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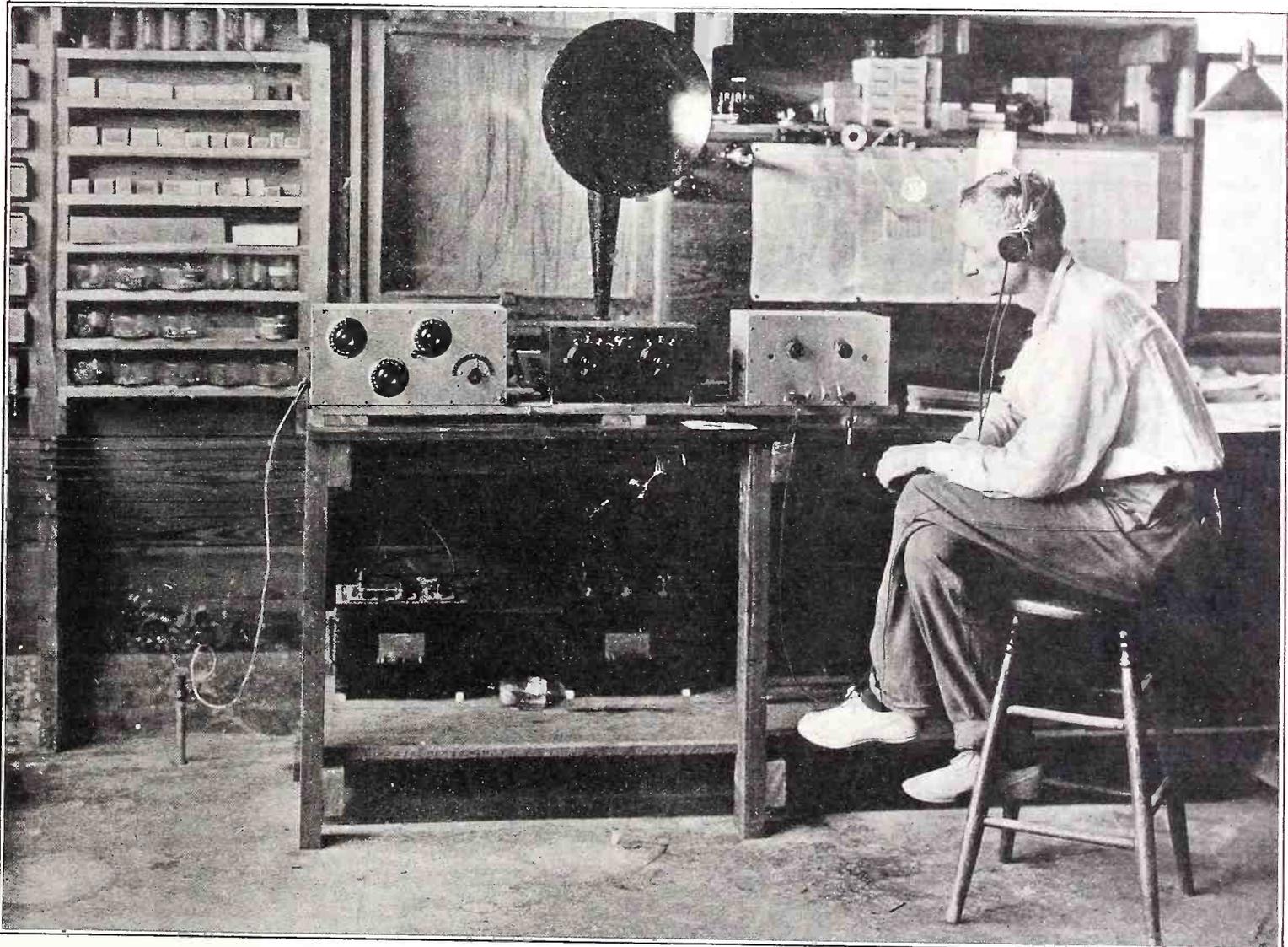
RADIO WORLD

Title Reg. U. S. Pat. Off.

ILLUSTRATED

EVERY WEEK

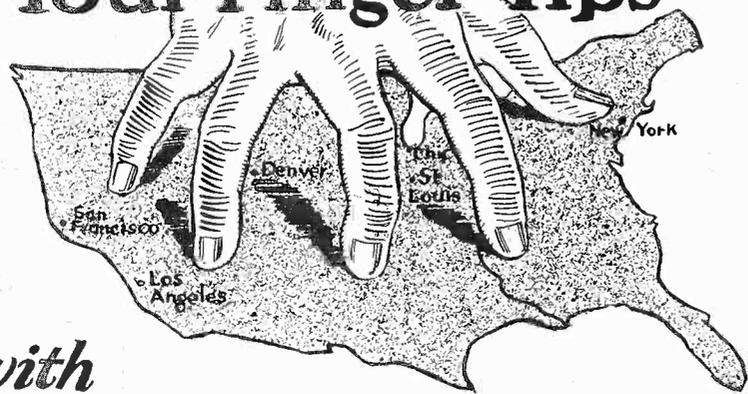
CLAIMS 2,300 MILES ON A LOUD SPEAKER WITHOUT AN AERIAL



Edward S. Huff, of Miami, Florida, in his laboratory where he perfected his new system of long distance reception on loud speaker, without antenna, the ground connection only being necessary. The illustration shows the new receiver in its working stages, with the ground connection plainly shown. Mr. Huff is an inventor of considerable note in the automobile line, having several patents on apparatus in that field. For further details see article on page 4 of this issue.

WHY RADIO SIGNALS FADE AWAY (See Page 5)

The Whole U.S.A. at Your Finger Tips



with

A KENNEDY TUNER

PATENT PENDING
NONE GENUINE WITHOUT THIS SIGNATURE

KENNEDY TUNER and DIAGRAM, \$5.00 F. O. B. N. Y. City. Diagram without Tuner, \$1.00.

T. J. KENNEDY, 137 West 48th Street, New York City

Kennedy Tuner is used in place of Variocoupler, Variometer and Honeycomb Coils, saving the cost of over \$9.00 worth of unnecessary junk that is in most present receiving sets.

METRO YARN CO.

122-124 Fifth Avenue

New York, Dec. 19, 1923.

My dear Sir:

Ever since last Monday night, when you extended me the courtesy of coming up to your home to listen in on your set using the "Kennedy Tuner," I am so enthusiastic about the "Kennedy Tuner," that I don't sleep nights; I dream about it.

I must admit this: I've built a number of sets and heard nearly every good make of set on the market, but I did not hear any set that can compare with your set using the Kennedy Tuner. Bringing in stations under any weather condition and under any circumstances over a distance of 1,000 miles on a loud speaker is something wonderful and a new achievement in the radio field.

I certainly feel disappointed for not being able to get the "Kennedy Tuner" now, as waiting until after Christmas seems like years.

Please put me down for one of your tuners, and please phone me when you are ready to distribute them on the market, so I could come and get it myself, as I am too impatient to wait for the mail to bring it to me.

I have spoken to a few friends about the "Kennedy Tuner," and they tell me that I am crazy, that the radio bug has got me. I am coming up with two friends to let the doubting Thomases convince themselves.

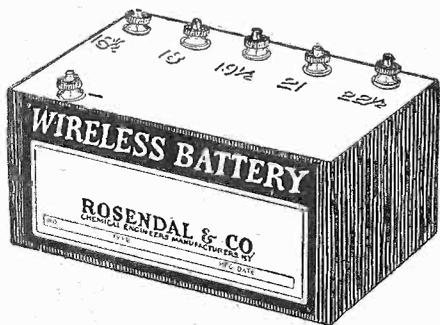
Awaiting an early phone call from you, bringing the good news to me, I beg to remain

Yours very truly,

(Signed) Wm. K. Solomon.

With Kennedy Tuner all unnecessary taps, switches, and useless noises are not needed.

Fresh "Lively" "B" Batteries



It is all important when buying a "B" Battery that you get it fresh—not one that's a month or two old. A Battery deteriorates whether it's being used or not and it stands to reason that a fresh Battery will last longer in your set.

A "Rosendal" is chock full of that electrical energy that makes a good battery, and it comes to you fresh—not a week old when you get it.

Guaranteed money back if you're not satisfied.

ROSENDAL & CO.

Chemical and Radio Engineers

2 and 4 Stone Street New York

Shipment prepaid at the following direct to consumer prices:

	Large	Medium	Small
22 1/2 Volt Plain.....	\$1.66	\$1.33	\$0.93
22 1/2 Volt Variable..	1.84	1.50	1.00
45 Volt Plain.....	3.33	2.33
45 Volt Variable..	3.66	2.66

Ask for Circular on other radio parts

Nath. Baldwin Phones

Reg. \$12.00 Original Packages, Type C...\$8.35
\$8.00 Brandes Superior Phones..... 4.65

Atwater-Kent Units

to build a 3 Tube Set. Wonderful value.

\$6.00 Detector Unit.....	\$4.45
10.00 One Stage.....	7.35
13.00 Detector, One Stage.....	9.65
16.50 Detector, Two Stage.....	12.25
12.00 Coupled Circuit Tuner.....	8.95
13.00 Mtd. Variocoupler.....	9.65

1500 MILES ON ONE TUBE SET

Complete parts ready to be assembled with our connecting diagram, including cabinet, for \$12.85. W.D. 11, W.D. 12, U.V. 199 and U.V. 201A Tubes. Guaranteed Firsts, \$5.50.

Everything guaranteed as firsts. Don't delay getting Price List No. 9. Wonderful bargains. We pay postage.

RADIO SUPPLY STORES

254 W. STIEGEL STREET MANHEIM, PA.



RADIO SETS

SUNBEAM Parts—Batteries Sundries

12 Years at the Same Spot. Electrical Supplies

FROM WHOLEALER DIRECT TO YOU

Rebuild or Remodel Your Set at the Lowest Possible Cost.

Free on Request—Handy

RADIO RECORD BOOK

SUNBEAM ELECTRIC CO.

71 Third Avenue

New York City

"The best I ever spent \$65 on"



CROSLLEY MODEL X-J

THAT'S the unanimous opinion of owners of the Crosley Model X-J Radio Receiver. It is the last word in radio efficiency at a price within the reach of all.

Local interference can be easily tuned out and far distant stations quickly and clearly heard.

This 4-tube set, combining one stage of tuned radio frequency amplification, detector and two stages of audio frequency amplification, is the best radio receiver ever offered for consistent performance.

Listen in on a Crosley Model X-J for real enjoyment. Then go to any good dealer and purchase this unequalled instrument for just \$65.

Free Catalog on Request.

Crosley Manufacturing Co.

Powel Crosley, Jr., President

1401 Alfred Street

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11 FEET LONG

INSIDE AERIAL

12 INCHES DIAMETER

Substitute for Outside Antenna
110 Feet Stranded Copper Wire

NOT A LOOP BUT A FULL SIZE ANTENNA.

Often doubles tone getting far stations in series with outside antenna

COMPLETE POSTPAID Unaffected by Wind-Rain-Sleet-Lightning

INTER-STATE SIGNALS, COLUMBUS, OHIO

RADIO WORLD

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

A Weekly Journal Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Phones: Lackawanna 6976 & 2063.

Vol. IV, No. 15. Whole No. 93

January 5, 1924

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A Satisfactory Two-Control Receiver

By Leroy Western

THE aim of a certain class of radio receiving fans is toward a set which will give loud signals, fairly good selectivity and a minimum of controls. For this class, a receiving set connected as shown in the accompanying illustration will give excellent results. As will be noted, there is only one tuning control—the variometer; and a control of regeneration—the variable condenser.

The variometer, connected in series with the antenna and ground, tunes the antenna circuit and also the secondary circuit. The honeycomb coil and variable condenser connected in parallel are in turn connected in series with the plate, affording means of tuning the plate circuit to resonance with the secondary. In this case, the secondary circuit includes the grid, grid leak and condenser and variometer. When the circuits are in resonance, regeneration will be obtained with the resultant amplification of weak signals. Of course, if the builder desires or happens to have on hand a variometer, the same may be connected in series with the plate instead of the honeycomb coil and variable condenser. However, the combination shown in the diagram has been found to give excellent results and works much better than a variometer.

In regard to the tuning variometer used in this circuit, almost any type will give good results. The writer in this particular case used a home-made instrument consisting of two cardboard tubes, one 4 inches in diameter by 2½ inches wide and the other 3 inches in diameter by 2½ inches wide. The stator was mounted by screwing it fast to a base and the rotor mounted by means of two long machine screws with nuts drawn up tight on the rotor tube so as to clamp it firmly. Two wooden uprights then supported the rotor shafts. The connections from the winding on the coil were made to the heads of the bolts and pig-tails were soldered to the latter at a point outside of the stator coil. Thus sliding contacts were eliminated and the efficiency greatly increased. The stator coil was wound with 65 turns of No. 22 D.C.C. wire, leaving a space of ¼ of an inch in the center of the winding for the shaft. The rotor winding was made in the same direction and consisted of 70 turns of the same sized wire leaving the same sized

space for the shafts. The two coils were then connected in series and the leads to the set brought out to two binding posts mounted on a base.

In any case, where a detector or soft tube was used, a maximum of 22½ volts was used for the "B" battery. It was found that even a lower voltage than this gave good results and the "B" battery should, therefore, be of the tapped variety so that 1½ volt taps from 16 volts up can be obtained. This gives flexibility and improves the operation of the set as the best operating voltage of the vacuum tube can thereby be found.

The size of the honeycomb coil used for tuning the plate circuit will depend to a certain extent upon the size of the variometer. Four coils should be on hand when trying this circuit and they should be a 25, 35, 50 and 75 turn coil. From these four, the operator can quickly determine

just which one will give the best results with the variometer used.

A peculiar effect was noted with this circuit and is one with which most amateurs are not familiar. It was that, when local stations were tuned in, the setting of the variable condenser would not seem to make much difference. This is because regeneration will not always build up loud signals to much greater strength. However, in "DX" work, where the signals are weak, it will be found that the proper setting of the variable condenser will assist greatly and will build up the signal strength remarkably. Therefore,

as you first try out this set on local stations, do not expect any great results when regeneration is employed. However, you will see the superiority of this set when you try for "DX" signals. These weak impulses coming from distant stations are transferred to the grid at almost their original intensity as no losses occur as by inductive coupling. This refers to the variocoupler which is found in most three circuit tuners where considerable losses occur in the transformation of the current from the stator to the rotor coils. In the circuit, however, conductive coupling is used and great signal strength is possible. This circuit, in the writer's opinion, is fully equal to any standard three circuit tuner.

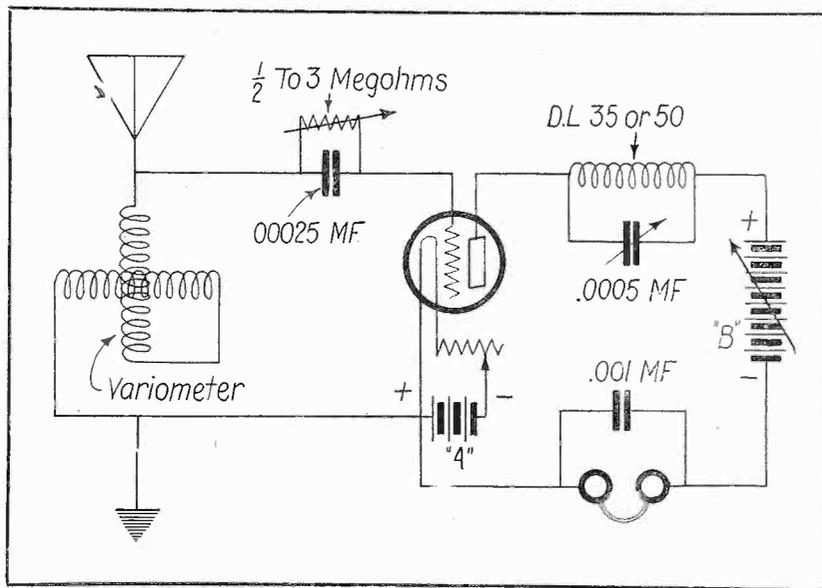


Diagram of a satisfactory two-control receiver. Regeneration is controlled and made possible by the impedance in the plate circuit being tuned to resonance with the grid circuit.

Distance Reception On a Loud Speaker Without An Aerial

By *Laurence Blackhurst*

RADIO receiving may be revolutionized as the result of an invention by a resident of Miami, Florida, Edward S. Huff, who, for many years, has been known as an inventor. (See illustration on front cover page of this issue.)

Hundreds of inventors have been conducting experiments to improve the wireless telephone, popularly known as radio, but it is said Mr. Huff's invention will make possible the placing of a radio receiving set in every home, without elaborate apparatus, overhead aerials or loops, and also make possible the carrying around of a complete radio set in a space smaller than a suitcase, and a set with which anyone can hear any broadcasting station in the country with the turning of a couple of dials.

There is only one connection to Mr. Huff's set—a ground connection. Instead of an aerial or a loop, he uses a new device, the details of which he has not made public, owing to the fact that he has not yet filed his patent papers. This device occupies a space of only 3"x3½" and easily is concealed in the hands. The range, he says, is far beyond any loop which has previously been invented. Mr. Huff has as yet failed to ascertain the limit of his instrument, for additional experiments are constantly extending the range.

In his laboratory Mr. Huff uses a Western Electric 10-D loud talker, guaranteed by its manufacturers to work well on any station in a radius of 25 miles. With no power amplifier whatever on his receiving set he picks up programs from Mexico City, Los Angeles, Winnipeg, Manitoba, and reproduces them on his loud speaker, tuning in on the loud speaker without the use of an audiphone, or ear receiver as is usually done.

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present time, with three stages of radio and two stages of audio. His set is non-regenerative and while he has used earphones in his experimental work, he has developed his set to a point where these are no longer necessary.

He has three controls for tuning, his fourth dial, or vernier, not being considered a control. He gets his power for the operation of the set, from a 72-volt storage battery.

Mr. Huff stated that he is not ready to put his device on the market, as he is working out a number of improvements that will make it "fool proof." He is planning to cut his control down to two dials and to add other equipment which will eliminate static as far as possible.

It was during the course of his experiments on the elimination of static that Mr. Huff discovered his new method of receiving. He was working with a standard five-foot loop, and accidentally made a break in some connections. This brought in a program from the Electrical Equipment Company's broadcasting station in Miami clearer and louder than he had ever received it before. He carefully studied his connections, and later that evening tuned in more distant broadcasting stations, receiving all of them with unusual distinctness.

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Navy Radio Men Promoted

RECENT orders of the Naval Bureau of Navigation promoted sixty-seven radiomen and established 210 men as radiomen third class. Despite the appointments and promotions, there is still a shortage of approximately 500 operators in the Naval sea and land service. The new orders promote 17 second class petty officers to first class, and 50 third to second. The advancement of the non-rated men to radiomen third class, was as follows: Battle fleet, 105; Scouting fleet, 45; Asiatic fleet, 21; Control force, 21; and Naval force in Europe, 18.

Beware of "Mud" Apparatus

CHEAP composition dials, sockets, grid leak condensers, etc., that have sprung up overnight as if it were and are selling at extremely low price, look as good as the originals after which they were modeled. In nine cases out of ten they are nothing but red clay with shellac or cheap varnish, and are conductors of high frequency current rather than insulators. To use them is to ruin all chance of the proper working of a set. Rather pay ten times the price for good apparatus than think of getting "mud" parts.

Why Radio Signals Fade Away

By Roger H. Bryant

Radio Engineer, Westinghouse Electric & Manufacturing Co.

MANY of us have experienced a feeling of great disgust when listening to a good concert from a broadcasting station to have the music gradually die out. This usually happens at the most interesting part, for instance, when a distant station is just about to sign off. Frequently the regularity with which the signals die out at the crucial point leads one to think that something has control of this phenomenon and is using this control with diabolical intent.

The periodical dying out of radio signals is known as fading. There have been many attempts to make measurements on radio transmissions to determine the exact cause of fading, but few of these measurements have produced any worthwhile data. The best explanation of fading seems to be a theoretical one. It is believed that at a height of thirty or forty miles above the surface of the earth the air becomes so rarefied that it becomes a conductor of electricity. As such it acts like a reflector of the electromagnetic waves by which radio communication is effected. The result is that the waves reach the receiving antenna not by one definite path but by a number of paths of different length. To make this clear I think we had best have a diagram.

"A" represents a radio transmitting station sending out electromagnetic waves which radiate in all directions. Some of them go directly to the receiving station "B" while others go by an indirect route up to the

conducting layer and then down again. If the difference in length of these two paths is right, that is, a multiple of the wave length, the waves will add and the effect produced will be greater than by the direct transmission alone. But the difference in length may also be such that the waves do not add and thus the effect may be less than it would be by direct transmission. The reflecting layer is constantly shifting so that the reflection varies momentarily between the limits described resulting in varying intensity of the signal received. Thus the fading.

This simple explanation of fading leads to several interesting things. The reflecting layer is very indefinite during the day. Hence there is less fading during the day, and this seems to be the case. On account of the lack of reflection, the range of a station is much less during the day than at night, and this we all know to be the case. It would also appear that it is impossible to send radio signals away from the earth.

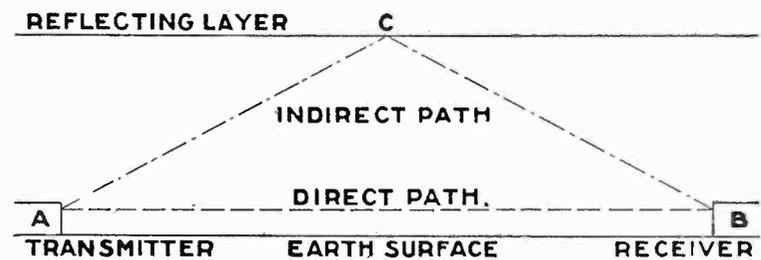


Diagram illustrating why radio signals fade.

The Radio Primer for Beginners

By Lynn Brooks

STORAGE BATTERIES—Edison type. Besides the lead storage battery there is another type, not so generally used in radio, but which is nevertheless well worth investigating. It is the Edison nickel-iron-alkaline cell, and was developed by Thomas A. Edison primarily as a storage battery that would stand a lot of hard abuse without appreciable wear.

In these cells, the positive plates consist of a number of hollow nickel-plated steel tubes, perforated and supported in a nickel-steel frame. A number of these hollow tubes, resembling metal pencils, are used for each plate. In the average cell, from 20 to 40 tubes are used in a single positive plate, depending upon the ampere-hour capacity wanted. The tubes are filled under great pressure with a mixture of nickel peroxide and flake nickel alternate layers. The nickel peroxide is the active material, the flake nickel being added to diminish the internal resistance of the plate. These tubes are forced into a steel nickel-plated frame under heavy pressure.

The negative plate consists of another nickel-steel plate with rectangular pockets, which are filled with finely divided iron oxide, also pressed into the frame under great pressure.

In the cell, the plates are arranged in alternate fashion, there being an uneven number of plates, always one more negative than positive. They are separated by either perforated rubber strips or plates, or thin rubber strips. The assembled section is then placed

in a nickel-plated steel jar or container, which is insulated from the plates by strips of hard rubber along the sides and bottom. The cover is also of nickel-plated steel, welded into place, with insulated bushings to permit the connectors to come through.

In this cell the electrolyte is a 21 per cent solution of potassium hydrate (caustic potash) and a small amount of lithium hydroxide. Its open circuit voltage when fully charged is 1.5 or thereabouts, and the average discharge that can be drawn is only 1.2, so therefore it would take four or five of these cells to supply the ordinary receiving set that uses six-volt tubes. However, they are extremely sturdy and will charge fast, as they can be practically driven by an overcharge without any undue harm to the battery.

When charging this battery, gassing occurs during the entire period. As a matter of fact the battery fairly boils when the correct charge is applied. As before stated, it may be charged at an excess of the regular charging rate without harm coming to the battery, although this, of course, is not to be recommended as a steady procedure.

The main point that recommends this battery is its immunity to "hard knocks." It will stand almost anything outside of the application of acid, which immediately ruins it. It is not harmed by standing uncharged for long periods and at the same time is not hurt by what would prove an excessive and killing charge for a lead cell.

