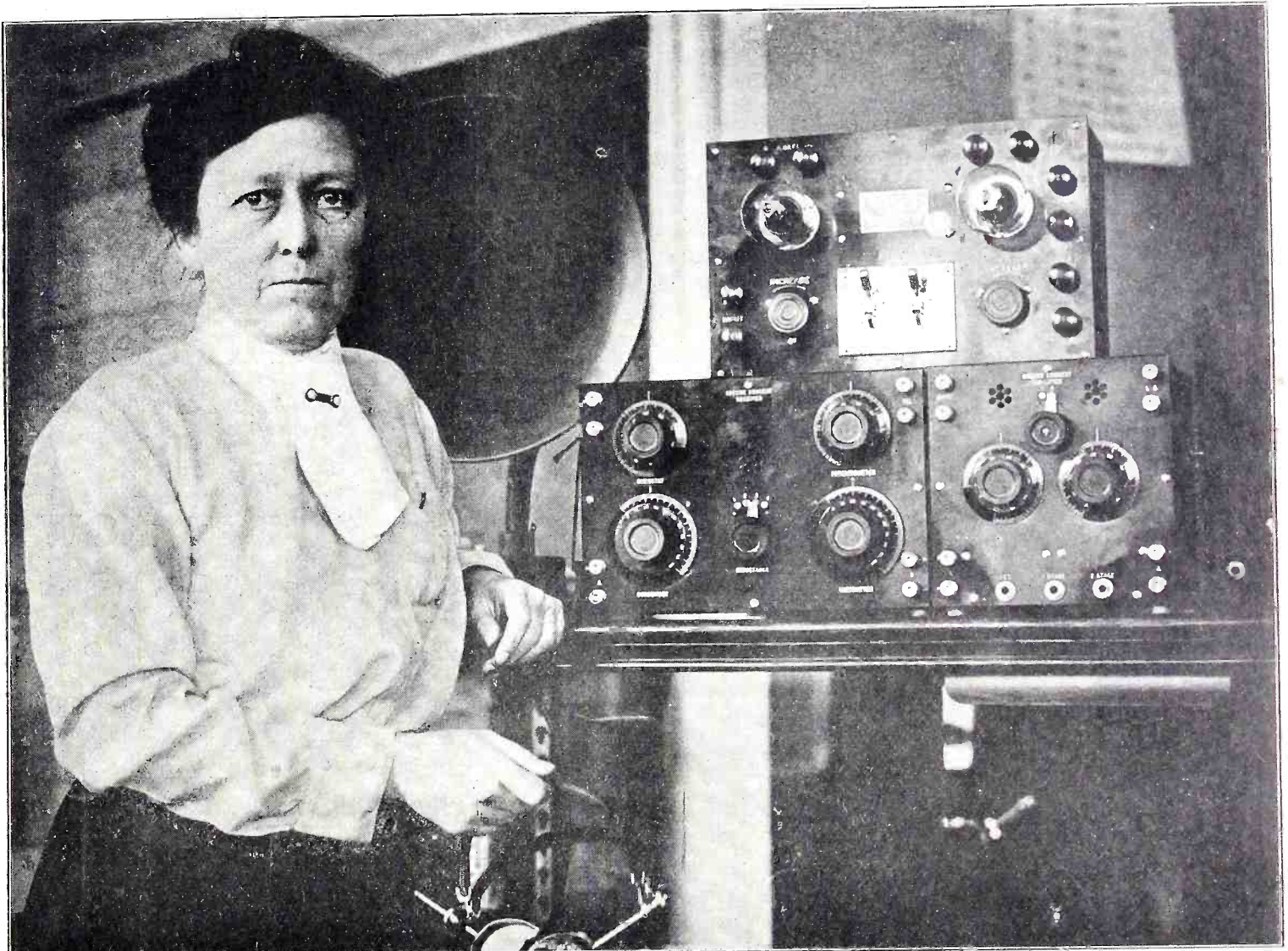
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WORLD

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EVERY WEEK

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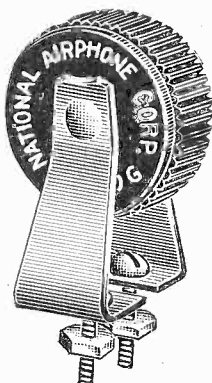
This is Miss Rachel M. Thompson, of Boston, Mass., the only woman graduate of the radio school she attended and the holder of a first-class radio operator's license. She has wound armatures in a factory and has done machine tool work. Her favorite occupation is lecturing to boys on radio and other subjects.

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NATIONAL AIRPHONE IMPROVED "GOLD-GRAIN" DETECTOR

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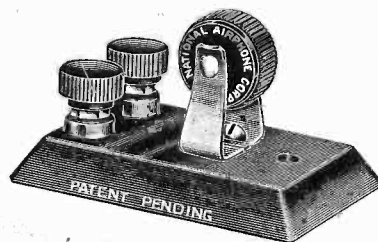
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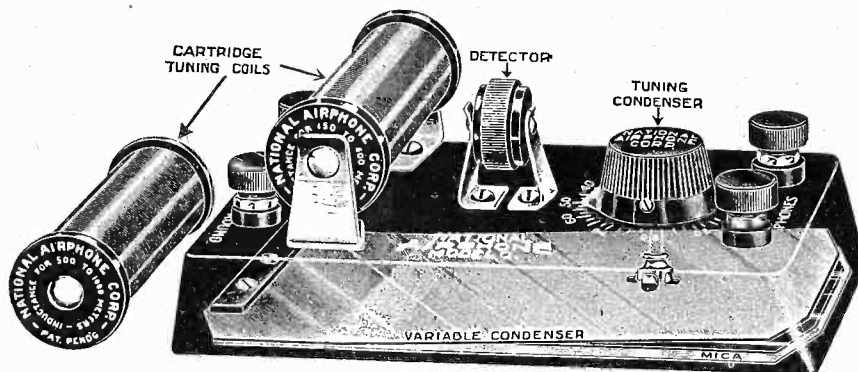
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NEW YORK, N. Y.

VOLUME THREE OF
RADIO WORLD

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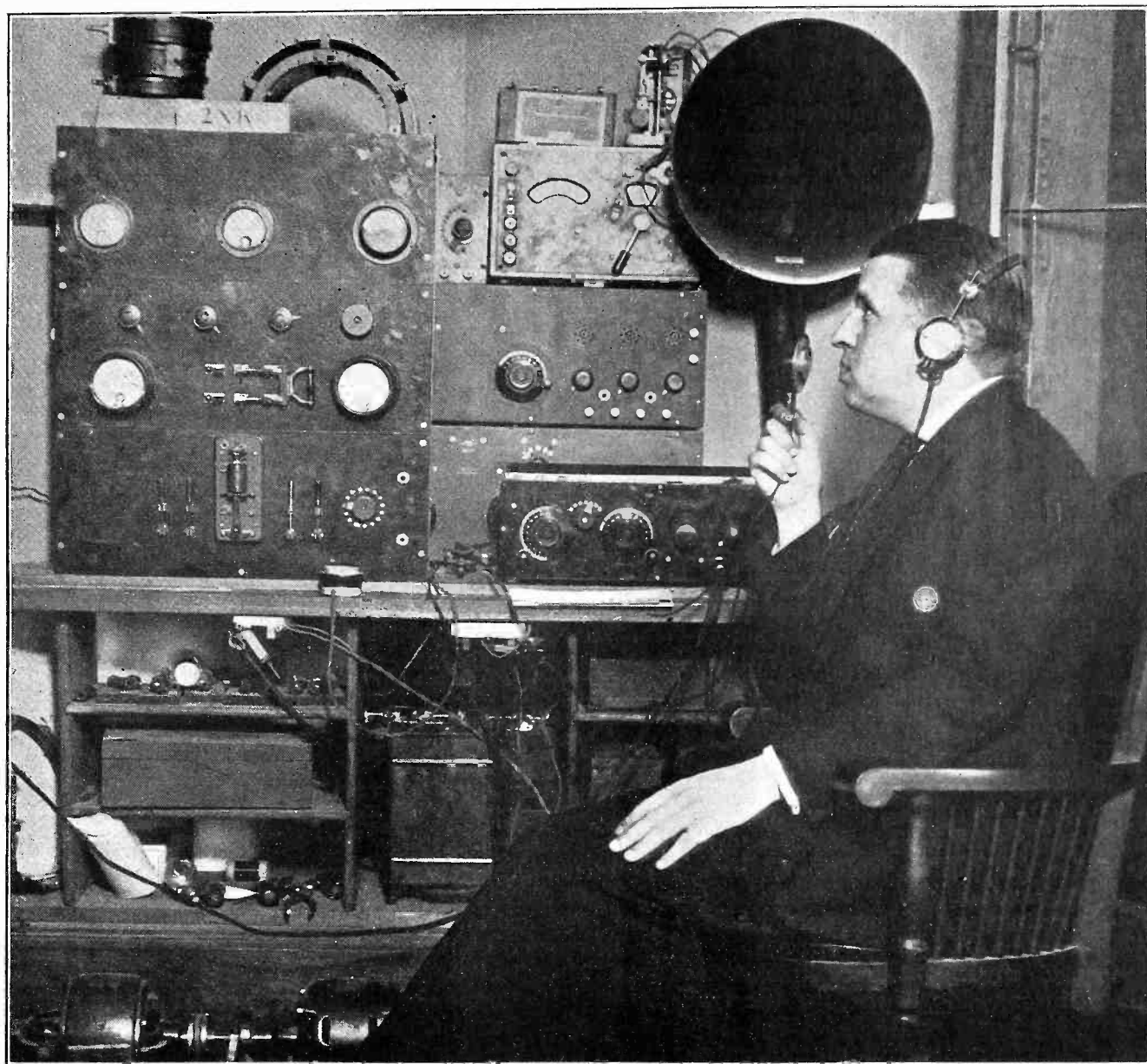
Vol. III, No. 5. Whole No. 57

April 28, 1923

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A Notable Member of Radio's Higher Circles

By William Silver



(C. Photonews, N. Y.)

Transmitting and receiving equipment of L. M. Cockaday, one of the prominent amateurs of the United States. Mr. Cockaday, who is operating his radiophone set, has just perfected a new four circuit receiver shown below his right hand.

ONE of the best known amateur radio stations in the United States is 2XK, operated by Lawrence M. Cockaday, and located at 1522 Jessup Avenue, New York City. It is a station that has done remarkable work in both telegraphy and telephony and has established several records in both for the other amateurs to shoot at.

The illustration shows the receiving and transmitting equipment of 2XK as well as its owner. The transmitter, situated on the left hand side of the table, is rated at 200 watts maximum, uses six tubes, (four 50-watt tubes and two five-watt), and can be used for either telephony or

CW. Power for the plates is furnished by the motor-generator shown on the floor.

Mr. Cockaday has just perfected a four circuit tuner, shown directly to the right of the transmitter at the front of the table. With this receiver he has picked up stations all over the United States, Canada, Cuba, and Porto Rico. The circuit is at present a secret, because of certain technical parts that have to be brought to a higher standard of perfection before the receiver is really complete.

The regular receiving equipment is shown directly back of the new receiver.

Features of Carrier Current Telephony

By *B. R. Cummings*

Radio Engineer, General Electric Company

IT is a matter of common knowledge that a single electrical conductor can be made to be a part of two or more electrical circuits and function in each circuit simultaneously. It is possible, for example, for a single conductor to carry both alternating and direct current, or two or more alternating currents of different frequency characteristics, simultaneously.

These currents do not exist independently in the conductor, however, and at any instant the current flowing is the sum of all component currents.

While the current in the conductor is the resultant of individual currents, it is possible to attach to such conductors suitable groups of apparatus, so that one group will respond to the current of one characteristic, and the other to that of the other characteristic.

This fact is somewhat analogous to transmission by radio at different wave lengths. The ether, which is the medium which conveys radio signals, is carrying a very great number of independent communications simultaneously, although we are able to adjust our radio receivers so that we can select signals at one frequency, and, with sufficient frequency separation, hear nothing that is being transmitted at other frequencies.

So that, while signals carried by wire are transmitted by conduction rather than by radiation, a conductor may be made the medium whereby a great number of signals having individual characteristics are carried simultaneously, and each can be received by apparatus which is adjusted to select any of the incoming signals.

This phenomenon has found growing application in communication systems. For example, if a group of wire lines between two points are being used for telephone communication to their capacity, additional communication can be provided between these points either by erecting new lines, or by making the existing conductors carry an additional load of characteristics differing sufficiently from those of the existing load to permit its independent reception. The choice between the two methods becomes a question of economic selection.

Similarly, if communication is desired between two points already converted by lines used for another purpose, such as a line for the transmission of power, it is possible to utilize these lines for telephone communication, rather than erect an independent line for this purpose.

The method used to superimpose telephone communication on a line already in use for the transmission of speech by the usual methods, or for the transmission of power, lies in generating an alternating current of rather high frequencies, modulating it in much the same manner as the output of a radio transmitter is modulated, and coupling the generator to the line. At the receiving end, apparatus is used which somewhat resembles a radio receiver. This is also coupled to the line and tuned to the frequency of the communication current.

The system of communication which results is known as "carrier current telephony," a name derived from the fact that the communication is carried by the high frequency source rather than directly, as in the case of the usual telephone line.

Since radiation is almost directly proportional to frequency and since the frequencies used for carrier current work are comparatively low, a line utilized for carrier current communication radiates very little en-

ergy, and communication is carried on primarily by conduction. Such transmission, therefore, is fundamentally different from transmission by radio.

Carrier current communication has advantages over wire telephony in addition to the fundamental in that it can be applied to existing lines. For example, it is customary for power companies who maintain long transmission lines to provide for telephone communication between their various stations and sub-stations, by running wires either above or below the power lines. Such procedure, while undoubtedly serving its purpose to a certain extent, is subject to failure from a number of sources.

For carrier current telephony over transmission lines, the exposure to such failure is appreciably reduced. The carrier current telephone equipment is coupled to the transmission line by means of a capacitance in one form or another. The maximum exposure offered in such installations is that of one or more coupling wires strung for a length of 1,000 ft. beneath the transmission line. This is necessary at both the transmitting and receiving station. The physical exposure, therefore, is reduced to a negligible minimum when compared to the total length of the line.

The reduced exposure of the carrier system also results in its far greater freedom from disturbances which are usually encountered in telephone lines erected adjacent to transmission lines. This refers to induced noises, lightning disturbances and atmospheric.

While carrier current telephony require for successful operation a closed alternating current circuit, such a circuit may be maintained under conditions which would be fatal to a direct current circuit. One or more of the conductors of a transmission line may be severed without destroying communication, since the alternating current circuit remains operative so long as there is a single conductor left intact, or so long as any opening in the line has sufficient capacity associated with it to keep the alternating current circuit intact.

Carrier current telephony, however, will not be successful on a system if the line is completely opened either by switches or by all of the conductors in the system becoming severed, unless additional so-called "coupling equipment" is provided for bridging the point at which the circuit is opened. This provision is most applicable at points where the circuit is intentionally opened at intervals such as at switching stations or at circuit breakers.

If communication is required by the two points under the most severe conditions, such as the power transmission line being down for a considerable distance, straight radio is the only sure solution. One of the greatest advantages of carrier current telephony, however, lies in the fact that it is not radio equipment and the stations are not radio stations, and that, therefore, it is not necessary to obtain an operating license from the Department of Commerce and keep an operator on watch at all times.

Carrier current telephony on power lines can best be justified when the system is erected. If carrier current is used, no provision need be made for the erection of telephone lines. Since such provision is a matter of considerable cost, particularly in cases where provision for a telephone line would mean the erection of towers several feet higher than would otherwise be required, it is far more economical to install a carrier current communication system.

Government's New Radio Regulations

FOR the benefit of all interested in radio broadcasting the following amendments to the radio regulations are reproduced as issued by the Department of Commerce recently:

TO RADIO INSPECTORS AND OTHERS CONCERNED:

Regulation 57, page 55, amended April 2, 1923, to read:

CLASS 2—Limited commercial stations are not open to public service, and are licensed for a specific commercial service or

375 and 545 meters only will be assigned for the use of stations of this class, which must be free from harmonics. Whenever necessary the use of a coupled circuit transmitter will be required. Hereafter but one wave length within these ranges, including the 400 meters wave length, will be assigned to any one locality.

POWER—The power supply must be dependable and non-fluctuating. The minimum required will be 500 watts in the antenna and the maximum shall not exceed 1,000 watts in the antenna.

MODULATION—The system must be so arranged as to cause the generated radio-frequency current to vary accurately according to the sound impressed upon the microphone system.

SPARE PARTS—Sufficient tubes and other material must be readily available to insure continuity and reliability of the announced schedule of service.

ANTENNA—The antenna must be so constructed as to prevent swinging.

SIGNALING SYSTEM—Some adequate and dependable system must be provided for communication between the operating room and the studio.

STUDIO—The radio equipment in the studio must be limited to that essential for use in the room. The room shall be so arranged as to avoid sound reverberation and to exclude external and unnecessary noises.

PROGRAMS—The programs must be carefully supervised and maintained to insure satisfactory service to the public.

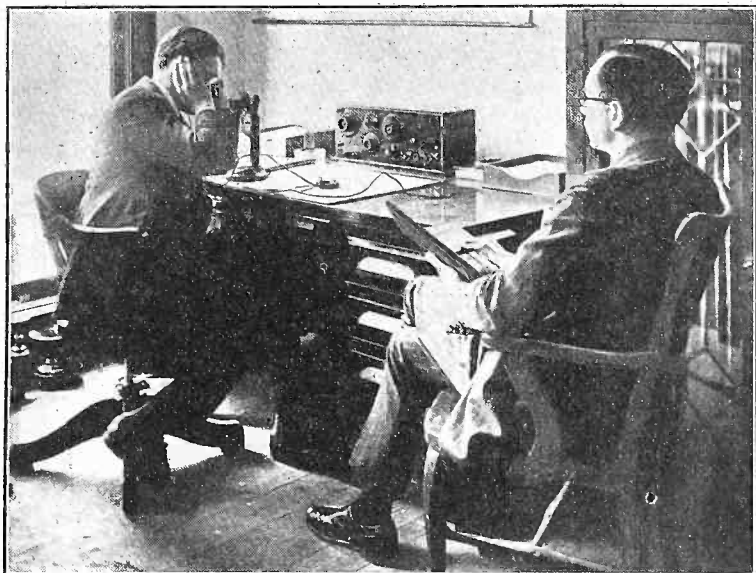
MUSIC—The use of mechanically operated musical instruments is prohibited.

DIVISION OF TIME—Where two or more stations of Class "B" are licensed in the same city or locality a division of time will be required if necessary.

Forfeiture of Class "B" Privilege

Licenses issued for the use of the wave lengths between 300 and 345 meters and 375 and 545 meters shall specifically provide that

Combining Radio and Telephone



(C. Kadel and Herbert)

Many men, having found out how immensely important radio is in daily life, have installed radio receivers in their private offices, in order to get market prices first hand without waiting for ticker or paper reports. The particular office above is combining radio and the long-distance phone to circulate reports directly over the long-distance line between two offices of the same company.

services defined in the license. Stations of this class must not transmit or accept public messages from other stations. No rates are authorized.

Licenses of this class are required for all transmitting radio stations used for broadcasting news, music, lectures, church services, government reports, and such matter, and do not permit the transmission of private or commercial communications.

The reading of telegrams or letters by broadcasting stations will not be construed as point-to-point communication so long as the signer is not addressed in person and so long as the text matter is of general interest.

Broadcasting stations must be operated by or under the supervision of an operator holding a commercial second-class license or higher; such operator must be on duty during the entire time the station is being operated.

No testing or experimenting is authorized in broadcasting stations between the hours of 10 a. m. and midnight, local standard time.

Broadcasting stations the operation of which interfere with the reception of time signals and meteorological information by marine service must remain silent while such signals are being transmitted.

Class "A" Radiotelephone Broadcasting Stations

Class "A" radiotelephone broadcasting station licenses will be issued to stations equipped to use power not exceeding 500 watts in the antenna, and will be assigned a wave length between 222 meters (1,350 kilocycles) and 300 meters (1,000 kilocycles).

Where more than one station of this class are licensed in the same city or locality a division of time will be required if necessary.

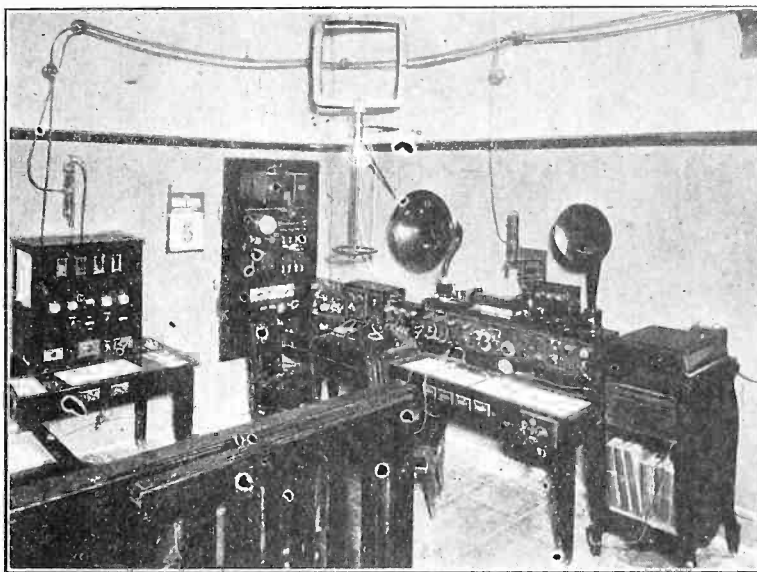
Class "B" Radiotelephone Broadcasting Stations

A license will not be issued for a station in this class which does not comply in every respect with the specifications hereunder.

