

RADIO AGE

The Magazine of the Hour

Price
25 cents

MAY, 1923

IN THIS NUMBER

How to Make the Erla Single
Tube Reflex Receiver

How to Make a Portable
Reinartz Set for Sum-
mer Use

Radio Music Cannot Be
Throttled

Complete Corrected List of
Broadcasting Stations

Hook-ups --- Lots of 'em!



R. L. Frazer

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Radio

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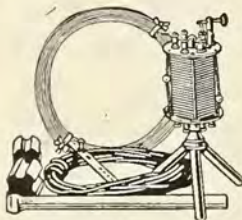
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1429 South Michigan Ave., Chicago

RADIO AGE

The Magazine of the Hour

Volume 2

MAY, 1923

Number 4

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FREDERICK SMITH, *Editor*
FRANK D. PEARNE, *Technical Editor*
M. B. SMITH, *Business Manager*

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Our Anniversary

WITH this issue of RADIO AGE we embark upon the second year of a pleasant voyage on the waves of wireless. We celebrate our birthday anniversary by moving into new and larger offices at 500 North Dearborn Street, Chicago. We celebrate also by adding another competent radio expert to our technical staff. We celebrate by the addition of a circulation expert who is directing our rapidly increasing sales on news stands in every state in the union. He has just returned from a tour of the New England states where the results have been particularly gratifying.

Dealers report to us that there are numerous radio fans who insist on having their RADIO AGE each month regardless of how many other radio publications may be offered. There's a reason. Our readers have discovered that there are original articles and drawings in each issue of the magazine that appeal to the man who wants to make something. We may be giving away a trade secret to the opposition when we make the foregoing statement. But we take that chance, confident that the following we have established will continue its loyal support and celebrate many other birthdays with us.

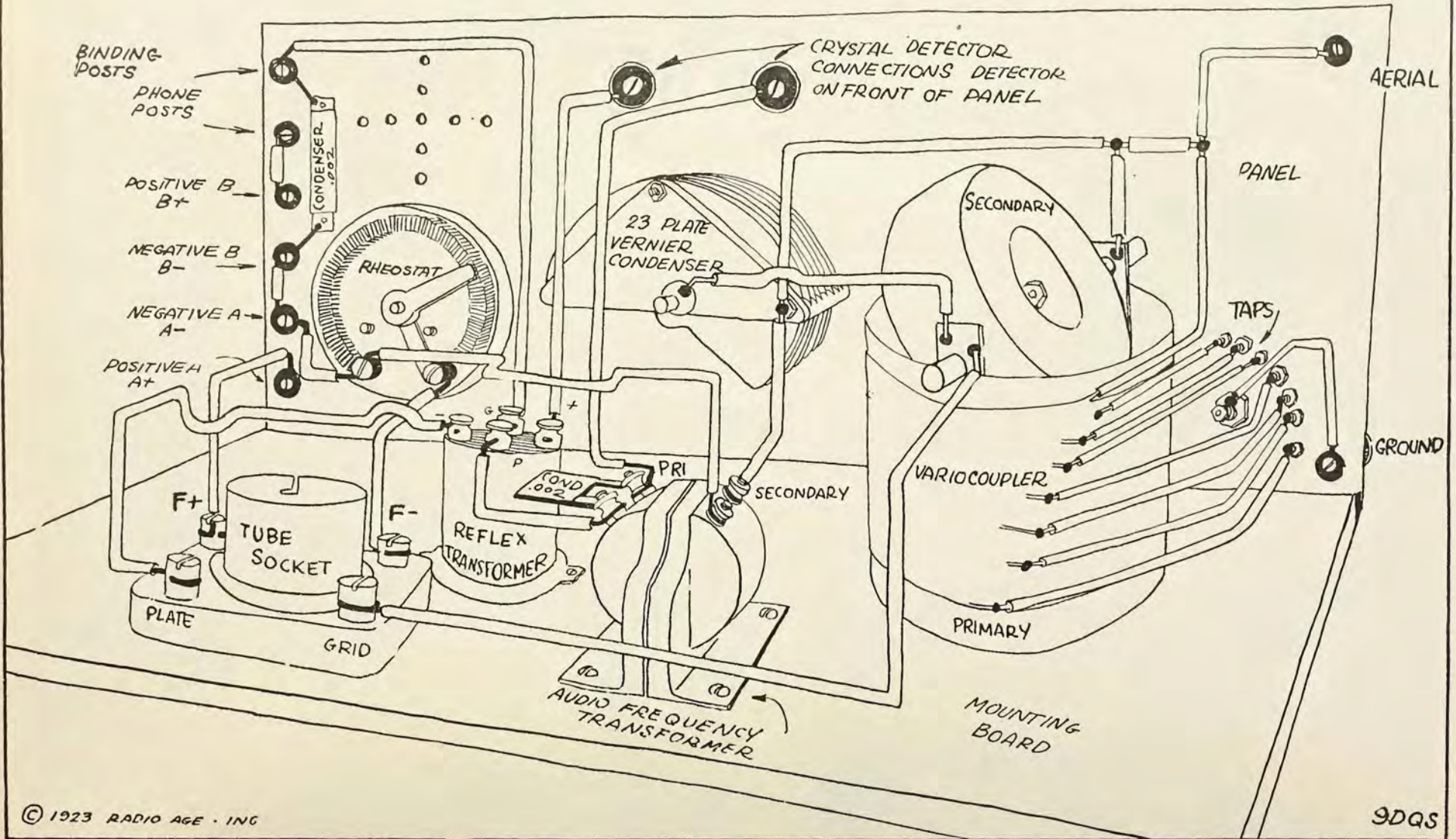
Since the first issue of RADIO AGE operators of receiving sets have increased from thousands to millions. Broadcasting stations have increased from thirty-six to five hundred and eighty-nine. This magazine has become the official news medium of the National Broadcasters' League which is the biggest association of its kind in the world. This magazine was the first radio publication west of the Atlantic to publish a complete, corrected list of broadcasting stations, with program and time schedules in each issue.