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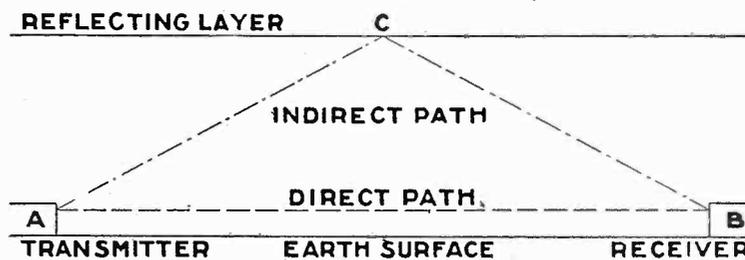
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No Radio Conference Just Now—New Radio Bill Ready

By Washington R. Service

WASHINGTON, D. C.—There will be no general radio conference in Washington in the near future, Secretary Hoover announced last week. The Commerce Department is rapidly completing the details of a tentative regulatory radio bill, based on the old White Bill, he explained. He believes that this can best be done by government officials without further conference. Practically all the suggestions offered by representatives in the several lines of radio work presented at last year's conference will be incorporated, the Secretary indicated, pointing out that conditions have not changed materially since last year, except that the number of transmitting stations has increased.

When it is attempted to draw upon legislative recommendations or bills with a large body of diversified interests, it usually takes several months. Early action on the new radio bill is necessary and it is hoped that a tentative bill can be delivered to Representative White of Maine, for introduction soon after January 5, the Secretary stated.

A few days ago a delegation of radio interests representing the press, clubs, engineers, broadcasters and amateurs called upon President Coolidge and the Secretary of Commerce, urging that a general conference be called, in an effort to reduce interference from ships affecting commercial, amateur and general broadcasting. The secretary explained that interference was decreasing due to the voluntary adoption of regulations laid down last year and that the department was striving to remedy present difficulties through revising the White Bill, which was passed by the House last session. Any recommendations which the committee desired to make in writing, the secretary said, would be considered by the department officials now working out the revisions to the existing radio laws established in 1912.

Officials of the government point out that many

difficult questions arise when regulatory legislation is attempted. Such questions as monopolistic control, it is believed, should be handled by courts under existing laws, and not incorporated in radio legislation. The prohibition of operation by aliens, if injected into radio legislation, would tend to handicap American radio development commercially in foreign countries, and could be regulated without being covered in a radio bill. The question of whether or not radio is a public utility is not essentially necessary in a law which should be regulatory, it is believed. Some definite standards of operation and equipment, especially in the commercial fields must be included, however, so that Secretaries of Commerce will have some basis for their decisions, as to whether an existing station may continue operation in the event a new company desires to enter the field or whether it must cease operating to permit the opening of another station. The amount of traffic might or might not demand more than one station, and efficiency would be questioned. Many phases of development indicate that broad latitude must be granted to the Commerce Department, but standards of requirements and service in the public interest should be made clear for future expansion, it is believed.

Recently new interference problems have arisen, over which the department has no control under existing laws. Complaints received report interference from regenerative or re-radiating receiving sets, violet ray machines, electrical precipitating plants, bell-ringing magnetos on telephone lines, and leaking insulation on power transmission lines. Government regulations, should, it is believed, give the department power to prevent such interference.

After the presentation of the tentative bill in the House, and its assignment to the Merchant Marine and Fisheries Committee, it is understood that public hearings will be held at which time all interests may appear to present their suggestions and recommendations.

1924 Will Be a Good Radio Year

By Carl H. Butman

A GOOD radio year is in prospect, according to Chief Radio Supervisor W. D. Terrell, of the Department of Commerce, who has just returned to his office in Washington after a tour of all nine radio districts of the country.

Today very little radio interference is reported from amateurs during the silent evening periods. Radio sales are now much better than was anticipated by forecasters of this business a few months ago. Dealers with whom he talked during his trip find it difficult to keep enough stock to meet the sales and demands. Every one connected with the industry with whom he came into contact is "tickled to death" with the prospects of continued good business, it is understood.

Reports from radio sales agents state that in many districts, farmers are coming to town from near and

far to buy receiving sets. In some sections of the country reports state that practically all farmers living at considerable distances from news and market centers already have or are buying radio sets. Besides the practical value of weather, market and stock reports, it is pointed out that the farmers and suburban residents take great delight in the excellent evening entertainments broadcast daily by over 500 stations in all parts of the country.

The growing general interest in broadcasting is reported healthy, both among the broadcasting station owners and the listeners-in, due to the fact that the industry and art is getting on a stable basis. In general, Mr. Terrell believes that people have gotten to the point where they feel they cannot get along without radio.



(C. Foto Topics)

Mr. Stein giving Jack Dempsey, heavyweight champion of the fist world, some pointers on the operation of Jack's new Federal DX61 receiver at the Hotel Alamac, New York City. Dempsey was bitten by the radio bug during his recent training and, like all the fans, wants to have a set with him all the time.

Warner received a terse message saying that matches and other evidences of recent occupancy had been found.

The scouts were then directed to search the woods to the north where the figure of the dummy was found leaning against a tree. Three shrill blasts of a scout whistle announced the find.

Maxim Greets Marconi by Radio

HARTFORD, CONN.—By virtue of recent two-way amateur radio contacts established by Kenneth B. Warner, secretary of the American Radio Relay League, England comes to the forefront among nations of the world that can now communicate across the Atlantic through radio stations operated by citizen amateur radio men. Nine complete messages have

been sent in both directions, one of them being a greeting from Hiram Percy Maxim, president of the A. R. R. L., addressed to Senatore Guglielmo Marconi, pioneer in the development of wireless communication:

"The American Radio Relay League presents its respects and this evidence of the dawn of international amateur radio.

(Signed) "Hiram Percy Maxim."

The English amateur station, in addition to working both ways with IMO here, has been heard by a number of amateurs in the East and was recently reported as far west as Chicago. While this contact has been going on, the French amateur station 8AB, operated by Monsieur Leon Deloy, has been working consistently with about seven American stations. The two most recent stations reported to have worked 8AB are 1CMP, operated by William E. Jackson, at Bridgewater, Mass., and 2AGB, operated by John H. Dodman, Summit, N. J.



H. C. Snook, staff engineer of the Western Electric Co., upon whom the Radiological Society of North America recently conferred a gold medal in recognition of his invention of the high tension rectifying switch. The presentation of the medal was part of the program of the Society meeting held recently in Rochester, Minn.

been sent across the ocean on a wave length of 100 meters between Mr. Warner, operating station IMO here and J. A. Partridge, owner of the English amateur station 2KF in London.

With the utmost ease these two amateurs have been able to seek out in the already over-busy ether their respective call signals and maintain consistent communication without atmospheric breaks or interference, at various times while dawn was approaching across the ocean. For three nights they conversed back and forth with the same reliability that amateurs do over short distances on this side.

In order to determine just how practical this communication would be for regular message traffic, acting in co-operation with relay stations on either continent, several formal communications were trans-

Private Wireless in India

ISSUANCE of its first private wireless transmitting and receiving license has been made by the Government of India to the Radio Club of Bengal. Under the terms of the license, weather reports, concert and student programs and non-political lectures, but not news items, can be transmitted to members of the Radio Club only. The broadcasting of programs is expected to commence within a short



(C. Wide World Photos)

C. J. Waldron, of Medusa, N. Y., who listens in at noon each day, gets the time signals from Station WGY and then rings the bell of the village church of which he is the sexton. Thus, all in the village may set their watches to the exact time, due to the kindness and up-to-date methods of their friend, the modern sexton.

time, under an arrangement with the Indian States and Eastern Agency. The Radio Club of Bengal is located at Calcutta and wants American radio literature.

Scouts Use Radio in Man Hunt

HARTFORD, CONN.—Will the Boy Scouts of the United States use portable radio sets in place of semaphore signals?

Without some means of signalling, troops of Boy Scouts are as helpless in the field as an army detachment on special service. In order to determine the value of portable receiving and transmitting radio apparatus in connection with scout work, Hiram Percy Maxim, president of the American Radio Relay League, and local scout officers conducted a successful experiment recently, showing how radio might be used by the scouts in searching for lost persons.

As the test was to be made similar to a real emergency, a dummy man was made and hidden in a patch of woods outside the city. The scoutmasters announced to their troops that a demented man had left his home in a neighboring city and attended to the details of organizing a searching party. The scouts assembled at a given point and set up their portable radio apparatus. Their movements were directed entirely from 1AW, which is Mr. Maxim's amateur radio station.

K. B. Warner, secretary of the League, operating 1AW, announced by radio that the missing man had been seen last near a deserted house about a mile from the place where the scouts were situated. He instructed them to dismantle the radio equipment and proceed to the house where they were to search the premises thoroughly and report what they had found. This was done speedily and in a short time,

The Old Reliable Armstrong Circuit Revised

By Arthur S. Gordon

SINCE early fall I have tried most of them, from the super-regenerative down through the ultras to the simple crystal receiver, and while some of the circuits gave good results, nearly all of them lacked reliability. By reliability I mean that quality which gives uniform results, day in and day out, without too much fussing—something that will work when the invited guests make an appearance. All of which is a fairly desirable quality for any set. And so, when

I had read many glaring accounts of how shielded panels did this very thing, but experience has taught that while shields do the trick, they also cut down the strength of the signals. This, therefore, was out of the question. Back-panel mounting was next considered, and this method I finally adopted. All the instruments were mounted upon a separate panel erected within the cabinet 4" behind the front panel, and the shafts brought forward by means of fibre extensions.

This "insulated" the instruments from the hand and body of the operator, and since my adoption of the method, it has proved its effectiveness time and time again.

Another change brought about after experimentation was in reference to the condensers. Two of these instruments are used, a 43 plate in series with the antenna for coarse tuning, and a five plate connected across the secondary circuit to act as a vernier. This made a very flexible tuning arrangement which worked to perfection. The conventional method of connecting the vernier condenser across the 43 plate was tried, but abandoned in favor of the secondary circuit method.

The grid condenser should be .00025 for WD12 tubes. There are almost innumerable makes of variable grid leaks on the market, some of which function, and some of which do not. I have discovered that the best and most uniform results are obtained by the use of a fixed grid leak of the proper resistance. When you buy a tube, you will find a circular in the box giving data concerning the tube. From this circular you can find the proper value to use. Purchase a grid leak of this value, install it in its proper place, and proceed to forget about it from that time forward.

If, upon assembling the set, you find that it contains squeals and screeches, look for the trouble somewhere else than in the adjustment of the grid leak. The rotor of the variocoupler, for instance, often causes excessive regeneration, on account of the extra number of turns it may contain.

The manufacturers of variocouplers are required to meet extreme conditions when determining the number of turns of wire to put on the rotor. The number of turns required to give regeneration varies in proportion to the resistance of the antenna circuit. If

(Continued on next page)

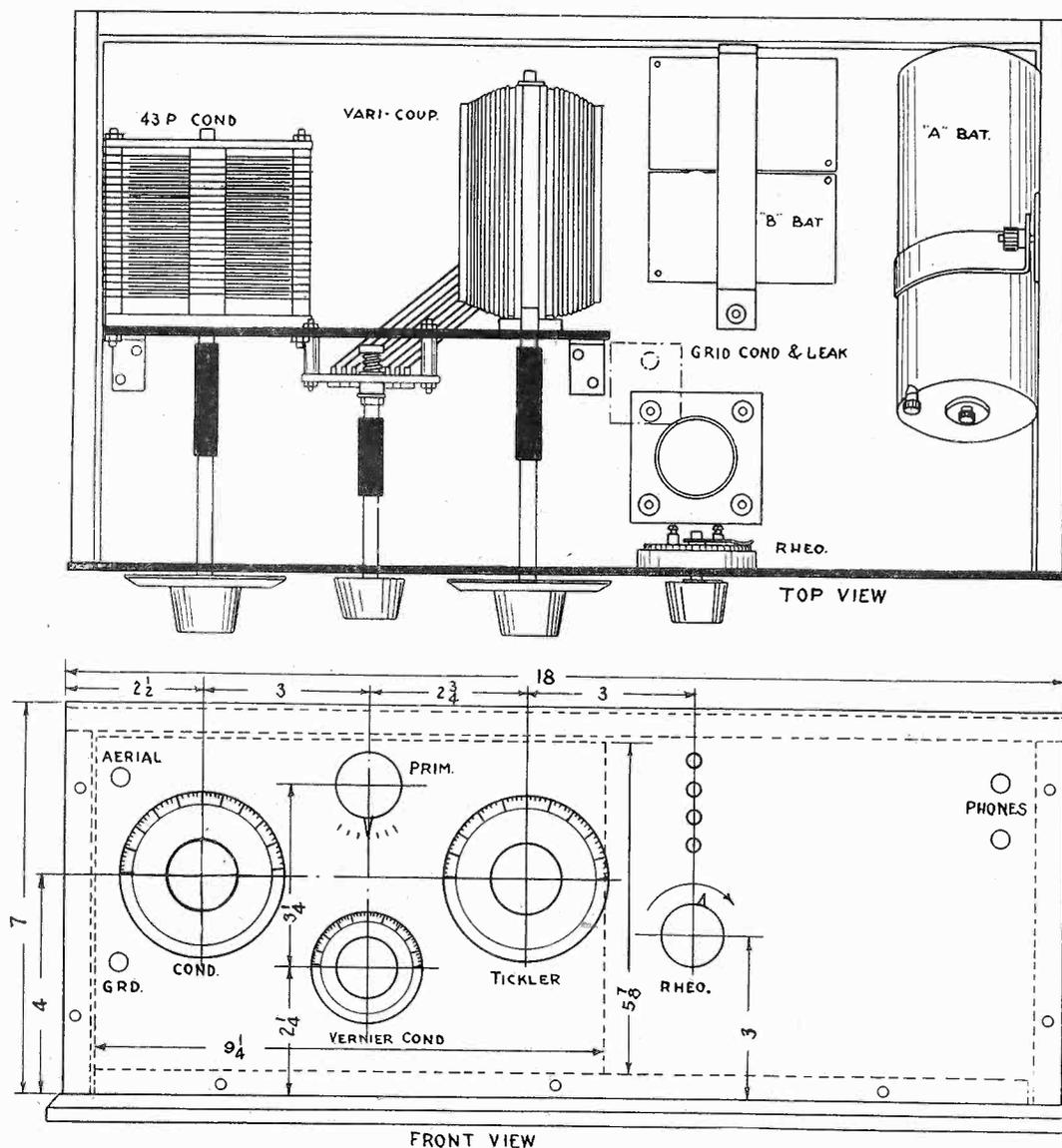


Fig. 1. Front and top views of an Armstrong dry cell regenerative set with several interesting features which add to its reliability. The batteries are all inside the cabinet. The number of turns on the rotor of the coupler has been reduced until the set is perfectly balanced and therefore responds very well to all wave lengths used in broadcasting.

asked to make a set for an invalid friend, I set out experimenting in order to find a circuit which had it. As I say, I tried most everything, but at length I returned to the old reliable single circuit Armstrong receiver, as being the one best fitted for my shut-in acquaintance.

Fundamentally, therefore, the circuit described in this article is the same as several others that have been described in this periodical, but mechanically it is vastly different. This difference comes about in an effort to eliminate body capacity without detracting from the efficiency of the set.

the resistance is high, it requires more turns than if the resistance were low, and therefore, except in extreme cases, you will find that the rotor coil contains too many turns for your antenna circuit. In order to obtain a finely balanced set, therefore, you must remove some of the turns.

The way to do this is much simpler than you may think. Turn the rotor in the coupler so that you can reach the middle connection. Remove four or five turns of wire from each side of the center, solder the

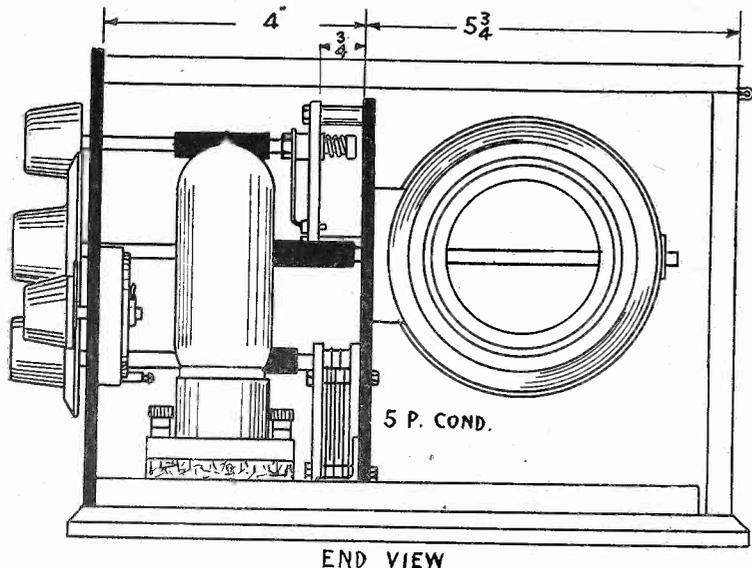


Fig. 2. End view of the simple Armstrong receiver. Note that all the instruments are conveniently mounted on a sub back panel, with fiber rods connecting the controls on the front panel, giving additional insulation and obviating the necessity of panel shielding, making the set absolutely free from troublesome body capacity.

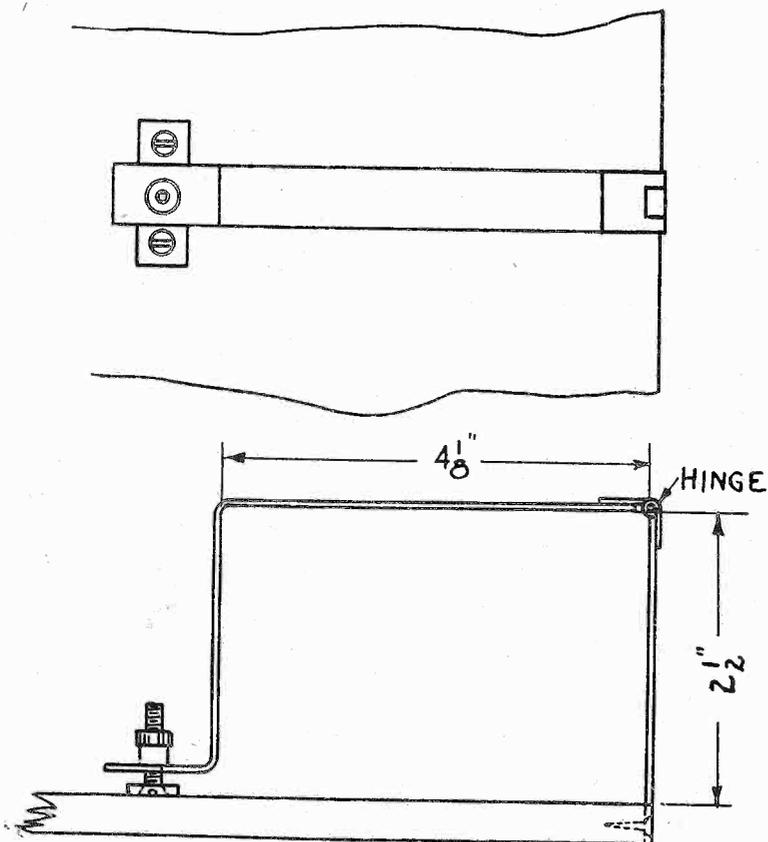


Fig. 3. Method of fastening the B battery to the baseboard by the use of a brass hinge here shown. This keeps the B batteries in place, preventing them from knocking around should the set be moved.

two ends together and start the set up as before. You will find that now you will be able to turn the rotor clear around, perhaps, without causing the tube to break into violent oscillations. This better balance will enable you to tune in a station much more loudly than before, when your tube began to squeal almost the moment you began turning the rotor.

Still another change in the usual construction of this simple set is the incorporation of both the "A" and "B" battery into the cabinet. This does away with batteries on the parlor table, and also simplifies the interior wiring of the set. A small sized "B" battery is used (although the same voltage as the larger size, 22 1/2 volts) and Fig. 3 shows the construction details of a brass clamp which will hold it in place.

No. 6 dry cell supplies the current to the WD12 filament, and this cell is stood at an angle against the

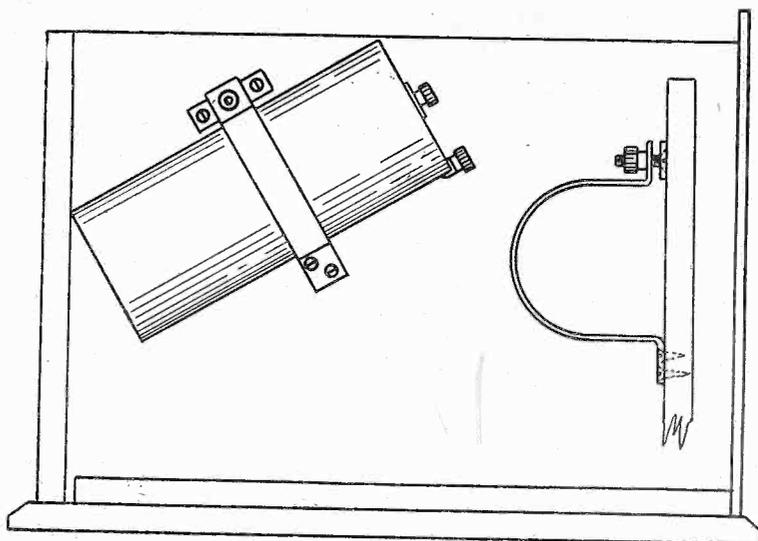


Fig. 4. Brass hinge used to keep the A battery in place on the side of the cabinet. The battery is slipped inside the loop of brass and the nut is tightened. Details of the side view are shown to make all constructional details clear.

right end of the cabinet, as shown in both Figs. 1 and 4.

The Armstrong single circuit regenerative hook-up is given in Fig. 5, and this is self-explanatory. The mere constructional details, such as measuring two inches from here, and one inch from there, and so on,

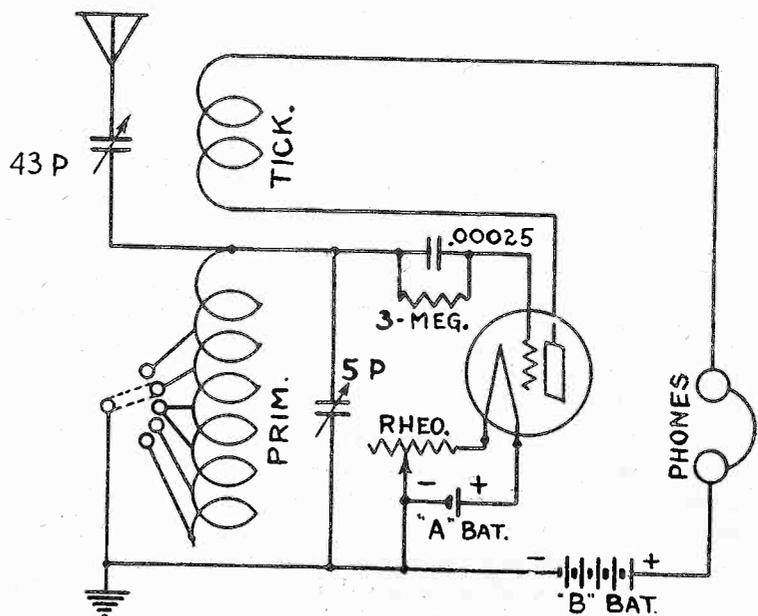


Fig. 5. Circuit used in the revised Armstrong receiver. It is the conventional Armstrong single-circuit receiver with specially wound tickler and a five-plate condenser shunting the secondary circuit for fine tuning and control of the regeneration.

have been omitted, but the drawings accompanying this article show quite clearly the arrangement of dials in the front of the panel and of instruments behind the back panel. Fig. 2 is a side view of the completed set and, together with Fig. 1, gives to the prospective builder all the information he needs concerning a simple set upon which he can depend.