Specifications covering the requirements governing the construction, licensing, operating and service of Class "B" radiotelephone broadcasting stations:

WAVE LENGTH—The wave lengths between 300 and 345, and

A Cuban Broadcasting Station



(C. Kadel and Herbert)

Interior of the control and operating room of Station CG, Havana, Cuba. Of particular note is the complete and extremely powerful receiver, located on the table. Fans who think that they have a receiver when they use four or five tubes are invited to look at the 12 tubes used here, besides the power amplifier and additional two-stage radio-frequency when the loop shown in the corner is used. The transmitter control is directly next to the operator, and the transmitting apparatus is in the small case to the left of it.

any failure to maintain the standards prescribed for such stations may result in the forfeiture of the Class "B" privilege and relicensing of the station to use a wave length below 300 meters.

All radiotelephone broadcasting stations now licensed to use 360 meters (834 kilocycles) are placed in this class. No new licenses will be issued for stations to use this wave length. Renewal licenses for the use of 360 meters will be granted if necessary.

(Signed) D. B. CARSON,

Commissioner.

Approved:

(Signed) HERBERT HOOVER,

Secretary.

Allocation of New Wave Lengths for Class B Stations

Wave Lengths for Specific Stations Will Be Assigned Later

THE Department of Commerce issued last week the allocation of wave lengths for class B radio broadcasting stations published below.

The specific wave lengths indicated are in accordance with the plan sent to radio inspectors following the recommendations of the Second National Radio Conference. The radio inspectors have been instructed to communicate the plan to stations in their districts. Every station which

Entertaining Fifth Ave. Crowds



(C. Kadel and Herbert)

Blasé New Yorkers were recently startled out of their usual complacency when they heard music and talking in the vicinity of the Public Library, apparently emerging from nowhere in particular. Upon closer inspection, the curious found that Miss Tinsler had equipped a tea wagon with a De Forest reflex set and a couple of loud speakers, and was taking a stroll accompanied by sounds of sweet music from WEA and WJZ. Miss Tinsler and her Radio Go-Cart in front of the Public Library are shown here.

the department has so far heard from has willingly fallen in with the plan. Of course, it is understood that any station now operating on 360 meters has the privilege of remaining on that wave length.

It is to be noted that assignments are for cities and not for specific stations.

Wave lengths marked "Reserved" are being held for localities in the zones where Class B stations do not exist at the present time.

Allocation of Wave Lengths,— Class B Stations, Operating and Pending

| | Zone 1. | Frequency Kilocycles | Wave Length Meters |
|---------------------------------|---------|-------------------------|-----------------------|
| Springfield, Mass. | | 890 | 337 |
| Wellsley Hills, Mass. | | | |
| Schenectady, N. Y. | | 790 | 380 |
| Troy, N. Y. | | | |
| New York City & Newark, N. J... | | 740 | 405 |
| | | 660 | 455 |
| | | 610 | 492 |
| Philadelphia | | 590 | 509 |
| | | 760 | 395 |
| Washington, D. C. | | 690 | 435 |
| Reserved — 303 — 319 — 469 | | | |
| — (357) — (288) | | | |
| | Zone 2. | | |
| Pittsburgh, Pa. | | 920 | 326 |
| Chicago, Ill. | | 670 | 448 |
| Davenport, Iowa | | 620 | 484 |
| Des Moines, Iowa | | | |
| Detroit, Mich. | | 580 | 517 |
| Dearborn, Mich. | | | |
| Cleveland, Ohio | | 770 | 390 |
| Toledo, O. | | | |
| Cincinnati, O. | | 970 | 309 |
| Madison, Wis. | | 720 | 417 |
| Minneapolis, Minn. | | | |
| Reserved. — (294) — 345 — (366) | | | |
| | Zone 3. | | |
| Atlanta, Ga. | | 700 | 429 |
| Louisville, Ky. | | 750 | 400 |
| Memphis, Tenn. | | 600 | 500 |
| St. Louis, Mo. | | 550 | 546 |
| Reserved. — 300 — 316 — (353) | | | |
| — 375 — 462 — 333. | | | |
| | Zone 4. | | |
| Lincoln, Neb. | | 880 | 341 |
| Kansas City, Mo. | | 730 | 411 |
| Jefferson City, Mo. | | 680 | 441 |
| Dallas, Texas | | 630 | 476 |
| Fort Worth, Texas | | | |
| San Antonio, Texas | | 780 | 385 |
| Denver, Colo. (Reserved) | | 930 | 323 |
| Omaha, Neb. | | 570 | 527 |
| Reserved. (361) — (291) — 306 | | | |
| | Zone 5. | | |
| Seattle, Wash. | | 610 | 492 |
| Portland, Oreg. | | 660 | 455 |
| Salt Lake City, Utah | | 960 | 312 |
| San Francisco, Calif. | | 590 | 509 |
| | | 710 | 423 |
| Los Angeles, Calif. | | 760 | 395 |
| | | 640 | 469 |
| San Diego, Calif. | | 560 | 536 |
| Reserved. — (297) — 330 — (349) | | | |
| (370). | | | |

Will the Freeman Tube Revolutionize Radio?

By Arthur S. Gordon

[The prophecy put forth by the writer of this article is, of course, conjecture; but it is based upon a conviction that the advent of a practical alternating current tube will bring a radio receiver to the stage where it can be connected with a household electric lighting fixture, as a vacuum cleaner or an electric iron is now attached. Does the Freeman tube hold this promise? Will it revolutionize radio? The writer presents the facts as he sees them—RADIO WORLD readers may draw their own conclusions. The Freeman tube, the author says, has been successfully tested and used with alternating current and the theory of its operation is sound. The writer has gone a step ahead and indicated the possible future of a tube with the characteristics of the Freeman device.—Editor, RADIO WORLD.]

WILL the vacuum tube newly evolved by Mr. H. M. Freeman revolutionize the radiophone industry? Radio engineers who have examined the features of this new tube say that it makes possible the dream of the vast radio public for a receiver which will operate by being connected to an electric lighting fixture, much as a lamp, or a flatiron, is connected now. No other outside helps will be needed excepting a "B" battery. The lighting wires will not only furnish the power with which to light the filament of the tube, but they will also furnish the aerial. A ground, it is thought, will not be necessary.

An extra element in the Freeman tube not found in the standard tube makes all this possible. The ordinary three-element tube contains a filament, a grid and a plate. The Freeman tube has a fourth element, consisting of a nickel tube, which entirely surrounds the filament, which in this case is made of ordinary tungsten. This nickel tube or sleeve is coated with electron-producing oxides, of barium and strontium, which, when heated to a proper temperature by the filament, give off the electrons for the operation of the tube. The filament is thus relieved of this duty, and is used only as a heater for the separate electron-producing element. Because the flow of electrons is not dependent upon the quality of the filament current, it is possible to light this filament with alternating current, without that persistent and annoying hum so noticeable when ordinary tubes are used in the lighting circuit.

A step-down transformer is used, of course, with an

output of six volts as reduced from the input of 110 volts. The grid and plate are the same as in other tubes and perform the same functions. When used with the present regenerative circuit, the Freeman tube is connected up as shown in the accompanying hook-up. Note that the nickel sleeve over the filament is connected to the minus post of the "B" battery. This is so that it can carry out the work of the filament in its electron-producing function. Observe also that the filament is in a separate circuit and has no connection with the remainder of the set other than to heat the nickel sleeve.

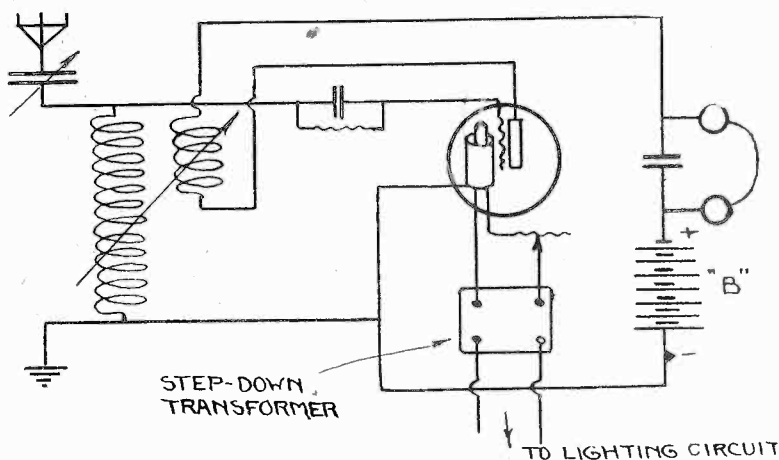


Diagram illustrating how the Freeman tube will be operated from commercial lighting circuits. A separate nickel-oxide-coated plate is heated by the filament. The nickel plate is depended upon for the electronic flow, instead of the filament, as is now the practice.

The Freeman tube is not yet on the market in commercial quantities. It is expected to capture the trade of the amateur from one end of the country to the other. It marks a distinct step in the evolution of the science.

Hints to Amateur Workmen from an Old Hand

STUDY your drawings with the greatest care. Learn to read them and understand just what they mean. This is the secret of rapid, efficient and satisfactory work.

Be sure you understand both drawings and specifications before you touch a tool. An observance of this rule will not only save time but prevent the waste of material and temper.

"Order is Heaven's first law." Nature is the best example of the truth of this saying. Have a place for everything and keep everything in its place. This means not only tools, but material such as screws, nuts, bolts, connectors, binding-posts—in fact, all small parts.

Perform every task to the best of your ability—as if it were the only chance you would ever have to do this particular bit of work and do it right. "That's good enough" has no place in the good workman's vocabulary.

"It's a poor workman who complains of his tools." Many amateurs cannot afford a full set of tools and therefore are obliged sometimes to make one tool do the work of several. It is surprising how few tools are required.

Neatness and care in every operation performed will pay big dividends in results. Good work cannot be hurried even by a skilled mechanic. The principal advantage a pro-

fessional workman has over the amateur is due to experience. After you have drilled as many holes as the man in the shop around the corner, you may be able to drill as many per hour as he; but if you take plenty of time, you can do each job now as well as he can.

Especial care should be exercised in making electrical connections and in following directions explicitly wherever they have to do with parts which transmit electric current. A half-soldered joint, a poor electrical contact or using too much flux when soldering will cause the failure of the best piece of electrical apparatus ever built.

When designing a panel, lay it out on paper first. This is a good way to save material—and disappointment.

Keep your tools sharp and clean. An oilstone, a rat-tail file and a three-cornered file are sufficient to keep your tools in first-class working order. All tools, especially those not in constant use, should be wiped at least once a week with an oily rag. This prevents rust—the sign of a careless workman.

Clean up the dirt and chips when you have finished work. This prevents a possible fire hazard, helps your standing with the family and gives a personal satisfaction such as can be enjoyed only by one who has learned to do things.

Latest Broadcasting Classifications and Regulations Issued

WASHINGTON, D. C.—Official orders from Secretary Hoover have gone forward to the nine radio districts directing each inspector to put new radio broadcasting classifications into effect immediately as far as is practical.

New regulations provide for the allocation of the nationally exclusive wave length to all Class B or high-powered broadcasting stations and the distribution of wave lengths within the band 222 to 300 meters in each district to the Class A stations before May 15. At noon on that date, general broadcasting on 400 meters will cease, the transfer to new wave lengths being made. Such Class A stations as desire to continue to broadcast on 360 meters may do so in the new class designated as C, but no new licenses will be issued on 360 meters.

Radio, Restless Mystery

By Will Chamberlain

I HAD not dreamed that quiet atmosphere
Screened lips of such surpassing song,
I had not known that love and hope and fear
From hearts afar could this same stillness throng.

I had not dreamed that oratoric pleas,
Peak-touching flights of forums elsewhere,
Could flash, as on a silver-pinioned breeze,
To me across the ocean waves of air.

But now I know, and knowing, pause to think.
O restless hand that picks from sky and cloud
The gems of mystery, and with them spaces link—
You have high fellowship with God!

Stations now listed in Class A, which can qualify in Class B, may be transferred upon application to local inspectors. No new licenses will be issued until all old stations receive their new waves, although several applications are on file at the department.

Hereafter all Government reports will be sent out on wave lengths assigned to the station and the exclusive use of the 485 meters wave length will be discontinued for this service.

The thirty Class B stations, all now operating on 400 meters, will virtually become national broadcasters, since with exclusive waves they should reach every corner of the country. To-day 15 states and 21 cities have B stations. In seven localities more than one station exists. This is true in Philadelphia which has four stations, and also in New York, Atlanta, Kansas City, Detroit, San Francisco and Los Angeles, each of which has two. In these cities time will have to be divided as is done to-day on 400 meters. Philadelphia, New York, San Francisco and Los Angeles, however, will share four additional wave lengths it is understood.

Specific wave lengths have not been announced by Secretary Hoover collectively, but it is understood that each radio inspector will announce those in his district as soon as they are assigned.

Several wave lengths have been reserved for such new stations as may qualify or transfer from Class A. It is believed that Arlington, NAA, will change from 710 meters to a commercial wave of 435, and that when the new R C A station at Washington is licensed, it will re-

ceive an independent wave, since NAA is busy almost continually. Special waves will probably be given also to the new General Electric Company stations planned, one near San Francisco and one between Schenectady and the Pacific Coast, both of which will be high-powered stations.

Class B Station Distribution

| | |
|---|------|
| California— | |
| Los Angeles, Earle C. Anthony | KFI |
| Los Angeles, Times Mirror | KHJ |
| San Francisco, Hale Bros., Inc. | KPO |
| San Francisco, Mercantile Trust Co. | KFDB |
| Georgia— | |
| Atlanta, Constitution | WGN |
| Atlanta, Journal | WSB |
| Illinois— | |
| Chicago, Westinghouse Elec. & Mfg. Co. | KYW |
| Iowa— | |
| Davenport, Palmer School of Chiropractic | WOC |
| Kentucky— | |
| Louisville, Courier-Journal & Times | WHAS |
| Massachusetts— | |
| Springfield, Westinghouse Elec. & Mfg. Co. | WBZ |
| Michigan— | |
| Detroit, Free Press | WCX |
| Detroit, News | WWJ |
| Minnesota— | |
| Minneapolis, Cutting & Washington Radio Corp. | WLAG |
| Missouri— | |
| Kansas City, Star | WDAF |
| Kansas City, Sweeney School Co. | WHB |
| St. Louis, Post Dispatch | KSD |
| New Jersey— | |
| Newark, Bamberger & Co. | WOR |
| New York— | |
| New York, American Tel. & Tel. Co. | WBAY |
| New York, Western Electric Co. | WEAF |
| Schenectady, General Electric Co. | WGY |
| Troy, Rennselaer Polytechnic Inst. | WHAZ |
| Oregon— | |
| Portland, Oregonian | KGW |
| Pennsylvania— | |
| Philadelphia, Gimbel Bros. | WIP |
| “ Lit Bros. | WDAR |
| “ Strawbridge & Clothier | WFI |
| “ Wanamaker | WOO |
| Pittsburgh, Kaufman & Baer Co. | WCAE |
| Tennessee— | |
| Memphis, Commercial | WMC |
| Texas— | |
| Dallas, News & Journal | WFAA |
| Fort Worth, Star Telegram | WBAP |

In a letter to all inspectors, Secretary Hoover points out that all broadcasters must stick to the new individual waves if interference is to be eliminated. His instructions follow:

“Under the reallocation of the wave lengths plan, effective May 15, 1923, it will be necessary for all transmitting radio stations to be accurately adjusted to the wave length specified in the license.

“Any variation from this rule may be considered a violation of Section 2, Act of August 13, 1912, justifying the revocation or suspension of the station license.

“Beginning May 15 radio inspectors of each district will carefully check the transmitting wave lengths of stations in their districts by personal inspection of the stations as far as practicable and by listening in with accurately calibrated receivers, and report to the department promptly any discrepancies observed.

“The Bureau of Standards will transmit standard wave lengths from time to time, which will be helpful in determining accurate wave lengths, and will also listen in and check the wave lengths being used.”

Dr. De Forest's "Speaking Flame" Eliminates Vibrating Diaphragm

DR. LEE DE FOREST announces that he has realized the dream long held by telephone engineers, namely, the translating of sound waves in the air directly into electrical currents, thereby eliminating the vibrating diaphragm.

An entirely new form of microphonic device has been evolved by the inventor. It is a "speaking flame," which gives promise of revolutionizing the present methods of transmitting voice sound waves into electrical waves and without the distortion associated with the older methods of voice transmission. The field of immediate application of the talking flame device is not only in the province of the talking motion picture film, but in the world of radio as well, and especially in those stations used for broadcasting the human voice.

"In response to numberless inquiries of scientists, educators, engineers and others directly interested in the development of the talking motion picture art," says Dr. de Forest in a statement issued by the De Forest Laboratories, "I should like to take this occasion to announce that as a result of my development of the new phonofilm my investigations and experiments have resulted in revealing what I consider will be another revolutionary step forward in the transmission of the human voice or sound through space. The advance itself may be regarded as a technical one from the engineering point of view, and yet from the benefits to be derived from the world at large the improvement is somewhat marvelous in that by means of it hereafter we shall be enabled to change voice or sound waves directly into electrical energy.

"It has for a long time been realized by telephone and acoustic engineers that the necessity for a diaphragm at the transmitter introduces at the very outset of the sound translation problem a source of distortion and imperfection. It is the diaphragm more than any one element which introduces the deformation in recording and in reproducing voice and music on the phonograph as well as in telephone transmission. Therefore, for many years efforts of telephone and phonograph engineers have been devoted to reducing as far as possible distortions thus introduced by the natural period of vibration of the diaphragm, or membrane, against which the sound waves impinge.

"But where exact and accurate translation of sound waves into electric currents is desired it is quite unnecessary to use a vibrating diaphragm. The discovery of the audion first came to me as a result of observation of a sensitive gas flame. From this rudimentary idea, which originated in 1900, was developed, during the ensuing five years, the three-electrode vacuum tube which was destined to become the telephone repeater or amplifier for which telephone engineers had been vainly searching for twenty years.

"And now in exactly the same way has been evolved a new form of microphonic device, which turns sound waves in the air directly into electric currents. Take the ordinary bat-wing gas burner or a certain form of Welsbach mantle gas light, or special forms of oxy-acetylene gas flames, insert two heat-resisting electrodes therein, in proper relation to the flame and to each other, connect these electrodes to an appropriate electro-motive force. You will then have an extremely sensitive sound converter which gives an electric reproduction of the sound waves in the air enveloping the flame which is of an entirely different order of fidelity from that ever obtained from any form of microphonic device, using a diaphragm, whether this be of the carbon, electro-magnetic, or electro-static variety.

"But I have found still another method of translating sound waves direct into electric currents without the imposition of any diaphragm. This arrangement, independently suggested to me by Mr. Theodore W. Case, is the reversal of the well known 'thermophone,' a device wherein an extremely fine platinum wire, through which is passed telephonic currents, reproduces these in the form of sound waves due to the alternate heating and cooling of the air immediately surrounding the extremely fine wire."



(C. P. & A. Photos)

Dr. Lee De Forest and his "speaking flame" device.

An Aerial Problem to Solve

BELOW, fellow fans, is a problem and a common one in these days; but this specific instance makes it stand out above all others of its kind.

On top of a certain apartment house in New York City, there are located no less than 23 aerials, of all shapes, sizes and form, some of them running just a few inches above the others and forming a veritable cage of wires. The roof of the house is large and there is plenty of space to put them up. The trouble is not in the erecting of the antenna, or anything of that sort. It is that out of the 23 there is only one that is not a regenerative set, and that is a humble crystal set, which due to re-radiation does nearly as good work as the one-tube sets in the house.

The trouble is that of the 22 other owners, there is not one who can properly tune in a station, even though it be WJZ, without squeals and howls, not only in his set but in the sets of all those around him. It is impossible to listen to DX work before 1 a. m. because up to that time all the other sets are persistently squealing and howling into one another's ears, and making the air sound like a pig sty when there is a particular fight going on.

The problem is how can this be eliminated, and at the same time give satisfaction to the owners of the sets?

Don't say "Cut out the regenerative sets," because they are all expensive and up to date.

Radio and the Woman

By Crystal D. Tector

WELL, well, I certainly woke up a lot of my women readers when I published the request to send in DX notices. I have not the space to publish them all, but here's the best one, from Mary Devoux, way out in Sacramento, California. She writes me a nice little letter and tells me that she hears the following stations regularly on her brother's two tube set, which was made in the cellar of the house. Her farthest distances are Davenport, Iowa, station WOC, and Fort Worth, Texas, WBAP with the following in-between stations: KDYY, Denver, Colo.; KDYL, Salt Lake, Utah; KDYW, Phoenix, Ariz.; KYJ, Los Angeles, Cal. Now girls, don't be backward about coming forward, as when I get enough "lady DX'rs" I am going to ask the editor to run a Lady DX page and publish all the reports of the girls who read RADIO WORLD and listen in.