In all humility we confess to having found many steadfast friends, far and near. Herewith our thanks.

—THE EDITOR.

ERLA REFLEX CIRCUIT

WITH PANEL ARRANGEMENT AND WIRING ILLUSTRATION



RADIO AGE

"The Magazine of the Hour"

M. B. SMITH
PUBLISHER

PUBLISHED MONTHLY

FREDERICK SMITH
EDITOR

How to Construct the New Erla Single Tube Reflex Circuit

Brings in Distant Stations on the Loud Speaker

By F. D. PEARNE

TO HEAR it said that with a single tube circuit, stations from all over the United States could be picked up loud and clear on a loud speaker would make the radio fan shake his head in doubt. Never the less this is now an accomplished fact and a tremendous advance in radio progress has been made. The new Erla single tube reflex circuit is doing this very thing and the results obtained by this arrangement will surprise the most skeptical.

It is hard for the average amateur to keep up with the rapid improvements in the radio field, with the new circuits coming so fast that before he has advanced far enough in the construction of one set, another is upon him and he wonders where it will all end. This may be discouraging to the amateur, but it just goes to show that radio has aroused the interest of the entire world and is a good omen. With this enormous body of thinking people behind the thing, we may feel quite sure that the future will soon show results in the art of radio reception heretofore undreamed of.

Now comes the Electrical Research Laboratories with a new reflex circuit, using a single amplifying tube, which will duplicate in power and range, the multistage amplifiers now in use, cutting down the expense of operation to less than one third of the ordinary three tube set. This means a great deal. For one thing, the storage battery is only called upon for one third of the discharge occasioned by the three tube set, which makes it possible to use the storage battery three times as long without charging. Then there is the wear and tear on tubes, reduced to the limit and the ease of adjustment

with which the set may be operated.