The Greene Concert Receiver

By C. White, Consulting Engineer

THE Greene receiver was designed and developed by Lloyd C. Greene, radio editor of the Boston "Globe," and represents one of the highest types of regenerative receivers. It is unique in construction, efficient in operation, and inexpensive to build. Although a single circuit tuner is employed, great selectivity is obtained by the use of a variometer in the plate circuit instead of the customary tickler coil style of feed-back. So smooth is the regeneration in this type of receiver that the oscillation point of the detector tube may be steadily and evenly approached by turning the rotor of the plate variometer. There is no sudden tendency to jump off into oscillation which

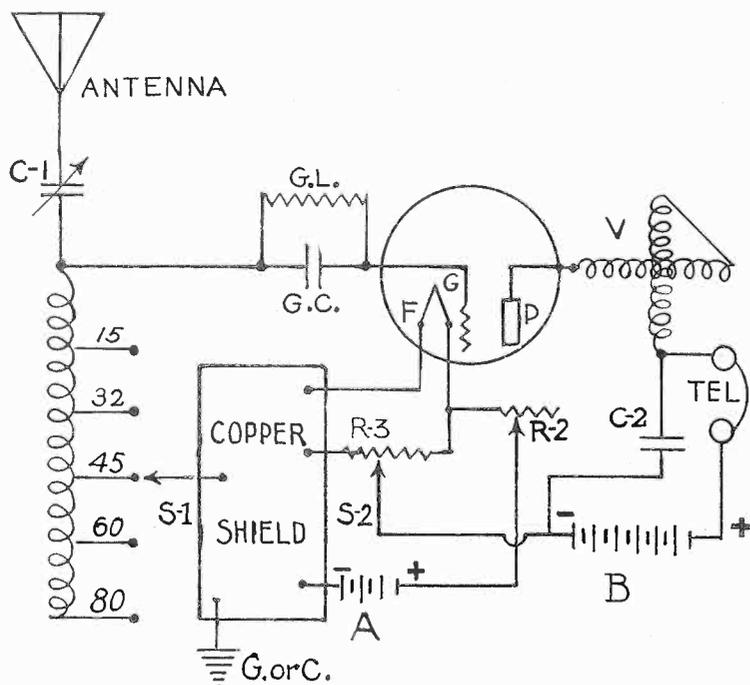


Fig. 1. Circuit diagram of the popular Greene receiver. The grounding of wires to the shield simplifies matters considerably, but care has to be taken not to short-circuit any of the apparatus on it.

is noted by a sharp click in the phones. When the regenerative point is passed and the tube does begin to oscillate, it oscillates very feebly and does not radiate any large amount of radio-frequency energy to disturb the neighborhood. Regenerative whistles are largely caused by poorly designed and constructed receivers in the hands of inexperienced operators. If a regenerative receiver gradually and gently slips into oscillation, which is accompanied by a rushing sound in the phones similar to running water or escaping steam, there is only a slight chance that a whistle will be picked up by even an unusually close antenna. But, on the other hand, when a receiver jumps into the oscillatory state with a very sharp click in the phones, followed by a strong sound like running water, you can rest assured that you are disturbing the neighborhood by sending out, or reradiating, strong, not feeble, radio waves.

The great secret in the success of this simple receiver lies in the fact that its operation is smooth. After a station has once been picked up by means of the taps on the inductance coil and the variable condenser C-1, the volume can be gradually increased by slowly turning the variometer in a clockwise direction until a point is reached where a further increase in the volume is accompanied by severe distortion. Then the slider S-2 on the potentiometer R-3 can be moved from right to left until the proper volume and

signal quality is obtained. The best possible results are obtained from this receiver when a "soft" detector tube, such as the UV200 or C300, is used. These "soft" or "gaseous" tubes are more sensitive detectors of weak signals than the "hard" or high vacuum tubes like the UV201A, WD12, and the UV199. If you are building this set for the first time and wish to keep the expense as low as possible, of course the UV200 can not be used to advantage, owing to the fact that a storage battery is necessary to light the filament of the same.

I would recommend that you purchase a UV201A tube which can be run as a detector on three dry cells, and as you enlarge your outfit by the addition of an amplifier you can shift the UV201A that you have been using as a detector to the amplifier and replace it with the more sensitive UV200, since you will find it more economical to use a storage battery when two or more tubes are used. In this way you can distribute your expense and still be able to operate the receiver in the meanwhile with good results, although not to its maximum efficiency. With the UV201A as a detector, however, you will discover that the potentiometer R-3 has very little effect upon the operation of the receiver no matter where the slider S-2 is placed. But when you change over to the more sensitive UV200, the adjustment of S-2 and R-2 will play a most important function in tuning. Therefore, it is advisable to purchase a rheostat that has sufficient resistance to care for the UV201A and provide fine control for the UV200 without over-heating.

By reviewing the diagram, Fig. 1, you will discover that there are quite a number of electrical connections

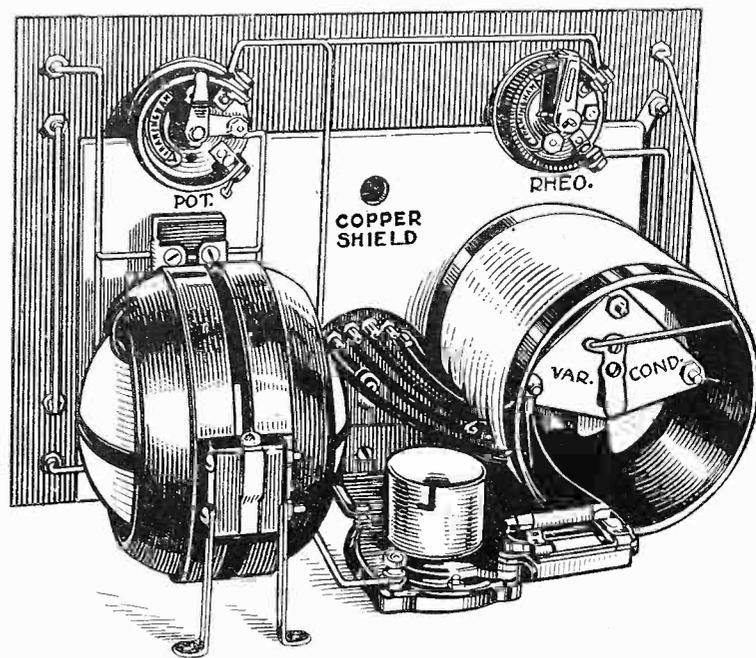


Fig. 2. Plan view of the completed Greene receiver, showing layout of apparatus.

to the copper shield, which serves to eliminate body capacity effect while tuning in. By placing these connections on the shield, the wiring of the circuit is greatly simplified. In Fig. 2 is shown the actual appearance of the set when completely wired. By laying your parts out as illustrated therein and connecting them up as shown by the diagram you will experience no trouble in successfully constructing this receiver, although it may be your first time at such a job. In

Fig. 3 is illustrated the appearance of the panel front after the set has been completely assembled. A panel 8"x12"x $\frac{1}{4}$ " will afford ample space to assemble the necessary controls. The best method to effectively attach the copper foil shield to the panel is as follows: Coat the back of the panel with shellac in the approximate position that it is desired to locate the shield. Before the shellac has a chance to dry up, light it with a match thus allowing the alcohol content of the same to burn off, thereby leaving a sticky and gummy residue on the panel. The shield should be laid on smoothly and evenly by gently rubbing and pressing it to the panel. In a few minutes the job will be done with the shield firmly adhered to the panel in the exact position desired. In connecting up the variable condenser C-1, be sure to see that the fixed plates of the same are connected to the grid side of the circuit and the movable plates to the antenna side (the post marked A on the panel front).

The symbols used in the diagram (Fig. 1) have the following meanings: C-1 is a variable condenser, having a capacity of .00025 or .0005 microfarads. If you get the latter be sure to have some sort of vernier either as a separate movable plate built in the condenser, or some kind of sharp tuning dial. If the .00025 mfd. size be used a separate vernier control is not altogether necessary, still it will be found convenient. The symbols G.L. and G.C. represent grid leak and grid condenser, and a .00025 mfd. fixed mica condenser is required with a grid leak of a value recommended by the tube manufacturer for the particular tube you may decide to use as a detector. The unit V is a good reliable make of variometer, while R-3 is a potentiometer. The units R-2 and C-2 are a rheostat with the correct value of resistance for the filament control of the vacuum tube used, and C2 is a .005 mfd. fixed mica bypass condenser. The main tuning inductance coil is wound with No. 22 D.C.C. magnet wire on a 4" tube and the number of turns between the first turn and each successive tap is given on the

diagram (Fig. 1). The coil has 80 turns in all with taps at the 16th, 32nd, 45th, 60th, and 80th turns, respectively. The post marked G on the panel is the ground terminal of the set and the symbols G or C on the diagram in Fig. 1 represent a ground or counterpoise.

No matter how well a receiver is designed a large measure of the good results to be obtained are dependent upon the use of good reliable parts and care in construction and assembly. You should use resin core solder and should well solder all joints, taking care to wipe away all excess solder flux with a small rag dampened with alcohol. The tap wires from the inductance coil should not be allowed to touch each other and should be insulated with spaghetti tubing. The inductance coil should be wound with no shellac covering to act as a binder and care should be taken to see that no excess solder or solder flux gets into these windings. It is easily possible to build this receiver with a vacuum tube complete for dry cell operation for less than \$35.00.

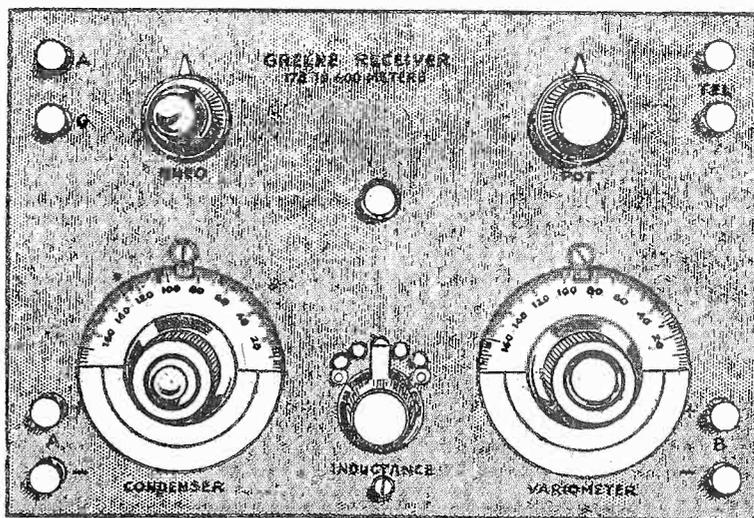


Fig. 3. Front view of Greene receiver, showing location of controls. It is neatly balanced and makes a good looking receiver.

Radiograms

Station 2LO, London, England, is now transmitting on 360 meters.

* * *

A novel feature of the annual report of Surgeon General Hugh S. Cumming is the section which deals with the use which the United States Public Health Service is making of radio for the dissemination of popular health information and the stimulation of a wider interest in general health matters.

* * *

At the Boston City Club recently, an audience of 2,000 people watched David Sarnoff, vice-president and general manager of the Radio Corporation of America, and Fred D. Heiser, superintendent of the marine wireless station at Chatham, Mass., establish radio communication with London, Paris, Warsaw, Stavanger, Norway, Berlin, and with ships 3,000 miles at sea.

Although not in the list of radio code combinations, C. O. D. gets a flattering amount of attention in this the holiday shopping season.—New York Tribune.

* * *

A Cleveland scientist says the human body is an electrical mechanism made up of 28,000,000,000,000 cells, each a tiny wet battery. Wayne Wheeler might look into this and have the law require the use of dry cells.—Indianapolis News.

* * *

The Emperor of Japan has conferred upon Dr. Frank S. Jewett, vice-president of the Western Electric Company, the decoration of the fourth class of the Imperial Order of the Rising Sun. A letter accompanying the decoration said "the assistance which you and your company are rendering to our Government is gratefully acknowledged by this order." Both were forwarded by Sannosuke Inada, chief engineer of the Japanese Department of Commissions. Dr. Jewett is a past president of the American Institute of Electrical Engineers.

Major Armstrong Suggests Radio Muffler

THE other day our Washington correspondent had the pleasure of meeting Major Edwin H. Armstrong in the office of the Chief Supervisor of Radio in Washington. The major has cut loose from radio for a while and, with his wife, is en route south in his automobile, where he plans a month's vacation and honeymoon in Florida.

Future activities of the major, it is understood, will be devoted to a large extent in remedying interference troubles said to be caused by his famous regenerative

circuit. A large amount of the difficulty encountered, it is believed, is due to poor manipulation, but he suggests the use of an additional tube of radio-frequency as a "muffler." Just as in automobiles where excess noises are eliminated by the use of an engine muffler, in the operation of the regenerative sets a radio muffler can be incorporated. One exception is noted. In the automobile the muffler is placed after the engine, behind it, so to speak, while in a radio set the "muffler" should be put in front or before the regeneration.

Interesting Combination Receivers

By R. H. Langley

Radio Engineering Dept., General Electric Company

ONE of the most fascinating things about radio is that it provides such a fruitful field for experiment. The art is young, and there are many questions yet to be answered. The apparatus for the study of these problems is already planted in millions of American homes, and this paper is addressed to those who find pleasure in trying new circuit combinations.

With a small selection of the standard apparatus, it is possible to arrange many interesting new combinations that are not given in the instructions. I give below a list of the apparatus needed for the combinations to be described later, and it might be well to make mental note of the items which you do not have: Two single circuit regenerative tuners; 1 vacuum tube detector and 2 stage amplifier; 1 three-stage radio amplifier; 1 variable air condenser; 1 6 volt storage battery or 6 No. 6 dry cells; 4 blocks of plate battery, 22½ volts each; 1 3 cell flashlight battery for bias, 4½ volts; 1 homemade loop antenna; 6 radiotrons, UV201, UV201A or UV199; outdoor antenna and ground connection.

The loop will consist of eight to 10 turns of almost any kind of copper wire, wound at ⅜ or ½" spacing on a wood frame 3' or 4' square, and arranged so that it may be rotated on a vertical axis.

In all the circuits to be described, a UV200 soft detector tube may be used, if suitable arrangements are made for obtaining the correct plate voltage.

With the apparatus just enumerated, there are at least 18 different receiver circuits possible. Some will be very sensitive, some highly selective and some both selective and sensitive. Some will be suitable for use in congested districts, some will be preferable in rural districts, some will function best for nearby stations and some for distant stations. It is not possible of course to give diagrams of these circuits, but we can classify and describe them so that the possibilities of the various combinations may be seen.

Let us divide the 18 circuits into five classes: First, on the outdoor antenna without radio amplification. Second, on the outdoor antenna with radio amplification. Third, on the loop antenna. Fourth, using both the outdoor antenna and the loop. Fifth, some special arrangements.

In the first class, that is, on the outdoor antenna without radio amplification, we can list seven different combinations. Two of these are regenerative; the other five circuits are not regenerative. This, of course, means a great deal in signal strength, particularly on the more distant stations, but for the sake of making the list clear and easy to remember, we will take them all together.

The seven circuit arrangements possible on the outdoor antenna without radio amplification are as follows: First, single circuit tuner, using crystal detector. Second, single circuit tuner, with vacuum tube detector amplifier. Third, single circuit tuner, with detector amplifier and the regenerative connection. Fourth, using the outside condenser to make a two-circuit tuner. Fifth, using two tuners to make a two-circuit tuner. Sixth, using two tuners to make a three-circuit tuner. Seventh, using two tuners and the external condenser to make a three-circuit tuner, with all three circuits tuned.

There are two ways of using the external variable air condenser to make a two circuit tuner. We may connect the variable condenser across the tickler coil to make a secondary circuit, or we may connect the condenser in series with the tickler coil to make a primary circuit.

In using two tuners to make a two-circuit tuner the tickler coil of the first tuner is used as a coupling coil and connected to the input terminals of the second tuner.

In using two tuners to make a three-circuit tuner, the two tickler coils are connected together to form the third or link circuit. If we connect the variable air condenser in series with the two tickler coils, we can then tune this intermediate circuit.

The second class of circuits was those on the outdoor antenna with radio amplification. For these we use our three-stage radio amplifier and insert it between the tuning system and the detector amplifier. This may be done on any of the seven combinations which we have just noted, except possibly with the crystal detector.

In the third class we use the loop antenna. There are several combinations here; let us notice only two. The first is the straight loop circuit where the variable air condenser is connected across the loop and then connected to the three stage radio-frequency amplifier and from this to the detector audio amplifier. The second combination, which by the way is a very interesting one, provides a method for using the loop in a regenerative circuit. This uses the loop and one of the single circuit tuners, then the radio-frequency amplifier and the detector amplifier.

The fourth class uses the antenna and the loop in combination. There are also several possibilities here. The best one, perhaps, consists in connecting the antenna and ground to one of the single circuit tuners. The loop and variable air condenser are connected to the three-stage radio amplifier and the detector amplifier in the usual way. These are two independent circuits, the only connection between them being that the tickler coil in the tuner is connected to the tickler terminal on the detector amplifier. This combination is quite remarkable in performance. The antenna circuit is brought into resonance with the signal by means of the tuner and the loop circuit picks up energy from this tuned antenna circuit. The reactions obtained by the tickler coil connection make it possible successfully to eliminate very loud nearby stations.

In the fifth class, let us notice two stunts. The first one consists in amplifying the signal obtained from the crystal detector, by connecting in such a way that the output of the crystal detector goes through the primary of the first audio-frequency transformer. No batteries are needed in the crystal detector circuit. This is a very fine way of obtaining excellent loud speaker signals from nearby stations. The second stunt is the use of a grid bias and a higher plate voltage on the amplifier tubes. Open the grid circuit and insert a small flashlight battery of say 4½ volts between the grid and the filament bus. The negative end of the biasing battery should be connected to the grid and the positive end to the filament bus. It is then possible to use very much higher plate voltage on the amplifier tubes, with the result that consider-

ably greater amplification is obtained with the same or even better quality of reproduction. With the UV201, UV201A or UV199 radiotrons, the plate voltage may be increased to 90 or 110 volts. When using the higher voltages, be very careful of short-circuits.

Many people imagine that the loop antenna is a substitute for the big outdoor aerial and that the same results can be obtained from either. This of course is very far from the truth. There is a very fundamental difference. The aerial is a condenser. It is a very large condenser to be sure, so far as its physical dimensions are concerned, but it does not have a very large capacity. The loop, on the other hand, is an inductance. This means that the method of tuning the aerial is quite different from the method for the loop. The same receiving sets will not work interchangeably on either. The single-circuit tuners are suitable for tun-

ing the antenna, but when we used the loop, we used a separate variable air condenser to tune it.

In these experimental combination receivers, it makes very little difference which tube we use. The main difference between the various tubes is in energy consumption in the filament, rather than in performance as detectors or amplifiers. Some are slightly better than others in this respect, but the main purpose of the newer types is to simplify the A battery problem. The UV200 and the UV201 require one ampere filament current, necessitating a storage battery. This is expensive and troublesome and requires frequent charging. The UV201A takes only $\frac{1}{4}$ ampere and can be operated four times as long as one charge of the battery. It may also be operated from dry batteries. The UV199 tube takes only .06 ampere and can be operated from dry batteries with great success.

Cooperation Necessary in Radio Traffic Problems

By Washington R. Service

CONTROLLING radio traffic is something like handling vehicular traffic in a busy city where regulations exist and are observed by all.

Amateur radio operators and the broadcasters, it appears, have "laid off" each other as far as interference is concerned, but both are now complaining of the ship interference, supervisors of the Department of Commerce point out. Needless to say, the ships must be permitted to communicate with the shore stations and each other, and while some of them may not have gotten over the idea that the air belongs to them, as it did virtually for years, they now claim with some justice that there are not enough channels for their necessary communication.

Ship operators report, and supervisors agree, that the wave lengths assigned to vessels are not all they should be. The 300 meter wave is not efficient; the 600 meter wave, used for calling and for distress signals, is always in use, and the 706 meter wave can't possibly serve all the vessels operating. So far as is known, it is understood that many foreign ships are not yet equipped to use 706 meters, which throws them on the 450 or 600 meter waves. Consequently the ships have to resort to the 450 meter wave assigned them, which is right in the middle of the broadcasting wave band. They are practically forced to use this wave length for their position reports transmitted between 7 and 11 p.m. daily.

In an effort to alleviate the interference, the Department of Commerce has asked supervisors to take up the question with owners and operators. They are asked to transmit their position reports before 7 and after 11 p.m., which, it is believed, would relieve about 25 per cent of the existing interference off the coasts in the neighborhood of broadcasting stations.

Commenting on the interference situation recently, an official of the Department of Commerce said that the control of radio traffic was very similar to heavy automobile traffic in the street; regulations have to be laid down and enforced in the air as well as on the public roads.

Automobiles have no special privileges as to right of way or speed. In other words, there is no class distinction shown. Regulations provide a speed, the right side of the road, stops at crossings, etc., for trucks, private, public and commercial cars. So the Depart-

ment is trying to regulate the radio traffic in the air in the same way, and broadcasters, amateurs, commercial shore and ship stations must comply with traffic regulations, keeping in the channels assigned them. Through co-operation alone can the great air traffic be managed successfully.

Listeners-in who complain of interference waste their time and the time of the department and its field force by complaining of interference in general; they must be specific, if aid is to be rendered, it was explained. Unless the call letters, or name of the offender, the time of interference and the nature of the matter sent is given to the department, it is necessary to send a special investigator to the locality, where he has to listen-in for several days to find out who is causing the trouble. This entails a great amount of time and expense; and the field force is small and inadequate to the demands.

Owners of receiving sets who think they hear interference in the silent amateur period, must ascertain if it is an amateur or a ship, for example, and if they cannot read the code, they should find an amateur neighbor who can, asking him to listen in and record what is being transmitted. His report can then be forwarded to the district supervisor or the department. Such complaints would aid the department materially. Literally hundreds of valueless complaints are received in comparison to one reliable and accurate report of interference. Sometimes receiving sets are supersensitive, it was pointed out, and the interference may not actually be in the air.

A Trick Worth Trying

MANY times listeners can barely hear the whisper of a station on detector and one stage. They switch over to the second stage, and would hear but for the noise that occurs when two stages are used on phones. They may have put in C batteries, and everything may be perfectly O.K. for loud speaker work, but if they will just shove a high resistance grid across the secondary leads of the last stage, they will be surprised at the tremendous volume to be had without scratching and crackling. Try it the next time.