* * *

We were invited to a birthday party in Brooklyn last Sunday. At about 8 o'clock the guests filed into the parlor and were agreeably surprised at the sight of a beautiful radio set of ample proportions. In a few minutes we heard the strains of a popular dance tune and of course the crowd lost no time getting coupled up for the light fantastic. Needless to say, the party was an unquestionable success and we have an inkling that this crowd one and all will find an excuse to visit the apartment of Mr. and Mrs. B. very soon again.

* * *

French-speaking residents of Canada are learning English from the announcers of WGY, according to a letter received recently by the Schenectady radio broadcasting station of the General Electric Company. Mrs. R. Normandin, a resident of Shawinigan Falls, Quebec, writes: "Many persons are taking advantage to learn to pronounce

English, especially from your station. Our daughter, aged four, speaks French only, and she startled us recently when she said all of a sudden "WGY, Schenectady, N. Y., one minute please." Those in charge of the radio broadcasting activities of the General Electric Company realize that the right to broadcast carries with it the responsibility to offer something worth while. An earnest and conscientious effort is made to provide good music, to give variety of entertainment and to give helpful addresses. Announcers strive to pronounce all words correctly. Before an announcement is made or an address delivered, the announcer goes over the manuscript, and if he is in doubt about the pronunciation of a word he looks it up. The announcer knows that his audience is made up of those who may copy his pronunciation and those who may criticize the slightest slip. He therefore has two reasons for accuracy.

* * *

A friend of ours who started in to study the code over the radio has become quite proficient, and can now copy the amateurs around town, with the exception of one station that sends fast no matter who he is talking to. He must use what they call a "bug" key because he certainly is a "bug." When it comes to sending he sounds like a Ford when a woman is driving it up hill and can't keep her foot on the gas steady. Slow—fast—stop—slower, fast—faster—all balled up—repeat—then he waits and has to repeat it because no one can understand him. Wish he would learn how to send. I live just two blocks away from him and like to listen to the "hams" once in a while, but he simply spoils all my aspirations to copy them. I think a good idea for some of those speed hounds would be to tame themselves down until they send distinguishable copy and then pick up speed gradually.

Radiograms

The electric central stations of the United States are planning extensions and additions in 1923 which will cost more than six hundred million dollars.

* * *

Marion Davies, the movie actress, thinks that radio will eventually be used to acquaint people all over the country with events of importance transpiring in the motion picture world.

* * *

Dance music will be broadcast by WGY, the Schenectady radio station of the General Electric Company, every Saturday evening from 9 to 11 o'clock for a period of about six weeks. The music will be supplied by Cain's Castle orchestra. The WGY studio will be connected to the dance hall by wire.

* * *

A letter signed "Patients of the Vermont Sanatorium" was recently received by WGY, the General Electric Company broadcasting station at Schenectady, N. Y., acknowledging the pleasure and entertainment they get from the radio programs. The sixty patients are suffering from incipient tuberculosis and most of them depend upon WGY for the Sunday religious services. They wrote that they get the 7:45 p. m. concert, but have to be tucked into bed at 8:30.

* * *

Frank Smithson, the stage director, has been at work on a plan for radio entertainment on behalf of the Wired Wireless Corporation, a subsidiary of the North American Company, which Smith calls the "Theatrome," coined from "theatre-at-home." The Wired Wireless company is installing a large number of receiving sets on Staten Island, New York, to test its system of wired entertainment, before attacking the metropolis. This demonstration will test the practicability of General Squier's devices for receiving music and entertainment over the regular house lighting electric system.

The chemical faculty of the University of Chicago is soon to broadcast chemical lectures by radio.

* * *

Construction of a radio station, claimed to be the second largest in the country, has been started at Hialeah, near Miami, Fla., by the Tropical Radio Telegraph Company. The plant is to handle South American, Central American and West Indian business and will cost about \$250,000. The towers will be 437 feet high with a span of 1,500 feet.

* * *

All London is in the throes of wireless telephony, according to W. E. Wroe, of San Antonio, Texas, who arrived last week in New York after a long stay in England. One of the novel uses to which the new marvel has been put is the radio sandwich man, who parades up and down the Strand and Piccadilly with a complete radio outfit. He is able to pick up all the stations, and all passers-by get an earful.

* * *

From Georgian Bay, Canada, WGY, Schenectady, N. Y., has received one of those letters which help radio station personnel and artists feel that their efforts are relieving the sum total of loneliness in the world. L. E. Monck, on Wahsouné Island, Sans Souci, Ontario, Canada, writes: "We are all very much attached to the program of WGY, and, best of all, the night devoted to the WGY players, as this class of entertainment takes us back to the cities and bright lights, and for the duration of the play we forget we are alone on one of the 30,000 islands of Georgian Bay, and, for weeks at a time, cut off from all communication with the rest of the world. Our nearest winter post-office is Parry Sound, eighteen miles away; and when the ice is too thick to use a boat and not thick enough to walk on we just stay here and hope for good ice so as to be able to get out, either with dog-team or horse, to get our mail. Just now the ice is good, and we make the trip every eight or ten days, but soon now the ice will start to break up, and then we are marooned until it is clear enough for a motor-boat."

Elementary Instruction for the New Army of Radio Beginners

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

By Lynn Brooks

RADIO: The transmission and reception of signals or vocal sounds through the ether, without the use of conducting wires, by means of high frequency electric waves. In radio telephony, these waves are modulated by means of suitable transformers, the speaker talking into a microphone, where the propagated waves are modulated to conform to the variations of the human voice. In radio telegraphy the propagated wave is formed by means of a spark jumping across a space.

* * *

AERIAL (antenna): A system of wires used to collect energy transmitted through space. They are divided into different types, such as inverted L, T, and fan, each getting its name from its appearance. The L antenna, or aerial, is constructed so that the lead-in is taken off one end, generally the end nearest the apparatus. The T aerial is constructed so that the lead-in comes off the center, giving the appearance of an enlarged letter T. The fan antenna is constructed so that the wires radiate, after the manner of the leaves of a fan, spreading from a central pole with the lead-in taken off the converging point of all the wires.

* * *

GROUND: A means of dissipating the received energy after it has done its useful work in going through the circuit. It generally consists of a wire attached to a cold water pipe, or a pipe driven into the earth. The ground wire should not be any smaller in diameter than the sum total of diameters of the wires used in the antenna where a transmitter is concerned; but for receiving, it may be a single wire about No. 12 or 14 in size.

* * *

INDUCTANCE COIL (tuner): A number of wires wound on a suitable core, such as a round tube. They can also be made in various other forms, such as honeycomb coils, spider web coils, pancake coils. In the first, the straight inductance coil, the wire is wound contiguously in one single layer. This has been found to be quite inefficient, because such a coil possesses "distributed capacity," or capacity between one turn and its neighbor, with the insulation of the wires acting as the insulating plate. The honeycomb coils are wound in such a manner that all the turns are spaced, and in winding they cross one another at an angle. Such a coil can be built up to very high inductance values, taking but little space, and having a very low distributed capacity. Spider web coils are wound on a "former" resembling the spokes of a wheel, the wire weaving in and out. In the pancake coil the wire is wound spiral-wise, one layer on top of the other, in the form of a continuous spiral.

* * *

FIXED INDUCTANCE: A coil, the inductance of which cannot be varied. Honeycomb coils and spider web coils come under this classification.

VARIABLE INDUCTANCE: A coil, the inductance of which can be varied through the agency of either taps or sliders.

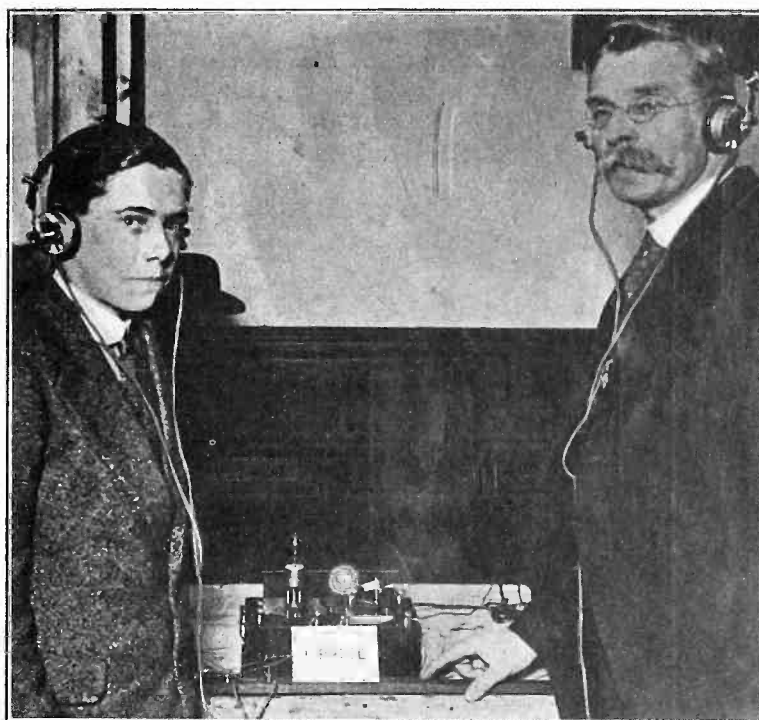
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NON-INDUCTIVE RELATION: Coils placed in such a manner that a current passing through one will not induce a similar current in the other. This can be done by placing the planes of the coils at right angles to each other.

* * *

CRYSTAL DETECTOR: A rectifier of the received radio-frequency signals which makes them audible in the phones. As the received signals are alternating current, they would not make any impression on the diaphragms of phones. The crystal in the detector allows only one-half of the current cycle to pass. It is by nature a unilateral conductor and allows the current to pass in only one direction, making a direct current out of the pulsating or alternating current. Without some means of rectification, the signals could not be made audible.

English Boy Wins First Prize



(C. Kadel and Herbert)

Master W. H. Hildersley, 15-year-old radio enthusiast, was awarded first prize at the Handicraft Exhibition, London, England, for making the best one-valve crystal combination radio set. The entire set was made by himself, with the exception of the tube and phones, and he has heard American phone stations in London on it. The illustration shows a local official listening in to American concerts on this home-made combination receiver.

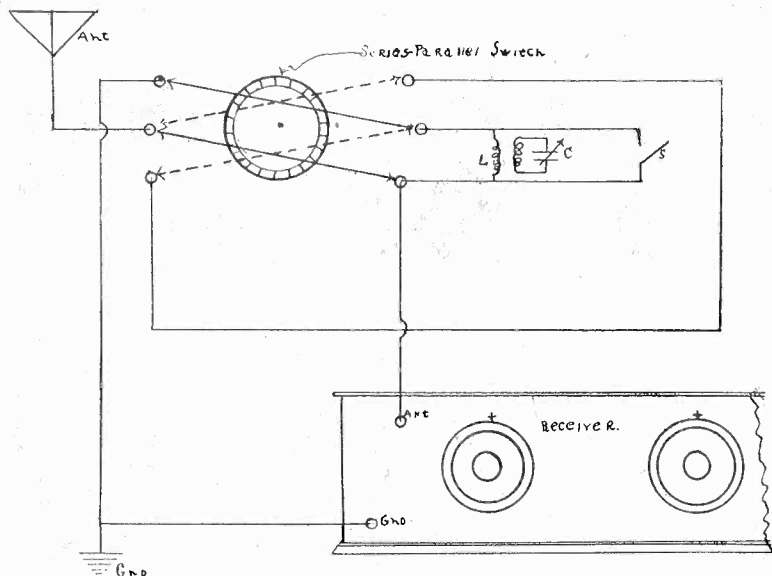
TYPES OF CRYSTAL DETECTORS: Crystal detectors are of several different kinds, such as galena, carborundum, silicon, pyrites and numerous other minerals, some of which are elements. Others are synthetic, being products of the electric furnace or chemical reaction. Galena, the most popular, is sulphide of lead. It is bluish grey in color. Carborundum, which is a product of the electric furnace, is iridescent, the basic colors being purple and green. Silicon, which is an abundant element, is light steel grey in color and extremely hard. Silicon is also made in the electric furnace, by fusing silica with a small amount of pure carbon at extremely high heat. Pyrites is found in several forms, two of the most common used in radio work being iron pyrites (commonly called fool's gold) and copper pyrites (chalcopyrites). The first is a dull gold color and copper pyrites is dull brown or almost black in color. These last two are mostly used in connection with some other mineral to make a "perikon" detector, which is very sensitive. These minerals are among the most common in use.

An Improved Wave Trap Filter

By C. White, Consulting Engineer

THE number of broadcasting stations is steadily increasing. If some method is not devised to secure greater selectivity within the wave bands that have been assigned for general broadcasting and amateur work, it will become extremely difficult for any one to get the station he wants without much interference. Especially is it true in the more densely settled cities, where it is now possible to hear two stations at the same time with a receiver that tunes rather broad. Although the solution of the problem is the construction and design of more selective receivers and circuits, still there are many who are perfectly satisfied with their outfits save for the lack of proper selectivity. The ordinary crystal detector outfit and the single circuit regenerative receivers, indeed, have been rather hard hit for selectivity in large and densely populated districts.

Then, again, there are many owners of radio-frequency amplifiers who are desirous of increasing the selectivity of their receivers, in order to cut out the local stations that are not desired when distant ones are trying to be tuned in. The wave trap filter is the logical solution of the problem.



How to hook up a wave trap filter with a series-parallel switch to obtain great selectivity.

A wave trap filter simply adds to the selectivity of the tuning circuit that is already on the receiver and, while it slightly cuts down the volume of the received signal, it certainly adds to the clarity by removing interference. The warm weather radio pest is greatly cut down by the use of filters, and it is possible to receive under many conditions with filters when ordinarily such a feat would require a more selective tuner with more amplification.

The filter illustrated is nothing more than a tuned coupled circuit. The inductance coil L and the variable air condenser C form the desired filter. The coil L can either be wound on a four-inch tube with 50 turns of number 22 D.C.C. magnet wire with a rotor having 40 turns, or a standard type of variocoupler can be used, employing the stator in the main circuit and the rotor in parallel with the condenser C . The latter is preferable since by changing taps on the stator and the coupling, the sharpness of the trap tuning subsequently can be readily altered in order to meet the requirements of the interference. The condenser C has a maximum capacity of .0005 micro-farads, which is the normal capacity of the average 23 plate air variable. The switch S is nothing more than a single knife-blade switch that is used to short out the filter while tuning in on

the receiver. Under normal conditions of operations, S is kept open as illustrated. A series-parallel switch enables the filtering element to be thrown in series with the ground-antennae terminals of the receiver or parallel with these terminals, depending upon the nature of the interference that it is desired to eliminate. The series-parallel switch consists of six switch points and two switch arms which are rigidly attached to a knob. By moving the knob so that the switch arms take the position indicated by the dash lines, the wave trap is placed in series with the receiver and, by allowing them to remain in the position as shown by the solid lines, the wave trap is placed in parallel with the receiver. The ingenious amateur can mount his filter with the control switches in a little cabinet or incorporate it in the cabinet with his receiver if there is enough room inside and on the panel.

The operation of the wave trap is very simple. If it is desired to erase an interfering signal from a nearby station the blades of the series parallel switch should be so placed that the filter is put in series with the receiver. The switch S is closed and the desired station is tuned in; then S is opened and the condenser C and the coupling is adjusted until the interference is eliminated entirely or reduced to a minimum. Under certain conditions when the strength of the interfering signal is so strong that it is impossible to tune in the desired station on the receiver first, then it would be better to close S , tune in the interfering signal on the receiver, open S and move C and the coupling until the volume of the interference is a minimum. After this has been accomplished the receiver can be tuned to the wave length of the desired signal. Often it is wished to tune in one particular station when many other stations are interfering. Under such conditions we want to pick out one station from the midst of many who are operating around the same wave length, instead of eliminating one strong interfering station as explained previously. In this case the wave trap is placed in series with the antennae-ground terminals of the receiver by means of the series-parallel switch and short-circuiting switch S is closed. Again the receiver is approximately tuned to the signal of the desired station, S is opened and the series-parallel switch is then moved so that the filter is placed in parallel with the receiver. Then C and the coupling is adjusted until the signal desired is amplified to a maximum and the volume of those interfering will be greatly reduced or completely fall out of audibility. In the first place L and C were tuned to the wave length of the interfering station and, in the second, L and C were adjusted to the wave length of the desired station.

There is probably no small addition to your receiver which would be more useful and more fully appreciated than a filtering wave trap such as briefly outlined. With the use of this device a single circuit set is made almost equally as selective as the triple circuit regenerative receiver, which is generally considered paramount among amateur radio receivers for selectivity. There is generally just enough difference in wave length between the various broadcasting and amateur CW stations to allow the filter to function satisfactorily. Users of multiple stage radio-frequency amplification, which employs the standard type of radio-frequency transformers, have long been complaining of the poor selectivity they have been getting. While it was quite true that they could bring in the distant fellows, still their poor selectivity resulted in hearing many stations at the same time. The wave trap filter greatly aids to increase the tuning selectivity and by its use the owners of radio-frequency outfits can obtain better results.

How to Make a Compact Universal Receiver

By *W. S. Thompson, E. E.*

IN designing the set described in this article, the author has tried to meet several specifications which are the outgrowth of the popular demand for a simple and compact receiving set that is really efficient and which can be constructed for a reasonable sum.

regeneration can be controlled by the filament rheostat. The only tuning control that is necessary is a condenser, so the set as described can be very efficiently operated by the most inexperienced novice.

To eliminate all dead end losses and to make the set universal in its wave length range, a honeycomb coil with a standard mounting has been used for the inductance coil. In order to tune in to a higher wave length all that is necessary is to plug in a honeycomb coil with a sufficient number of turns to reach the desired wave length. The proper size coil to use can be obtained from the table published by the manufacturers of these coils. By calibrating the condenser dial for a number of different coils, a wave meter can be made of this set, the calibration holding true within a few per cent. for any antennae to which the set may be connected.

The author advises using a vacuum tube such as the WD-11, UV-199 or others of the same type, because a dry cell can then be used for the "A" battery, saving a considerable amount when purchasing the accessories and also saving considerable in the up-keep expenses. These dry cell tubes will be found to be ideal for use as a detector, especially when used in circuits in which regeneration is used.

Body capacity effects can be very easily avoided by connecting the rotating blades of the condenser to the ground binding post. By thus keeping the shaft of the rotor at ground potential, shielding by other means becomes unnecessary. Provision for connecting this set to an amplifying unit has been made by placing two binding posts on the panel. These binding posts should be connected in parallel with the jack as shown in Fig. 1. The jack used should be the special radio jack recently placed on the market, because it only extends back of the panel about an inch and allows the vacuum tube socket to be placed as near the panel as possible, thus conserving space.

The parts necessary for the construction of this set are listed below with average prices for each although the builder will probably be able to purchase them for less if he is a careful buyer:

Materials for Construction

| | |
|--|--------|
| 1 Honeycomb Coil (75 turns)..... | \$1.50 |
| 1 Variable Air Condenser (vernier) .0004 mfd. | 2.50 |
| 1 Filament Rheostat (vernier)..... | 1.85 |
| 1 Phone Condenser .001 mfd. | .40 |
| 1 Grid Condenser with Variable Grid Leak.. | 1.00 |
| 1 Vacuum Tube Socket | .75 |
| 1 Single Circuit Telephone Jack..... | .75 |
| 1 Bakelite Panel 6"x4"x3/16" | .75 |
| 1 Wood Baseboard 5"x4"x1/2" | .10 |
| 5 Binding Posts..... | .25 |
| Wire for connections..... | .10 |

Total Cost \$9.95

Accessories.

| | |
|---------------------------------------|------|
| 1 Dry Cell for Filament Lighting..... | .40 |
| 1 B Battery | 2.00 |
| 1 Vacuum Tube (dry cell type)..... | 6.50 |

Total Cost 8.90

Cost of set with accessories \$18.85

(Continued on next page)

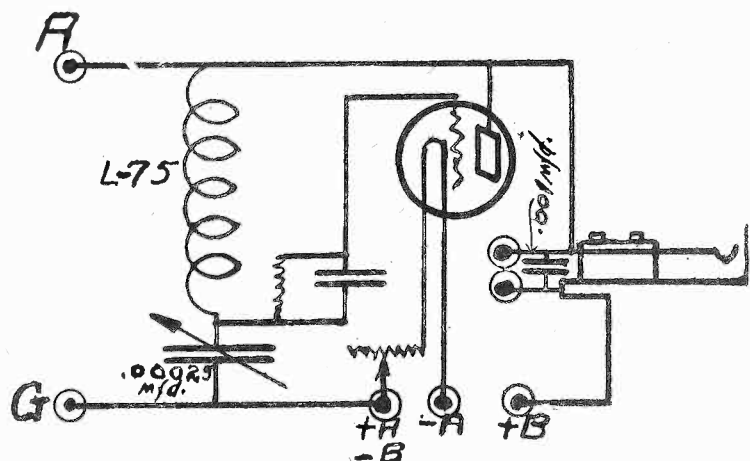


Fig. 1—Modified Colpitts oscillator circuit referred to in the accompanying text.