By using the new 201-A or the 301-A tubes, the storage battery may be eliminated and three cells of dry battery substituted, making the receiver easy to move from one place to another, in other words, a portable set which can be conveniently taken along on the summer vacation, with little or no trouble.

For the reception of local broadcasting and distances up to 250 miles a loop aerial can be used with excellent results, which is another very important feature to the fan who is not allowed to place an aerial on his building. Very good results can be obtained by merely attaching about twenty feet of stranded copper wire in place of the aerial and throwing it on the floor, but where an outside aerial is used a maximum length of seventy-five feet is recommended. If a longer aerial is used, it will only serve to broaden the tuning, with no apparent increase in efficiency.

Material for Construction.

The parts necessary for the construction of the set are few in number, and the cost is low compared to the amazing results obtained. They consist of the following: One cabinet with a Bakelite panel 6x15 inches and 3-16 of an inch in thickness, one Erla reflex radio frequency transformer, one audio frequency transformer, having a ratio of 5 to 1, one ordinary vario-coupler, two sets of contact points with stops, two switch knives, one variable Vernier condenser having twenty-three plates, one Radiotron 201-A or 301-A tube, one rheostat (25-ohm), one crystal detector, one vacuum tube socket, two dials, one fixed condenser, .001 M. F., one fixed condenser .002 M. F., one "A" battery (six-volt

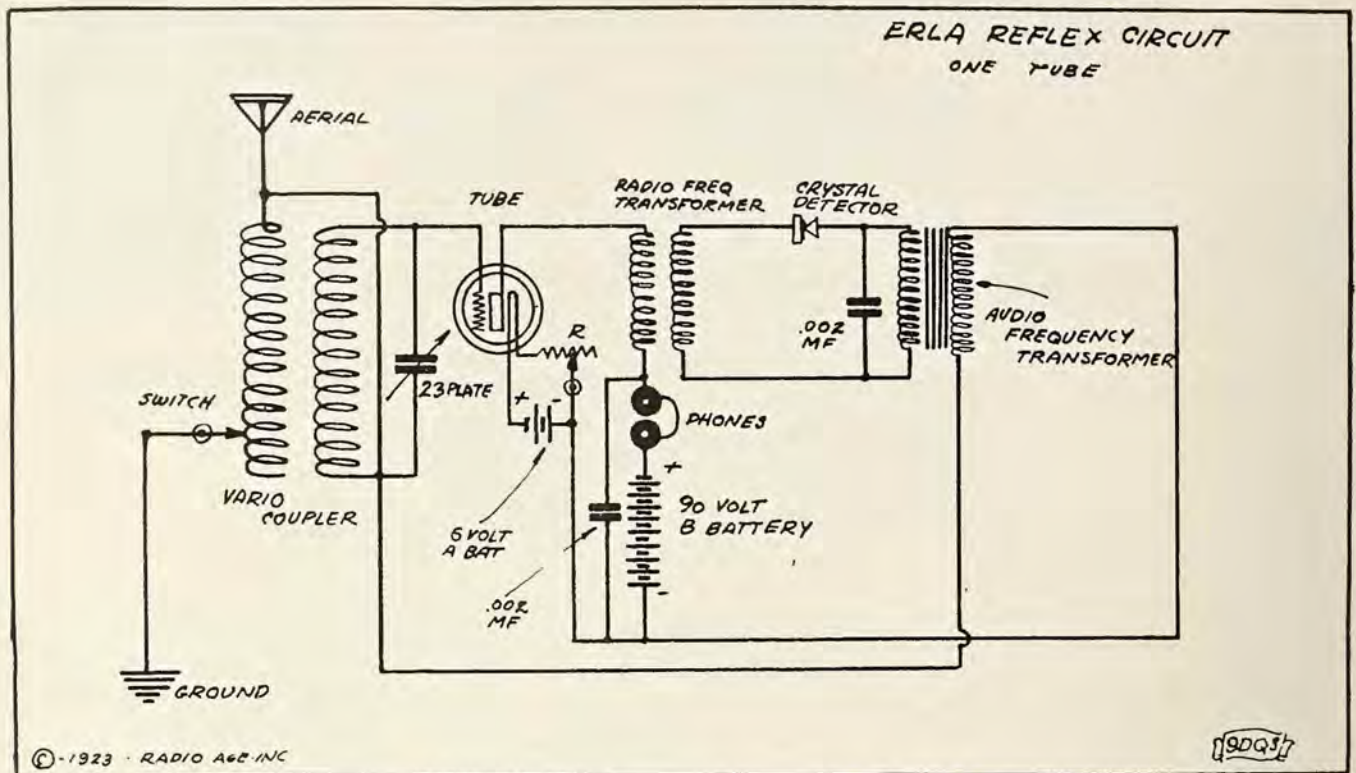
storage, or three dry cells), four to six "B" batteries of 22 1-2 volts, eight binding posts, one pair of head phones, and one loud speaker.