Revised List of Broadcasters

Call	Owner	Location	Meters	Kcys.	Call	Owner	Location	Meters	Kcys.
KDKA	West'ghouse Elec. & Mfg. Co.	E. Pittsburgh, Pa.	326	920	KFJJ	Carrollton Radio Shop	Carrollton, Mo.	236	1270
KDPM	West'ghouse Elec. & Mfg. Co.	Cleveland, Ohio	270	1110	KFJK	Delano Radio & Elec. Co.	Bristow, Okla.	233	1290
KDPT	Southern Electrical Co.	San Diego, Cal.	244	1230	KFJL	Hardsack Mfg. Company	Ottumwa, Iowa	242	1240
KDYL	Telegram Publishing Co.	Salt Lake City, Utah	360	830	KFJM	University of North Dakota	Grand Forks, N. D.	229	1310
KDYM	Savoy Theatre	San Diego, Cal.	280	1070	KFJR	Ashley C. Dixon & Son	Stevensville, Mont.	258	1160
KDYO	Oregon Inst. of Tech.	Portland, Oregon	360	620	KFJU	Central Power Co.	Kearney, Neb.	234	1289
KDYS	The Tribune	Great Falls, Mont.	360	830	KFJV	T. H. Warren	Dexter, Iowa	224	1340
KDYW	Smith, Hughes & Co.	Phoenix, Ariz.	360	830	KFJW	Le Grand Radio	Tonawanda, Kan.	226	1320
KDYX	Star Bulletin	Honolulu, Hawaii	360	620	KFJX	Iowa State Teachers' Col.	Cedar Falls, Iowa	229	1310
KDZB	Frank E. Siefert	Bakersfield, Cal.	240	1250	KFJY	Terminal Radio Co.	Fort Dodge, Iowa	246	1220
KDZE	The Rhodes Co.	Seattle, Wash.	455	660	KFJZ	Texas National Guard	Fort Worth, Texas	254	1180
KDZF	Auto Club of So. California	Los Angeles, Cal.	278	1080	KFKA	Colo. State Teachers' College	Greeley, Colo.	248	1210
KDZT	Electric Supply Co.	Wenatchee, Wash.	360	830	KFKB	Brinkley-Jones Hospital	Millfeld, Kan.	286	1050
KDZK	Nev. Machine & Elec. Co.	Reno, Nevada	360	830	KFKH	Denver Park Amuse. Co.	Lakeside, Colo.	226	1320
KDZO	Nichols Academy of Music	Denver, Colo.	360	830	KFKO	Conway Radio Lab.	Conway, Ark.	224	1340
KDZR	Bellingham Publishing Co.	Bellingham, Wash.	261	1150	KFKV	F. Gray	Butte, Mont.	283	1060
KDZT	Seattle Radio Association	Seattle, Wash.	360	830	KFKX	West'ghouse Elec. & Mfg. Co.	Hastings, Neb.	286	1050
KFAE	McArthur Bros. Merc. Co.	Phoenix, Ariz.	360	830	KFKZ	Nassour Bros.	Colorado Springs, Colo.	234	1280
KFAF	State College of Washington	Pullman, Wash.	360	830	KFLA	A. R. Willson	Butte, Mont.	248	1210
KFAJ	Western Radio Corp.	Denver, Colo.	360	830	KFLB	Signal Mfg. Co.	Menominee, Mich.	248	1210
KFAN	University of Colorado	Boulder, Colo.	360	830	KFLD	P. E. Greenlaw	Franklinton, La.	234	1280
KFAP	The Electric Shop	Butte, Mont.	360	830	KFLE	Nat'l Educational Service	Denver, Colo.	268	1120
KFAR	Standard Publishing Co.	Hollywood, Cal.	280	1070	KFLP	Errickson Radio Co.	Salt Lake City, Utah	261	1150
KFAU	Studio Lighting Service Co.	Boise, Idaho	270	1110	KFLQ	E. N. Foster	Cedar Rapids, Iowa	240	1250
KFAV	Daily Sun	Boise, Idaho	270	1110	KFLR	Bizzell Radio Co.	Little Rock, Ark.	261	1150
KFAW	Abbott, Kinney Co.	Venice, Cal.	258	1160	KFLS	University of New Mexico	Albuquerque, N. M.	254	1180
KFAZ	The Radio Den	Santa Ana, Cal.	280	1070	KFLU	Rio Grande Radio Co.	San Benito, Texas	236	1270
KFBY	W. T. Virgin Milling Co.	Medford, Ore.	283	1060	KFLV	Rev. A. T. Frykman	Rockford, Ill.	229	1310
KFBZ	F. A. Buttrey & Co.	Havre, Mont.	360	830	KFLW	Missoula Elec. Supply Co.	Missoula, Mont.	234	1280
KFBC	W. K. Azbill	San Diego, Cal.	278	1080	KFLX	Geo. R. Clough	Galveston, Texas	240	1250
KFBE	Reuben H. Horn	San Luis Obispo, Cal.	360	830	KFLY	Fargo Radio Co.	Fargo, N. D.	231	1300
KFBG	First Presbyterian Church	Tacoma, Wash.	360	830	KFLZ	Atlantic Auto Co.	Fayetteville, Ark.	273	1100
KFBH	Kimball-Upson Co.	Sacramento, Cal.	283	1060	KFMO	University of Arkansas	Sioux City, Iowa	263	1140
KFBK	Leise Bros.	Everett, Wash.	224	1340	KFMR	Morningside College	Spokane, Wash.	283	1060
KFBL	Trinidad Gas & Elec. Co.	Trinidad, Colo.	360	830	KFZ	Doerr-Mitchell Elec. Co.	Tacoma, Wash.	252	1190
KFBS	The Cathedral	Laramie, Wyo.	283	1060	KGB	Tacoma Daily Ledger	Portland, Ore.	360	830
KFBT	Nielsen Radio Supply Co.	Phoenix, Ariz.	238	1260	KGG	Hallock & Watson Radio Ser.	Portland, Ore.	360	830
KFCB	Salem Electric Co.	Salem, Ore.	360	830	KGN	Northwestern Radio Mfg. Co.	Portland, Ore.	360	830
KFCD	Frank A. Moore	Walla Walla, Wash.	360	830	KGU	Marion A. Mulrony	Honolulu, Hawaii	360	830
KFCF	Electric Service Sta., Inc.	Billings, Mont.	360	830	KGW	Portland Morning Oregonian	Portland, Ore.	492	610
KFCH	Colorado Springs Radio Co.	Colorado Springs, Colo.	258	1150	KGY	St. Martin's College	Lacey, Wash.	258	1160
KFCK	Richmond Radio Shop	Richmond, Cal.	244	1230	KHJ	Los Angeles Times	Los Angeles, Cal.	395	760
KFCM	Ralph W. Flygare	Ogden, Utah	360	830	KHQ	Louis Wasmer	Seattle, Wash.	360	830
KFCN	Fred Mahaffey, Jr.	Houston, Texas	360	830	KJO	C. O. Gould	Stockton, Cal.	360	830
KFCO	Western Union College	Le Mars, Iowa	360	830	KJR	Northwest Radio Service	Seattle, Wash.	283	1060
KFCP	Omaha Central High School	Omaha, Neb.	258	1160	KJS	Bible Inst. of Los Angeles	Los Angeles, Cal.	360	830
KFCQ	Adlers Music Store	Baker, Ore.	360	830	KJN	Monterey Electric Shop	Monterey, Cal.	261	1150
KFCR	St. Michael's Cathedral	Boise, Idaho	252	1190	KKL	Warner Bros. Radio Co.	Oakland, Cal.	360	830
KFCS	University of Arizona	Tucson, Ariz.	360	830	KKLX	Tribune Publishing Co.	Oakland, Cal.	360	830
KFCT	Oregon Agricultural College	Corvallis, Ore.	360	830	KKLZ	Reynolds Radio Company	Denver, Colo.	360	830
KFCD	H. Everett Cutting	Bozeman, Mont.	248	1210	KKMJ	San Joaquin Lt. & Pr. Corp.	Fresno, Cal.	360	830
KFCE	Bullock's Hdw. & Spt. Goods	York, Neb.	360	830	KMO	Tacoma Times	Tacoma, Wash.	273	1100
KFCF	Nebraska Radio Elec. Co.	Lincoln, Neb.	240	1250	KNT	Gray's Harbor Radio Co.	Aberdeen, Wash.	263	1140
KFCG	Gilbrech & Stinson	Fayetteville, Ark.	360	830	KNV	Radio Supply Co.	Los Angeles, Cal.	256	1180
KFCH	First Baptist Church	Shreveport, La.	360	830	KNX	Elec. Lighting Supply Co.	Los Angeles, Cal.	360	830
KFCI	S. D. State Col. of Agric.	Brookings, S. D.	360	830	KOB	N. M. Col. of Ag. & Mec. Arts	State College, N. M.	360	620
KFCJ	Harry O. Iverson	Minneapolis, Minn.	231	1300	KOP	Detroit Police Department	Detroit, Mich.	286	1050
KFCK	Meier & Frank Co.	Portland, Ore.	360	830	KPO	Hale Bros.	San Francisco, Cal.	423	710
KFCL	Winner Radio Corp.	Denver, Colo.	360	830	KQI	University of California	Berkeley, Cal.	360	830
KFCM	Radio Equipment Co.	Denver, Colo.	360	830	KQJ	Apple City Radio Club	Hood River, Ore.	360	830
KFCN	J. L. Scroggin	Oak, Neb.	270	1110	KQK	Doubleday-Hill Elec. Co.	Pittsburgh, Pa.	360	830
KFCO	Auto Electric Service Co.	Fort Dodge, Iowa	231	1300	KQW	Chas. D. Herrold	San Jose, Cal.	360	830
KFCP	Radio Electric Shop	Douglas, Wyo.	263	1140	KRE	Berkeley Daily Gazette	Berkeley, Cal.	278	1080
KFCQ	Augsburg Seminary	Minneapolis, Minn.	261	1150	KSD	Post Dispatch	St. Louis, Mo.	546	550
KFCR	Bunker Hill & Sull. Mng. Co.	Kellogg, Idaho	360	830	KSL	The Emporium	San Francisco, Cal.	360	830
KFCS	Am. Soc. of Mech. Engineers	St. Louis, Mo.	360	830	KSS	Prest & Dean Radio Co.	Long Beach, Cal.	360	830
KFCU	Jenkins Furniture Co.	Boise, Idaho	273	1100	KTW	First Presbyterian Church	Seattle, Wash.	360	830
KFCV	Eastern Oregon Radio Co.	Pendleton, Ore.	360	830	KUO	Examiner Printing Co.	San Francisco, Cal.	360	830
KFCW	Dr. E. H. Smith	Hillsboro, Ore.	229	1310	KUS	City Dye Wks. & Laun. Co.	San Francisco, Cal.	360	830
KFCX	Marksheffel Motor Co.	Colorado Springs, Colo.	360	830	KUY	Coast Radio Company	El Monte, Cal.	256	1170
KFCY	Jim Kirk	Sparks, Nev.	226	1330	KWG	Portable Wireless Tel. Co.	Stockton, Cal.	360	830
KFCZ	Graceland College	Lamoni, Iowa	360	830	KWH	Los Angeles Examiner	Los Angeles, Cal.	360	830
KFD	McGraw Company	Alexandria, La.	275	1090	KXD	Herald Publishing Company	Modesto, Cal.	252	1190
KFD1	Pincus & Murphey	Dallas, Texas	226	1330	KYV	West'ghouse Elec. & Mfg. Co.	Chicago, Ill.	536	560
KFD2	Al. G. Barnes Amuse. Co.	Baton Rouge, La.	254	1180	KYO	Electric Shop	Honolulu, Hawaii	360	830
KFD3	Louisiana State University	Chickasha, Okla.	248	1210	KZM	Preston D. Allen	Oakland, Cal.	360	830
KFD4	Chickasha Radio & Elec. Co.	Chickasha, Okla.	248	1210	KZN	The Deseret News	Salt Lake City, Utah	360	830
KFD5	Leland Stanford University	Stanford Univ., Cal.	226	1330	KZV	Wenatchee Bat. & Motor Co.	Wenatchee, Wash.	360	830
KFD6	Mo. Nat. Guard, 138th Inf.	St. Louis, Mo.	226	1130	WAAB	Valdemar Jensen	New Orleans, La.	268	1120
KFD7	Arlington Garage	Arlington, Ore.	234	1250	WAAD	Tulane University	New Orleans, La.	463	650
KFD8	Cray Hardware Co.	Boone, Iowa	226	1330	WAAG	Ohio Mechanics Inst.	Cincinnati, Ohio	360	830
KFD9	Heidbreder Radio Sup. Co.	Utica, Neb.	224	1340	WAAP	Daily Drivers Journal	Chicago, Ill.	286	1050
KFD0	First Presbyterian Church	Orange, Texas	250	1200	WAAB	Gimbel Bros.	Milwaukee, Wis.	280	1070
KFD1	Gjelhaug's Radio Shop	Baudette, Minn.	224	1340	WAAM	I. R. Nelson Company	Newark, N. J.	263	1140
KFD2	Emmanuel Missionary Col.	Berrien Springs, Mich.	268	1120	WAAN	University of Missouri	Columbia, Mo.	254	1180
KFD3	Colo. State Normal School	Gunnison, Colo.	252	1190	WAAP	Omaha Grain Exchange	Omaha, Neb.	360	830
KFD4	Rialto Theatre	Hood River, Ore.	280	1070	WABB	Dr. John B. Lawrence	Harrisburg, Pa.	266	1130
KFD5	Utz Elec. Shop Company	St. Joseph, Mo.	226	1330	WABC	Fulwider-Grimes Battery Co.	Anderson, Ind.	229	1310
KFD6	Central Christian Church	Shreveport, La.	266	1130	WABD	Parker High School	Dayton, Ohio	283	1060
KFD7	Ambrose A. McCue	Neah Bay, Wash.	261	1150	WABE	Y. M. C. A.	Washington, D. C.	283	1060
KFD8	Fallon & Company	Santa Barbara, Cal.	360	830	WABF	Mt. Vernon Register	Mount Vernon, Ill.	234	1289
KFD9	Curtis Bros Hardware Store	Los Gatos, Cal.	242	1240	WABG	Arnold Edwards Piano Co.	Jacksonville, Fla.	248	1210
KFD0	Star Electric & Radio Co.	Seattle, Wash.	270	1110	WABH	Lake Shore Tire Co.	Sandusky, Ohio	240	1250
KFD1	Clifford J. Dow	Linue, Hawaii	275	1090	WABI	Bangor Railway & Elec. Co.	Bangor, Me.	240	1250
KFD2	M. S. Sateren	Mayville, N. D.	261	1150	WABJ	The Radio Laboratories	South Bend, Ind.	240	1250
KFD3	Robert W. Nelson	Hutchinson, Kan.	229	1310	WABK	First Baptist Church	Worcester, Mass.	252	1190
KFD4	Earle C. Anthony, Inc.	Los Angeles, Cal.	469	640	WABL	Conn. Agricultural College	Storrs, Conn.	283	1060
KFD5	Franklin W. Jenkins	St. Louis, Mo.	244	1230	WABM	F. E. Doherty Radio Sup. Co.	Saginaw, Mich.	254	1180
KFD6	Ross Arbuckle's Garage	Iola, Kan.	246	1220	WABN	Waldo C. Grover	La Cross, Wis.	234	1280
KFD7	Benson Poly. Institute	Portland, Ore.	360	830	WABO	Lave Ave. Baptist Church	Rochester, N. Y.	252	1190
KFD8	Gladbrook Electrical Co.	Gladbrook, Iowa	234	1280	WABP	Haverford Col. Radio Club	Haverford, Pa.	261	1150
KFD9	Windisch Elec. Farm Eqp. Co.	Louisburg, Kan.	234	1280	WABQ	Scott High School	Toledo, Ohio	270	1100
KFD0	North Central High School	Spokane, Wash.	252	1190	WABR	Essex Mfg. Co.	Newark, N. J.	244	1230
KFD1	Yakima Valley Radio Broad-	Yakima, Wash.	224	1340	WABS	Holliday Hall	Washington, Pa.	252	1190
KFD2	casting Association	Yakima, Wash.	224	1340	WABU	Victor Talking Machine Co.	Camden, N. J.	226	1330
KFD3	Alaska Elec. Light & Pr. Co.	Juneau, Alaska	226	1330	WABV	John H. De Witt	Nashville, Tenn.	263	1140
KFD4	V. H. Broyles	Pittsburgh, Kan.	240	1250	WBAA	Purdue University	W. Lafayette, Ind.	360	830
KFD5	Church of Latter Day Saints	Independence, Mo.	240	1250	WBAH	The Dayton Company	Minneapolis, Minn.	360	830
KFD6	Brott Laboratories	Seattle, Wash.	236	1270	WBAK	Pennsylvania State Police	Harrisburg, Pa.	400	750
KFD7	Daily Commonwealth	Fond du Lac, Wis.	273	1100	WBAN	Wireless Phone Corp.	Paterson, N. J.	246	1220
KFD8	Central Power Co.	Grand Island, Neb.	244	1280	WBAO	James Millikin University	Decatur, Ill.	360	830
KFD9	Marshall Electrical Co.	Marshalltown, Iowa	248	1210	WBAP	Star-Telegram	Fort Worth, Texas	476	620
KFD0	Seattle Post-Intelligencer	Seattle, Wash.	233	1290	WBAU	Republican Publishing Co.	Hamilton, Ohio	258	1160
KFD1	Weld Co. Ptg. & Pub. Co.	Greeley, Colo.	236	1270	WBAV	Erner & Hopkins Co.	Columbus, Ohio	390	770
KFD2	National Radio Mfg. Co.	Oklahoma City, Okla.	252	1190	WBAW	Marietta College	Marietta, Ohio	246	1220
KFD3	"The Sugar Bowl"	Selma, Cal.	273	1100	WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	360	830
KFD4	Liberty Theatre	Astoria, Ore.	252	1190	WBAY	American Tel. & Tel.	New York, N. Y.	492	610

Call	Owner	Location	Meters	Keys.	Call	Owner	Location	Meters	Keys.
WBBA	Newark Radio Laboratories	Newark, Ohio	240	1250	WJAM	D. M. Perham	Greentown, Ind.	254	1180
WBBD	Barbey Battery Service	Reading, Pa.	234	1280	WJAN	Peoria Star	Cedar Rapids, Iowa	268	1120
WBL	T. & H. Radio Company	Anthony, Kan.	261	1150	WJAO	Capper Publications	Peoria, Ill.	280	1070
WBR	Penna. State Police	Butler, Pa.	286	1050	WJAR	The Outlet Co.	Topeka, Kans.	360	830
WBS	D. W. May, Inc.	Newark, N. J.	360	830	WJAS	Pittsburgh Radio Sup. House	Pittsburgh, Pa.	360	830
WBT	Southern Radio Corporation	Charlotte, N. C.	360	830	WJAT	Kelly-Vawter Jewelry Co.	Marshall, Mo.	360	830
WBZ	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337	890	WJAX	Union Trust Co.	Cleveland, Ohio	390	760
WCAC	J. Finke Jewelry Mfg. Co.	Fort Smith, Ark.	360	830	WJAZ	Chicago Radio Laboratory	Chicago, Ill.	448	670
WCAD	St. Lawrence University	Canton, N. Y.	360	830	WJD	Dennison University	Granville, Ohio	229	1310
WCAE	Kaufman & Baer Company	Pittsburgh, Pa.	462	650	WJH	Wm. P. Boyer Company	Washington, D. C.	273	1100
WCAJ	C. R. Randall	New Orleans, La.	268	1120	WJX	De Forest Radio T. & T. Co.	New York, N. Y.	360	830
WCAH	Entrekin Electric Company	Columbus, Ohio	286	1050	WJY	Radio Corp. of America	New York, N. Y.	405	740
WCAI	Nebraska Wesleyan Univ'ity	University Place, Neb.	360	830	WJZ	Radio Corp. of America	New York, N. Y.	455	660
WCAK	Alfred P. Daniel	Houston, Texas	360	830	WKAA	H. F. Paar	Cedar Rapids, Iowa	360	830
WCAL	St. Olaf College	Northfield, Minn.	360	830	WKAD	Charles Loeff	E. Providence, R. I.	240	1250
WCAM	Villanova College	Villanova, Pa.	360	830	WKAF	U. S. Radio Supply Co.	Wichita Falls, Texas	360	830
WCAO	Sanders & Stayman Company	Baltimore, Md.	360	830	WKAN	United Battery Co.	Montgomery, Ala.	226	1330
WCAP	Chesapeake & Potomac Tel. Co.	Washington, D. C.	469	640	WKAP	Dutec W. Flint	Cranston, R. I.	360	830
WCAR	Alamo Radio Elec. Co.	San Antonio, Texas	360	830	WKAQ	Radio Corp. of Porto Rico.	San Juan, P. R.	360	830
WCAS	Wm. Hood Dunwoody Ind. Inst.	Minneapolis, Minn.	246	1220	WKAJ	Mich. Agricultural College	E. Lansing, Mich.	280	1070
WCAT	S. D. School of Mines	Rapid City, S. D.	240	1250	WKAU	Laconia Radio Club	Laconia, N. H.	254	1180
WCAU	Durham & Company	Philadelphia, Pa.	286	1050	WKAW	Turner Cycle Company	Beloit, Wis.	242	1240
WCAV	J. C. Dice Elec. Co.	Little Rock, Ark.	360	830	WKAY	Brenau College	Gainesville, Ga.	280	1070
WCAW	Kesselman O'Driscoll Co.	Milwaukee, Wis.	261	1150	WKY	WKY Radio Shop	Oklahoma City, Okla.	360	620
WCBA	Charles W. Heimbach	Allentown, Pa.	280	1070	WLAG	Cutting & Wash. Radio. Corp.	Minneapolis, Minn.	417	720
WCBD	Wilbur G. Voliva	Zion, Ill.	345	870	WLAH	Samuel Woodworth	Syracuse, N. Y.	234	1250
WCE	Findley Electric Company	Minneapolis, Minn.	360	830	WLAJ	Waco Elec. Supply Co.	Waco, Texas	360	830
WCK	Stix-Baer & Co. & Fuller Co.	St. Louis, Mo.	360	830	WLAK	Vt. Farm Machine Corp.	Bellows Falls, Vt.	360	830
WCM	University of Texas	Austin, Texas	360	830	WLAL	Naylor Elec. Co.	Tulsa, Okla.	360	830
WCX	Detroit Free Press	Detroit, Mich.	517	580	WLAN	Putnam Hardware Co.	Houlton, Maine	283	1050
WDAE	Tampa Daily Times	Tampa, Fla.	360	830	WLAP	W. V. Jordan	Louisville, Ky.	360	830
WDAF	Kansas City Star	Kansas City, Mo.	411	730	WLAQ	A. E. Schilling	Kalamazoo, Mich.	283	1060
WDAH	J. Lawrence Martin	Amarillo, Texas	263	1140	WLAU	Electric Shop	Pensacola, Fla.	254	1180
WDAH	Trinity Meth. Church (So.)	El Paso, Texas	268	1120	WLAU	Police Dept. of N. Y. City	New York, N. Y.	360	830
WDAJ	Atlanta & West Point R.R. Co.	College Park, Ga.	360	830	WLAX	Putnam Electric Company	Greencastle, Ind.	231	1300
WDAK	The Courant	Hartford, Conn.	261	1150	WLB	University of Minnesota	Minneapolis, Minn.	360	830
WDAL	Florida Times-Union	Jacksonville, Fla.	360	830	WLW	Crosley Mfg. Co.	Cincinnati, Ohio	309	970
WDAO	Automotive Electric Co.	Dallas, Texas	360	830	WMAJ	Clive B. Meredith	Cazenovia, N. Y.	261	1150
WDAP	Board of Trade	Chicago, Ill.	360	830	WMAK	Round Hills Radio Corp.	Dartmouth, Mass.	360	830
WDAR	Lit Bros.	Philadelphia, Pa.	395	760	WMAK	General Supply Company	Lincoln, Nebr.	254	1180
WDAS	Samuel A. Waite	Worcester, Mass.	360	830	WMAJ	Drovers Telegram Company	Kansas City, Mo.	275	1090
WDAU	Slocum & Kilburn	New Bedford, Mass.	360	830	WMAK	Norton Laboratories	Lockport, N. Y.	360	830
WDAX	First Nat'l Bank	Centerville, Iowa	268	1120	WMAL	Trenton Hardware Company	Trenton, N. J.	256	1170
WDAY	Fargo Radio Electric Co.	Fargo, N. D.	244	1280	WMAN	Broad St. Baptist Church	Columbia, Ohio	286	1050
WDBC	Kirk, Johnson & Company	Lancaster, Pa.	258	1160	WMAJ	Utility Battery Service	Easton, Pa.	246	1220
WDM	Church of the Covenant	Washington, D. C.	360	830	WMAJ	Chicago Daily News	Chicago, Ill.	448	672
WDZ	James L. Bush	Tuscola, Ill.	248	1210	WMAV	Alabama Poly. Inst.	Auburn, Ala.	250	1200
WEAA	Fallain & Lathrop	Flint, Mich.	280	1070	WMAZ	Kingshighway Pres. Church	St. Louis, Mo.	280	1070
WEAF	West. Elec. Co. (A. T. & T.)	New York, N. Y.	492	610	WMAZ	Mercer University	Macon, Ga.	268	1120
WEAH	Wichita Board of Trade	Wichita, Kan.	244	1230	WMC	Commercial Appeal	Memphis, Tenn.	500	600
WEAI	Cornell University	Ithaca, N. Y.	286	1050	WMU	Doubleday-Hill Elec. Co.	Washington, D. C.	261	1150
WEAJ	University of South Dakota	Vermilion, S. D.	280	1070	WNAC	Shepard Stores	Boston, Mass.	278	1080
WEAM	Borough of North Plainfield	North Plainfield, N. J.	252	1190	WNAD	University of Oklahoma	Norman, Okla.	360	830
WEAN	Shepard Company	Providence, R. I.	273	1100	WNAL	R. J. Rockwell	Omaha, Nebr.	242	1240
WEAO	Ohio State University	Columbus, Ohio	360	830	WNAM	Ideal Apparatus Company	Evansville, Ill.	360	830
WEAP	Mobile Radio Company	Mobile, Ala.	360	620	WNAN	Syracuse Radio Telephone Co.	Syracuse, N. Y.	286	1050
WEAR	Baito. Am. & News Pub. Co.	Baltimore, Md.	360	830	WNAP	Wittenberg College	Springfield, Ohio	230	1300
WEAS	Hecht Company	Washington, D. C.	360	830	WNAO	Charleston Radio Elec. Co.	Charleston, S. C.	360	830
WEAU	Davidson Bros. Company	Sioux City, Iowa	360	830	WNAJ	C. C. Rhodes	Butler, Mo.	231	1300
WEAY	Will Horowitz, Jr.	Houston, Texas	360	830	WNAS	Austin Statesman	Austin, Tex.	360	830
WEB	Benwood Company	St. Louis, Mo.	360	830	WNAT	Lenning Bros. Co.	Philadelphia, Pa.	360	830
WEV	Hurlburt-Still Electrical Co.	Houston, Texas	360	830	WNAU	Peoples Tel. & Tel. Co.	Knoxville, Tenn.	236	1270
WEW	St. Louis University	St. Louis, Mo.	261	1150	WNAW	Peninsular Radio Club	Ft. Monroe, Va.	360	830
WEAA	Dallas News & Dallas Journal	Dallas, Texas	476	620	WNAW	Dakota Radio Apparatus Co.	Yankton, S. Dak.	244	1280
WEAB	Carl F. Woese	Syracuse, N. Y.	234	1280	WNJ	Shotton Radio Mfg. Co.	Albany, N. Y.	360	830
WEAF	H. C. Spratley Radio Co.	Poughkeepsie, N. Y.	360	830	WOAA	Dr. Walter Hardy	Armore, Okla.	360	830
WEAG	Electric Supply Company	Port Arthur, Texas	360	830	WOAB	Valley Radio	Grand Forks, N. D.	280	1070
WEAH	Hi-Grade Wireless Inst. Co.	Asheville, N. C.	360	830	WOAC	Maus Radio Co.	Lima, Ohio	266	1130
WEAI	Times Publishing Company	St. Cloud, Minn.	485	620	WOAD	Friday Battery & Elec. Corp.	Sigourney, Iowa	360	830
WEAJ	Hutchinson Elec. Ser. Co.	Hutchinson, Minn.	360	830	WOAE	Midland College	Fremont, Nebr.	360	830
WEAK	Wo. Wesleyan College	Cameron, Mo.	360	830	WOAF	Tyler Commercial College	Tyler, Tex.	360	830
WEAL	Daily Argus-Leader	Sioux Falls, S. D.	360	830	WOAG	Apollo Theatre	Belvidere, Ill.	224	1340
WEAV	U. of Neb. Dept. of Elec Eng.	Lincoln, Neb.	275	1090	WOAH	Palmetto Radio Corp.	Charleston, S. C.	360	830
WEI	Strawbridge & Clothier	Philadelphia, Pa.	395	760	WOAI	Evening News & Express	San Antonio, Tex.	385	780
WEG	Lancaster Elec. Supply Co.	Lancaster, Pa.	248	1210	WOAJ	Ervine Electrical Co.	Parsons, Kans.	360	830
WGA	Cecil E. Lloyd	Pensacola, Fla.	360	830	WOAL	Em. E. Woods	Webster Groves, Mo.	286	1050
WGAL	Glenwood Radio Corp.	Shreveport, La.	360	830	WOAN	Vaughn Conservat'y of Music	Lawrenceburg, Tenn.	360	830
WGBO	Ernest C. Albright	Altoona, Pa.	261	1150	WOAO	Lyradion Mfg. Co.	Mishawaka, Ind.	360	830
WGAW	North Western Radio Co.	Madison, Wis.	360	830	WOAP	Kalamazoo College	Kalamazoo, Mich.	240	1250
WGAY	South Bend Tribune	South Bend, Ind.	360	830	WOAQ	Portsmouth Kiwanis Club	Portsmouth, Va.	360	830
WGZ	Amer. Radio Research Corp.	Medford Hillside, Mass.	485	620	WOAR	Henry P. Lundsckow	Kenosha, Wis.	229	1310
WGI	Federal Tel. & Tel. Co.	Buffalo, N. Y.	360	830	WOAT	Boyd M. Hamp	Wilmington, Del.	360	830
WGR	Interstate Electric Co.	New Orleans, La.	360	830	WOAV	Penn. National Guard	Erie, Pa.	242	1240
WGV	General Electric Co.	Schenectady, N. Y.	380	760	WOAW	Woodmen of the World	Omaha, Nebr.	526	570
WGY	University of Wisconsin	Madison, Wis.	360	830	WOAX	Franklin J. Wolff	Trenton, N. J.	240	1250
WHAA	State University of Iowa	Iowa City, Iowa	283	1060	WOC	Palmer Sch. of Chiropractic	Davenport, Iowa	484	620
WHAB	Clark W. Thompson	Galveston, Texas	360	830	WOI	Iowa State College	Ames, Iowa	360	830
WHAC	Cole Bros Elec. Co.	Waterloo, Iowa	360	830	WOO	John Wanamaker	Philadelphia, Pa.	509	590
WHAD	Marquette University	Milwaukee, Wis.	280	1070	WOQ	Western Radio Company	Kansas City, Mo.	360	830
WHAG	University of Cincinnati	Cincinnati, Ohio	222	1350	WOR	L. Bamberger & Co.	Newark, N. J.	405	740
WHAH	Haer Supply Co.	Joplin, Mo.	283	1060	WOS	Mo. State Marketing Bureau	Jefferson City, Mo.	441	680
WHAK	Roberts Hardware Co.	Clarksburg, W. Va.	360	830	WPAB	Penn. State College	State College, Pa.	283	1060
WHAM	University of Rochester	Rochester, N. Y.	283	1060	WPAC	Donaldson Radio	Okmulgee, Okla.	360	830
WHAP	Otta & Kuhns	Decatur, Ill.	360	830	WPAH	Wis. Dept. of Markets	Waupaca, Wis.	360	830
WHAR	Paramount Radio & Elec. Co.	Atlantic City, N. J.	231	1300	WPAJ	Doolittle Radio Corp.	New Haven, Conn.	268	1120
WHAS	Courier-Journal & Lo. Times	Louisville, Ky.	400	750	WPAK	N. Dak. Agricultural College	Agricultural Col., N. D.	360	620
WHAV	Wilmington Elec. Spec. Co.	Wilmington, Del.	360	830	WPAL	Superior Rad. Tel. & Eqp. Co.	Columbus, Ohio	286	1050
WHAZ	Rensselaer Poly. Inst.	Troy, N. Y.	380	760	WPAM	Auerbach & Guettel	Topeka, Kans.	360	830
WHB	Sweeney School Co.	Kansas City, Mo.	411	730	WPAN	Theodore D. Philips	Winchester, Ky.	360	830
WHK	Radio Box Co.	Cleveland, Ohio	283	1060	WPAQ	Gen. Sales & Engineering Co.	Frostburg, Md.	360	830
WHN	Loew's State Theatre	New York, N. Y.	360	830	WPAR	Ward Battery & Radio Co.	Beloit, Kans.	283	1060
WHO	Mich. Limestone & Chem. Co.	Rogers, Mich.	300	1000	WPAT	St. Patrick's Cathedral	El Paso, Tex.	360	830
WHI	Joslyn Automobile Co.	Rockford, Ill.	252	1190	WPAU	Concordia College	Moorhead, Minn.	360	620
WHJ	Galveston Tribune	Galveston, Texas	360	830	WPAZ	Dr. John R. Koch	Charleston, W. Va.	273	1100
WHK	H. R. Miller	Philadelphia, Pa.	254	1180	WPG	Nushagwa Poultry Farm	New Lebanon, Ohio	234	1280
WHL	Gustava DeCortin	New Orleans, La.	234	1250	WQA	Horace A. Beale, Jr.	Parkesburg, Pa.	360	830
WHM	Continental Radio & Mfg. Co.	Newton, Iowa	360	830	WQAC	E. B. Gish	Amarillo, Tex.	360	830
WHN	Heer Stores Company	Springfield, Mo.	252	1190	WQAD	Whithall Electric Co.	Waterbury, Conn.	242	1240
WHO	Fox Riv. Val. Radio Supply Co.	Neenah, Wis.	224	1340	WQAE	Moore Radio News Sta.	Springfield, Vt.	275	1090
WHI	Journal-Stockman Co.	Omaha, Neb.	278	1080	WQAF	Sandusky Register	Sandusky, Ohio	240	1250
WHI	School of Eng. of Milwaukee	Milwaukee, Wis.	360	830	WQAH	Brock-Anerson Elec. Eng. Co.	Lexington, Ky.	254	1180
WHI	Chronicle Publishing Co.	Marion, Ind.	226	1330	WQAL	Coles Co. Tel. & Tel. Co.	Mattoon, Ill.	258	1160
WHI	Home Electric Company	Burlington, Iowa	360	830	WQAM	Electrical Equipment Co.	Miami, Fla.	360	830
WHI	Leon T. Noel	Tarkio, Mo.	360	830	WQAN	Scranton Times	Scranton, Pa.	280	1070
WHI	Am. Trust & Savings Bank	Le Mars, Iowa	360	830	WQAO	Calvary Baptist Church	New York, N. Y.	360	830
WHI	K. & L. Elec. Supply Co.	McKeesport, Pa.	360	830	WQAP	West Texas Radio Co.	Abilene, Tex.	285	1050
WHI	Continental Elec. Supply Co.	Washington, D. C.	360	830	WQAS	Prince-Walter Company	Lowell, Mass.	266	1130
WHI	Gimbel Bros.	Philadelphia, Pa.	50						