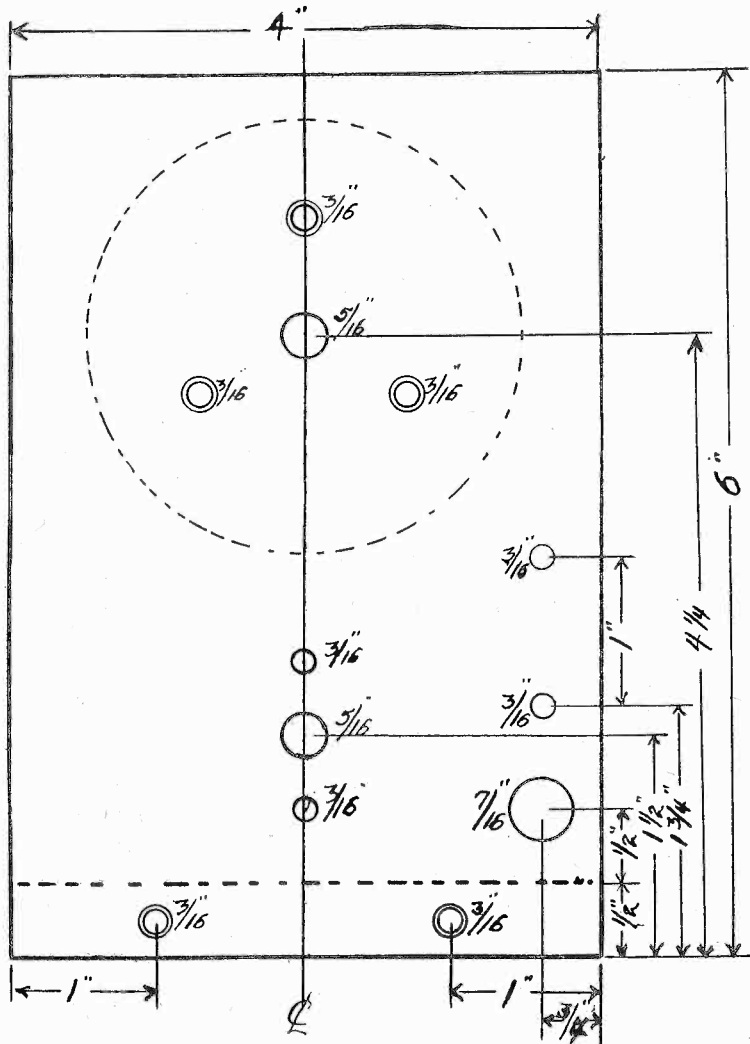
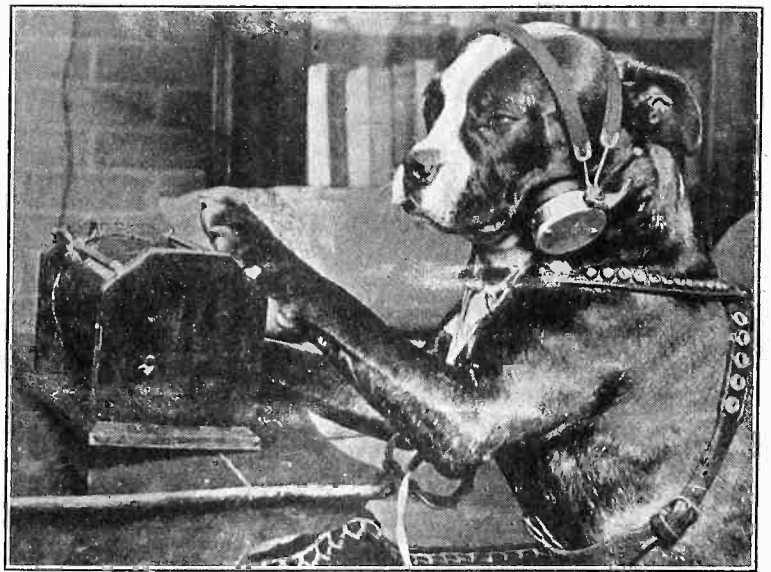
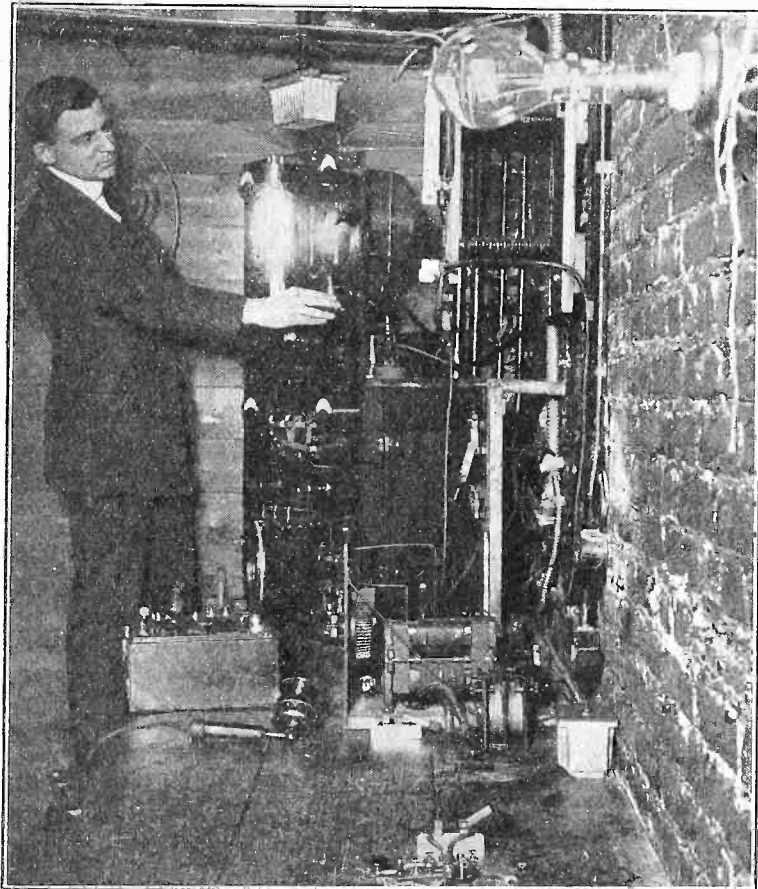


Fig. 2—Panel pattern used in making a compact universal receiver.

The electrical circuit which adapts itself very well to meet these specifications is the Colpitts oscillator, a modification of which is shown in Fig. 1. By using this circuit, regeneration has been incorporated although no additional control has been necessary, due to the fact that the

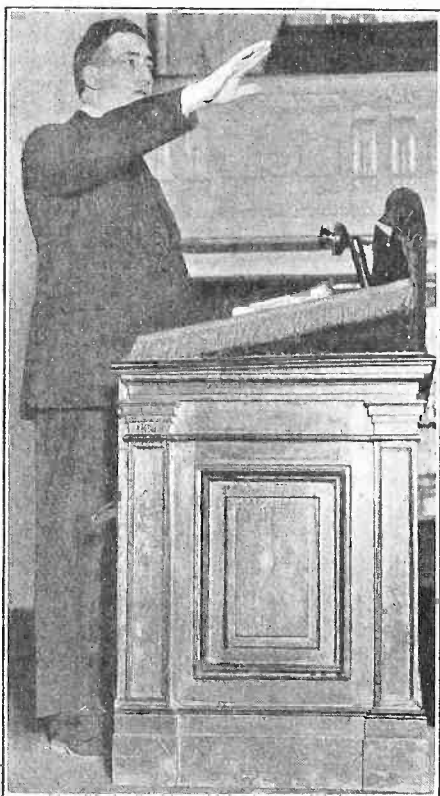
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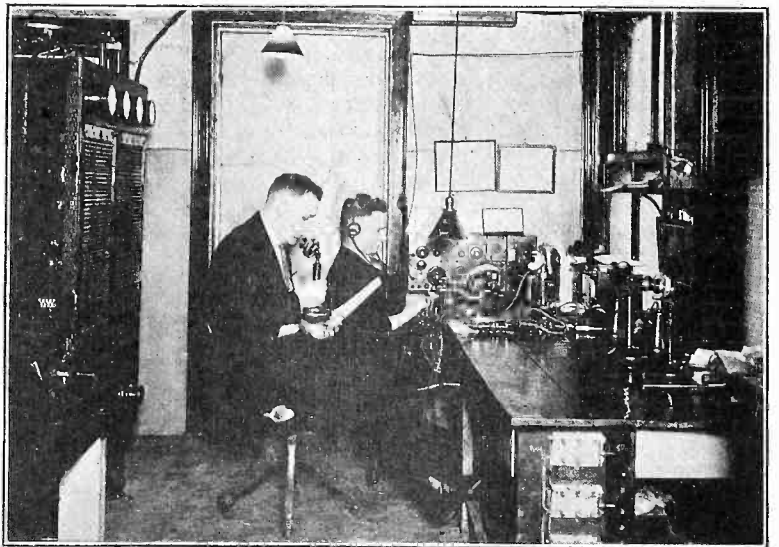
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(C. International Newsreel)



(C. Kadel and Herbert)

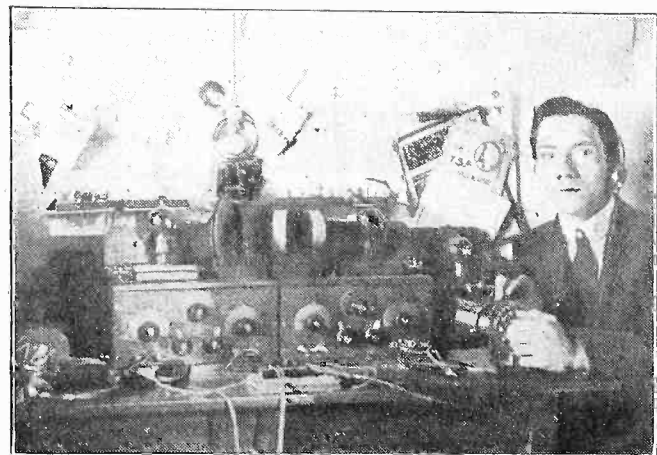
The fact that radio has already taken a great place in religious work was again demonstrated when the City Temple, Lenox Ave. and 120th St., New York City, installed a powerful broadcasting set and station to allow many thousands of radio listeners to be within reach of church, even though they stayed home on Sunday mornings. The larger illustration at the top of this column shows the apparatus that has been installed to take care of the direct broadcast. R. Ketcham, who installed the set, is shown operating it on its final test before being put into actual operation. The wave meter, shown on the table, is a part of the equipment and readings are taken before every broadcast to assure the operators of WSAP that they are within the 360-meter wave. The apparatus is up to date in every manner, a standby listening-in system being used to enable the operator of the station to tell just how the music is going out and to correct any fault. The lower picture shows the way in which the microphone has been installed on the pulpit, shielded from the eyes of the congregation.



(C. Photonews, N. Y.)

The above illustration shows the interior of the operating room of Station KYW, the Westinghouse Radio Station in Chicago. The transmitting apparatus is contained in the steel cabinet shown at the left of the photo.

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Station of Marius Thouvais, president of the Radio Club de Sologne, France, whose set was described in a recent issue of RADIO WORLD.



(C. Amrad Photo)

Captain Donald K. MacMillan, Arctic explorer, relating over the radio of the Amrad Station, at Medford Hillside, Mass., his experiences in his travels through the frozen northland.



(C. Kadel and Herbert)

The Rev. Lyman R. Hartley, the terian Church, New York City, r the homes of sick members of his church" regularly. Mr. Hartley i congregation in the operation of

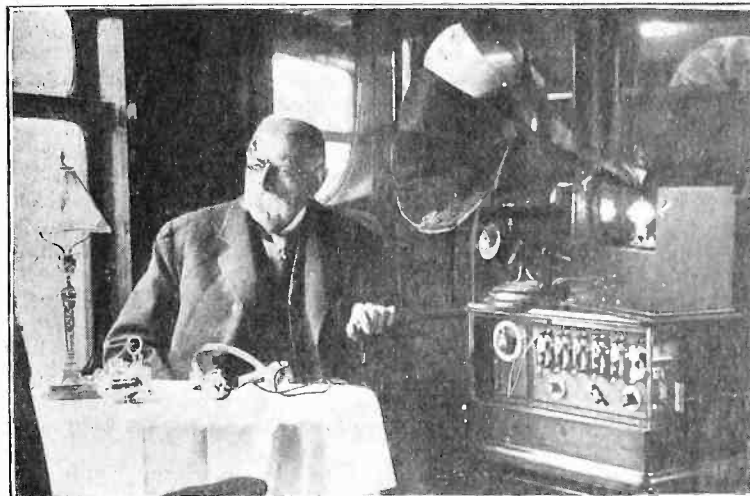
UNDERS SPREAD BEFORE D READERS



(C. P. and A. Photos)
Little Winifred Coker and her mother. Miss Coker holds the distinction of being the first "radio christened baby" on record. The ceremonies took place at WSB, Atlanta, Ga.



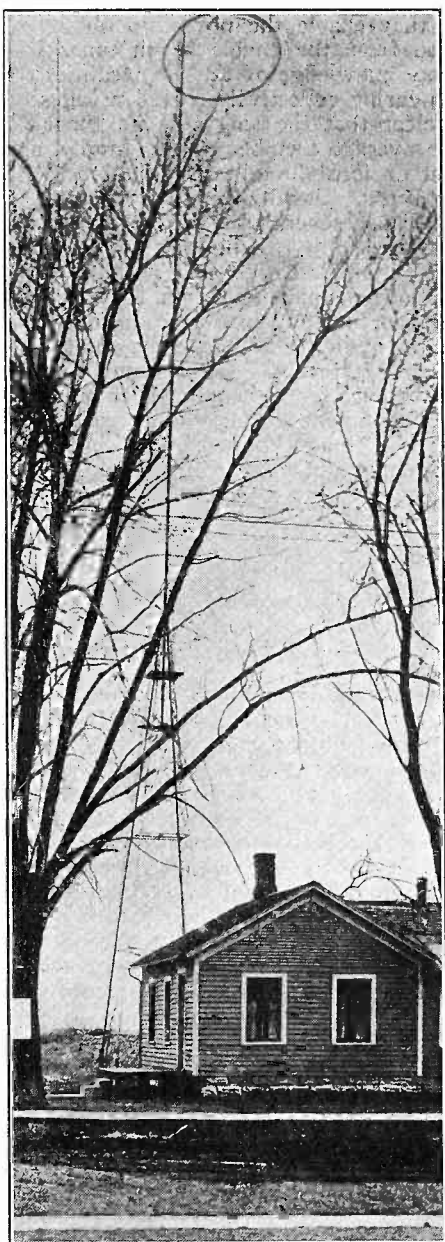
(C. Kadel and Herbert)
The Salvation Army has adopted radio in its routine work as a means of teaching small boys and girls that they meet in their ministrations the benefits of radio. Brigadier W. Palmer, of the Salvation Army, is shown giving instruction in the operation and care of regenerative sets. These girls are being trained as thoroughly as the regular army operators.



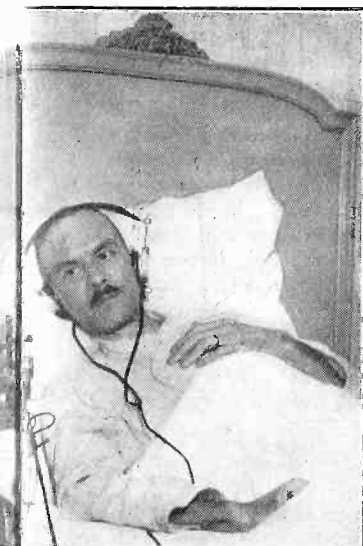
(C. Keystone Views)
Radio receiving sets have been installed on the Pullman cars running between London and Dover to keep travelers entertained and comfortable. Sir Davison Dalziel, chairman of the Pullman Car Company, is being entertained while waiting for the Garcon to bring on his "paté de foie gras." Six tubes and a powerful amplifier are used because of the low short antenna that is of necessity used:



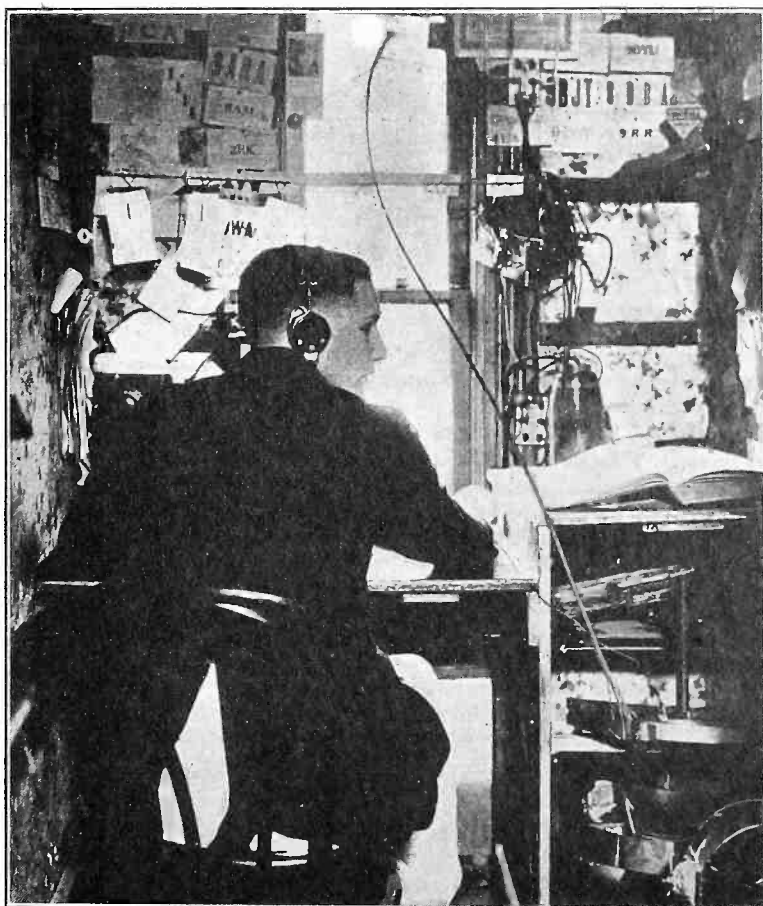
(service)
...lessness finds that radio helps him ... by keeping his watch right to ... The moving picture colony have ... adopted radio as one means of ... idle minutes that occasionally ... open in their busy days.



(C. Underwood and Underwood)
What constitute the rights of the air will be determined in a few days, when the first injunction suit ever instituted on the question will be tried at Levingston, Ill. E. McWilliams, a wealthy banker of Dwight, is suing Wylie Bergman, an amateur, claiming that his transmitter interfered with the former's receiving equipment to such an extent that it was impossible to listen in. Mr. Bergman's antenna and station are here shown. The money for mast and apparatus was obtained by doing odd jobs. The notables of the radio world are watching this case with intense interest.



... Pastor" of Fort George Presby- ... helped install receiving sets in ... gation, so that they could "attend ... pared instructing a member of his ... be set donated for the purpose.



Relative Capabilities of Double-Circuit and Single-Circuit Receivers

By E. E. Bucher

MISINFORMATION has been broadcast to the radio trade with regard to relative capabilities of the double-circuit and single-circuit receiver. By skilful distortion of certain fundamental technical facts, the public, as well as the jobber and dealer, have been informed and in some cases led to believe that the two-circuit tuner enables one to obtain unusual results which cannot possibly be secured with the single-circuit tuner.

There are, however, certain outstanding facts in the situation which no amount of propaganda can contravene:

First—The interference sometimes encountered in radio broadcasting reception is primarily a problem of broadcasting transmission. It can be fully eliminated only by the enactment of suitable government legislation that will enable wave lengths other than 360 and 400 meters to be assigned to broadcasting stations.

Second—No receiving tuner, whether it be of the single or double-circuit type, will prevent two broadcasting transmitting stations operating identically on the same wave length from setting up interference in the receiving set, unless the signals of one station are of sufficient intensity to drown out those of the other station.

Third—Two broadcasting stations operating on nearly the same wave lengths will produce an audible note or "whistle" in a receiving apparatus, which no tuner of either the single or double-circuit type will eliminate. The cure for this problem is the assignment of wave lengths to the transmitting stations of sufficient separation so as not to produce an audible note.

The single-circuit tuner will enable the listener to differentiate between two local broadcasting stations by one of two ways, (a) by connecting a .001 mfd. fixed condenser across the antenna and ground binding posts, or (b) by erecting a short antenna 15 to 40 feet in length and not of too great height. It has been conclusively demonstrated that a low antenna gives greater selectivity than a high antenna.

Selectivity in regenerative receiving sets is primarily dependent on the amount of regeneration. Two local broadcasting stations on different wave lengths will often interfere with one another on either the single or double-circuit receiver, but this is due to the overwhelming power of the transmitter which causes the apparatus to respond even when not accurately tuned to the transmitter. It has been demonstrated beyond all cavil that interference set up by two local stations can be eliminated on the single-circuit receiver by an antenna not exceeding 40 feet in length.

The ordinary regenerative set with the double-circuit tuner gives from 20 to 50 per cent less signal than the single-circuit with the same number of tubes and the same general circuit. In other words, stronger signals will be obtained, in long distance reception, from a single-circuit set than from a double-circuit set.

For those who have interest in long distance reception, as well as local reception, it is sometimes advisable to erect two single wire aerials, one for long distance reception—which may be of any length up to 150 feet, and the other for local reception—which may be of any length up to 40 feet, depending upon the sensitiveness of the receiving instrument. The small antenna enables one to differentiate between local signals, while the large antenna can be used for long distance work after the local stations have discontinued.