How It Is Constructed.

The panel is secured to a one-half inch thick base board which is just wide enough to reach the back of the cabinet when the panel is in position. The holes for the switch contacts and stops are drilled in a convenient place in front of the vario-coupler and the taps from the primary winding of the coupler are soldered to them, as shown in the drawing. The shaft of the coupler extends through the panel and one of the dials is fastened to it. The crystal detector may be mounted at any convenient place, preferably at the top and on the outside of panel. Mount the variable condenser in the position shown, with the shaft extending through the panel upon which the other dial is mounted.

The rheostat should be mounted directly in front of the socket and holes are drilled with a one-fourth-inch drill just above the rheostat so that the filament of the tube may be observed through the panel. The arrangement of these holes is shown. The two transformers are mounted on the base board in such a way that all connections will be as short as possible. These short connections are very necessary where ever radio frequency is employed.

The location and connections of all the binding posts are clearly shown and one should have no trouble in following out the general idea of the circuit. Many of those who have had experience with crystal detectors will be in doubt as to how this piece of apparatus can be very sensitive in a circuit



of this kind, but it must be remembered that the difficulty experienced in adjusting the crystal in the ordinary crystal detector set will not be found here, as the incoming signals will have been greatly amplified before they reach it, and it will be found to work on any point and work well if a good crystal is used. All wires should be covered with sleeving to keep them well insulated and prevent them from coming in contact with each other, and all connections must be carefully soldered.

Action of the Circuit.

In reflex circuits the tube is used for two purposes. Radio and audio amplification are both obtained through the same tube, therefore the tube does double duty. The first impulse which reaches the instrument from the aerial is amplified at radio frequency, through the special transformer and vacuum tube employed. It then goes to the crystal where it is rectified and detected, after which it is passed through the audio frequency transformer and back through the tube again. This gives double amplification and in addition, there is an extra reflexing of amplified impulses which are returned to the tube through the transformer windings, condensers, and filament circuits of the set.

So, in the single tube Erla circuit, in which the crystal serves as the detector, the conventional three tube circuit, with one stage of radio and one stage of audio amplification is obtained. Com-

parative tests have demonstrated that the absence of detector amplification, such as is usually gained by using a tube detector, is more than compensated for, by the increased resonance of the circuit and the double reflex secured.

The reflex action should not be confused with the Armstrong regenerative principle, as no relation between them exists. In reflex action the plate current undergoes a transformation in wave form, phase, and frequency, the complex result being re-impressed upon both grid and plate circuits in a form that enables the tube to give separate and distinct radio and audio amplification. Whistles, howling, and distortion such as are encountered in feed-back circuits are not apparent in the reflex circuit. To obtain the best results with the 201-A or 301-A tube, it should be operated as near the spilling point as possible in order to carry the reflex audio frequency impulses to the highest attainable amplification. To make a test for maximum amplification, lift the contact point off from the crystal, which will, if the adjustment is good, throw the tube into violent oscillation, which will return to normal condition when the contact is replaced.