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JANUARY 5, 1924

The Future of Radio

THE fact that radio has so established itself with the general public as to approach almost the proportions of a public utility, which shortly it will become, does not prevent the layman from making the frequent inquiry "What is the future of radio?" This question is asked usually with the object of learning from one connected with the industry whether radio is a fad, a game, a passing form of amusement, a narrow scientific achievement with restricted and technical possibilities only or whether it is something that eventually will enter the daily life of every man.

To one on the inside looking out, an attempt to answer such a question from the uninformed outsider is surrounded with difficulties—principally those of restraint. The future of radio is so broad, so over-

whelming in its possibilities touching the very fundamentals of life as we know it; its necessary and far-reaching effects on the social and economic fabrics of the whole world; its very pregnant possibilities as a factor in future world peace, perhaps through forcing the adoption of a universal language leading to a better understanding and more intimate contact between the nations of the earth—all these and other considerations equally interesting if not as important, cause the would-be prophet to hesitate before declaring himself fully or making even a partial prediction. Amongst a wealth of jewels one hesitates to choose even a diamond.

Basically the radio industry is one of anomalies. It is founded on scientific laws discovered long ago and for many years applied to other electrical requirements of man. Only within the last decade have these elementary principles been adapted to radio apparatus. The inventors who have developed the radio devices of today all have been young men, even boys. Hence it is often called "the young man's" industry. The older generation of electrical scientists regretfully look back on things they might have done. And these young inventors have secured the future to themselves in many instances through the protection of the Patent Office. In fact, the whole radio structure is built upon a foundation of patent protection assembled, in at least one case, from the choicest talent of several nations.

And yet, over against this patent protection, must be set the natural disinclination of the manufacturer to involve a considerable capital investment in equipment for making a device which may be superseded in the morning by something better or simpler or less expensive or all three. The status of the industry is still so youthful that such possibilities are more than likely to prove not only probabilities, but cold facts. But let it be said to the credit of the industry as a whole that no such considerations as those mentioned have at any time militated against legitimate progress.

Then again, the broad-visioned and liberal policy pursued by those who control the patent situation toward the amateur builder of radio apparatus has done more than can be told to advance the public's appreciation of radio. And on top of that, the wonderful programs supplied free of any charge to all who will receive them from the air has stabilized the art in public approval. No attempt has been made to prevent or restrict the amateur in build-

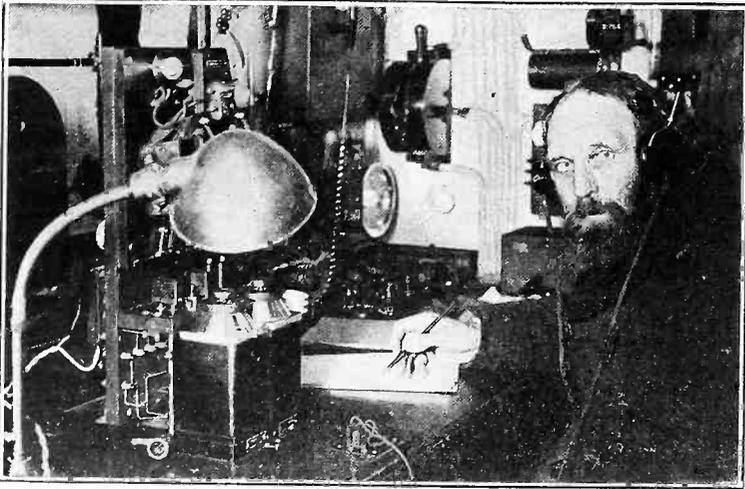
ing radio receiving sets not only for himself but for his friends. As a matter of fact, the making of radio sets has approached very closely the old cottage industry and still is growing.

Suppose that when the typewriter had been commercially developed and introduced, a hundred manufacturers of typewriter parts had sprung up and offered these parts for sale to amateur builders with diagrams of complete writing machines and instructions for building them. Would the owners of the patents and the monied men behind the manufacturing plants have stood idly by? The answer is obvious. And yet the radio industry has been encouraged to grow and develop by the liberal policy adopted and still carried on by the owners of patents which are worth millions of dollars. It seems to us that the height, depth and width of the whole radio industry is here emphasized and accentuated. Not many industries with a less strong public appeal could exist, let alone grow daily, under such a policy.

Therefore, it would seem from even this cursory glance at a most interesting background that at present there is nothing to hinder the future expansion of radio. The limits of its development no man can dream. It seems certain that radio will affect the people most widely as a public utility. It already has been demonstrated that the user of electric light can enjoy radio programs broadcast by his central station company and received on apparatus supplied by the company. For this, of course, an extra charge is made. The next, and most obvious, step is to have radio service supplied by the local telephone company. In the near future one undoubtedly will be able to contract for telephone service, as now, or for the same service plus a continuous radio program of news, market reports, concerts, church services and so on as now supplied by the broadcasting stations. All this, probably, in addition to the free programs furnished at present and received on private sets.

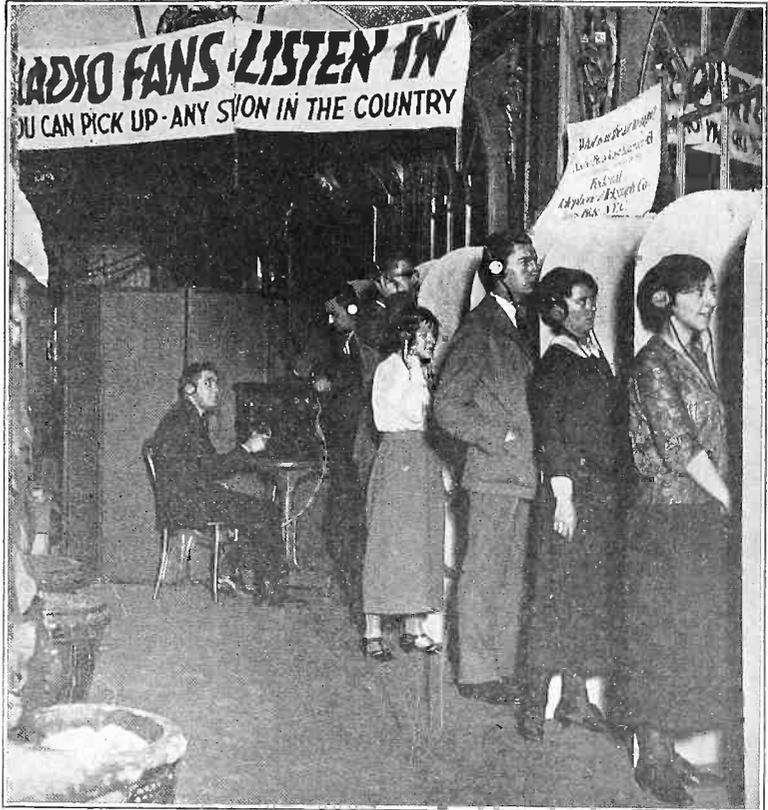
The technical future of radio is not of much concern to the layman. He is interested only insofar as radio progress improves the results he gets from his receiver—he doesn't care how they happen or are developed. And yet we venture to predict that the future holds in store technical progress of such magnitude and astounding wonders that radio of today will seem like child's play.

People in the Radio News Pictured



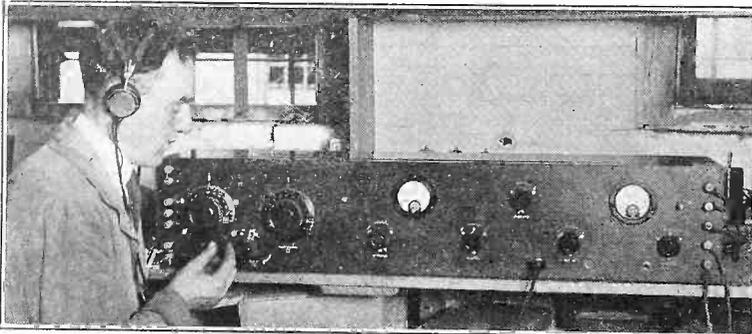
(C. Foto Topics)

Anton Lang, the Christus of the Oberammergau Passion Players, snapped while listening to American broadcasting when the ship that brought these famous players over neared New York. The broadcasting of the sermons and hymns from the famous old churches in and around New York was a constant source of wonder to these players, and especially appealed to Lang, who spent a great deal of his time listening in.



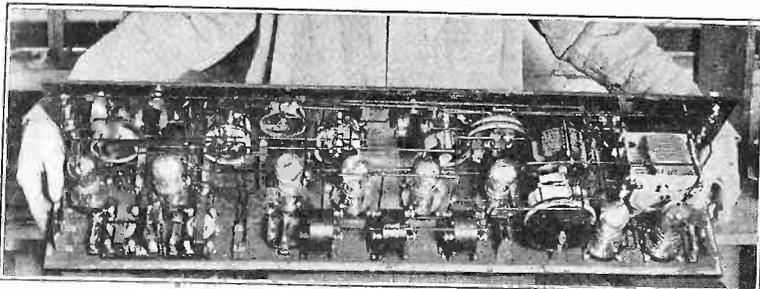
(C. Foto Topics)

At the recent radio ball, given at the Roseland Dance Hall, New York, advocates of terpsichore had a chance to listen in on the world, by means of the Federal receiver donated for the purpose. There were over twenty booths arranged along the wall, and each had a pair of phones. An experienced operator of the receiver was in charge, and you had but to ask for a station—bing—there it was.



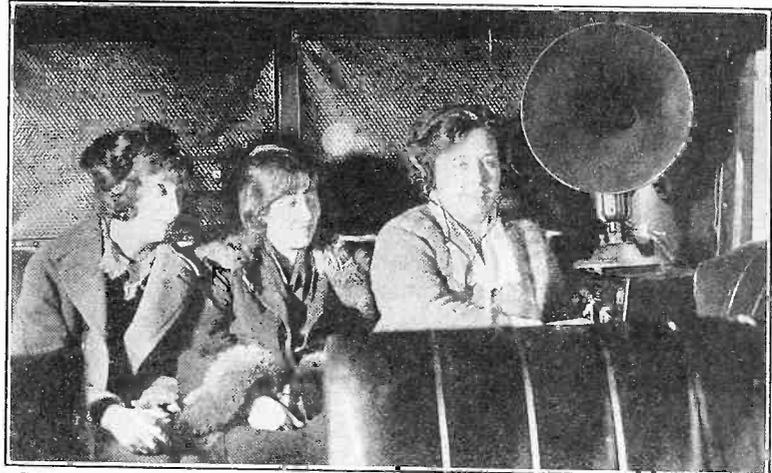
(C. Kadel and Herbert)

W. K. Koellner, radio engineer and well-known super-heterodyne experimenter, testing out his latest creation in the way of a "super". It is an eight-tube affair and has but two tuning controls. The rheostats are not counted in as controls because of the filament control jacks. This makes one of the most powerful sets known, also one of the simplest.



(C. Kadel and Herbert)

The inside works of the "baby" shown above. Most all standard apparatus is used, with the exception of one transformer and the coupler. Note the extremely neat wiring and the method of laying it out so that everything is in a place and there is a place for everything, even though eight tubes, several transformers and other similarly bulky apparatus is necessary. This type of receiver is the most powerful made, and there is no range limit to them as they are always "steppin' better." Note that this "super" is complete in one cabinet instead of two as is usual.



(C. International Newsreel)

The new Prunier Coach Line, established for passenger traffic between New York and Montreal, and the first of its kind, has its coaches fully equipped with radio, to cheer the passengers during their long ride. This is the first coach line established for this mode of travel, and radio is only one of the many comforts afforded the patrons of the line. The illustration shows three prominent New Yorkers enjoying the concert of WGY while riding through the mountain section of upper New York State.



(C. Harris and Ewing)

The Interdepartmental Radio Advisory Committee, composed of the representatives of all Government departments, who met recently in executive session to discuss the present troubles of radio and to suggest remedies. Judge Stephen B. Davis, of the Department of Commerce, is chairman.

Here Are Good Broadcast Programs

Station WOC, Davenport, Iowa

484 Meters (620 Kilocycles), Central Standard Time. January 4.—10:00 A. M.—Opening market quotations and household hints. 10:55 A. M.—Time signals. 11:00 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12:00 Noon—Chimes concert. 2:00 P. M.—Closing stocks and markets. 3:30 P. M.—Educational program—(Musical numbers to be announced). Lecture by C. A. Russell. Subject, "Radium and Radio Activity." 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 7:00 P. M.—Educational lecture, "Plans and Purposes of the Farmers' National Union of America," by J. Harvey Robillard, general counsel, of Kankakee, Illinois. 7:20 P. M.—Sunday school lesson—International lesson for next Sunday discussed by Dr. Frank Willard Cour, pastor St. John's Methodist Episcopal Church, Davenport, Iowa. 8:00 P. M.—Musical program (1 hour) Erwin Swindell, musical director. Program of old-time fiddle music by fiddlers from Muscatine and Riverside, Iowa.

January 5.—10:00 A. M.—Opening market quotations and household hints. 10:55 A. M.—Time signals. 11:00 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12:00 Noon—Chimes concert. 12:30 P. M.—Closing stocks and markets. 3:30 P. M.—Educational program—(Musical number to be announced). Lecture by C. C. Hall. Subject, "A Silk Worm." 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 9:00 P. M.—Orchestra program (1 hour) P. S. C. Orchestra. Gerald M. Barrow, director.

Station WRC, Washington, D. C.

469 Meters (640 Kilocycles), Eastern Standard Time. January 4.—5:15 P. M.—Instruction in code practice. 6:00 P. M.—Children's hour by Peggy Albion. 8:00 P. M.—A talk on the Coast Guard by Oliver M. Maxon, chief of the Division of Operations of the United States Coast Guard. 8:15 P. M.—Song recital by F. W. Schieck, tenor. 8:30 P. M.—A talk on the Study of the Bible. 8:45 P. M.—Song recital by Beatrice Wheeler, soprano. 9:00 P. M.—Concert by the Albert Trio. 9:15 P. M.—Piano recital by Marie Young. 9:30 P. M.—Song recital by Wanda Brent, contralto. 9:55 P. M.—Re-transmission of time signals and weather reports. 10:00 P. M.—Concert of dance music by Hal Lee Vim's Southern Syncopators.

January 5.—3:00 P. M.—Fashion Developments of the Moment by Women's Wear. 3:10 P. M.—Report of the Conference Board. 3:20 P. M.—Piano recital of popular music by Ellen Gaunt. 3:35 P. M.—The Magazine of Wall Street. 3:45 Song recital by Henrietta Black, soprano. 4:00 P. M.—Current Events prepared by the Review of Reviews. 5:15 P. M.—Instruction in code practice. 6:00 P. M.—Children's hour by Peggy Albion.

Station WBZ, Springfield, Mass.

337 Meters (890 Kilocycles), Eastern Standard Time. January 4.—11:55 P. M.—Arlington time signals; weather reports; Boston and Springfield market reports. 6:00 P. M.—Dinner concert by the WBZ Quintette. 7:00 P. M.—"A Whistling Wind" by the Youth's Companion. 7:30 P. M.—Twilight tales for the kiddies. Current Book Review. 7:50 P. M.—Talk by a member of the Eastern State Farmers' Exchange. 8:00 P. M.—Concert and dance music furnished by Jarrett's Orchestra, directed from the Springfield Auditorium. 9:55 P. M.—Arlington time signals. 11:00 P. M.—Program of chamber music by the WBZ Quartette; and the Moran Trio.