Many users of broadcasting sets are now installing two antennae—a long one for long distance reception after the local stations have closed down, and a small one, or an indoor aerial, for local reception. The indoor aerial may consist of 25 to 50 feet of lamp cord concealed behind the picture moulding, or a piece of inconspicuous No. 28 wire stretched across the corners of the room. Listeners located up to 15 or 20 miles from a broadcasting station can often obtain all the signal audibility necessary for local work by concealing the antenna under the carpet of the living room or the library of the home.

The foregoing are technical points which will stand the closest analysis. Speaking purely from the practical phases of the matter, the single-circuit tuner is, without qualification, the most suitable for the novice, that is, for the user unskilled in the art; for generally, the multiplicity of knobs involved in the operation of the double-circuit tuner places them beyond the stage of practicability for the non-technical public. Single-circuit tuners were designed primarily with the idea of providing simplified operation, and as such, they enable the novice to obtain results which can only be secured from the double-circuit tuner when the user possesses an intimate knowledge of the technicalities of the art.

Comparing collectively the advantages of the two types of tuners, it is clear that the single-circuit tuner is by far the more useful to the average member of the family, as it enables picking up far distant or local broadcasting stations with a minimum number of adjustments. Usually the distant station can be found on the single-circuit tuner several minutes before it can be located on a double-circuit tuner, to say nothing of the increased strength of signal which the single-circuit set provides.

For long distance reception, it is preferable in every case to install an outdoor antenna in a free open space keeping the lead-in away from the building and bringing it as directly to the receiving apparatus as possible. The antenna is preferably kept at the maximum distance from the trolley car lines, power lines, trees, buildings, etc., whereupon a marked increase in selectivity and in signal strength will be obtained. Lead-in wires should not be tacked to wooden mouldings or laid parallel to metal mouldings.

Heard Over the Radio Counter

EPISODE XV.

"Lo, Bill! How are you?"

"Well, holy oscillators and jumping regeneration, Jack, where did you fall from?"

"Oh, just got back from the zone. Guess I'm here permanently now. What's new?"

"Oh, say, you don't know anything. Everything is changed since you went away. Why, even crystal detectors are coming back. What do you think of that?"

"Ahah, quit your kiddin'. I read the papers. Some bunch got across during the tests, didn't they?"

"You said it. Say, what are you goin' to do—set up another station, or stay away from it altogether?"

"Stay away! I should say not. I'm going to rig up a set that's going to be the crocodile's cough. Say, what kind of a tube is that over there? No, not that one; the one next to it."

"Oh, that's a new tube the G—— Electric just brought

out. It's a pip, kid; you can't beat the tubes they are turning out now-a-days."

"Go on. I'll bet a stack of wheats in Childs' against a diamond tiara that they aren't as good as the old tubular audions that they used to turn out."

"O. K., OM; you're on. Come over here and listen to this tube work in any set in the house. Take your pick."

"Well, let's try it on that two-step regenerative over there."

"Well, there is Atlanta, Georgia. Is that plain enough?"

"Sure! Let me work that set for myself. It's been so long since I worked a regular set that I don't know how to turn the dials any more. Say—SSSHHH! It's a 6—O, boy! Gimme two of these tubes quick before I change my mind and buy a dozen."

"O. K., OM. Come on up to the house tonight and listen to some real DX on a three-step radio frequency with just a loop. I get them all."

"Sure! Say, rustle up that change, will you? I want to get home. I think the bug bit me all over again."

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 announced. 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 Class B stations appears elsewhere in this issue of RADIO WORLD.

"Killing Two Birds With One Stone"

TO merchandise radio goods successfully the manufacturer needs, first, to sell the trade and then the consumer—two birds that need a killing.

The trade hesitates about stocking goods until there is a consumer demand, and the consumer cannot buy until the dealer is stocked, for the average man is not a mail-order buyer; so this is the stone radio manufacturers stumble over.

RADIO WORLD is a "fan" weekly. Seventy odd thousand read it weekly to learn what kind of a radio receiving set to buy or how to improve, add to, or make work better the radio equipment they now have.

Each Thursday RADIO WORLD goes to press with every bit of radio news and information that breaks up to midnight, and, wherever you live, your nearest newsstand has RADIO WORLD the following Wednesday morning, while the monthly radio publications trail along with the news six to eight weeks after.

A radio dealer or jobber must be as well informed as his buyers (the consumers). When asked about the Armstrong, Flewelling, Reinartz, or Hazeltine circuits Mr. Dealer cannot very well say to Mr. Consumer: "In six or eight weeks I'll get the information from some radio monthly and then I'll be able to wait on you intelligently."

No, Mr. Dealer does not say this. He sends in his six-dollar subscription. *He reads RADIO WORLD each week as a matter of business necessity.* Unquestionably more radio dealers and jobbers read RADIO WORLD than any radio trade monthly.

Here, then, is how two birds can be killed with one stone—i. e., by advertising in RADIO WORLD 70,000 live radio buyers (consumers) are reached, and, simultaneously, almost one hundred per cent of all the radio dealers and jobbers read your advertisement.

RADIO WORLD is the weekly radio publication that creates demand, reaches the buyers, and sells both the consumer and the dealer with the one advertisement.

Circulation is less important in RADIO than READER INTEREST. For instance, the same keyed advertisement was run in RADIO WORLD and in another publication of over a million guaranteed circulation. RADIO WORLD brought cash returns of over two to one. Why? The million copy publication was bought because it contained good literature—RADIO WORLD because it supplies the radio information desired. This is one reason why thousands choose to pay three times as much per copy for RADIO WORLD as for the *Saturday Evening Post*.

Now the Theatrical Managers Want Broadcasting Royalties

THE Producing Managers' Association of New York City does not intend that royalties for broadcasting shall flow only to the American Society of Composers, Authors and Publishers.

On behalf of the producing managers, Arthur Hammerstein issued last week an announcement that no music from any opera, musical comedy or musical play would be permitted without the consent of the producing managers.

The musical plays now being produced, as well as other plays, are the property of the producers, Hammerstein contends. Any play, once delivered over to its producer, cannot again be bartered by the author or composer, or by any organization of authors and composers.

Broadcasters, the royalty line forms on this side!

"Synthetic Resins and Their Plastics," by Ellis

SYNTHETIC RESINS AND THEIR PLASTICS," by Carleton Ellis, consulting chemist, has been received from the Chemical Catalog Company, Inc., of New York. It is a highly technical, historical and comprehensive dissertation on the chemistry, compounding and uses of synthetic products of a resinous character. Some of these, such as bakelite, are used in radio work for insulating purposes. The price of the book is \$6.

Radio Market Possibilities Abroad

MR. JULIUS KLEIN, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, recently stated that conditions affecting the market possibilities for radiotelephone apparatus are changing rapidly throughout the world. Interest appears to be universal, and no branch of the electrical industry in recent years has been given such popular publicity as has radiotelephony. Broadcasting service is gradually being introduced in all the important countries, with a resultant brisk demand for receiving sets. Even people in isolated and remote regions, cut off from quick contact with the rest of the world, and fascinated by the possibilities opened up by radiotelephony, are installing expensive tube sets to enable them to hear distant broadcasting stations.

WEAF Capitulates on Broadcasting Royalties

THE dispute between the American Society of Composers, Authors and Publishers and broadcasting stations in and near New York over the question of copyright took a new turn last week, when Station WEAf, controlled by the American Telephone & Telegraph Company, and operated by the Western Electric Company, took out a license from the society. A contract was signed calling for an annual payment, which gives WEAf the right to broadcast any compositions the copyright of which is vested in the society.

No Wireless Receiving Set is complete without



MAGNAVOX products are designed in our own laboratories and manufactured in our own factory—greatly extended in size during the past few months.

The Magnavox Power Amplifier has been designed for use especially in connection with the Magnavox Radio, and its use greatly increases your range and signal strength.

Every owner of a Magnavox Radio should also add the Power Amplifier Model C if he has not already done so.

R-2 Magnavox Radio

with 18-inch Horn

FOR those who wish the utmost in amplifying power; for large audiences, dance halls, etc. Requires only .6 of an ampere for the field.

Price, \$60.00

Type R-3 Magnavox Radio

with 14-inch Horn

THE same in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.

Price, \$35.00

Magnavox Power Amplifier Model C

INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage \$55.00
AC-3-C, 3-Stage \$75.00

Magnavox Products may be had of good dealers everywhere.

The Magnavox Company

Oakland, California

New York Office: 370 Seventh Ave.

**Radio brings it
MAGNAVOX tells it**

Some DX Records to Shoot At

Tennessee, the Land of Songs

From Frank D. Sutton, Sparta, Tenn.

AM sending my "record" for publication in your DX Nite Owl Dept. It is a one tube set using the diagram published on the cover of Radio World, dated September 16, 1922. It is one using a variable condenser.

The following are stations, twenty in number, received in two hours and thirty minutes, which came in as loud as my two step regenerative: WGM, WSB, WBT, WBAP, WHAS, KDKA, WWJ, WMC, WDAJ, WOAN, WCX, WFAA, WJAS, WJAR, WCAZ, WDAF, WLK, WJAX, WHB, WSW. The nearest is 75 miles and the furthest, 750 miles.

Just Like the Lizzie, It Gets There Just the Same

From W. A. Cale, 296 Madison St., Brooklyn, N. Y.

This is a list of stations I have heard on one tube while DXing for less than a half hour on four different evenings. Several of them I heard on each of four evenings. Chicago and Kansas City come in particularly well, and are as clear as nearby stations.

WBS, WJZ, WOR, WAAM, WEA, WHN, WOC, WDAP, WGM, WDAF, 2BR, KSD, WOS, WLAG, WMC, WIP, KDKA, WGY, WNAC, WGI, WLAK, WBAN, WBS, WHAS, WHAZ, 2XB.

The set costs about six dollars plus batteries, tube and phones. These latter items vary greatly with the type used. The set cost \$14.45 complete. I shall be glad to answer any inquiries made by your readers.

Only Slightly Damp Around the Ankles

From A Constant Reader, 2316 Each Michigan Ave., Lansing, Mich.

JUST want to say that Mr. Keating's record for DX is the best ever, though I have copied some long-distance stations myself with humble galena, though not equalling his record by any means. My outfit consisted of 2-slide tuner, fixed condenser, ten-cent store detector and phones. Antenna 230 ft. long, 40 ft. high at farther end with 20 ft. lead in at lower end. With this outfit I have copied KDKA, WJZ, WOR, WHAZ, WOC, WCAE, WCX, WWJ, WDAP, WGY, WHB, and any number of code stations.

A "Nite Hawk" to the "Nite Owls"

From "Nite Hawk" Wm. L. Klein, Box 950, Newark, Ohio

I HAVE been a constant reader of your valuable magazine for about six months now and can truthfully say there is none better. Always up to the minute with new dope and circuits. Below you will find a "Nite Owl" record which I think will compare favorably with any I have seen so far. I have listened to stations in 25 states, Canada and Cuba. Following are some of the stations: CFCN, CFCN, KFI, KHJ, KFFQ, KSD, KYW, PWX, WBAP, WBAV, WBZ, WEA, WGI, WGM, WGY, WHA, WHAS, WJZ, WLAG, WLAK, WLK, WMC, WOC, WPAC, WSB, WSY, WOAW, and many others I didn't enumerate. I am using a standard three-circuit set with two stages of audio-frequency amplification composed of the following parts: One general radio .001 primary condenser, one Kellogg variocoupler, secondary condenser,

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.

and variometer, Rhamstine and all American transformers, rheostats. I am using a detector tube called the "Vacobob" and WD-11's for my amplifier. This is a home-made set and I would like to see anybody better this record.

High and Handsome from St. Louis

From Lawrence Levy, 5915 Lindell Blvd., St. Louis, Mo.

HERE is my record, using two sets. My aerial is two wires 80 feet long and 40 feet high. The ground is a wire attached to a pipe driven into the ground. One set is a single circuit tuner with two stages of audio-frequency amplification. The other, which I have just finished, is a one-tube set using the Flewelling super circuit. This has worked fine on either aerial or ground, as both cannot be used at the one time. I have received Schenectady, N. Y., on ground alone. I recommend this set to any one wanting a cheap long distance receiving set.

List of stations received: CFCN, CFCN, CJCG, KDKA, KFI, KFAF, KHJ, KOP, KWH, PWX, WBL, WBT, WCX, WGF, WGM, WGR, WGY, WHA, WHB, WJZ, WLK, WLW, WMC, WOC, WOH, WOI, WQQ, WOR, WOS, WPA, WSB, WSY, WWJ, WAAC, WAAL, WAAP, WAAZ, WBAP, WBAV, WCAE, WCAL, WCAW, WDAF, WDAJ, WDAP, WDAO, WDAV, WFAA, WGAS, WHAS, WIAA, WIAO, WJAN, WJAP, WJAX, WLAG, WLAL, WMAQ, WNAD, WNAV, WOAI, WOAN, WOAW.

A Thousand Miles on a One Foot Square Loop!

From George Bailey, Weston, Mass.

I WISH to thank you for the article on Reflex Hook-Ups by W. E. Thompson, in your March 3 issue. I have obtained really wonderful results, and wonder if readers realize what can be done with the hook-ups. I picked out the three tube set with the crystal detector, and put it together, following directions very carefully. For the plate resistances I used a variable grid leak, values 1,000 to 100,000 ohms, on the middle tube, and on the other tube a carbon potentiometer, values 0 to 5,000. Both of these instruments I had on hand, and found that they worked well. For tubes I used three U. V. 201, with 90 volts on the plates for volume, but 45 will work.

I made a loop just twelve inches square, with nineteen turns of ordinary insulated bell wire, and I put this in the circuit.

And now here comes the fun. I turned on the juice, set the condenser for resonance, turned the vernier on it, caught a carrier wave, then a girl singing came in loud. Weston is twelve miles from Boston, and as it was late for the local stations I thought I had New York, but to my surprise it was

WDAP, the DRAKE HOTEL, CHICAGO! I hung the phones on the hook, got out my tape measure, and backed off twenty-five feet from the phones, and the music was plainly audible.

A little later I picked up WOC, DAVENPORT, IOWA, very loud and clear. Then WSB, ATLANTA GEORGIA!!!

The set is surprisingly selective, as a swing of the loop cuts out WNAC completely, only twelve miles away, and a slight turn of the vernier brings in a distant station.

The two local stations, WNAC and WGI come in very loud on a Victrola with a tone arm attachment, and the modulation is almost perfect, as the crystal detector is much better than a tube for a detector in the case of clearness, and only a little less in volume. To obtain good results, the plate resistances must be always used in tuning. The potentiometer must be set very carefully also. The loop condenser needs a vernier, and with care very sharp tuning is obtained. The rheostat on the third tube can be used for final adjustment, but is not important.

I have only been a "radio bug" for a year, but I have tried many hook-ups, and this one is best of all. I enjoy your weekly very much, and hope you will "Live long and prosper."

All on One Tube—Whee!!

From Henry A. Westermeyer, Cleveland, Wis.

RECEIVED my first copy of RADIO WORLD last week, and it sure is a fine radio magazine.

Herewith I send you a list of 34 broadcasting stations which I received February 15, 1923, from 6 p. m. to 12 p. m. on a single-tube set, no amplification, WKAQ, of San Juan, Porto Rico, and KFI and KHJ, of Los Angeles, Cal., being the most distant stations heard.

The mileage of the 34 stations is a total of 22,085 miles, which I think is very good for a one-tube set. My set is a "Michigan Junior," made at Grand Rapids, Mich.; and my antenna is 125 feet long, 35 feet high.

| Call Letters | Location | Distance |
|--------------|--------------------------|----------|
| WKAQ | San Juan, Porto Rico | 2,240 |
| WGY | Schenectady, N. Y. | 695 |
| WMV | Washington, D. C. | 645 |
| WMAQ | Chicago, Ill. | 150 |
| WMAV | Auburn, Ala. | 795 |
| KDKA | East Pittsburgh, Pa. | 450 |
| WPA | Fort Worth, Texas | 950 |
| WCX | Detroit, Mich. | 265 |
| WIAO | Milwaukee, Wis. | 60 |
| WLAL | Tulsa, Okla. | 710 |
| WGM | Atlanta, Ga. | 750 |
| WOC | Davenport, Ia. | 230 |
| WWJ | Detroit, Mich. | 265 |
| WHB | Kansas City, Mo. | 495 |
| WMC | Memphis, Tenn. | 625 |
| WEAF | New York, N. Y. | 725 |
| KYW | Chicago, Ill. | 150 |
| CFCN | Toronto, Ont. | 420 |
| WEAN | Providence, R. I. | 815 |
| WKAC | Lincoln, Neb. | 530 |
| KLZ | Denver, Col. | 960 |
| WFAA | Dallas, Texas | 940 |
| WFI | Los Angeles, Cal. | 1,770 |
| WOI | Ames, Ia. | 335 |
| WCAE | Pittsburgh, Pa. | 450 |
| WBAP | Fort Worth, Texas | 950 |
| WSB | Atlanta, Ga. | 750 |
| KHJ | Los Angeles, Cal. | 1,770 |
| WLW | Cincinnati, O. | 360 |
| WLAG | Minneapolis, Minn. | 300 |
| WDAP | Chicago, Ill. | 150 |
| WCAL | Northfield, Minn. | 260 |
| WDAF | Kansas City, Mo. | 495 |
| CKCG | Winnipeg, Manitoba, Can. | 630 |

Total

22,085

FREE

Illustrated Booklet on Radio Frequency Amplification with circuit diagrams and operational characteristics.

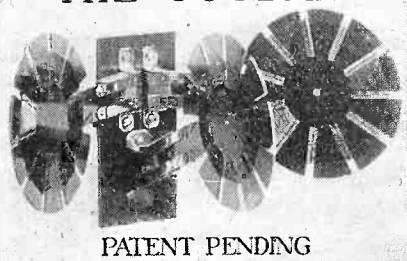
By **LESTER L. JONES**
Formerly Expert Radio Aid,
U. S. N.

DANZIGER-JONES, INC.

(Sole Licensees)

143W PRINCE ST., NEW YORK, N. Y.

THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

"The Little Wonder"

FOR BOYS AND GIRLS

CRYSTAL SETS

Unassembled-Net **\$3.50**

Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at \$5.00.

GUARANTEED TESTED CRYSTALS

Galena 15c Radiosite 20c

Write for Free Catalog

It lists all our radio parts and supplies.

Holloway Elec. Supply Co., Inc.
238 Third Ave. New York City

WBZ Broadcasts Concert in French

GREAT interest was aroused in and around Springfield, Mass., last week, when a group of ten famous French artists visited the city to give a concert from radio station WBZ of the Westinghouse Electric & Manufacturing Company. These artists were sent by "La Presse," of Montreal, Canada, and their appearance was one of the big events in the musical season at Springfield.

This concert would seem to indicate a new era in radio broadcasting—this is, a traveling company from one station to another. It is possible that the exchange of artists by the large radio stations may be one of the future developments in this great art. Naturally any city, outside New York and Chicago, will utilize all available talent in a year or two and the same artists must perform over and over again. By the exchange of talent each city can gain a variety.

The artists were in charge of J. N. Cartier, the famous announcer from station CKAC of the Montreal "La Presse." He made the announcements both in French and in English. Mr. Cartier speaks both languages fluently and his speaking first in one language and then in another was a novelty in broadcasting.

WBZ was fortunate in securing Mr. Cartier to make the trip to Springfield, as he is considered one of the best of radio announcers. Besides being an excellent announcer, Mr. Cartier has had much experience as a newspaper man, soldier and wireless operator. He is a direct descendent of Jacques Carrier, one of the earliest pioneers of Canada, and possesses the roving spirit of this forbear. He was a wireless operator before he was twenty years old and has had many experiences in the frozen North.

Radio Controlled Airplane

A THREE HUNDRED horse-power Voisin bombing airplane, carrying two passengers, made a flight last week, all movements of which were controlled by radio from the ground. The demonstration was made at the flying field at Etampes, France, and was directed by Captain Boucher, of the French air service, from a hangar, in which was located the switchboard for controlling the airplane's movements. The landing was made without difficulty.

W. T. 501 DETECTOR TUBE

For tube sets, or to convert crystal sets into tube sets at small cost. **\$2.00**

Special Socket 40c extra
Special Adaptor 75c extra

RADIO RESEARCH GUILD

40 Clinton St. Newark, N. J.

RADIO TUBES REPAIRED

"Guaranteed Equal to New"

FOUR DAY SERVICE

6 V. Detectors, \$2.50; Amplifiers, \$2.75;
5 Watt Power Tubes, \$4.00

Refilled Tubes Always in Stock

Our repaired tubes speak for themselves.

Radio Tube Laboratories, Inc.

776 Broad Street Newark, N. J., U. S. A.



CRYSTAL RECTIFIER

MULTIPOINT

(Patent Pending)

A Synthetic CRYSTAL DETECTOR sensitive over its entire surface

Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.

Price, mounted, Sensitiveness guaranteed **50c**

RUSONITE CATWHISKER

14-Karat Gold Multiple contact. **25c**

Supersensitive

Order from your dealer or direct from us.
Rusonite Products Corp., 21 Park Row, N. Y.