NEW STUFF

A radio tube, which consumes 70 per cent less current than any of the small or so-called peanut variety now being sold and the first to operate with the filament current supplied from the ordinary flash-

light battery, has been perfected by the General Electric Company. It will be known as the UV199. It will be described in the June number.

The Music Row.

BROADCASTERS from all parts of the country met in Chicago on April 25 to discuss ways and means of getting music for broadcasting purposes. The owners of stations apparently will pay no tax to the American Society of Authors, Composers and Publishers for the privilege of broadcasting copyrighted music.

Scores of letters from members of the National Broadcasters' League indicate that the station owners prefer to dispense with music rather than submit to what they regard as extortion.

At the Chicago meetings it was evident that broadcasters have in mind a plan to obtain music from independent publishers, authors and composers, who will arrange with representatives of the broadcasters to furnish popular music for radio purposes, getting their recompense from the sale of music stimulated by this wide advertisement of their wares.

One of the meetings in Chicago was held under the auspices of the Chicago broadcasting stations and the other was called by the National Broadcasters' League, the nationwide official organization.

Detailed reports of both conferences will appear in the June number of Radio Age.

How to Make a Portable Reinartz Outfit for Summer Use

By FELIX ANDERSON, Radio 9DQS



WITH the approach of summer, people in general abandon the indoor pleasures and diversions which go with inclement winter weather and usually venture forth in search of entertainment outdoors. Many people have already realized the entertaining value of a radio set, and have installed large multicontrol sets, necessitating storage batteries, cabinets and the other familiar accessories. Of course such a set usually remains stationary in one section of the house, and with the advent of summer will fall into disuse due to its cumbersome nature, making easy transportation impossible.

Something of a more diminutive size and which utilizes less apparatus and accessories is in demand; a set which can be readily installed, dismantled, packed into a small space, and then again be installed with a minimum amount of trouble and labor.

With summer comes the vacation season, extended motor tours, excursions, and camping trips. There are motorboat rides and week end trips to summer homes, and countless other forms of entertainment. There are doubtless people who would like to take a radio set along, but the prevalent idea of too much trouble makes them hesitate.

You will no doubt recall times when you were in camp, and were

lazing before a fire wishing you could find something to do which did not take much effort; or you were out in a motor boat and were pondering as to what kind of weather tomorrow will bring and what's going on in the city, though perhaps you are miles and miles away from the city, a mere turn of a knob or two on a portable radio set will give you all the necessary information you wish.

One will agree that of course it is a perfectly good thing to talk about, but is it feasible? Who wants to

drag a lot of clumsy cabinets, batteries and other accessories, which are usually necessary with the present radio sets, along on a vacation or camping trip?

With the predominating ideas of compact arrangement and minimum size, together with the ease of transportation let us build a portable set which you can take along on any of the summer trips, and with which you can, by carefully executing the instructions which follow, receive over a radius of 300 miles or more at nighttime. With the powerful broadcasting stations of today, no matter where you camp in the United States you will be within the range of some station and you will find it a great sport to have as your central station some station other than the one you have been accustomed to listen to. To go on with the set:

Construction.

Because of the ease of constructing and the minimum expense involved, together with the efficiency of the circuit, the REINARTZ hookup will be used. The parts for this circuit can be purchased without trouble, and due to the small space the builder has at disposal this circuit seems best.