January 5.—11:55 A. M.—Arlington time signals; weather reports; Boston and Springfield market reports. 7:00 P. M.—Dinner concert by the Hotel Kimball Trio directed from the Hotel Kimball dining room. 7:30 P. M.—Twilight tales for the kiddies. "Bringing the World to America." 8:00 P. M.—Concert by Loretta Champagne, pianist; Miss McDonald, soprano. 9:00 P. M.—Bedtime story for grownups by Orison S. Marsden. 9:55 P. M.—Arlington time signals.

Station WFAA, Dallas, Texas

476 Meters (630 Kilocycles), Central Standard Time. January 4.—12:30-1:00—Address by Dr. Robert Stewart Hyer, Southern Methodist University, on "The Sunday School Lesson. 8:30-9:30—Aida Choral Club, Portia Washington Pittman, director and accompanist.

January 5.—12:30-1:00—Address, Frank Reedy, on "The Mountains of Mexico." 8:30-9:30—Musical recital, presenting Don Albert, directing the orchestra, broadcast from the Palace Theater. 11:00-12:00—Harris Bros. Orchestra in dance music.

January 6.—6:00-7:00 P. M.—Radio Bible class, Dr. William M. Anderson, Jr., pastor of the First Presbyterian Church, teacher; half hour Bible study, half hour gospel song. 9:30-10:00—Choristers from Gaston Avenue Baptist Church. 10:00-11:00—Ligon Smith's Orchestra in dance music program.

Station KYW, Chicago

536 Meters (560 Kilocycles), Central Standard Time. January 4.—9:30 A. M.—Late news and comment of the financial and commercial markets. (This service is broadcast every half hour during the twenty-four). 11:35 A. M.—Table talk by Mrs. Anna J. Peterson of Peoples Gas Company. 12:30 P. M.—"The Progress of the World" by Review of Reviews. 6:50 P. M.—Children's bedtime story. 8:00 P. M.—Program furnished by the American Farm Bureau Federation. 10:00 to 12:30 A. M.—Midnight Revue. KYW, "The World Crier Station" will broadcast the latest news of the world every half hour day and night.

January 5.—9:30 A. M.—Late news and comment of the financial and commercial markets. (This service is broadcast every half hour during the twenty-four.) 10:30 A. M.—Farm and Home Service. 11:35 A. M.—Table talk by Mrs. Anna J. Peterson of the Peoples Gas Company. 6:30 P. M.—News, financial and final market and sport summary furnished by the Union Trust Company and Dun's Review. 6:50 P. M.—Children's bedtime story. 8:00 to 8:58 P. M.—Musical program. 9:05 to 9:25 P. M.—"Under the Evening Lamp" service furnished by the Youth's Companion.

January 6.—11:00 A. M.—Central Church service broadcast from Orchestra Hall, Chicago. Dr. F. F. Shannon, pastor. 6:30 P. M.—Excerpts from the New Testament—An American translation by Prof. E. J. Goodspeed, read by William Ziegler Nourse. 7:00 P. M.—Chicago Sunday Evening Club service broadcast from Orchestra Hall, Chicago. Special musical program under the direction of Edgar Nelson.

Station WHAZ, Troy, N. Y.

380 Meters (790 Kilocycles), Eastern Standard Time. Advance Programs. Monday evenings at 9 P. M., Eastern Standard Time:

January 7.—Program arranged by Edna B. Towne, elocutionist and reader, assisted by Jermain Memorial Church Quartet and Mrs. Robert Hanna, violinist. Educational talk by Prof. Thomas R. Lawson of the Rensselaer Polytechnic Institute faculty.

January 14.—Concert of operatic numbers under the direction of Captain and Mrs. Albert Geiser. Talk on "Telephone Courtesy" by Harry F. Carroll. Late program at midnight by Rensselaer Polytechnic Institute Students' Symphony Orchestra and Glee Club.

January 21.—Concert recital of songs and ballads under the direction of Dick Reece. Address on "College Athletics" by Captain Harry A. Van Velsor, director of physical education at Rensselaer Polytechnic Institute. Thrift talk by George N. Patrick.

January 28.—Another of the popular programs of old-time melodies by the Radio Male Quartet and Trorad Mixed Quartet under the direction of Will H. Wade. Educational address on chemical engineering.

Station WLW, Cincinnati, Ohio

309 Meters (970 Kilocycles), Central Standard Time. January 4.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Market reports. 3:00 P. M.—Business reports. 4:00 P. M.—Lecture recital by Mildred Templeton Williams of the Cincinnati Conservatory of Music.

January 5.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Stock exchange and business reports.

January 6.—Sunday school services at 9:30 and regular morning services of the Church of the Covenant, beginning at 11 o'clock.

Station WGY, Schenectady, N. Y.

380 Meters (790 Kilocycles), Eastern Standard Time.—January 4.—7:45 P. M.—Radio comedy, "Here Comes the Bride" (Marcin and Atwell), presented by WGY Players; music by WGY Orchestra. 10:30 P. M.—Musical program by Edward A. Rice, violinist; Isabelle Franklin, soprano; Peter Schmidt, clarinetist; and the WGY Orchestra.

January 5.—9:30 P. M.—Program of dance music by Jack Symond's Orchestra, Hampton Hotel, Albany, N. Y.

Station KSD, St. Louis, Mo.

546 Meters (540 Kilocycles), Central Standard Time. January 3.—8:00 P. M.—Broadcasting the concert of the St. Louis Symphony Orchestra, Rudolph Ganz, conductor; Ossip Gabrilowitsch, pianist, soloist, as given at the Odeon.

January 4.—Silent.
January 5.—7:15 P. M.—Orchestra concert, organ recital, vocal and instrumental specialties broadcast direct from the Missouri Theater.

Station WTAM, Cleveland, Ohio

390 Meters (770 Kilocycles), Eastern Standard Time. January 5.—9:00 P. M.—Dance program by WTAM Orchestra. Soles by Miss Jule Sigmund.

Station KDKA, East Pittsburgh, Pa.

326 Meters (920 Kilocycles), Eastern Standard Time. January 4.—9:45 A. M.—Union live stock market report. 1:55 A. M.—Arlington time signals. 12:00 M.—Weather forecast; United States Bureau of Market reports. 12:10 P. M.—Noon-day concert. 6:15 P. M.—Organ recital by Lucile Hale, from the Cameo Motion Picture Theater, Pittsburgh, Pa. 7:15 P. M.—Radio Boy Scout meeting. 7:45 P. M.—The children's period. 8:00 P. M.—National Stockman and Farmer market report. 8:15 P. M.—Sunday school lesson for January 6, presented by Dr. R. L. Lanning. 8:30 P. M.—Concert by Edith Lucile Hale; piano Rex Call, June Call, William Cook, violin; Ruth Keally, reader. 9:55 P. M.—Arlington time signals. Weather report.

January 5.—9:45 A. M.—Union Live Stock market reports. 11:55 A. M.—Arlington time signals. 12:00 M.—Weather forecast—United States Bureau of Market reports. 12:10 P. M.—Noon-day concert by Dougherty's Orchestra from McCreery's dining rooms. 6:15 P. M.—Dinner concert by the Westinghouse Band under the direction of T. J. Vastine. 7:30 P. M.—"Bringing the World to America," prepared by "Our World." 7:45 P. M.—The children's period. 8:15 P. M.—"Budgeting for Better Business," Dr. Charles Reittel, Professor of Accounting, University of Pittsburgh, Pittsburgh, Pa. 8:30 P. M.—Concert by the Westinghouse Band, under the direction of T. J. Vastine. 9:55 P. M.—Arlington time signals. Weather forecast.

Station WHAS, Louisville, Ky.

400 Meters (750 Kilocycles), Central Standard Time. January 4.—4 to 5 P. M.—Selections by the Walnut Theater Orchestra; Walter Davison, Kentucky, Indiana and Tennessee. "Just Among Home Folks," a daily column printed in the Courier-Journal. Selections by the Strand Theater Orchestra; Harry S. Currie conductor. Late important news bulletins. 4:50 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official Central Standard time announced. 7:30 to 9 P. M.—Full concert by the Manning Hawaiian and Jug Orchestra. Reading: "An Interesting Historical Episode." Late important news bulletins. Official Central Standard time announced at 9 o'clock.

January 5.—4 to 5 P. M.—Selections by the Strand Theater Orchestra; Harry S. Currie, conductor. Police bulletins. Weather forecast for Kentucky, Indiana and Tennessee. "Just Among Home Folks," a daily column appearing in the Courier-Journal. Selections by the Walnut Theater Orchestra; Walter Davison, conductor. Late important news bulletins. Selections played on the Alamo Theater organ. 4:50 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official Standard time announced. 7:30 to 9 P. M.—Concert under the auspices of Carl Zoeller's melodists. Thirty-minute concert by Barney Rapp and his orchestra. Reading: An Historical Episode. Late important news bulletins. Official Central Standard time announced at 9 o'clock.

Station WGI, Medford, Mass.

360 Meters (830 Kilocycles), Eastern Standard Time. January 4.—12:00 Noon.—Noon-day program. 12:40 P. M.—New England weather forecast. 12:45 P. M.—Closing report on farmers' produce market report. 3:00 P. M.—Amrad Women's Club program. Talk by Miss Dorothy H. Goodwin entitled "Watch Supply and Demand." Afternoon musicale. 5:30 P. M.—Closing stock market reports. Government reports. Live stock market reports. 6:15 P. M.—Code practice, lesson No. 206. 6:40 P. M.—Boston police reports. 7:30 P. M.—Evening program. Selected verses by Mr. Charles L. H. Wagner Radio post. Red Cross health talk by Henry Copley Green.

January 5.—6:45 P. M.—Code practice, lesson No. 207. 7:05 P. M.—New England weather forecast. New England crop reports. 7:30 P. M.—Evening program. No. 40 of a series of talks on New England business problems by Arthur R. Curnick. Arthur Murray's course in ballroom dancing. Concert by the Watertown High School Orchestra.

January 6.—4:00 P. M.—Twilight program, "Adventure Hour" conducted by the Youth's Companion. Musicals. Address by Rev. Domina, "The Signs of the Times." Musicals. 8:30 P. M.—Evening program, "Talk on World Unity" under the auspices of the Greater Boston Federation of Churches. Concert by the Duckworth Mandolin Club.

Station WDAP, Chicago

360 Meters (830 Kilocycles), Central Standard Time. Standard Program.—Market reports daily, except Sunday, at 9:35, 10:01, 10:31, 11:01, 11:31 A. M.; 12:01, 12:31, 1:01, 1:25, 6:00, 10:30 P. M. Concert periods—1:35 P. M.—Luncheon concert daily, except Sunday. 7:00 P. M.—Dinner concert daily, except Sunday and Monday. 9:15 P. M.—Sunday only. 10:00 P. M.—Dance program and popular concert daily, except Sunday and Monday.

More Good Broadcast Programs

Station KFAE, Pullman, Wash.

330 Meters (910 Kilocycles). Pacific Time. January Programs—Monday, Wednesday and Friday nights at 7:30.

January 9—"How to Prepare for One's Vocation," Dr. D. W. Hamilton; guitar solos, Ray Kromer, Spokane; piano solos, Fredericka Kershaw, Waitsburg; "Dangers of Untested Seeds," Dr. Hanna Aase; "Marketing," E. F. Dummeier.

January 11—Piano solos, Mrs. Ruth Bradley-Keiser; "Taxation," Dr. H. W. Cordell; tenor solos, Verle Keiser, Waitsburg; "New Novels," Alice Lindsey Webb.

January 14—"Value of Physical Training and Athletics," Dr. J. Fred Bohler; Bailey's Campus Orchestra, Herbert Bailey Monroe, leader; vocal solos, instrumental music.

January 16—"Vocational Manners," Dr. Hamilton; soprano solos, Margherita Beneke, Spokane; "The Hibernation of Wild Animals," Dr. W. T. Shaw; instrumental music.

January 18—"Physical Training for Women," Miss Genevieve Barber; cello solos, Vincent Hiden, Rochester; taxation talk, Dr. Cordell; vocal solos.

January 21—Chemistry popular lecture, Dr. Ralph W. Gelbach; Hawaiian guitar solos, Ray Kromer, Spokane; poems, Prof. A. B. Cunningham; xylophone solos, Edward Whittendale, Seattle; vocal numbers.

January 23—"Vocational Citizenship," Dr. Hamilton; soprano solos, Miss Erna Cavelle; "New Things to Read," Alice L. Webb; instrumental music.

January 25—Talk by Dr. E. A. Bryan; recital by Mu Phi Epsilon, women's honorary musical society; "Efficient Work and Its Reward," Dr. Hamilton.

Station WOS, Jefferson City, Mo.

441 Meters (680 Kilocycles). Central Standard Time. Standard Program.—8:00 A. M.—Estimated receipts at Kansas City, St. Joseph, St. Louis and Chicago; announcements. 9:00 A. M.—Repeating estimated receipts; Chicago hog market; Eastern meat trade conditions; announcements. 10:00 A. M.—Weather forecast; St. Louis and Kansas City hog market; St. Louis and Chicago optional grain opening; announcements. 11:00 A. M.—Kansas City and St. Joseph flashes; St. Louis live stock market report; Chicago live stock market report; St. Louis and Chicago optional grain at 10:30; announcements. 12:00 Noon—Kansas City live stock market report; St. Joseph live stock report; St. Louis and Chicago optional grain at 11:30; announcements. 1:00 P. M.—Poultry, butter and egg report Chicago, New York, St. Louis; announcements. 2:00 P. M.—Advance estimates closing live stock markets Chicago, Kansas City, St. Louis; Chicago and St. Louis cash grain close; announcements. 5:00 P. M.—Music; marketgram; music; address; music; announcements. 8:00-9:30 P. M.—Monday, Wednesday and Friday nights; Concerts, agricultural lectures and public addresses.

Station KHJ, Los Angeles, Calif.

395 Meters (760 Kilocycles). Pacific Time. January 4.—12:30 to 1:15 P. M.—News items, music. 2:30 to 3:30 P. M.—Matinee musicale. 6:45 to 7:30 P. M.—Children's program presenting Richard Headrick, screen juvenile. 8:00 to 10:00 P. M.—De luxe program. 10:00 to 12:00 P. M.—Broadcasting Art Hickman's Orchestra by line telephony from the Los Angeles Biltmore Hotel. January 5.—12:30 to 1:15 P. M.—News items, music. 2:30 to 3:30 P. M.—Matinee musicale. 6:45 to 7:30 P. M.—Children's program, arranged by Marshall Stedman. 8:00 to 10:00 P. M.—Program presented by William H. King. 10:00 to 12:00 P. M.—Broadcasting Art Hickman's Orchestra by line telephony from the Los Angeles Biltmore Hotel.

Station WFI, Philadelphia, Pa.

395 Meters (760 Kilocycles). Eastern Standard Time. Standard Program.—Daily 10:15 A. M.—Produce market and livestock report, 1:00 P. M.—Meyer Davis Bellevue Stratford Hotel Concert Orchestra. 1:50 P. M.—Agricultural report. 3:00 P. M.—Concert. 6:30 P. M.—Meyer Davis Bellevue Stratford Hotel Concert Orchestra. 7:00 P. M.—Talks to children. On Tuesday, Thursday and Saturday evenings special features starting at 8:00 o'clock. On Sunday chapel service at 4:30 P. M., and services of the Arch Street Presbyterian Church, Philadelphia, alternating 10:30 A. M. and 7:30 P. M.

Station WJY, New York City

405 Meters (740 Kilocycles). Eastern Standard Time. January 4.—7:30 P. M.—"Income Taxes" by Frank Shevit. 7:45 P. M.—Piano recital by Katherine Jaggi Wier. 8:15 P. M.—Popular songs by Philip Braver, baritone. 8:45 P. M.—"General Review of the Work of the Assembly" by Julius S. Berg. 9:00 P. M.—Concert by the Harmonica Band of the Junior High School No. 61.

Station WJZ, New York City

455 Meters (660 Kilocycles). Eastern Standard Time. January 4.—3:00 P. M.—Organ recital by Leo Riggs on the Hotel Astor Organ. 4:00 P. M.—Concert by the New York School of Music and Art. 5:00 P. M.—"The Larger Aspect of World Affairs," by Frederick Dixon. 5:30 P. M.—Closing reports of the New York State Dept. of Farms and Markets; Farm and Home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; "The Condition of the Leading Businesses," by the "Magazine of Wall Street"; "Evening Post" News. 7:30 P. M. Burr McIntosh, the Cheerful Philosopher. 7:50 P. M.—Recital by Marie Nicholson, soprano. 8:00 P. M.—Looseleaf Current Topics. 8:15 P. M.—Recital by Marie Nicholson, soprano. 8:30 P. M.—Dance program by Jerome Green's Society Orchestra. 9:30 P. M.—Recital by Alexander Delleron, baritone. 9:55 P. M.—Time signals and weather forecast. 10:00 P. M.—Recital by Alexander Delleron, baritone. 10:30 P. M.—Dance program by Paul Specht and his Alamac Hotel Orchestra.

January 5.—3:00 P. M.—Recital by Vincent Desantis, violinist. 4:00 P. M.—Tea concert by the Hotel Belmont Stringed Ensemble, direct from the Balcony of the Tea Room, Hotel Belmont. 5:30 P. M.—Closing reports of the New York State Dept. of Farms and Markets; Farm and Home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; "Bradstreet's" financial report; "Evening Post" News. 7:30 P. M.—Talk by Winifred Lenihan. 7:45 P. M.—Recital by Harry Adams, tenor. 8:45 P. M.—"Ground Wires and Sky Waves," one of the "Highlights of Modern Radio Broadcasting" by Dr. Alfred N. Goldsmith, Director of Research of the Radio Corporation of America. 9:55 P. M.—Time signals and weather forecast. 10:30 P. M.—Dance program by Harold Stern and his Hotel Majestic Orchestra.

Station WJAX, Cleveland, Ohio

390 Meters (770 Kilocycles). Central Standard Time. Condensed Program.—9:00 to 9:45 A. M.—Bond gossip, financial news and grain markets. 10:00 to 10:45 A. M.—Quotations upon foreign exchange, live stock, grain, bonds and stocks; financial news bulletins and weather reports. 2:00 to 2:45 P. M.—Quotations upon grain, stock butter, eggs and poultry; foreign exchange and bonds; financial news bulletins and weather reports. 3:00 to 3:45 P. M.—Quotations upon fruits and vegetables, butter, eggs and poultry, live stock, hay and grain, flour and feed, foreign exchange, bonds and stocks; weather reports. This is for Monday, Tuesday, Wednesday, Thursday and Friday each week. First half holds for Saturday morning. Saturday afternoon and Sunday, no broadcasting from WJAX.

Station WOR, Newark, N. J.

405 Meters (740 Kilocycles). Eastern Standard Time. January 4.—2:30-3:00 P. M.—Sam Conly, "Close Ups on Life." 3:00 P. M.—To be announced. 3:15 P. M.—"Health Hints" by Dr. Harriet VanBuren Peckham. 3:30-4:00 P. M.—Anna Hughes, D. D. S. 6:15 P. M.—Marietta Sternberg, composer-pianist. 6:30-7:00 P. M.—"Man in the Moon Stories for the Children." 7:00-7:30 P. M.—Marietta Sternberg.

January 5.—2:30 P. M.—Baritone solos by Claude Hinman. 2:45-3:05 P. M.—Mary VanKleeck on "The Best Known Women in Industry." 3:05 P. M.—Solos by Claude Hinman. 3:20 P. M.—Ruth Engle in piano selections. 3:45 P. M.—Dr. Joseph F. Craigen on "Practical Psychology." 6:15 P. M.—Mario Cutayer, tenor. 6:30 P. M.—Inez Allen Potter, soprano. 6:45 P. M.—Solos by Mario Cutayer. 7:00 P. M.—Inez Allen Potter, soprano. 7:15 P. M.—Fred J. Bendel on "Sporting News Up-to-the-Minute." 8:00-9:00 P. M.—Halsey Miller's Newark Athletic Club Orchestra. 9:00 P. M.—Fannie Hurst, novelist and playwright. 9:20 P. M.—Olcott Vail, violinist. 9:35 P. M.—Harry Hirschberg, "What's the Answer?" 9:45 P. M.—Belle Bart, astrologist. 10:00 P. M.—Solos by Olcott Vail. 10:15 P. M.—Belle Bart, astrologist. 10:30-11:00 P. M.—Harry Hanbury Revue in Popular Songs and Sketches.

Station WEF, New York City

492 Meters (610 Kilocycles). Eastern Standard Time. Regular Schedule.—Mornings—Tuesday to Friday, inclusive, 11:00-12:00 A. M. Afternoons—Monday to Saturday, 4:00-5:30 P. M. Evenings—Monday, Tuesday, Wednesday and Friday, 7:30-10:00 P. M.; Thursday, 7:00-12:00 P. M.; Saturday, 7:30-12:00 P. M. Sunday, 2:45-5:30 and 7:20-10:00 P. M.

Station WJAZ, Chicago

448 Meters (660 Kilocycles). Central Standard Time. Standard Program—Including a special "North Pole" Wednesday night program, WJAZ is "on the air" from 10:00 P. M. to 2:00 A. M. Tuesday, Wednesday, Thursday, Friday and Saturday; and 6:00 to 10:30 P. M. on Sunday.

Coming Events

SECOND ANNUAL RADIO SHOW, Biltmore Hotel, Los Angeles, Calif., February 5 to 10, 1924.

INTERNATIONAL RADIO & ELECTRIC SHOW, Baltimore, Md., March, 1924.

DETROIT RADIO SHOW, Arena Gardens, Detroit, Mich., Jan. 15-17, 1924.

For Nocturnal Dial Twisters

(Paste this on your table for reference)

Station	Wave Length	Frequency Kcys	On the air during the week, except Sunday.
WDAP	Chicago, Ill.....	360 830	7:00-2:00 Tuesday to Saturday.
KSD	St. Louis, Mo.....	546 550	9:00-11:00 Except Wednesday.
WGY	Schenectady, N. Y.	380 790	7:50-11:00 Mon. Tues.-Thurs.-Fri.
WHB	Kansas City, Mo..	411 730	9:00-11:00 Tuesday-Thursday.
WOC	Davenport, Iowa..	484 620	8:00-9:30 Monday-Thursday-Friday.
			11:00-12M. Wednesday.
			10:30-11:00 Saturday.
WLW	Cincinnati, O.....	309 970	8:00-10:00 Monday-Wednesday.
WSB	Atlanta, Ga.....	429 700	10:00-12M. Tuesday-Thursday.
			9:00-1:00 Monday-Tuesday - Wednesday - Thursday - Friday-Saturday.
WOAW	Omaha, Neb.....	526 570	10:00-11:00 Every night but Wednesday
PWX	Havana, Cuba.....	400 750	9:00-11:30 Wednesday-Saturday.
WBAP	Ft. Worth, Tex....	476 630	10:30-11:30 Monday to Friday.
KFI	Los Angeles, Calif.	469 640	9:45-2:00 Every night.
KHJ	Los Angeles, Calif.	395 760	9:45-1:00 Every night.
KYW	Chicago, Ill.....	345 870	8:00-10:00 Tuesday to Saturday..
WFAA	Dallas, Tex.....	476 630	9:30-10:30 Except Wednesday.
WJAZ	Chicago, Ill.....	448 670	10:00-2:00 Tuesday to Saturday.
WJAX	Cleveland, O.....	390 770	7:00-9:30 Tuesday and Thursday.
WMC	Memphis, Tenn....	500 600	9:00-10:30 Monday - Thursday - Saturday.
			9:00-1:00 Tuesday-Thursday.
WCX	Detroit, Mich.....	517 580	8:30-10:00 Monday - Wednesday - Thursday-Friday.
			8:30-1:00 Tuesday.

The Radio University

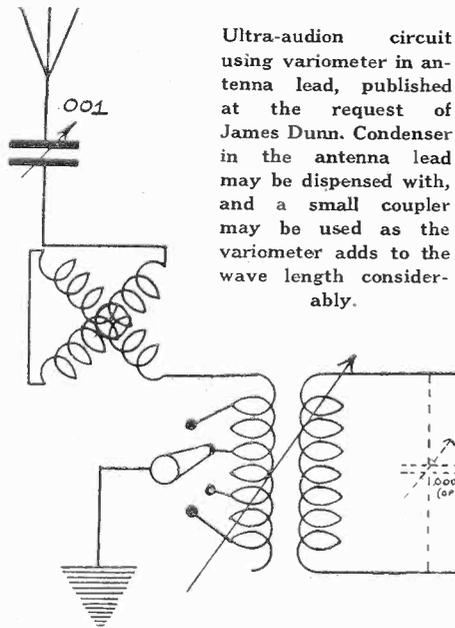
A Question and Answer Department conducted by the Technical Staff of RADIO WORLD for the information and instruction of its subscribers.