GUARANTEED REPAIRS

Broken and Burned Out

VACUUM

TUBES

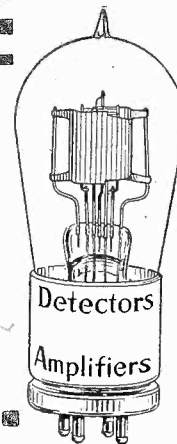
W.D.-11 not accepted for repair

Your dealer should know, but if he does not, send direct to

HARVARD RADIO LABORATORIES

Boston 9, Mass.

Tubes returned parcel post C. O. D.



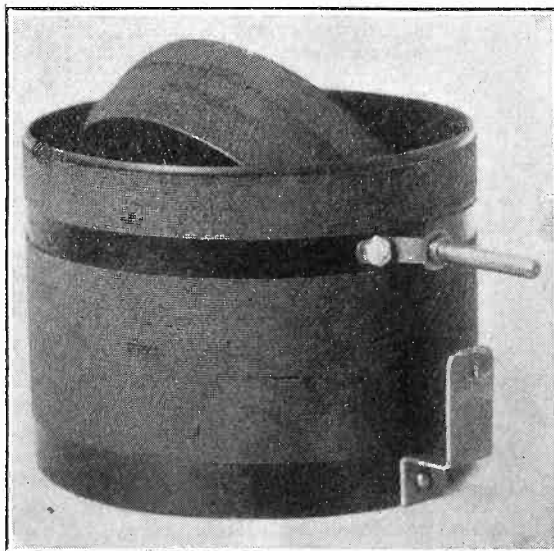
TO GET THAT DISTANT STATION

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



Make All Remittances Payable to

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

Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word.

Telephone Bryant 4796.

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 O'B. Nehin, 39 Fairchild Place, Buffalo, N. Y.

H. C. Bachle, P. O. Box 774, Hartford, Conn. (Retailer.)

Vincent French, 31 Kingsville Avenue, Ashtabula, Ohio.

Earl Horstmann, 159 Kearney Street, Kearney, N. J.

The Wilkenda Company, Walden, N. Y. (Distributors.)

Flynn Bros., Box 702, Cement, Okla. (Interested especially in radio parts.)

Clark O. Darling, Sidney, N. Y. (Dealer.)

Alexander Electrical Company, Hollis, Okla. (Dealer.)

The Berger Drug Co., 1024 South Washington St., Marion, Indiana. (Retailers.)

H. Spencer Graham, 2621 Verdun Avenue, Los Angeles, Calif.

Edwin Webster, 1903 Moser Avenue, Dallas, Texas.

R. E. Head, 67 J Street, Salt Lake City, Utah.

P. Ricard West, 18th floor, Keith Theatre bldg., Philadelphia, Pa.

R. Watt, 359 Forty-third Street, Brooklyn, N. Y. (Retailer.)

The A. N. Whitlock Co., 501 Eighth Street, S. W., Washington, D. C.

M. B. Chapman, Logan, Kansas.

Robert O. Cull, Box 354, Frederick, Oklahoma.

Alf. Giroux, 426 Centre, Pte. St. Charles, Montreal, Canada.

H. P. Johnson, 706 Fort Street, Victoria, B. C., Canada.

Bartell J. Geib, Box 73, Shreve, Ohio. (Retailer. Wants an agency.)

Roy M. Canfield, 45 N. Park Street, East Orange, N. J.

Joseph N. White, 2731 W. Silver Street, Philadelphia, Pa.

Lemuel D. Leighton, 33 Elm Street, Waterville, Maine.

Max R. Hoffman, 20 Rowsley Street, Apt. 3, Bridgeport, Conn.

O. Kein, general manager, United Music Stores, 619 Cherry Street, Philadelphia, Pa.

Henry N. Omitt, Box 58, Iola, Wisconsin.

George McGuire, 126 West Fifth Street, Erie, Pa. (Wants to purchase good set.)

Edgar L. Pond, 11 Boyden Street, Worcester, Mass. (Will buy or build a set.)

H. K. Witherspoon, Box 17, Raleigh, N. C.

G. C. Mullikin, 1323 Fifth Street, Ft. Madison, Iowa.

G. B. Fleming, 75 Adelaide Street, St. John, N. B., Canada.

Henry Hall, 213 North Rose Street, Baltimore, Md.

James D. Savage, 5809 Rodman Street, Philadelphia, Pa.

A. L. Ober, Box 466, North Manchester, Ind.

Hayden Deaner, 211 Church Street, Danville, Pa. (Retailer and distributor prices wanted.)

B. E. Brown, Lincoln, Maine.

Harry W. Six, 71 Church Street, New Rochelle, N. Y.

D. J. Shinn, Box 172, Elgin, Kansas.

James N. Crowder, Box 599, Memphis, Tenn.

Combined Condenser-Grid Leak

A NEW product of the Charles Freshman Company, New York City, and one which will prove a very popular addition to their ever-increasing family, is a combined condenser and grid leak made for panel mounting. With this new product it is not necessary to muss around the inside of a set, when it is necessary to change the capacity of the leak, but by having it handy on the outside, the change can be quickly made. In construction it much resembles the old and well known product but, being square, looks very well on any panel. Two machine screws with nuts and washers project through to the back making it necessary to drill only two small holes in order to put it on the panel.

New Radio and Electric Firms

Wireless Ignition Company, apparatus, \$50,000; C. Willis, J. H. Strong, W. H. Koch, Minneapolis, Minn. (Delaware Registration Trust Co.)

Joplin Electric Steel Company, electric steel and iron castings, \$20,000; J. A. Lininger, New Wilmington, Pa.; J. M. Lininger, Sharon, Pa.; George R. Chapman, Erie, Pa. (Arley B. Magee, Dover, Del.)

Electric Power Securities Company of Niagara Falls, Buffalo, N. Y.

Krasco Mfg. Co., Illinois, make phonograph motors, 1,000 shares preferred stock, \$100 each; 1,000 common, no par value; representative, D. S. Root, 120 West 42d St., New York City.

Commonwealth Electric Co., appliances, \$135,000; James M. Whalen, Paul S. Schorr, Arthur L. Abbott, St. Paul, Minn. (Arley MaGee, Dover, Del.)

American Radio & Electric Corp., Wilmington, Del., apparatus, \$3,000,000. (Registrar & Transfer Co.)

Radio Panel and Parts Corp., New York City, \$15,000; S. J. Spector, A. G. Heller, W. A. Southworth. (Attorney, I. F. Vogel, 233 Broadway.)

Amsco Products, New York City, wireless apparatus, \$100,000; C. Hardy, B. H. and C. H. Price. (Attorneys, Price Bros., 261 Broadway.)

Radio Box Co., Brooklyn, N. Y., \$10,000; B. and E. Lubatkin, I. M. Torodosh. (Attorney, C. Goldenberg, 261 Broadway.)

Lane Relay Company, Waverly, N. Y., signal systems, \$500,000; W. H. Lane, C. R. Williams, J. J. Higgins. (Attorney, E. W. Eaton, Waverly.)

Elgin Electric Corp., New York City, incorporated for \$15,000. Directors, L. Weisberg, E. Gettinger. (Attorney, S. B. Lillenstein, 280 Broadway, New York City.)

Radio Stocks

(Quotations as of April 18, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York, Specialists in Wireless Securities.)

| Stock | Bid | Asked |
|------------------------------|------|--------|
| American Marconi Stamped.. | 5* | 15* |
| American Marconi Unstamped | \$5 | \$7.50 |
| American Tel. & Tel..... | 122¾ | 123 |
| Canadian Marconi..... | 2¾ | 3¼ |
| Dubelier Condenser..... | 13½ | 14 |
| English Marconi com..... | 10 | 15 |
| English Marconi pfd..... | 10½ | 15½ |
| Federal Tel. Calif..... | 5 | 5½ |
| General Electric..... | 180 | 181 |
| Henessey Prod. Corp. 8% pfd. | 9 | 11 |
| Mackay Companies com..... | 113 | 116 |
| Manhattan Elec. Supply..... | 55 | 58 |
| Marconi Int. Marine..... | 7 | 9½ |
| Radio Corporation com..... | 37½ | 4 |
| Radio Corporation pfd..... | 35½ | 3¾ |
| Spanish Marconi..... | 1 | 3 |
| Western Union..... | 113 | 113½ |
| Westinghouse E. & M..... | 57 | 57¾ |

*Cents

Coming Events

PERMANENT RADIO FAIR FOR BUYERS. Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

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

RADIO EXHIBITORS OF BROOKLYN, general exposition of radio apparatus and accessories. Signal Corps Armory, Dean Street and Washington Avenue, Brooklyn, N. Y., April 23 to April 28, inclusive.

Advantages of the Hazeltine Neutrodyne Circuit

PROFESSOR L. A. HAZELTINE in commenting recently upon his new receiver, now widely known as the "Hazeltine neutrodyne receiver," said in part: "The neutrodyne circuit is in effect a desirable simplification of all previous circuits and not, as many people think, an elaboration. In eliminating certain disturbing features that now exist in present sets, I, of course, had to change the design of several of the parts that are thought to be standard; but in doing so, I eliminated all previously existing disturbing features so that perfect relay amplification was possible. This circuit will get the utmost out of a received signal that can be had, without any extraneous noises, and with the least possible amount of tuning controls."

Where Push and Pull Transformers May Be Obtained

The article on a power amplifier by C. White, published in RADIO WORLD for February 24, 1923, apparently has created great interest among amateur builders. Numerous letters have been received by the author and RADIO WORLD inquiring where the push and pull transformers mentioned in the article can be obtained. In reply to these inquiries RADIO WORLD is requested by Mr. White to state that they may be secured from the General Radio Company, Cambridge, Mass. Letters addressed to Mr. A. F. Murray, in care of the Engineering Department of this company, will receive his personal attention and prompt action.

Injunction on Radio Tubes Vacated

THE Circuit Court of Appeals has vacated an injunction obtained by the Radio Corporation of America which restrained Jacob Hohenstein, Louis M. Rosenthal and the Liberty Appliance Corporation, of New York City, from continuing an alleged infringement of the De Forest radio vacuum tube patents. The opinion of the court was to the effect that the plaintiff was without right to sue and that it had no title to the patents.

Sunbeam Has New Outlet for Its Goods

The Sunbeam Electric Company, 71 Third Avenue, New York City, has added a new outlet for its radio and electric products by the purchase of the business which has been conducted successfully for ten years by John Ryffel at 207 East Fourteenth Street, New York City. Complete radio equipment of Sunbeam standard will be available at either address.

A New One Tube Set

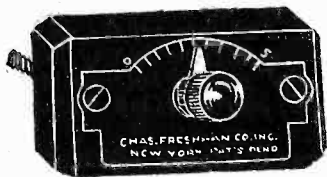
The Aldwin Radio Company, 676 Eighth Avenue, New York City, have brought out a new one tube set, using an original circuit of their own. The features claimed for the set are its remarkable sensitivity combined with simplicity of operation. The tuning is accomplished with a single dial. Stations can be tuned in or out with two degrees variation on the dial.

NEW CONSTRUCTION

of all **FRESHMAN**

Variable Resistance Leaks

guarantees long life and permanent resistance—no pencil markings—assures an unbroken range of 180 degrees. Eliminates hissing. Clarifies signals.



A New Leak for

PANEL MOUNTING

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

Complete with either .00025 or .0005 mfd. Micon Condenser

\$1.00

Without Condenser **75c.**

A necessary essential for every tube receiving set

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

Also ask your dealer for a free diagram of the Kaufman and Flewelling circuits.

Chas. Freshman Co., Inc.
108 Seventh Ave. New York City

BIG SLASH!

Cash with Order—Parcel Post Prepaid
 \$6.50 1 1/2 V Tube for dry cells.....\$4.95
 \$5.00 Detector Tube, 6 V.....2.75
 \$6.50 Amplifier Tube, 6 V.....3.50
 Welsh Peanut Tube, 4 to 6 volts, with socket.....2.40
 All above tubes fully guaranteed
 Thorardson Amp. Transformers.....3.95
 \$1.50 22 1/2 V "B" Battery......95
 \$4.00 45 V "B" Battery.....2.45
 Federal or Brandes 2200 ohm Headsets.....6.50
 Dictograph 3000 ohm Headsets.....6.98
 Murdeck 2000 or Gilbert 2200 ohm Headsets.....4.49
 \$4.50 Aame Amp. Transformers.....4.25
 Sockets and Rheostats......69
 Panels, 7x10, \$1.10; 7x12, \$1.50; 7x14, \$1.85; 7x18.....2.00
 23 Plate Condensers.....1.59
 43 Plate Condensers.....2.69

PAULA RADIO COMPANY
233 West 34th St., New York City

JOBBER S

AND DISTRIBUTORS

Something New in Batteries.
Exceptionally Good Proposition.
Assigning Territory Rapidly.

Write or Wire

SIDBENEL, 25 Mt. Eden Ave., New York

GUAR. 1 1/2 VOLT TUBES

\$6.50 Detector and Amplifier for dry cells.
Fits standard socket.....\$4.95
 5.00 Detector Tubes, guar.....2.75
 6.00 Amplifier Tubes.....3.50
 To avoid delays check items and total amount.

B. B. RADIO COMPANY

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

To the DX Nite Owls

and anyone else interested in radio! If you missed RADIO WORLD, dated Feb. 24, with the famous Flewelling Circuit, get it now and get your EARS WET! Send 15c or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

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.

Partial Program of WGI, Medford Hillside, Mass.

360 Meters

Saturday, April 28, 1923.

6:00 P. M.—New England Weather Forecast, furnished by the U. S. Weather Bureau. Late News Flashes, Early Sports News—Boston American.

6:15 P. M.—Condition of Massachusetts Highways, furnished by the Automobile Legal Association. Amrad Bulletin Board.

6:45 P. M.—Code Practice, Lesson Number Forty-two.

8:00 P. M.—Evening Program.

1. Fourth of a series of talks on New England problems under direction of the New England Business.

2. Musical Program to be announced.

Sunday, April 29, 1923.

4:00 P. M.—Twilight Concert.

1. Concert by the Mal-Con Band of Malden; Mr. C. Roland Reasoner, Director.

2. "Adventure Hour," conducted by the Youth's Companion.

8:30 P. M.—Federation Church Service, conducted by Rev. Lyman J. Radcliffe.

Program of WGY for Week of April 29

ALL time references in the program of A WGY, the Schenectady broadcasting station of the General Electric Company, are on the basis of Eastern Standard Time. Several changes have been made in the schedule to accommodate the program to all communities, whether under "old" or "new" time. The concert programs remains at 7:45 p. m., Eastern Standard Time, or 8:45 p. m. Daylight Saving Time.

Sunday morning and evening WGY will broadcast the services of the Albany Street Methodist Church and in the afternoon the WYG Symphony Orchestra will give a program assisted by soloists.

Thursday night, Winchel Smith's comedy, "The Fortune Hunter," will be produced by the WGY Players. During the first program, Friday night, May 4, "Daniel," nationally known sport writer of the New York "Herald," will talk on the prospects of the 1923 baseball season. A second address will be delivered by W. C. White of the Research Laboratory of the General Electric Company. Mr. White will talk on "The Radiotron."

At the late concert, Friday night, May 4, the Union College Musical Clubs will have the entire program. Saturday evening Cain's Castle Orchestra will play from 8 to 10. Eastern Standard Time.

Exchange Bars Stock Boosting by Radio

THE Governing Committee of the New York Stock Exchange, at its last semi-monthly meeting, adopted the following resolution:

"RESOLVED, That no member of the Stock Exchange, or firm registered thereon, shall make use of wireless or radio to transmit or broadcast market information or forecasts of business or financial conditions or any other matter intended to advertise such member or firm or to stimulate interest in particular securities or in the market; provided, however, that members may supply quotations to broadcasting stations which have been approved by the committee at such intervals and under such regulations as are prescribed by said committee."

A SENSATION

In New York and now Gaining an Enthusiastic National Reputation

KAUFMAN CIRCUIT

Designed by an Amateur and Dedicated to Radio Fans for Better Reception.

This Circuit acts like a three-star general, dependable, broad gauged and definite. It makes a recreation out of a fad. The wonderful results achieved on this marvelous circuit have forced us to turn over a New Department to handle the Kaufman Circuit exclusively for our Mail Order Patrons. You can get the whole circuit complete with a simple and clear diagram as follows:

KAUFMAN CIRCUIT, Drilled Panel, Active 20 Variocoupler, 46 Plate Vernier Condenser, Vern. Rheostat, Socket, 2 Variable Grid Leaks, .00005 Micon, .001 Micon, 34 Switch Points, 3 Levers, 2 Dials, 8 Binding Posts—ALL at This Specially Low Price.

\$12.50

Write out your order and pin a Post Office Money Order to it and Mail it to us. If you ask for our Catalogue, Given Free, you will learn of the Radio Instruments we offer for DX (Distance) work. Checks or stamps not accepted. Merchandise shipped postpaid East of the Mississippi.

D-X-Radio Co.

123 Liberty St. New York City

It's the contact that counts

The dual-wipe contact strips of the Na-ald DeLuxe 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).

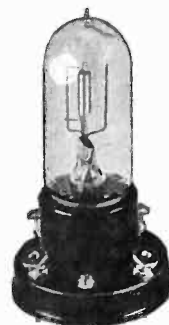
Price 75c

The Na-ald 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 molded of genuine Bakelite. The heat from soldering connections will not affect these sockets.

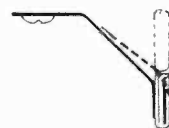
Price 75c

After May 20, 50c

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



Na-ald W.D. 11 No. 411



Na-ald DeLuxe No. 400

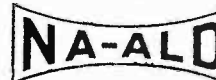
ALDEN MFG. CO.

Formerly

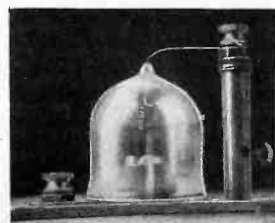
ALDEN-NAPIER CO.

Dept. L. 52 Willow Street

Springfield, Mass.



RADIO PRODUCTS



This tube, with an in-sealed contact point placed over the Crystal, will give better result. Mailed prepaid for 25c. (silver).

VACUUM ELECTRIC WORKS
Station C
TOLEDO, O.

Answers to Readers of Radio World

Has RADIO WORLD ever published a picture of Radio Photography? Who is responsible for the present invention?—James Mason, Three Rivers, Mich.

RADIO WORLD first published a picture of this kind in its June 24, 1922, issue. It was of a photograph that was sent from Rome, Italy, to Bar Harbor, Me., in forty minutes, utilizing the invention of Dr. Korn, of Berlin. The present device is the invention of C. Francis Jenkins, of Washington, D. C.

Kindly publish a diagram of a one-tube reflex similar to that used by Lionel Bigman, illustrated in RADIO WORLD for April 14.—C. T. Brown, 770 Flatbush Avenue, Brooklyn, N. Y.

Herewith is a similar hook-up. It is a one-tube reflex that will permit you to use either a loop or an antenna by simply hooking either across the terminals marked A and B. The constants are marked so that

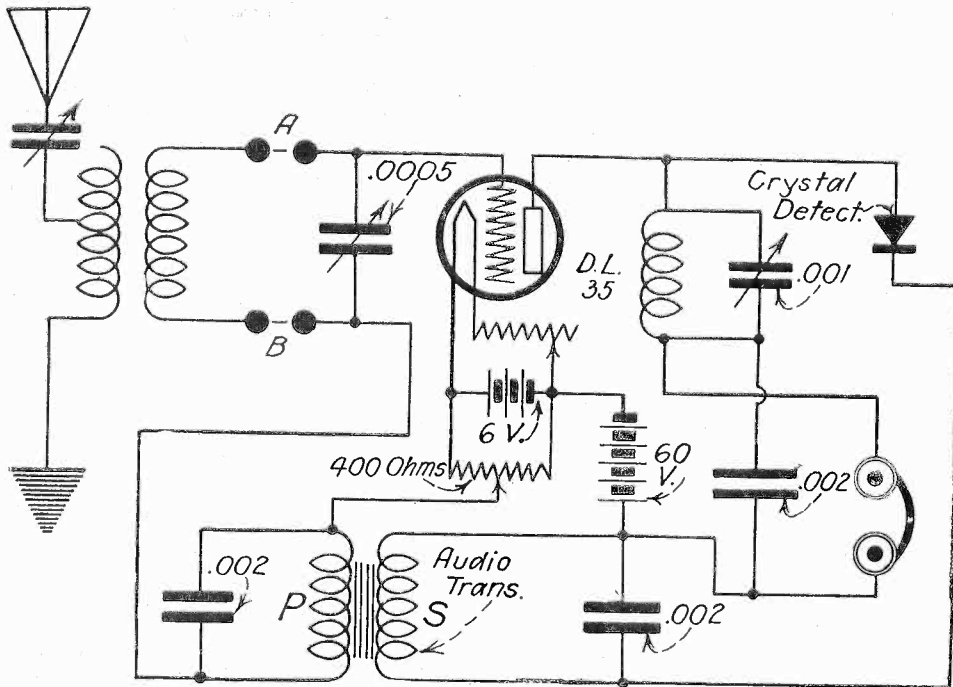


Diagram of a single tube reflex set using a crystal detector, asked for by Mr. C. T. Brown. Either tuner with antenna and ground or loop can be used simply by inserting the desired leads at A and B. If loop is used, the tuning is done with the condenser in shunt of it. The circuit shown is very selective and extremely sensitive, if a good tube is used.

no mistake can be made. The condensers .002 are fixed, and can be obtained at any radio shop. The variable condenser used in the plate circuit across the honeycomb coil should be one that has little dielectric loss, and the rotor side of the plates should go to the side connected to the audio-frequency transformer.