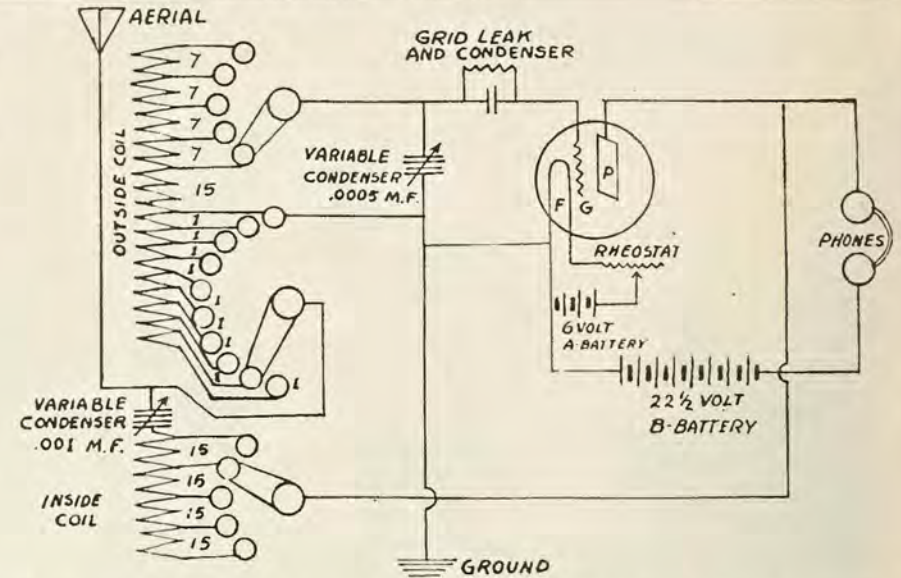
It is a well known fact that it approaches nearly anything now in use and a discourse on the advantages of this REINARTZ CIR-



CUIT is hardly necessary. The required parts for this portable REINARTZ set are as follows:

- 1 School Satchel, 13x9½x6 inches
- 1 Panel, 7x9½x1-4 inches
- 1 23 Plate Condenser Vernier
- 1 11 Plate Condenser Vernier
- 1 Pfanstiehl Reinartz Coil
- 3 Switch Levers
- 2 Dozen Switch Points
- 1 Tube Socket
- 1 Rheostat Vernier
- 7 Binding Posts
- 1 Pair Phones
- 1 22½ Volt B Battery
- 1 Grid Leak and condenser
- 200 Ft. No. 18 Copper wire, uninsulated
- 2 Cleat insulators
- Tube and filament battery

An ordinary school case will serve the purpose admirably as a medium for placing the apparatus in. Something of sturdy, well built make is recommended, as the set will have to be constructed to withstand bad weather, and rough usage. It can be purchased in practically any department or school store



at a cost of less than two dollars.

The panel is of bakelite or of other dielectric, 9½ inches high, 7½ inches wide and 1-4 inch thick. As all the apparatus is to be mounted on this small panel, care should be taken in the drilling, as space is the most valuable item on the set.