Please advise me if the enclosed diagram of a spiderweb set is correct. Will it be O. K. to use a 21 plate condenser in place of the 23 plate vernier? What capacity should I use for the grid condenser?—H. Schlebel, 16 Waugoo Street, Oshkosh, Wis.

The diagram as you present it is correct, but we fail to understand your notation that the binding posts for the phones are not included in the circuit. They are shown in the circuit you enclose. You may use the condenser you mention. The condenser should be .00025 mfd.

Some time ago you printed a diagram of an ultra audion circuit using a variocoupler with a variometer in the antenna lead. Would it be possible to operate such a receiver on one tube without amplification? Will a WD11 function in this circuit? If possible will you furnish the diagram? Is the ultra-audion circuit suited for distance work?—James Dunn, Waco, Texas.

The circuit you want is printed herewith. It is perfectly possible to operate this circuit on one tube. The circuit will function in distance work, but is not the most reliable regenerative circuit



Ultra-audion circuit using variometer in antenna lead, published at the request of James Dunn. Condenser in the antenna lead may be dispensed with, and a small coupler may be used as the variometer adds to the wave length considerably.

known. For that reason it is not much used. The voltage on the B battery is critical, and should be variable. Suggest that you carefully shield the panel of your set before attempting to operate the receiver as it is inclined to be unstable, and the least change in capacity in or around the circuit will throw it out. When you learn to operate it, the circuit will bring in distance. Suggest that you have a switch that will allow you to short the variometer and the antenna condenser as well. The variometer in the antenna circuit is not necessary, but was suggested by one of our readers who happened to have success with it. A vernier rheostat is necessary in this circuit, and if the optional condenser is used across the secondary, it should be vernier for best results.

In RADIO WORLD for November 24, 1923, page 11, there appeared a picture and description of a set constructed by Charles Hall, a New York radio engineer. It was entitled "Efficiently Combines Radio-Frequency and Regeneration." Have blue prints been made available for this receiver? Where can they be obtained?—Thos. V. Wright, 1208 Charlston Avenue, Mattoon, Ill.

For information concerning this receiver, address a letter to Charles Hall, in care of RADIO WORLD, and it will be forwarded to him. Blue prints are not available at this office.

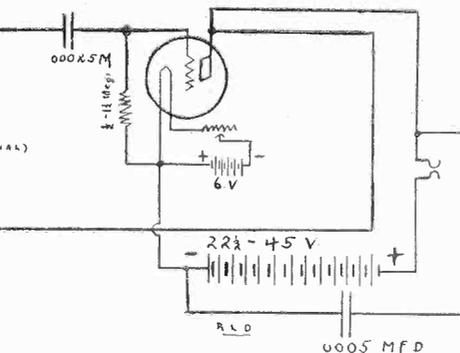
Will you kindly explain the following: I have a regenerative receiver (three-circuit two variometer) which up until the wave lengths were changed seemed to work perfectly. Tuning was sharp and control was easy. Then to accommodate the new wave lengths I shunted the two variometers and the coupler with .0005 fixed condensers. I now can hear the local stations no matter how I tune, and getting distance is almost next to impossible unless I actually tune by the

"zero beat" method, and keep my detector tube (UV200) turned up to maximum. The set is a standard manufactured regenerative and is not home made.—John V. Nabenheim, Tacoma, Washington.

It is quite evident that the receiver as it stood before was not meant for high length work. By placing condensers across it, you threw the circuits out of resonance, and therefore you get broad tuning. Your solution consists in getting a coupler and variometers suited for the wave range that you wish to work over. With the possible exception of a condenser in the secondary circuit, these sets tune much better by the use of inductance than by capacity. You can also accomplish the desired results by placing a small coil (DL25 unmounted will probably do) in the immediate circuit with each of the controls.

Is there any reason for a tube suddenly going "dead" and still lighting? Sometimes when I am operating my receiver the set will just stop receiving, and I will have to waste about twenty minutes pulling wires, touching posts and twiddling dials until I finally get it going again. I believe that it is the tube that is doing it, yet each one of my three tubes (UV199) seem to act the same. I use 30 ohm rheostats and Franco dry batteries.—Mason L. Charles, 416 Fourth Ave., New York City.

Suggest that you have an experienced man come in and look the set over. UV199 tubes have a habit of "clouding" when they are forced. This happens when you turn your filament up too high. The tube suddenly stops receiving, and to put it back in condition, it is necessary to disconnect the B battery and operate the tube under normal filament conditions for about ten or fifteen minutes. However, you evidently have a short circuit or a loose connection. If it is a manufactured set you had better let some one that understands it look it over.



Will an ordinary line telephone headset function on a single tube set? Can I wind a coupler with wire taken off a bell magnet? Does a WD11 tube need a storage battery to operate it? Can I use wood for a panel? Is the enclosed hook up a good one? Can I use a 35c fixed condenser instead of the variable condenser in this circuit?—Willie Benson, New York City.

You may use the line telephone headset, but better results by far will be obtained by using the regular radio headset, as it is far more sensitive and is made for that specific purpose. If the wire is in good condition and not too coarse it may be used. The tube you mention does not use a storage battery. A single dry cell, or two dry cells in parallel, is all that is necessary. Wood may be used but with poor results. The best material is bakelite or hard rubber. The circuit diagram is correct with the exception that a rheostat should be placed in the filament lead to control the filament current. No. As the primary circuit is tuned by means of the condenser, it is necessary to have it variable. It should be .0005 and not .00005 as listed.

I am continually bothered by a sound like dripping water whenever I tune my set around either high or low waves. The set is home-made and does not use any grid leak, as the diagram did not call for it, although it called for a resistance between the grid and one side of the filament battery. I am using a potentiometer winding for the purpose. Is this the cause of my trouble?—Jack S. Britton, Fort Lee Laundry, Fort Lee, N. J.

A potentiometer resistance is of no use as a leak resistance. Use a regular grid leak in place of it. The method of hooking the leak in the circuit is either across the condenser or to the

filament as you state. The purpose of it is to allow the electrons to leak off, stopping the tube from "choking." The continual dripping you note is the condenser discharging back into the circuit.

What station signs off "The voice of the Great Way?" I caught that slogan the evening of October 22, about 11:30 or 12 M. Central Standard time. I did not get their call, as local interference on spark prevented it. I have not been able to get them since.—L. B. M., Nortonville, Kentucky.

The station using that slogan is WHN. It is located at 45th Street and Broadway, New York City. It operates on a wave length of 360 meters.

Is there any fixed condenser that is made that you can change around to determine the correct capacity for a given circuit? I have constructed the Grimes inverse duplex and have had fairly good results with it, but on changing the value of one of the condensers to one of slightly higher value, it was improved and I think that were I to find the exact capacity that is needed I could get much better results. Are there any directly calibrated precision condensers sold on the open market which can be varied?—Lester Dupoiner, Montreal, Canada.

There is a condenser rack made by Charles Freshman & Co. that will allow you to try out different capacities, by changing parallel capacities, either adding or subtracting the condensers. For precision condensers that are calibrated directly, apply to the Bureau of Standards, Washington, D. C. The Seibt condenser is listed as a precision condenser, but you will have to calibrate it against a standard to get a chart.

I have just finished building a two-stage tuned radio-frequency receiver using three Western Electric "peanut" tubes. I notice that while these tubes act as wonderful detectors, they function erratically as radio-frequency amplifiers, especially as to the plate current. Are they good radio-frequency tubes? Can they be used in this type of circuit? What is their normal plate voltage?—Jacob Meyer. (No address).

The tubes you mention are called "N" tubes and are about the only all around dry cell (1.5 volt) tubes that will work more or less efficiently in radio frequency. If they are as you term erratic, it is the fault of your circuit or your batteries. A tube is either good or poor when it comes to radio-frequency amplification, and this is one of the good tubes. Look over your circuit and see if something is not wrong with it. 22½ to 60 volts.

In RADIO WORLD for December 1, you publish an article by C. White. What is the range in miles for this receiver? Also what is the wave length band that this receiver handles?—L. Hathaway, Calmar, Ia.

It is impossible to state the range of any receiver as there are too many exterior factors entering into its operation which determine the real range. The wave length is from 200 to 600 meters.

What is the cause of the greater selectivity of the super heterodyne receivers? Are they of any great use for distance reception? I have been told that they are good for local work only, and on distance work are so noisy that it is impossible to hear anything outside of the crackling and hissing. Is this so?—M. Cartier, Paris, France.

Briefly, the reason for their great selectivity is this: The signals are "boosted" to many times their original wave length (around 2,000 meters—or 150 kilocycles). After passing through the various radio-frequency tubes and heterodyne circuits they are rectified and passed through regulation audio-frequency circuits. This boosting of the wave length or lowering of the frequency, allows much greater selectivity. For full details as to the technical and theoretical explanations, see United States Bureau of Standards Handbook on the subject—it deals with the subject at great length. The receiver is the best and most reliable distance receiver known. It is not noisy when properly operated and constructed. Suggest that you write Experimenters Service Bureau, New York City, for further details.

I am much interested in the diagram in RADIO WORLD for December 8, page 15. Would it be possible for me to get full working plans, such as panel layouts, and specifications complete? What degree of selectivity has it and what range? I am close to two big high powered broadcast stations and am informed that another intends to open up in my immediate vicinity. For this reason I want a receiver that is capable of tuning through these, and reaching other stations that are more distant. Is such a thing possible with this receiver?—W. A. H. Connor, 112 California Hall, University of California, Berkeley, Calif.

We do not handle plans, as we have repeatedly stated. For information as to whether they could be obtained or not, get in touch with the writer of the article through this office. This receiver is selective to great degree, but it is a doubtful proposition if any set, outside of one employing the super principle will allow tuning through two powerful nearby transmitters such as those in your immediate vicinity, and allow the reception of distance. This set is a triple-circuit receiver, and embodies a form of coupling that should give extremely sharp tuning because of the degree of loose coupling that can be obtained. As to the range, nothing can be said. The range of a receiver depends upon too many variable factors to give even an approximate guess at it.

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gives you the melody
of concert and opera*

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*Radio
Reproducers and Amplifiers*



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Requires no battery for the field.
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A1—new 1-stage \$27.50

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AC-3-C—3-stage \$75.00

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Freed-Eisemann Moves

THE FREED-EISEMANN RADIO CORPORATION announces the removal of its manufacturing plant and executive offices to the Sperry Building, Manhattan Bridge Plaza, Brooklyn, N. Y. The telephone numbers at the new address are Main 9721-9722-9723.

Paul Specht Submits Band to England by Radio

PAUL SPECHT is to submit new bands to Lyon & Co., Ltd., of London, by means of WJZ broadcasting from New York. Specht recently played in England under Lyon's management and will submit several other units for their approval by radio, after which the selected bands will sail for England.

Radio for Churches and Schools

SUGGESTIONS that radio apparatus be installed at the various school auditoriums and churches of Elizabeth, N. J., for the benefit of the people in general are contained in a letter sent recently to the Board of Education by Mayor James S. Furber, who points out the advantages of having the buildings open for public use as much as possible.

New Radio and Electric Firms

Raflex Manufacturing Co., New York City, radio machines, \$20,000; H. R. Meneffe, D. Levow, S. McSpedon. (Attorney, L. Wolfson, 299 Broadway.)

Amsterdam Electricians, New York City, \$10,000; M. Weisse, G. G. Rosenberg. (Attorneys, Feinstein & Rosenberg, 154 Broadway.)

Resas, New York City, radio, \$10,000; J. A. Crowe, W. J. MacLead, F. Foley. (Attorneys, J. P. Shea, 33 West 42rd St.)

Radio Shield Stores, No. 1, New York City, \$1,000; W. B. and M. Schoeppler, J. B. Bogert. (Attorney, C. C. Cormany, 90 West Broadway.)

Hatheway & Co., New York City, electric machinery, \$10,000; G. L. Hatheway, R. D. Patterson, J. A. Byrne. (Attorneys, Ingraham, Page & Moran, 14 Wall St.)

A Well Tested Connector

THE Fahnstock Electric Company of Long Island City, N. Y., have been supplying telephone companies in the United States and Canada with test connectors for a period of over twenty years. These connectors are in use in all parts of the country and are therefore subject to various climatic conditions and temperatures. The fact that these connectors are now standard equipment on telephone lines would prove that they have given absolute satisfaction. One of these types, known as the No. 31, makes an ideal connection for joining the lead-in wire to the antenna. By snapping the larger connector over the antenna wire and inserting the end of the lead-in wire into the smaller one, connection is made thus eliminating the soldering and splicing of the two wires. The connector is made of the highest grade phosphor bronze and is guaranteed by the makers to keep its spring temper indefinitely.

Improved Condenser Construction

A PROPERLY soldered connection for a fixed condenser has long been the desire of all manufacturers and amateurs who build radio sets. The task of soldering three or four connections, however, has always resulted in a rather messy job, and sometimes condensers were not soldered, for this reason.

With the realization of the importance of soldered connections and joints, the Charles Freshman Co., New York City, have made an improvement in the design of all of their mica condensers. A lug of special construction is riveted by means of an eyelet to each terminal of the condenser. This lug is designed so that three or more wires may be soldered to it, giving exceptionally good contact and allowing right-angle bends. The lug is equipped with three grooves, permitting the wires to be laid properly and held in place while soldering. They are of advantage when a temporary connection is desired. In that case, all that is necessary is to lay the wire in place and pinch the lug with a pair of pliers to make a good firm temporary connection which can easily be loosened.

A Good Book for the Experimenter

Henley's 222 Radio Circuit Designs. A complete and up-to-date collection of Modern Receiving and Transmitting Hook Ups.

This new and practical book on the design of radio receiving and transmitting circuits should meet the needs of every radio enthusiast whether novice, expert, amateur or professional. It contains a large collection of radio circuits and hook-ups including all the standard types and latest improvements, such as those of Armstrong, DeForest, Reinartz, Cockaday, Hazeltine, Colpitts, Grimes and Flewelling.

The book explains in simple words the principles of operation of every circuit described and the functions of all the component pieces of apparatus, but needless theory is carefully avoided. The book is so simple that the novice will understand it. It contains complete descriptions of every type of circuit used in radio, from the simplest crystal receiver to the most complex super-heterodyne, from the simplest spark transmitter to the latest broadcasting station.

Prompt Tube Repairs

THE Harvard Radio Laboratories, 200 Old Colony avenue, South Boston, Mass., are occupying larger quarters with increased facilities for the prompt repair of vacuum tubes. They are now prepared to make almost immediate deliveries. This firm was one of the very earliest in the tube repairing business and has had the benefit of long experience in this field.

Doing business without advertising is like winking at a girl in the dark. You know what you are doing, but nobody else does.—Anon.

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:

I. W. Dickerson, Charles City, Iowa.
E. W. Penrose, 6KT, Grass Valley, Cal.
Harold James, Grass Valley, Cal.
S. G. Wismer, 50 Elgin St., Waterloo, Ontario, Canada.
D. Madden, 446 Quincy Ave., Scranton, Pa.
W. H. Cahoon, 125 Commercial St., West Lynn, Mass. (Builds and repairs sets.)
James C. Callaway, 15 West 83rd St., New York City.
Robert Pharr, Walter Pharr, 5ALY, 159 Clark Place, Memphis, Tenn.
Wright Neal, R. F. P. No. 7, Temple, Texas.

Large Radio Sales In Department Stores

DEPARTMENT store sales in the Second Federal Reserve District will establish a new high record this year, with a gain of 7.8 per cent. over those of 1922, according to an analysis made public last week by the Federal Reserve agent at New York, which was based on the business done prior to Dec. 20 by seventeen of the largest stores of New York and adjacent cities. Merchants reported especially heavy sales of radio equipment.

Body Capacity Eliminated in Crosley Condenser

THE Crosley variable condenser has been so designed as to provide direct positive metallic contact with the charging plates of the condenser, thus eliminating the serious contact resistance which is introduced by spring and friction contacts in the usual form of variable condenser. The internal resistance caused by imperfect contact between the plates and spacing washers of the rotary and stationary members of an interlocking condenser is entirely eliminated.

Not only has the Crosley type condenser many factors designed to improve the overall electrical efficiency but the arrangement of the plates is such that a minimum electric field is produced around the condenser. This condition is of vital importance where condensers are employed in circuits which require very delicate and precise adjustment.

With condensers of the usual type the stray electric field is quite strong for a distance of 3" or 4" from the plates. When the operator's hand is placed in this field the capacity of the condenser is naturally altered, thereby preventing the proper resonant adjustment of the receiving circuit to the most efficient position. In the Crosley condenser, however, this objectionable feature is completely removed. A demonstration of the fact can be made by moving the hand over the condenser while sharply tuned to a transmitting station without the least reduction in signal strength.

The Crosley condenser depends upon a thin sheet of high dielectric material as insulation between the plates. As there is no friction from the opening and closing of the plates, the insulation will last as long as the condenser.

The manufacturers state that tests have shown the maximum capacity to never be less than .0008 mfd. This frequently runs better than .001 mfd.

More Good DX Records and a Circuit

DX Nite Owls, Attention!

THE DX season is now upon us.

All faithful DXers are requested to get ready for the fray and prepare themselves for the night vigil.

Send your records to the DX Editor of RADIO WORLD.

Write only on one side of the paper and write clearly.

Give full particulars of your location, your set, your aerials and other items of interest.

Here is a Record—and a Circuit for You to Try Out

From A. J. Secor, 156 Poplar St., Bridgeport, Conn.

Noticing your invitation to send in DX records I decided to send in a list of the stations that I copied in one week's time:

WDAP, WOC, WJAR, WJAZ, KDKA, WSB, WBS, WGI, WGL, WCAR, WTAM, WIP, WFI, WBZ, PWX. All New York and Newark stations come in on loud speaker.

A copy of hook-up I am using is enclosed. Note the absence of ground connection to the filament. This connection was removed to eliminate a bothersome hum which I could not get rid of in any other way.

The programs of the above stations were listened

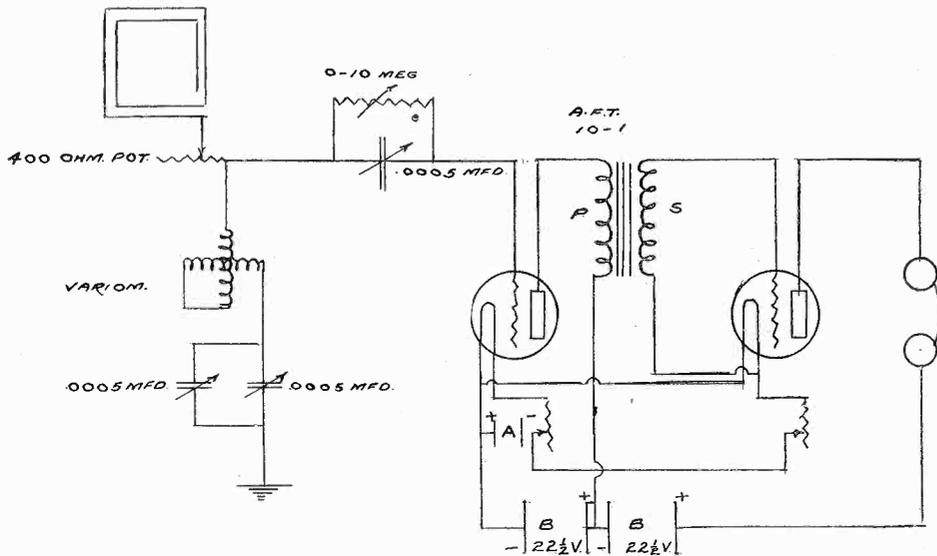
lady announcer, 625, Denver, Colo.; WOC, 6:50, bedtime talks, 700, Davenport, Ohio; WCX, 7:20, orchestra, 1,075, Detroit, Mich.; WGY, 7:30, tenor solo, Mr. Daniels, piano duet, 1,425, Schenectady, N. Y.; WHB, 7:35, announcement, 745, Kansas City, Mo.; WOQ, 7:40, soprano solo with orchestra, 475, Kansas City, Mo.; WLAG, 8:00, talk on a contest being held, 875, Twin Cities, Minn.; WCB, 8:10, singing, 850, Zion, Ill.; WAAW, 8:35, song, "Waiting for the Sunrise," 650, Omaha, Neb.; WJAD, 8:40, Hotel Raleigh orchestra, 80, Waco, Tex.; WOS, 8:50, Prison band, Mr. Snodgrass, pianist, 550, Jefferson City, Mo.; KSD, 8:56, orchestra, Grand Central theatre, 575, St. Louis, Mo.; WLB, 9:04, talk on pavement bond election, 850, Cincinnati, Ohio; WIAB, 9:10, announcement, 800, Rockford, Ill.; CKW, 9:25, music, "Anna-Belle," orchestra, 1,300, Tuinicu, Cuba; WOAW, 10:10, Gladys Williams sings, Mae Reynolds, pianist, 650, Omaha, Neb.; KFFQ, 10:15, orchestra, "Marquita," 600, Colorado Springs, Colo.; KFDL, 10:25, Mr. Bowman, violin, "Souvenir," 625, Denver, Colo.; WPAH, 10:46, orchestra, "Yes, We Have No Bananas," 850, Wapaca, Wis.; KFCF, 11:40, orchestra, "Yes, We Have No Bananas," 1,420, Walla Walla, Wash.; KIF, 12:00, Harry McCoy, pianist, from Examiner Studio, 1,125, Los Angeles, Cal.; CFCN, 12:10, soprano solo, election returns, piano solo, 1,525, Calgary, Canada; KGW, 12:15, merchants marine talk, 1,575, Portland, Ore.; WHA, 12:30, band, test program, 860, Madison, Wis.; KFIZ, 12:31, police report, man wanted, 9:30, Fondulac, Wis. Total stations, 35; total miles, 27,380; 7 hours 11 minutes. Single circuit, 3-tube set, WD-11 tubes, W. E. head phones.

How Do These Fellows Do It?

From L. B. Hill, R. F. D. 3, Woodburn, Ky.

Being an interested reader of the DX column I am sending my record made with the hookup

2 COMPLETE TURNS INDOORS 15'x12'



Exceptional circuit used by A. J. Secor. Note that the filament side of the circuit has no connection with the ground side.

described in November 3 RADIO WORLD by A. D. Turnbull:

WTAS, 380 mi.; WSAI, 180 mi.; WEA, 700 mi.; WGY, 760 mi.; WOS, 335 mi.; WDAP, 355 mi.; WLAG, 660 mi.; WAAW, 585 mi.; WFAA, 640 mi.; WSY, 240 mi.; WHAS, 100 mi.; WJAS, 425 mi.; WOO, 625 mi.; WWJ, 420 mi.; WOC, 390 mi.; WOAW, 585 mi.; KDKA, 425 mi.; WHB, 460 mi.; WSB, 245 mi.; WOQ, 460 mi.; CFTC, 595 mi.; WJAX, 400 mi.; WBAP, 670 mi.; WQAY, 670 mi.; WAAP, 590 mi.; WDBC.

The above were all received on one tube. The following after adding one stage audio:

WOR, 700 mi.; WGR, 570 mi.; WOAL, 865 mi.; KHJ, 1740 mi.; WPAH, KSD, 235 mi.; WMC, 230 mi.; KFJK, 585 mi.; KFID, 500 mi.; WLAC, 425 mi.; WCAP, 520 mi.; KFKX, 670 mi.; WJAZ, 355 mi.; WDAM, 400 mi.; WAW, 180 mi.; WAAF, 355 mi.; WLW, 180 mi.; WDAF, 460 mi.; WJX, 700 mi.; KFKA, 980 mi.; WIP, 625 mi.; WDAR, 625 mi.

A total of 48 stations in less than a month. This is the first and only set that I ever as much as listened over. I use WD12 tubes.

Few—But Distant

From E. Mathio, Grafard, Texas

I have been reading the RADIO WORLD and noticed some good DX records but I believe I have a good record also.

Within the past month I have heard 53 stations on a one tube regenerative set. Some of the most distant are: WGY-1600; WWJ-1100; KDKA-1200; KFI; and KHJ-1250; KRE-1300 WBAH-1000; WSB-850.