Inasmuch as the reflex circuit accomplishes the greatest detection and amplification for a given expense of tubes, why is it not more universally adopted? What are the objections to this circuit, if any? Where two stages of radio-frequency are used, is it necessary to alter the design of the transformer in the second stage?—D. S. McLane, 329 Harrison Avenue, Schenectady, N. Y.

The reflex circuit is very popular. Compared to other multi-tube circuits the reflex circuit is more widely adopted than any other. Because of the fact that it can be used with a loop antenna and saves tubes as well as current, by using one tube instead of two, it is the most economical circuit embodying radio- and audio-frequency. There are no objections to this circuit outside of the fact that the wiring is slightly

more complex than most circuits, which is really not an objection at all. The same type transformers can be used in the first and second stages if tuned radio frequency is not used.

* * *

Using the enclosed hook-up with two stages of audio-frequency I am able to receive 360 and 400 meters, but when I attempt to receive KFI and KHJ on 430 the set seems to "freeze," and I can only hear them faintly through the interference of the other stations. What is my trouble?—Gene Ullemeyer, 1511 9th Avenue, Rock Island, Ill.

We note that you are using honeycomb coils. Try using the following for the primary 100, with the primary condenser in shunt of the coil: Secondary, 75, and tickler, 35 or 50, with a three-plate condenser in shunt. Use a potentiometer across

I have constructed the receiver described by Geo. May, in RADIO WORLD for July 1. It is the circuit using two variometers and a variocoupler. In the article it advises to tune the grid variometer between two squeals. I cannot even get the set to squeal, and signals don't come in any louder than on my crystal set. What can my trouble be?—Wm. C. Martin, Hand Station, Michigan.

This circuit is the "old reliable" three-circuit Armstrong regenerative circuit, and you should get the squeals you mention. Try the following: Increase your B battery current and also put your grid variometer on the other side of the secondary (rotor) of your set, next to the grid condenser and grid leak. Use a variable grid leak resistance in the circuit.

* * *

I have constructed the set described in RADIO WORLD for January 20 by Ortherus Gordon and have not had much success with it, outside of burning out two tubes. I have seen two or three good reports on this circuit, and yet cannot seem to get it to work. I notice that the negative B battery goes to the plate. Is this right? Would this cause my tubes to burn out?—James Carroll, 24 King Street West, Toronto, Ont., Canada.

The plus in this diagram should go to the plate. The fact that they are reversed would not tend to blow your tubes, but simply to render the circuit inoperative. The plus terminal of the plate should always go to the plate in any circuit. You must have your circuit incorrectly wired, in order to blow tubes with it. Trace your wires, and make sure that everything is correct.

* * *

What is necessary to obtain a license for the operation of a small transmitter?—Louis Gallman, Box 83, Bridgton, Me.

In order to obtain a license for the operation of a transmitter it is necessary to do the following: Be able to transmit and receive signals at a fair rate of speed (ten words per minute; five letters constitute a word; so that is fifty characters per minute). Have a knowledge of the "Q" signals and their meaning and use. Know the international wireless regulations pertaining to the secrecy of messages and the operation of a station during a SOS call. Be able to understand and describe the receiver and transmitter that you are using.

* * *

I have built the set described by Ortherus Gordon, but use a De Forest and U. V. 200 tube instead of the WD-11 mentioned. I get the music and talk but it is distorted. What is my trouble, and how can I remedy it?—A. R. Moulton, 114 Putnam Street, Watertown, Mass.

The fact that you are using different tubes should not make any difference in the operation of the circuit. Don't burn your tubes so high, and also sacrifice some of the volume for quality. A signal will sometimes be much cleared and distortion not so noticeable, if it is detuned a bit.

* * *

Can a WD-11 tube be used instead of a U. V. 201 in a circuit and what plate voltage will be required for it?—H. W. Zimmerman, 723 W. Washington Street, Jackson, Mich.

This particular tube can be used as either detector or amplifier and when used as amplifier should have either 45 or 67½ volts on the plates. These tubes will stand up to 150 volts on the plates, as stated in a recent article in RADIO WORLD.

the filament and battery leads to get rid of the bluing of the tube. Don't use so much filament current.

* * *

I am using a radiotron tube, on four dry cells hooked in series. Is this as satisfactory as a six-volt storage battery?—C. A. Waldron, 1330 West Broadway, Minneapolis, Minn.

From an operating standpoint it is as good, but from an economic standpoint it is not so good. A set of dry cells will last about 60 active working hours, using one tube, which is not much considering the amount a tube is really used. You can therefore readily see that the money spent in constantly renewing dry cells will be more in the end than the price of the storage battery.

* * *

Kindly give me hook-up employing variable condenser, variocoupler, two transformers, and necessary tubes and sockets.—Fred Bingold, Hudson Motor Car Co., 315 West 68th Street, New York City.

We refer you to the article by Arthur S. Gordon published in RADIO WORLD for April 14, where you will find the hook-up you desire.

General Electric Will Erect Two New Giant Broadcasting Stations

PLANS are nearing completion for the erection of two more giant radio-broadcasting stations by the General Electric Company, according to an announcement recently made by Martin P. Rice, director of broadcasting for that company.

One of the new stations will be located near San Francisco and the other is indefinitely placed somewhere between the Pacific and Atlantic Coasts. Both will be modeled after General Electric Company station WGY, at Schenectady, N. Y., and the experience gained by the engineers in this station after fourteen months' operation will aid greatly in the plans to give radio listeners in other parts of the country a radio service of the highest transmission quality.

Mr. Rice recently returned from the coast after a tour of inspection. He was accompanied by Harry Sadenwater, engineer in charge of the technical operation of General Electric Company's radio-broadcasting stations. Sites were investigated in and near Oakland and San Francisco, Cal.; Denver, Col., and Dallas, Texas.

In each city visited Mr. Rice received assurance of co-operation from the local chamber of commerce and municipal officials, who were alive to the advantages and prestige which may accrue to the city which is the home of a powerful broadcasting station.

The expansion of radio broadcasting by the General Electric Company from one to three stations is part of a program agreed upon some time ago by the General Electric Company, the Radio Corporation of America and the Westinghouse Electric & Manufacturing Company. This plan contemplates the erection of nine large broadcasting stations. Of this number the Westinghouse now has three in operation—those at East Pittsburgh, Pa.; Chicago, Ill., and Springfield, Mass. The Radio Corporation has two stations under construction—one in New York and the other in Washington, D. C. The New York station—illustrated in RADIO WORLD for April 14, 1923—is on top of the Aeolian Building, on Forty-second Street, and will be opened in a short time. The General Electric Company now operates WGY at Schenectady, N. Y.

In discussing the plans of the General Electric Company, Mr. Rice said: "It is our conviction that the future of radio broadcasting will be on a plane of relationship with localized stations, similar to that of the national magazine to the local newspaper. Each will have its own functions—the local stations to carry events of local interest and larger and more powerful stations to transmit events of national import and interest."

Singer Claims Increased Popularity Accrues from Broadcasting

AN artiste who takes exception to the recent agitation started by many performers against broadcasting their music by radio is Vivienne Segal, the charming young star of numerous New York productions. She takes issue also with many music publishers, writers of songs and manufacturers of phonograph records who have lodged a claim in Washington for royalties from the radio-broadcasting corporations, saying that their popularity and that of their songs is hurt by being heard over the radio. On the contrary, it is the contention of Miss Segal that it heightens one's popularity to sing before so large and invisible an audience as the radio fans.

The Latest Book on Radio Telephony

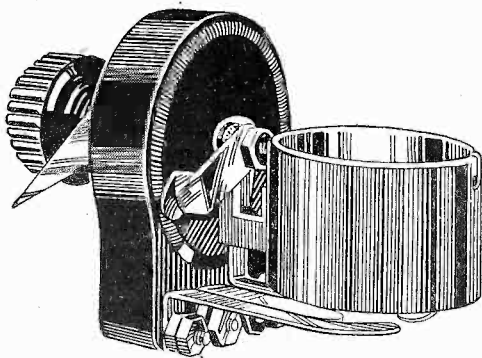
William C. Ballard, Jr., Assistant Professor of Electrical Engineering at Cornell University, is the author of a very valuable addition to radio literature under the title, "Elements of Radio Telephony."

The reader with a technical background who desires to bring his knowledge of the subject down to date will find this exactly

the book for the purpose. The radio enthusiast will find between its covers an excellent presentation of fundamental principles with their applications. The author is a recognized authority and the book is accurate, simple, clear, reliable and written in a pleasing style.

"Elements of Radio Telephony" retails for \$1.50, and will be sent postage free on receipt of this price by the Columbia Print, 1493 Broadway, New York City.

AJAX SOCKET-RHEOSTAT



Combination Socket and Rheostat

Eliminates Wiring

A device for which amateurs and professionals have long been waiting.

A combination V. T. Socket and Rheostat for panel mounting which entirely eliminates separate leads between socket and rheostat and at the same time provides a panel-mounted socket without the use of additional brackets, thus materially simplifying the installation and hook-up.

| Cat. No. | Type | Ohms | List Each |
|----------|------|-------------------------|-----------|
| 2007 | A-1 | 5 with Knob and Pointer | \$2.00 |
| 2008 | A-2 | 5 ¼" Shaft without Dial | 2.00 |

Unless otherwise specified, Type A-1 will be supplied.

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FOR ONLY \$7.00

You get all the parts necessary to build complete

OUR RADIO PUP SET

We get favorable comments from all who have built it.

IT HAS MADE GOOD! THE BEST BUY OF ITS KIND EVER ASSEMBLED!

We have all the "Hard-to-Get" Radio Supplies at Prices That Are Right.

MAIL ORDERS PROMPTLY FILLED

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185 GREENWICH STREET

NEW YORK, N. Y.

PHONES

Berwick Supreme, 2200 Ohms.....\$3.45
Potter, Loud and Sensitive.....\$4.95

WEBSTER WOODEN VARIOMETER
Tunes up to 1800 Meters.....\$2.95

EAGLE MOULDED VARIOMETERS and VARIOCOUPLERS, List \$8.00.....\$4.95

Loud Speakers
Pathe
\$17.50

AMPLIFIER TRANSFORMERS,
Special for 1½ Volt Tubes.....\$3.25

SEND MONEY-ORDER, INCLUDING POSTAGE. ALL GOODS GUARANTEED.

CORRESPONDENTS WANTED BY RADIO WORLD ALL OVER THE UNITED STATES AND CANADA

Send us your name and address and say that you want to become our correspondent. We will show you how you can represent RADIO WORLD in your locality and at the same time make money for yourself. We would particularly like to hear from those who are handling the "Saturday Evening Post."

Address Correspondent Editor, Radio World, 1493 Broadway, New York

Good Bye Aerials!



(Pat. Pending)

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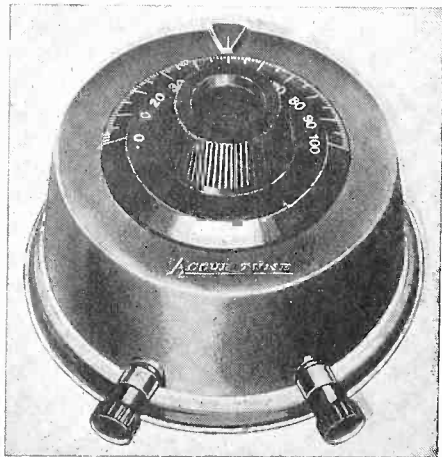
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Helps Cut Out
Those Interfering Stations

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RADIO MULTI-PARTS

897 17th Street

Newark, N. J.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

From HLW to WOR and WOR to HLW

NOT long ago local radio fans at Williston, North Dakota, had the pleasure of picking up broadcasting station WOR, L. Bamberger & Co., Newark, N. J. On the evening the program from this station came in so clear the woman announcer of the station asked all listeners at a great distance from Newark to write that they had picked up the station. In response, H. L. Weatherwax, Williston radio fan, sent the following letter to WOR:

L. Bamberger & Co.,
Station WOR.

GENTLEMEN AND ANNOUNCER: Last evening I had to marvel at the (W)onders (O)f (R)adio because (W)e (O)verheard (R)eception of a (W)oman (O)f (R)efinement (W)ith (O)ur (R)eceiver. I (W)ish (O)ur (R)eplay might contain (W)ords (O)f (R)espect for your (W)ish (O)f (R)eturn. However, (W)ith (O)ur (R)ambling of (W)himsical (O)ratorical (R)hetoric, I trust you will (W)rite (O)n (R)eceiving this kind (W)ish (O)f (R)egard.

Yours very truly,
H. L. WEATHERWAX.

In response the following was received last week from the broadcasting station at Newark, N. J.:

(H.) (L.) (W)etherwax, N. D.
(H)onored (L)ong-distance (W)ireless Friend:

(H)ow (L)ong (W)e (H)ave (L)ingeringly (W)aited to say we (H)ave (L)iked (W)ords of (H)e who (L)istened (W)hen we broadcasted. (H)ow (L)ucky (W)OR (H)as (L)ately (W)andered to (H)ome-like (L)ittle (W)illiston. (H)appiness, (L)ong Life and (W)ealth.

JESSIE E. KOEWING, "J.E.K.,"
Director, Chief Announcer and
(H)asty (L)etter (W)riter
of "WOR."

WOC Changes Its Wave Length to 400

STATION WOC, Davenport, Iowa,—
"Where the West Begins"—has issued the following:

"Notice has just been received from the Department of Commerce that in accordance with recommendation of the Second National Radio Conference, recently held in Washington, each station is authorized to broadcast on only one wave length. This means that, beginning immediately, the Government Reports broadcast from WOC heretofore on 485 meters, will be sent out on the regular broadcasting wave of 400 meters."

American Telephone & Telegraph Co.'s Broadcast Schedule

M. R. W. E. HARKNESS, Manager of Radio Broadcasting for the American Telephone & Telegraph Company, informs RADIO WORLD that it is the policy of his company to circulate its advance programs through the newspapers only.

The general schedule of broadcasting is as follows: On weekdays, 4:00 to 5:30 p. m.; evenings, 7:30 to 10:00 p. m., except Tuesday and Friday, when the schedule is 7:30 to 8:00 p. m. The Sunday schedule is 3:20 to 5:20 p. m. and 7:30 to 10:00 p. m.

Paris Catches Radio "Wild Cat"

POSTE ZERO," which has so long disturbed the listeners-in in Paris has at last been discovered. The mysterious operator turns out to be a manufacturer of wireless apparatus who has been testing his installations over wave lengths equal to those of the Eiffel Tower. He has been warned to experiment on shorter wave lengths, and it is hoped that listeners-in

SPECIAL VALUES

| List Price | Our Price |
|------------|---|
| \$35.00 | MAGNAVOX LOUD SPEAKER, newest model, \$28.75 |
| 8.00 | DICTAGRAPH PHONES, 3,000 ohms, 5.95 |
| 6.00 | NATHANIEL BALDWIN PHONES Singles, 4.95 |
| 12.00 | Doubles, 8.75 |
| 1.50 | KLOSNER VERNIER RHEOSTATS, .59 |
| 4.50 | THORPARSON Audio Frequency Transformers, 3.25 |
| 5.00 | FISHER Variocouplers or Variometers, 2.50 |

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COMPLETE WITH PHONES, TUBE,
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Willard Radio Co.

Dept. R.W.

291 BROADWAY NEW YORK CITY

REINARTZ CIRCUIT EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD variable condenser, 1 15-plate .00025 MFD variable condenser, 3 inductance switches, 16 switch points and nuts, 4 switch stops and nuts, 2-3" dials, 8 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, necessary bus bar wire, 1 high grade Radion panel and diagram and complete instructions.....**\$10.00**

FLEWELLING CIRCUIT EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit.....**\$11.00**

Write for descriptive catalog. Shipped prepaid East of Mississippi River—others include Postage.

You Need It!

Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20? This hook-up actually goes out and drags the distance in, and lays it at your table. All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it? If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

To many anxious inquirers: RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade

FREE: One Phone Plug

With Every \$9.00 Purchase

A Money-Back Guarantee Goes With Everything We Sell

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| Klosner Vernier Rheostat..... | \$0.70 |
| Atwater-Kent Variometers..... | 6.75 |
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| Raven Molded Variometer..... | 4.00 |
| Westinghouse Dry Cell Tube..... | 5.50 |
| French Detector Tubes..... | 4.00 |
| French Amplifying Tubes..... | 4.50 |
| A. B. C. 23 Pl. Condenser..... | 1.90 |
| A. B. C. 43 Pl. Condenser..... | 2.30 |
| A. B. C. 23 Pl. Vernier Condenser..... | 3.75 |
| A. B. C. 43 Pl. Vernier Condenser..... | 4.00 |
| Original Baldwin Type C Phones (double)..... | 8.75 |
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| Stromberg-Carlson Phones..... | 6.00 |
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| 150-3000 Meter Silk Wound 3 Bank Wound Coil..... | 3.50 |
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| King 600 Meter Variometer..... | 3.00 |
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REINARTZ CIRCUIT

This circuit is exceptionally quiet in operation. Works on small or indoor aerial. Very selective. Brings in long distance.

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| 1 Reinartz Coil..... | \$2.00 |
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| 16 Contact Points..... | .16 |
| 1 Grid Condenser..... | .15 |
| 8 Binding Posts..... | .32 |
| 1 Bakelite Panel..... | 2.50 |
| 5 Lengths Bus Wire..... | .20 |
| 1 Audion Tube UV 200..... | 3.95 |
| 1 22½ V. B. Battery..... | .98 |
| 1 6 V. 60 Amp. Storage Battery..... | 9.50 |
| 1 Cabinet, Mahogany Finish..... | 3.75 |
| Total..... | \$28.83 |

Complete Parts for Flewelling,
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| 45 V. "B" Batteries (each)..... | \$2.25 |
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| 22½ Volt "B" Battery..... | .89 |
| Nathaniel Baldwin Type C, Double Phones..... | 8.50 |
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| Brandes (Superior) Phones..... | 5.95 |

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Selectivity Sensitivity Simplicity

That's Just What the
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Complete Set in Cabinet
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Two Stage Amplification with Loud Speaker
\$100.00

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We will ship our sets anywhere in
the U. S. and guarantee satisfaction.

Helpful Hints to Hoosier Hams

DON'T fasten your antenna permanently to a bough of a tree if you want it to last. Fasten it by means of a pulley, with a heavy weight at the end, which will keep it taut, yet allow the tree to sway without breaking the wire.

The best possible ground is a wire dropped into a well, with a copper or zinc plate at the end of it. If you can't do this bury a dozen or so old tin cans and attach a wire to each one of them. This makes a good ground if the earth is moist.

Don't use an exceptionally long antenna just because you have the space to string it. Better results and sharper tuning will be obtained from an antenna 75 to 100 feet long than one of 200 feet, because the longer the antenna the broader the tuning on your set, and, consequently, the harder it is to tune in the long-distance fellows.

Keep your apparatus clean and free from dust if you want it to give you good service. A little bit of dust can form a high resistance leak across some part of your set, and you will wonder why it has suddenly lost its power to bring in the DX.

Don't use spring water in your storage battery. It may be the purest water in the state and yet contain enough mineral and metallic salts to ruin your battery. The cheapest way is to keep a supply of distilled water on hand. Boiled water is not distilled, so do not use it. It simply evaporates some of the water, killing the live organisms, and leaves the mineral and metallic salts in a stronger solution, if anything.

If you are troubled by clicking from party telephone lines run your antenna at right angles to the line, or, if that is not possible, put in a filter circuit, which will eliminate a great amount of it.

Don't run your antenna through trees. Trees will shield the antenna to a great extent, due to absorption, forming a sort of a protective screen around them, much the same as a tall building containing much steel will shield other buildings lower than it is.

If your set is located in the attic you can give your folks a chance to listen in by running wires downstairs and connecting a loud-speaker to them.

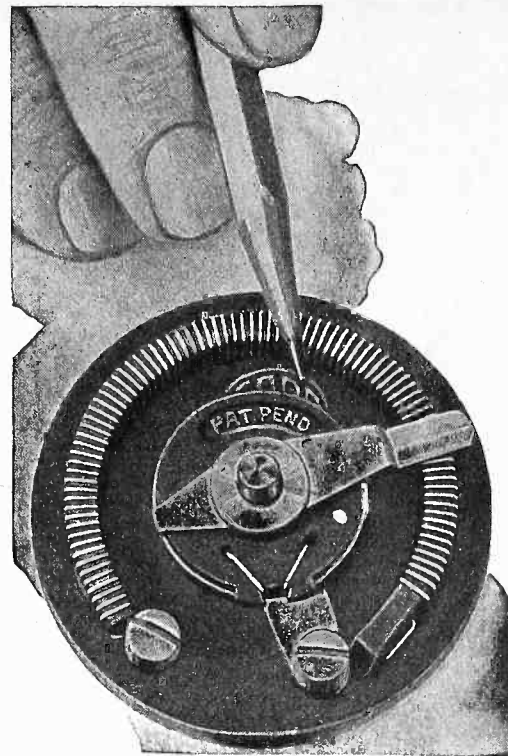
Every Electron a Miniature Radio, Says Sir J. J. Thomson

THE principles that underlie the electronic theory are essentially the same as make possible the sending and receiving of radio messages, it was stated by Sir Joseph John Thomson, the discoverer of the electron, before the Franklin Institute at Philadelphia last week in the fifth and last of his lectures on "The Place of the Electron in Chemistry."