Here is a Chance to Swap Circuits

From Wm. G. Raleigh, 1118 Bloomfield St., Hoboken, N. J.

I have built a three-circuit set which appeared in one of your past issues. With this set I have received the following stations:

WOO, WIP, WDAR, WFI, WHAZ, WWJ, WCX, WSB, WGM, WMC, WOAW, WLAG, PWX, CFCA, WDAP, WJAZ, KYW, WWAY, WNAC, WOC, KDKA, KSD, WMAK, WBAK, WSAI, WJAX, WTAM, WBZ, WCAP, WLW, WGY, WGR, WHAS, WBAP.

Several amateur stations from distant points have also been heard. During the past few weeks KDKA and WDAP have come in almost as loud as the locals. The set is a triple circuit one, using a Shamrock coupler and variometers and a 23-plate condenser. The tube, a C300, is the most sensitive of any I've yet tried. I would be very glad to hear from any one about the set and will describe it to any one.

If This is a Start— Oh, Man

From a Reader—Eugene, Ore.

I am a regular reader of RADIO WORLD and seeing your request for DX decided to send mine in. I started to keep track three weeks ago and have heard the following 61 stations on one bulb:

CFQC, Saskatoon, 1,000 mi.; CKCK, Regina, 1,000 mi.; KFEL, KFAF, KLZ, Denver, 1,000 mi.; WHB, WDAF, Kansas City, 1,500 mi.; WOAW, Omaha, 1,400 mi.; WFAA, Dallas, 1,600 mi.; WOC, Davenport, 1,800 mi.; WDAP, Chicago, 1,900 mi.; 2SA, every night; WJAZ, Chicago, 1,900 mi.; WBAP, Fort Worth, 1,600 mi.; WLAG, St. Paul, 1,500 mi.; WOAI, San Antonio, Tex., 1,700 mi.; WCB, Zion, Ill., 1,900 mi.

OVER 2,000 MILES—WJAX, Cleveland, 2,200; WGY, Schenectady, 2,600; WTAM, Cleveland, 2,200; WSB, Atlanta, 2,300; WJZ, New York, 2,600; KRKA, Pittsburgh, 2,300; WLW, Cincinnati, 2,100; WSAI, Cincinnati, 2,100; WGR, Buffalo, N. Y., 2,300.

to and enjoyed and did not come in with howls and squeals as does so much DX stuff.

I consider this pretty fair for an indoor aerial. You will note that all capacities are variable and I will also state vernier.

This set is as selective as a double circuit that I previously had and the signals come in much stronger.

I attribute this to the potentiometer in the antenna lead.

This Bradley Family Must Never Sleep

From J. E. Bradley, Justin, Texas.

KDKA, 5:20, symphony orchestra, 9:15, prize fight, 1,125, Pittsburgh, Pa.; WSB, 5:25, news items, 650, Atlanta, Ga.; KOB, 5:40, music, 540, State College, N. M.; KFKB, 5:45, music and singing, off, 11:50, musical program, 300, Milford, Kan.; WDAP, 6:03, markets, 825, Chicago, Ill.; WDAP, 6:05, school of the air program, 575, Kansas City, Mo.; WEAY, 0:08, music, Iris theatre, 300, Houston, Tex.; WCM, 6:10, special river stage report, 200, Austin, Tex.; WCK, 6:35, lecture, Mr. B—, 575, St. Louis, Mo.; WPAD, 6:40, piano solo, 825, Chicago, Ill.; KLZ, 6:45, music, line off,

Who Is America's Most Popular Radio Entertainer?

Everybody is interested in this query: Who is America's most popular radio entertainer? You have your favorite. Who is she or he? Let us know your choice, whether a comedian, an opera singer, a jazz band, or a story-teller.

RADIO WORLD wants to be able to tell the world the name of the entertainer who stands highest in the regard of listeners-in.

Use the accompanying blank and mail to the Broadcasting Editor, RADIO WORLD.

Cut off. Fill out. Mail today.

BROADCASTING MANAGER, RADIO WORLD, 1493 Broadway, New York City.

Dear Sir:

My favorite entertainer is.....
My second choice is.....

Name.....

Street Address.....

City and State.....

Pope to Speak by Radio
 A PRESS dispatch from Rome, Italy, to the Chicago "Tribune," states that a powerful wireless transmitter will be established in the Vatican, through which the living voice of the Pope may be heard in the remotest corners of the earth.

New Broadcasting Station
 COMPLETION of a large broadcasting station at Johannesburg, South Africa, will be accomplished during January, 1924, according to Consul G. K. Donald. An increasing demand for radio sets is expected to follow.

OUT OF THE ETHER

Chats About Broadcasting Stations

By Hirsch M. Kaplan

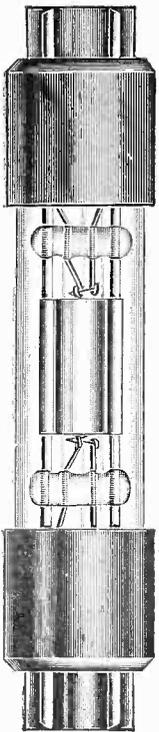
WJY unexpectedly has returned to the air, to be with us regularly hereafter every Tuesday, Thursday and Friday. It celebrated its return by offering as the main feature on the opening program, Bob Mullinari and his Radio Novelty Orchestra. They must be some jazz babies, for grandpa sat with the phones clamped to his ears and listened to the entire program.

Station WDAR verniered its way through with a program of dance music as played by Howard Lanin's dance orchestra. This combination sure can harmonize and they can make you dance even if you don't want to.

Another ivory tickler to enter Radio's Hall of Fame is Carolyn Willard, who entertained with a program of both popular and classical music. Miss Willard rendered her short but sweet recital from the Crystal Studio of station WJAZ.

If WOR fails to furnish you with a program of "Music While You Dine," the next best thing to do is to tune in Nagel's Providence Biltmore Hotel orchestra who play from station WJAR almost every evening at 7. This combination is one of the best to play by radio and it is almost certain that they will furnish you with a very delightful program.

Yes, I know all about stations WJZ, WHN, WHAZ and a few others telling the radio audience of the result of the Greb-Tunney clash for the middleweight belt, but it took station KDKA to broadcast a blow by blow description of the fight. What was the matter with the four broadcasting stations in New York City? A prize fight, especially one in which a title was at stake, taking place right under their noses and yet not one of them thinks that New York
(Concluded on next page)



(Actual Size)

The long-life tube!

Since their inception, radio vacuum tubes have been fragile. To knock or drop one incurred the expense of a new tube. But now there are

MYERS TUBES

Practically Unbreakable

—so protected by their unique design that they have been dropped on the floor without injury.

But their sturdiness is only one feature. They are the most perfect detectors and amplifiers obtainable. Smaller capacity and no bunched leads mean less interference—more clarity and greater amplification. Actual tests, all over the world, have proved their supremacy.

Two types—Dry Battery and Universal (for storage battery). At your dealer's—or send price and be supplied postpaid. Write for free circuit diagrams.

\$5 EACH Complete with clips ready to mount on your set; no sockets or extra equipment required.

F. B. Myers Co. Ltd.
Radio Vacuum Tubes

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 MONTREAL CANADA

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LOUD SPEAKER UNIT \$1.95

We Guarantee The Scientific Headset to be the greatest value on the market. Try it for five days. If not satisfactory send it back and your money will be refunded immediately. Circular on request. Dealers wanted.

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 Patd. 870,042

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No. 1004
 Multi Terminal Receiver Plug. instantaneous connection for as many as six pairs of standard receiver tips. \$2.00
 Patd. Aug. 28, 1923



No. 1002
 6 1/2 Ohm Micro-meter Rheostat \$1.50
 25 Ohm Micro-meter Rheostat 1.50
 40 Ohm Micro-meter Rheostat 1.50
 Patd. July 10, 1923

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Ask the man to show you the Howard line of quality Radio Merchandise. Every piece is sold with the guarantee of satisfactory performance.

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EVEREADY
Radio Batteries
-they last longer



RADIO PANELS

Cut exactly to size and a guaranteed 12 hour shipment. $\frac{1}{4}$ " thick. .01% per square inch. $\frac{3}{16}$ " thick .01% c. Made of the highest grade black fibre. This material possesses electrical strength of 200 volts per mil, is inexpensive, unbreakable, easy to work and takes a fine finish. We pay postage.

RADIO INSTRUMENT & PANEL CO.
564 W. Monroe St., Chicago, Ill.

FOR RELIABLE UP-TO-DATE

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Use Our Card Catalog Directory in use now with over 200 Radio Manufacturers and Jobbers
Your ENVELOPES ADDRESSED
At \$2.50 per 1,000

Write for Particulars

Sydell's Radio Trade Directory
410 W. 31st St., New York. Chickering 9840

WD-11 and WD-12

TUBES REPAIRED

WD-11 or WD-12, \$3.50 C-302 or UV-202, \$3.50
C-300 or UV-200, 2.75 C-301A or UV-201A, \$3.50
C-301 or UV-201, 3.00 DV-6 or DV-6A, 3.00
C-200 or UV-190, 3.50

All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"



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TUBES SENT PARCEL POST, C. O. D.

RADIO CONSTRUCTOR plans
make set building **EASY!**

Book of

7 COMPLETE PLANS 50c

- Reinartz Tuner
- One Tube Reflex
- Honeycomb Receiver
- Long Distance Receiver
- Short Wave Regenerative
- Two Stage R. F. Amplifier
- WD-11 Hookup.

FULL SIZE TEMPLATES

list of parts, diagrams, and directions

AT DEALERS OR DIRECT FROM

S. Newman
Publisher



74 Dey
Street
New
York

Out of the Ether

(Concluded from preceding page)

City's radio audience would be interested in hearing this bout via the air route. These stations should have had a representative at my office to listen to how many people phoned in requests, "Do you know if any of the local stations is going to broadcast the fight?" Maybe they could draw a conclusion.

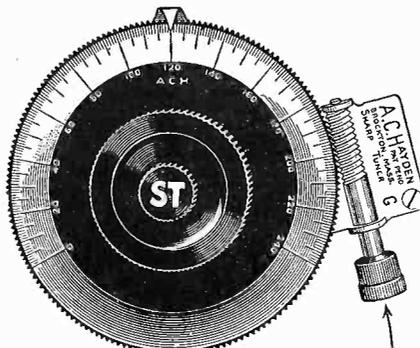
You folks who are thinking of giving books as birthday presents may profit by listening to the book reviews as broadcast every evening by stations WGI, KYW, WGY and sometimes station WOR.

The Jackson Glee Club at station WGR, "The City of Opportunity," entertained with a splendid array of classical songs. The Scotch folk songs as rendered by individual members of this clan are especially worth mentioning.

No doubt the farmers enjoyed John J. Weisberg's short address entitled, "Surmounting Freight Difficulties for the Farmer." Especially at this time of the year the farmer is confronted with many freight obstacles which he does not understand, but I should think that after hearing Mr. Weisberg's talk, nothing in the way of freight shipping should be an obstacle to him. This short address and many others pertaining to the farm are delivered Friday evenings at 7:30 from station WBZ.

There is no doubt that the voice of William Jennings Bryan, the "Silver-tongued Orator," never reached so many people as it did the other evening when he spoke in the Grand Lodge Room of the Masonic Temple to Mount Neboh Lodge. The subject of Mr. Bryan's speech was, "Masonry and the Bible, the Book of Books," and it was broadcast by station WJZ.

USE A C H SHARP TUNER DIALS



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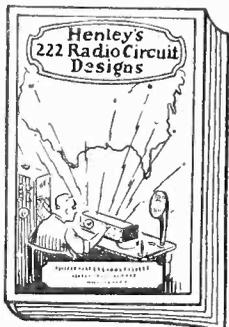
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that illustrates the complete electrical design of
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ductances, capacities and resistances, with the
name of each element on the diagram of the circuit.
It surpasses all other books in the scope of its
subject matter, in the simplicity and novelty of
presentation, and in thoroughness of detail.

THE COLUMBIA PRINT
1493 BROADWAY NEW YORK CITY

**Milwaukee Radio Ama-
teur's Club**

CONTRASTED with last year, the
technical committee of the Milwaukee
Radio Amateurs' Club, Inc., is no longer
represented by one man investigations and
reporting at meetings but is now the society's
largest committee and perhaps its most
active. Reports such as "The Relative Effi-
ciencies of Battery-Charger Rectifiers," by
R. E. Lathrop, 9ATX, former vice president
of the Waukesha Radio Amateur Club, "An
Amateur's Notion of the Heaviside Layer
Theory," by M. H. Doll, 9ALR, West Allis,
A.R.R.L. City Manager; and "The Remo-
tely Controlled System at Station 9AAP,"
by M. F. Szukalski, Jr., are typical of this
committee's work. Mr. Doll is chairman.

"Magnetism and Some Original Experi-
ments in Its Manifestation," was the title
of an address given before the society by
the Rev. John B. Kremer, S.J., A.M., Pro-
fessor of Physics and Director of Station
WHAD, Marquette University. Father
Kremer, known as an eminent physicist, has
recently become a deep student of radio
communication and has evolved a new
microphone for broadcasting stations. An-
other lecture arranged by the program com-
mittee was "Tube Transmitter Design,"
given by Le Roy M. E. Clausing, 9XN,
operating engineer at Station WJAZ of
the Chicago Radio Laboratory. As a pro-
gram feature, a contest in defining technical
radio terms was held. Great enthusiasm
was aroused, the winners being C. R. Gries-
bacher, 9CYL, and M. H. Doll, 9ALR, who
were awarded American Radio Relay League
emblems.

On the same evening of the weekly meet-
ings, Thursdays, at 7:15 p. m., a code class
for B.C.L.'s is held. This is in the Trustees'
Room of the Milwaukee Public Museum and
has been quite well attended. Among those
learning to receive the International Morse
Code are two Y.L.'s.

Under the leadership of F. W. Catel,
9DTK, a most successful membership drive
has been put over. From a large group of
Milwaukee County non-member amateurs a
majority have been induced to join the club
and the American Radio Relay League, of
which this society is a local section. M. F.
Szukalski, Jr., 9AAP, the society's vice-
president, has recently been appointed A.R.
R.L. City Manager for Milwaukee and now
heads the city's traffic work. An active
campaign against spark stations has begun,
and attempts to mitigate the spark inter-
ference to broadcasting, as caused by com-
mercial transmitters on ship stations, are being
made, for it is this interference that is most
troublesome to local radio fans.

The traffic committee solicits reports of
QRM for investigation. All communica-
tions to the club should be addressed to its
general office, 601 Enterprise Building, Mil-
waukee, Wisc., or its officers may be inter-
viewed at the weekly meetings, which are
open to the public.

**President Coolidge Greeted
Capt. MacMillan by Radio**

A SHORT time after he had written a
Christmas greeting to the children of
the United States President Coolidge
wrote a 43-word Christmas message for
Captin Donald B. MacMillan at Station
WNP.

Amateur radio men connected with the
American Radio Relay League, which has
maintained communication with the Mac-
Millan expedition, sent the Coolidge mes-
sage on its 4,000-mile journey from Hart-
ford on December 22.

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ner, 6 V., 6 Amp., \$12.50; Euraka Storage
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Reflex Neutrodyne Receiving Set with 6 V. tubes,
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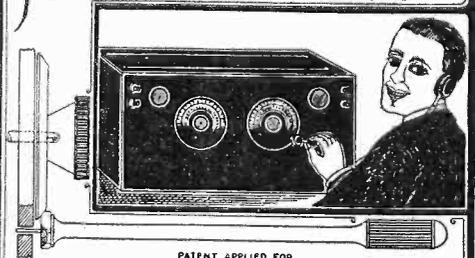
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Stock Swindles Balked by Radio

USE of the radio as a weapon to combat stock swindles is being considered by the Better Business Bureau of New York. Striking results have been obtained by the Union Trust Company of Cleveland by this method.

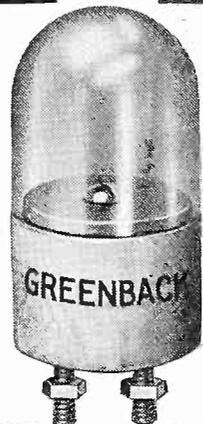
The plan, as now operated by the Cleveland company, depends largely for its success upon the alertness of the Cleveland Better Business Commission. This commission has advisers who watch men suspected of swindling schemes, and whenever these advisers run across the trail of a man or group who are contemplating a campaign to fleece unsuspecting investors, word is sent to the Union Trust Company. This company in turn prepares a "talk" on investment, in which it tells the story of the swindler, analyzes the fraud and broadcasts as complete a description as possible as to his method of approach, his argument and finally a description of the worthless security he is trying to sell.

The trust company reports that it has built up a regular clientele who tune in on Station WJAX, and hundreds of letters are received on the day following each "talk" asking for more complete information regarding propositions recently placed before them by fly-by-night salesmen. A number of swindling plans have in this way been exposed to the Ohio authorities which otherwise would not have been uncovered, according to the report of the Cleveland Better Business Commission.

A Radio Language?

APPROPRIATELY enough, Vienna is to entertain the sixteenth Esperanto congress next summer, says an editorial writer in the New York "World." Better than any other city Vienna knows the difficulties of a conflict in tongues.

Esperantists are likely to urge an American development as an argument for an international language. Nowhere would the argument be more forceful than in Vienna. It is in the United States that radio broadcasting has been most widely developed and distance-receiving has become a fad. In "The Evening World's" DX test last week hundreds of local enthusiasts picked up the test signal from Cincinnati, 520 miles away.

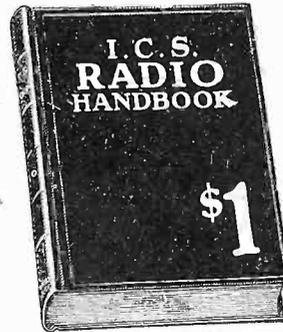


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This set is a one tube set which will accomplish all that other three tube sets will. The range of the set on the loud speaker is fifty to one hundred miles. With headphones the range is 2000 to 3000 miles. A beautiful set. 7"x12" panel, with an option of a beautiful mahogany cabinet with mahoganite panel.....
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The Unsung Heroes of Radio

WHEN the history of radio is written it will not be merely the story of the Marconis, the Lodges and the other discoverers of the principles underlying the art and the inventors of the means of applying these principles.

"It will also be the story of the unsung heroes of radio, the amateurs and the 'bugs,' according to G. E. M. Bertram, chief engineer of the Acme Apparatus Company. "The fans, though greenhorns in the science of electricity, and its application to the art of communication, will share with engineers and research men the credit for providing the endless experimentation and practical tests of everyday use which are in no small degree responsible for the present status and universal popularity of radio.

"To Hertz and Maxwell will always belong the credit for the discovery of the principle of wireless communication, and to De Forest for the invention of the third element in the audion tube which makes amplification, the key to radio, possible.

"But no small measure of the credit for making radio what it is today will belong to the 'One-Bulb Bills' and the 'Crystal-Set-Charlies' who built and rebuilt their crude sets, and experimented and tested results in the most practical ways. They knew little of technique or mechanics, but by getting of the beaten trail they worked out or stumbled upon various features which are important factors in the present success of radio.

"Furthermore, radio has entrenched itself so rapidly in everyday life that the literature on the art has not kept pace with its technical development and its expansion. The fan who has learned by actual use of a set all about radio-frequency, amplification, reflex circuits and other recent developments, is surprised when he consults library books on radio to find these subjects either omitted entirely or treated most vaguely and inadequately. He doesn't find much about these things which make radio reception loud, clear and undistorted because even a year or two ago when the books were written little or nothing was known about them.

"Some of the books on the subject give interesting, if not pathetic, glimpses of the discouraging efforts of the pioneers in the development of the art who, with their crude home-made apparatus, sat up nights trying to catch the faint buzz of the head-phone which might mean success or another failure.

"And many an earnest and experienced research man had his troubles and discouragements as well as the amateur. Not infrequently after months or even years of research these pioneers fell just short of success.

"It may be said to the credit of progressive radio manufacturers, however, that they have encouraged scientific research and experimentation, and their engineers have stuck to their problems and developed the type of circuits and controls which give the remarkable results obtained today—with distance, clearness, and amplification without distortion.

"To all the successful pioneers of radio and to the discoverers and inventors of sure fame we owe their full share of credit for the development of a new art of communication which can annihilate distance and bring the world's treasures of entertainment and education to every home. But we likewise owe more than we realize to the patient, courageous pioneers—amateur and professional—who, in the formative period of radio's development sought the key to its problems and intricacies, with meager success, and who labored unknown, unheralded and unsung."

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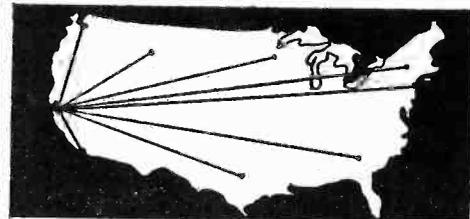
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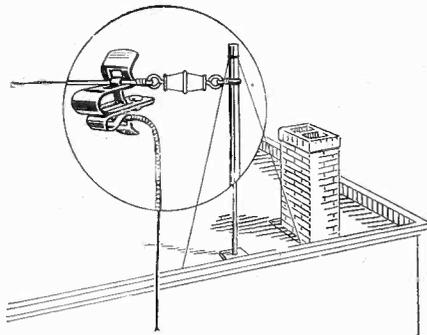
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Japan Wants China to Pay for Radio Rights

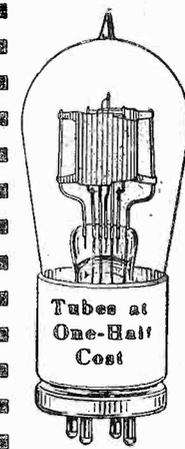
IF the powerful Mitsui Company of Japan is forced to surrender its "exclusive" radio contract in China, owing to the agreement made last summer between the Chinese Government and the Federal Telegraph Company in conjunction with the Radio Corporation of America, China must pay compensation to the Japanese concern, K. Yoshizawa, Japanese Minister to Peking, has informed the Peking Government, according to unofficial advices received at Tokio, says an Associated Press dispatch.

The agreement with the American firms, signed by R. P. Schwerin, president of the Federal Telegraph Company, provides for the construction of five powerful wireless stations in China, establishing for the first

time direct communication between the United States and China. Work has begun under the agreement. The total cost of the project is estimated at more than \$13,000,000.

Japan twice has protested to the United States against the contract, claiming that a previous agreement with the Mitsui Company gave that concern exclusive wireless rights in China. The Japanese Minister's statement was embodied in the latest demand for recognition of the Mitsui's monopolistic rights to radio facilities in China.

The controversy over the Schwerin contract resulted in a note from the American Government to China on the subject of the "open door" policy last summer.



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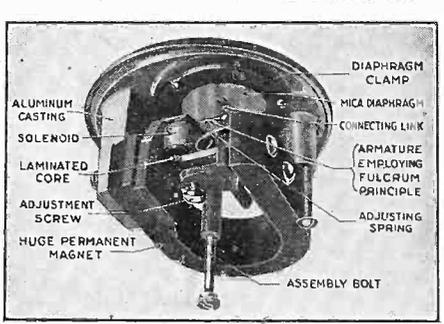
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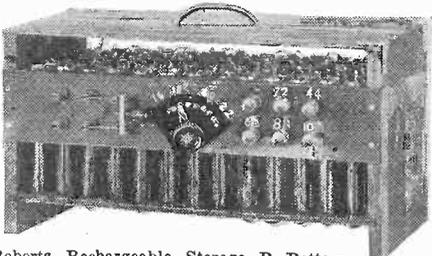
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RUMORS reached the offices of the Panama Pacific Steamship Company that its steamship Koonland, bound from New York to Los Angeles and San Francisco via the Panama Canal, was disabled. The vessel then was somewhere in the Pacific off the west coast of Mexico. The usual procedure in such cases is to forward a radiogram to the vessel via the nearest coastal radio station for a speedy confirmation, but on account of the disturbances in Mexico this was impossible. The messages were given to the Independent Wireless Telegraph Company's high power radio station at East Hampton, L. I., and forwarded direct to the vessel several minutes after filing. A reply was received within one hour, indicating that the Koonland was 1,890 miles south of San Pedro, Cal., and that the rumors were unfounded. The Koonland is equipped with Independent Wireless Telegraph Company's apparatus.

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