According to Sir Joseph, who is Master of Trinity College, Cambridge, the electrons set up vibrations in the same way as do the sending apparatus of radio, and the wave lengths of the vibrations have been measured. The only thing the electrons lack is variable condensers, but these they hardly need.

The wave lengths between the electrons have been observed, and are known as photoelectric effects, according to Sir Joseph. The fact that mathematical calculations for their wave length practically check the recorded observation for several of the elements gives definite proof of the truth of the electronic theory, and vindicates the discovery of Sir Joseph.

Electrons are tiny negative charge points circling a positive nucleus in the atom. The degree of force exerted by the positive nucleus of the atom on the nearest electron determines the extent of the attraction or repulsion. The nucleus attracts the electron, but other negative electrons repel it, and thus a vibration is started.



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used on your radio receiver brings in broadcasted concerts from stations thousands of miles away—by giving super-delicate control of the filament current of the detector tube.

Fada rheostats and potentiometers are practically standard with hundreds of thousands of radiophans who construct their own radio receivers.

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| 153-A Rheostat (8 ohm)..... | 1.00 |
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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).

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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.

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OLD MONEY WANTED—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. **Clarke Coin Company**, Ave. 83, Le Roy, N. Y.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. **Rokay Electric Company**, Ingomar, Ohio.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. **Betty Lee, Inc.**, 4254 Broadway, New York City

DO YOU WANT TO SAVE MONEY in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. **RADIO WORLD**, 1493 Broadway, New York.

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MOVIE FILMS—For Professional and Toy Machines. Wonderful complete stories with best Movie Stars. **SPECIAL BARGAIN—1,000-foot reels. ONLY \$3.00.** Stock up, BOYS, while they last. **Monarch Theatre Supply Co.**, 724 South Wabash Avenue, Dept. 69, Chicago.

FOR SALE—Regenerative receiver with one-step, \$35.00. **H. H. Bonney**, Springerton, Ill.

BECOME A MILLIONAIRE over night! I'll send you one million Russian roubles for \$2.00. 500,000 for \$1.50; 100,000 for 50c. **American Sales Co.**, Box 1278, San Francisco.

GRAM'S RADIO BROADCASTING MAP of the UNITED STATES & CANADA. Scale 100 miles to the inch. In two colors, size 34x28. Printed on high-grade map paper, up to-the-minute information, indicating all amateur and standard broadcasting stations, with complete index to stations. 35c postpaid. **The Columbia Print**, 1493 Broadway, N. Y. C.

20c RADIO BOOK. Make your own and operate. (Illustrated.) **Phipps**, 1014 Belmont, Chicago.

FOR SALE—5-dial omnigraph, fine condition, only \$7.00. 2 Murdock sockets, 60 cents each. **Robert McConnell**, Urbana, Ohio.

START YOUR OWN BUSINESS. Write to the Circulation Manager of RADIO WORLD and learn how you can get subscriptions for this publication. Start a business of your own which will bring you in money right along. Liberal terms to energetic young men. **RADIO WORLD**, 1493 Broadway, New York.

BUILDERS AND EXPERIMENTERS. Do you know that the Reflex circuit is one of the most interesting circuits to construct? You can not guess how much fun you are missing if you fail to try out at least one of these circuits. See RADIO WORLD issues of Feb. 24 and March 3. They contain two fine articles by W. S. Thompson, with plenty of new Reflex circuits to experiment with. Don't miss these! 15c a copy. **RADIO WORLD**, 1493 Broadway, New York City.

IF YOU ARE A REGULAR RADIO fan and like to hear the stations in the four corners of the United States come in with a bang, then you will want the **Flewelling Circuit**. If you do, send 15c for **RADIO WORLD**, issue of Feb. 24, which contains complete description and directions for the manipulation of the circuit. **RADIO WORLD**, 1493 Broadway, New York.

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SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, \$1.00. No checks. Build your own. Save 50% and get better results. **RADIO EXPERIMENTAL LABORATORY**, Box 194A, Berkeley, Calif.

RAND-McNALLY RADIO MAP OF UNITED STATES—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. **The Columbia Print**, 1493 Broadway, New York City.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. **Smith**, Box 3125, M. Portland, Ore.

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FOR the benefit of those interested in Radio and those who are becoming interested, **Rand McNally & Company** have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each. Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a **Rand McNally Radio Map of United States**. It is complete, accurate and up-to-date. The **Rand McNally Radio Map of United States** is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

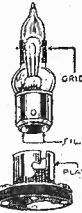
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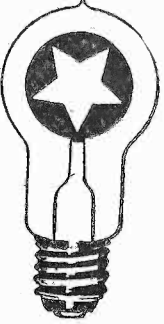
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Best Protective Arrester for Aerials on the Market

Can also be used as a Rectifier for small currents. Approved by Underwriters' Laboratory and N. Y. Tribune Laboratory

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 FRED S. CLARK, Secretary and Manager
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 Technical Editor: Robert L. Dougherty

Field Representatives:
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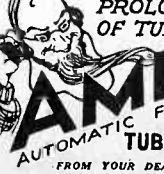
An Idea for the Experimentally Inclined

SOMETIMES, when a "ham" has made his set, and feels confident that it embodies the utmost of everything, he sees another circuit that captivates his fancy, and he is inclined to rip out the one he has just finished and build the new one.

This can all be eliminated in the following manner, when worked out neatly: Make up your panel, incorporating all the apparatus you can use, such as variometers, variocouplers, a couple of variable condensers, several values of fixed condensers, transformers and tubes. Then, instead of wiring them directly, bring each instrument out to small jacks, such as are sold in the stores and take up about an eighth of an inch of panel space. Now make up a series of small bridging cords with the plugs on either end. It will then be very easy for you to incorporate any number of hook-ups just by changing the connections. It is of course understood that all the apparatus is to be mounted on one panel, and that the panel will be large enough to accommodate everything. This is discounted by the fact that you can try out any number of queer circuits, just by shifting your cords.

Try it out, fellows! It works marvelously well and you can change your hook-up to suit your mood. If you feel like trying out an Armstrong, all you have to do is to switch your leads, insert your plugs, turn on the juice, and listen. Then if you decide that you would rather listen to the tune of a single circuit, it is a matter of five minutes to change your circuits through the agency of your jacks and plugs.

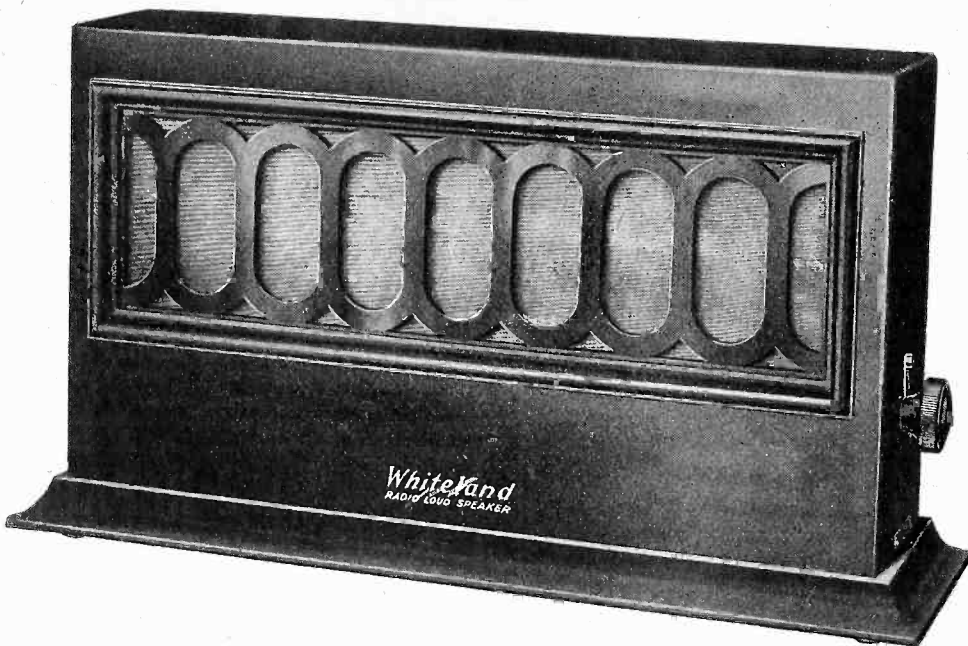
PROLONGS LIFE OF TUBES



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AUTOMATIC FILAMENT CURRENT ADJUSTER
 EXPELS ALL TUBE TROUBLES
 ELIMINATES RHEOSTATS

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Looks Better—Sounds Better Than A Horn

The WHITELAND is an improved Loud Speaker—Improved in every way.

The fine mahogany cabinet encloses the latest ideas for perfect tone reproduction. The volume of sound is controlled by a knob on the right side.

The WHITELAND harmonizes with the furniture in the finest homes and its tone quality is just as superior as its looks.

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WHITELAND MANUFACTURING CORPORATION

For 10 Years Manufacturers of Radio Apparatus

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MONEY BACK GUARANTEE

If for any reason you are not fully satisfied with the WHITELAND RADIO LOUD SPEAKER, tell us and we will take it back and return your money.

Radio Dealers: Write for the Whiteland Dealer Proposition.

1000 Miles Guaranteed on One Tube

A real Radio one tube set for a real low price.

Oak cabinet, two dials, drilled panel, vern. rheostat, vern. button for dial, eight rubber top binding posts, 23 p. A.B.C. condenser, variocoupler, socket, two fixed condensers, busbar and spaghetti. Together with simple diagram. Any boy can hook it up. Price.... **\$14.00**

Without cabinet **\$11.50**

The above can be used with any tube having standard base or W.D. 11 and U.V. 199 by using adapters. This set has been and is being used in many of the Eastern States. We can furnish names of owners who have received Havana, Cuba, and Los Angeles from New York, Chicago, Davenport, St. Louis, Kansas City, Atlanta can be tuned in from N. Y. any night, and Kansas City, 1,250 miles from Scranton.

Mr. York, Scranton, Pa., has had Minneapolis, Minn., and Kansas City, 1,250 miles from Scranton. Mr. E., Riverside Drive, N. Y., claims he gets Los Angeles any night after midnight.

Express or P. O. money orders accepted. Set shipped same day order received. Full description given above. At this low price we cannot bother with unnecessary correspondence.

The Radio Parlor, 2671 B'way (Bet. 101st and 102d Sts.), New York

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE?

Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.

ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

Amplified Three Thousand Billion Times

IMAGINE a man big enough to haul at one time all the freight moved in the United States in a year! But an average man could perform that super-Herculean feat if his strength were amplified as much as is the tiny flow of power from a radio-telephone microphone before it reaches the transmitting antenna.

In the studio of WEAf, the American Telephone & Telegraph-Western Electric radiophone station in New York, is a microphone of the condenser type. The minute capacity change which occurs when voice waves impinge upon the exposed plate of the condenser microphone causes a change in potential on the grid of a three-element vacuum tube.

This tube and others amplify the feeble output of the microphone and overcome the resistance of the wire line from the studio to the Western Electric Company's building on West Street. Here other tubes increase the power to such magnitude that they control the output of WEAf's high power oscillator tubes. From studio to antenna the power is amplified three thousand billion times.

To help you conceive this figure, imagine what an average man could do if his strength were amplified to that degree! Imagine all the locomotives of the United States working at their highest capacity, moving the largest haul in our history, as they did in 1918. That year our total freight movement was 408,011,453,783 ton miles. Not only could this amplified man move all that freight traffic and replace all the locomotives in our freight service, but he would find the task as easy as you find lifting a four-ounce weight. This imaginary giant could perform a similar service for 400 countries at the same time, each handling a tonnage of freight equal to that of the United States. Not only would this giant be endowed with immense power, but were he as sensitive as the amplified current to the variations in the microphone circuit he could control this immense power with the utmost flexibility, increasing and decreasing the speed of the giant freight system between minimum and maximum as frequently as 3,000 to 5,000 times per second.

Lord Robert Cecil Instructs a Class by Radio

LORD ROBERT CECIL probably doesn't know it, but he acted as professor for "History Six," the class in Modern European History at Haverford College, Philadelphia, for three-quarters of an hour on a recent day. Dr. Kelsey, who is the usual instructor for this class, was anxious that his pupils should have the advantage of learning, first hand, about the League of Nations, and arranged to have a powerful three-tube receiving set and loud-speaker installed in the classroom so that the entire speech delivered by Lord Robert Cecil at the Bellevue-Stratford, and broadcast by Station WFI, Strawbridge & Clothier, could be heard. At 1:30 p. m. the class of thirty-five undergraduates, armed with notebooks and pencils, assembled in the classroom and listened to the distinguished English statesman until 2:10 p. m.

Radio Church of America

THE church will be brought direct to the people by radio under a plan proposed by the Radio Church of America, which has been incorporated at Sacramento under the laws of the state of California, and purports to be non-sectarian and non-denominational. Headquarters of the church are to be established in San Francisco. Branches will be established, according to the articles of incorporation, wherever and whenever a radio broadcasting station is available.

Facts About Foreign Radio Stations

IN compliance with a number of requests the following information is supplied by the Department of Commerce for the benefit of all concerned: Nauen, Germany, call letters, POZ; range, 6,500 miles; w.l., 3,100, 4,900, 5,600, 6,300, 8,700, 9,800, 13,000. Kootwijk, Sambeek, Holland, call letters, PCG; range, 5,000-6,000 miles; w.l., 6,250, 8,400, 12,500, 16,800. Stavanger, Norway, call letters, LCM; w.l., 12,100. Bordeaux-Lafayette, France, call letters, LY; power,

500 KW arc. Lyons, France, call letters, YN; power, 60-200 KW. Eiffel Tower, France, call letters, FL; power, 40 KW. Basse Lande (Nantes), call letters, UA; power, 200 KW.

Alaskan Radio Stations Re-opened

THE following radio stations in Alaska have been reopened: KKA, Yakutat; KOXN, Pirate Cove; KJK, King Cove; KXW, Ikatan.

truth about filament controls



Electronic flow in vacuum tube depends upon filament heat. This heat varies as the square of the current. The least variation of filament

heat has a great effect on electronic flow and upon reception. Wire wound rheostats cannot provide the fine adjustment necessary for filament control. Inferior filament controls are scarcely better. The Fil-Ko-Stat is distinctly designed to utilize the great tuning possibilities of the vacuum tube. It gives absolute control of electronic flow and permits the finest tuning possible. Fine adjustment of fractional currents makes it ideal for dry cell tubes; infinitesimal control of electronic flow gives fine adjustment so very essential in DX. It is non-microphonic, absolutely silent. Its fine adjustment starts where tube begins to function, at full-on resistance is practically zero. A definite off indicates complete A Battery disconnection.

NO DISCS TO BREAK OR CHIP
Resistance element so finely divided, further division impossible. Fil-Ko-Stat, compact in size takes little space on panel, replaces other control without re-drilling.

GUARANTEED
The Fil-Ko-Stat is to all purposes "fool proof." Each instrument is packed with the maker's guarantee that it will be replaced if broken within one year.

Manufactured by **DX INSTRUMENT CO.** Harrisburg, Pa. **PRICE \$2.00**

RADIO STORES CORPORATION
Sole International Distributors
Dept. RW-430, No. 218-222 W. 34th St., New York
Pat. App. for Fitted with Palmstock Clips



Proof! Proof of Fil-Ko-Stat superiority as shown here, can be had in any well equipped laboratory. Comparison of fine adjustment control indicates superiority.

Filament Control of Infinite Adjustment
FIL-KO-STAT

We Recommend For Investment

HENNESSY RADIO PUBLICATIONS CORP.

8% PREFERRED STOCK

(Publishers Radio World)

Complete details sent free upon request

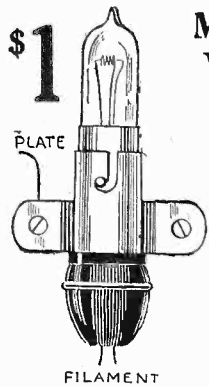
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Specialists in

Wireless Securities Since 1917

35 Broad St. New York

Tel. Broad 5519-1670-3641



Margo Detector Vacuum Tube

Operates on one dry cell with or without "B" battery. If your dealer has not stocked them send direct, adding 25c for socket and 5c for postage.

Margo Detector Co.
66 Boylson Street
Newark, N. J.

BARGAINS BY MAIL

PROMPT SERVICE

- \$6.50 1 1/2-Volt Dry Cell Tube.....
- \$5.00 6-Volt Detector Tube..... **\$2.00**
- \$6.50 6-Volt Amplifier Tube..... **Each**
- 3-Plate Vernier Condenser..... \$0.40
- 13-Plate Precision Condenser..... .85
- 23-Plate Precision Condenser..... 1.10
- 43-Plate Precision Condenser..... 1.55
- Kardon Audio Transformer (Reg. \$5).. 2.95
- Freshman Variable Grid Leak..... .55
- Freshman Var. Leak and Condenser..... .75
- .006 Condensers (Flewelling)..... .38
- W.D.-11 Bakelite Sockets..... .35
- Guaranteed Elect. Soldering Iron..... 4.50
- 7x10 Hard Rubber Panels..... .75
- 180° Bakelite Variocoupler (Reg. \$5).. 2.00

Send for complete list of other items.

Economy Radio Company

132 Nassau Street New York City, N. Y.

ELEMENTS OF RADIO TELEPHONY

By **WILLIAM C. BALLARD, JR.**

Assistant Professor of Electrical Engineering, Cornell University

This is a standard book on radio telephony, the work of a recognized authority.

It is accurate, simple, clear, reliable and strictly up to date.

The man with a technical background who wants to post himself on radio will find this exactly the book for his purpose.

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For Special Positions, etc., Address

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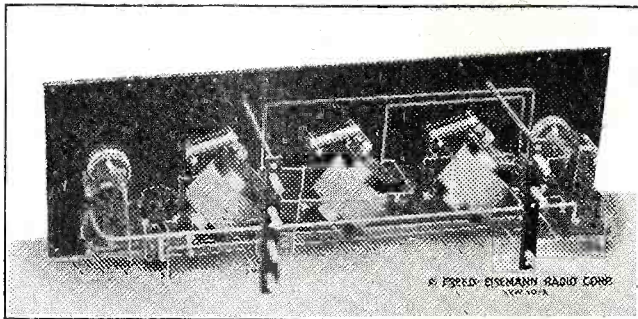
The New Hazeltine Neutrodyne

AND DEPENDABLE PARTS FOR OTHER CIRCUITS

A startling advance in radio progress. Non-regenerative. Non-oscillating. No howling or hissing. Remarkable clarity and power and tremendous distance. Simple in operation. Built by the Freed-Eisemann engineering organization of master craftsmen.



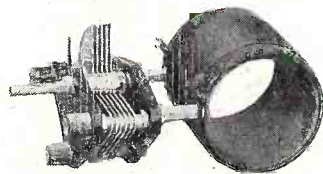
Hazeltine Neutrodyne Receiver. Wave length range, 200 to 550 meters. Designed to receive all stations operating on new broadcast wave lengths. 5-Tube Set encased in mahogany cabinet. Price, without tubes or batteries..... **MODEL NR-5 \$150.00**



REAR PANEL VIEW MODEL NR-5
(No Variometers Nor. Variocouplers Used)

ESSENTIAL PARTS for Hazeltine Neutrodyne Circuit

The mathematically accurate construction and testing apparatus necessary to satisfactory building of Neutrodyne parts makes it practically impossible for the amateur to build the parts. For this reason, we list two essential parts below. WIRING DIAGRAM INCLUDED WITH ARTICLES LISTED.
(Protected under Hazeltine Patents)



MODEL 351—Carton, containing 3 Neutroformers (primary and secondary coils) mounted on variable condensers, ready for panel mounting, \$6.50 each. Total, \$19.50.



MODEL 352—2 capacity balance adjustment Neutrotrons mounted on bakelite, in one unit. Total, \$2.00.

Freed-Eisemann apparatus is guaranteed. If your dealer cannot supply you—write us.

Send 5c. for catalogue or 25c. for wiring diagrams and descriptive matter.

Freed-Eisemann Radio Corporation

"Pioneers in Radio Broadcast Reception"

255 Fourth Avenue

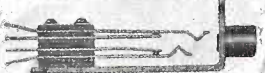
New York, N. Y.



3,000 OHM HEADSET \$7.50



THERMOSTAT - 75¢



JACKS
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CLOSED " - 40¢
DOUBLE " - 50¢



ALUMINUM SOCKET - 50¢



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VARIABLE CONDENSER
#3 PLATE - \$4.00
21 " - \$3.00
11 " - \$2.75



CRYSTAL DETECTOR - 70¢



AUDIO FREQUENCY TRANSFORMER - 40¢



GALENA CRYSTAL - 20¢



DOUBLE HEADSET-3,000 OHMS - \$7.50



RADIO PLUG - 60¢



VARIO COUPLER - \$3.00



VERNIER VARIABLE CONDENSER
46 PLATE - \$7.00
24 " - \$6.00
14 " - \$5.00