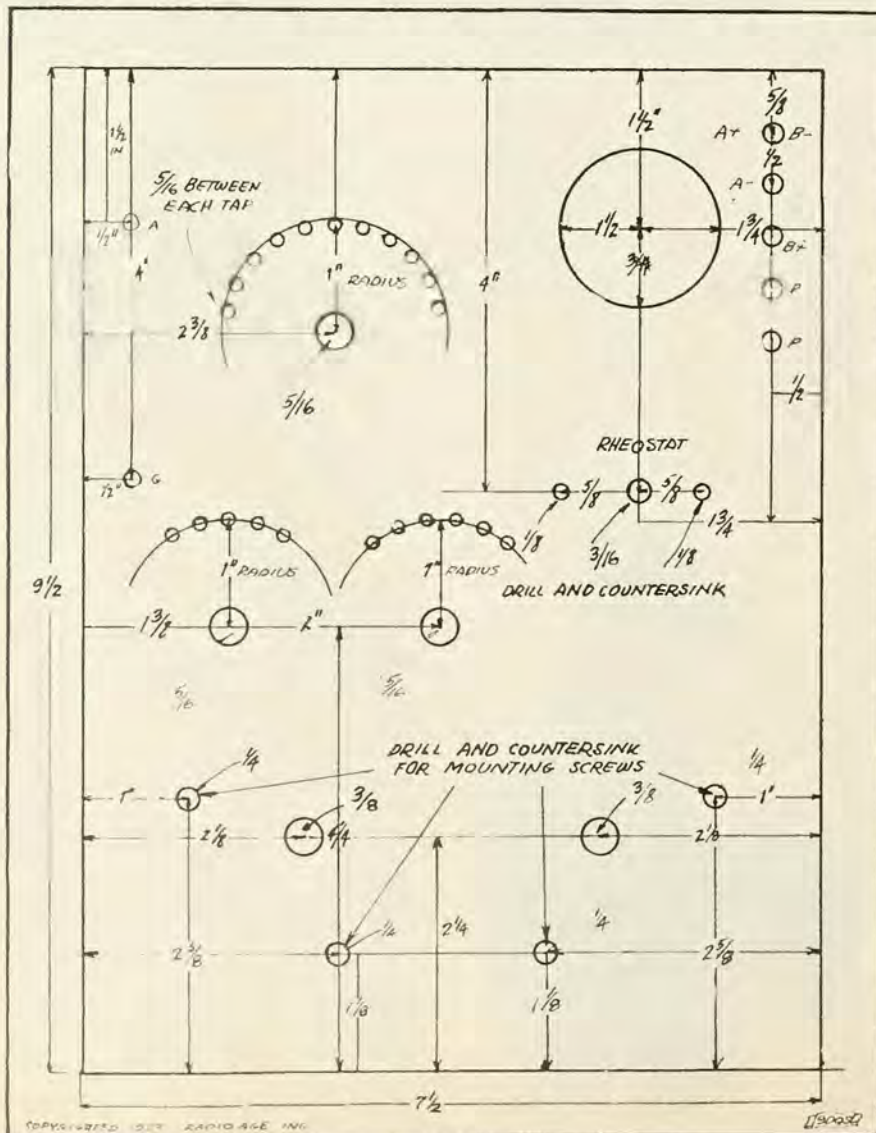
Two variable condensers are screwed on the panel, toward the grip side of the suitcase, the 23-plate vernier being mounted in the lower left hand corner and the 11-plate in the lower right hand corner.

Vernier condensers of the United type were used in the set made up by the writer, effecting very close tuning, and also because of their sturdy construction and small size. Because of the vernier, the panel will not be flush with the top of the satchel. The panel is lowered so that the cover of the grip can be closed without touching the knobs. This also makes it possible to lay the 200 feet of antenna wire which is wound in 2 coils of 100 feet each on top of the panel when the set is being carried. The No. 18 wire is used as it has less weight and can be more readily wound into coils about six inches in diameter.

Three small switches, having a radius of 1 inch each are used, and are mounted on the upper and center left hand side of the panel as the panel layout shows. The top switch is the primary control having 11 taps; the lower right hand switch, has 5 taps and controls the grid circuit, while the remaining switch is the plate feedback control, and has 6 taps. The panel layout shows the arrangement and the sizes of the holes to be drilled.

Directly behind the switches and taps, the Reinartz inductance is placed. A Pfanstiehl coil should be used here, chiefly because it can be mounted without any other support than the tap wires which if firmly and carefully soldered will hold the inductance in place without any other support. The inductance should be placed as close to the panel as possible, without crossing any of the taps.

A 1½ inch hole is cut out of the



panel with a coping saw in the top left hand corner $1\frac{1}{2}$ inch from the center of the hole to the top of the panel and $1\frac{3}{4}$ inch from the right side of the panel to the center of the hole. The tube socket is inserted here, the conservation of space making it necessary to have the tube on the outside of the panel when in use. A vernier rheostat is mounted directly under the tube socket 4 inches down from the top of the panel. The mounting screws on both the condensers and the rheostat should be countersunk in order that the knobs may pass over them without scratching.

Five binding posts are mounted parallel to the socket and rheostat, the top being the positive A battery (A+), the second from the top, the negative A (A-), the third the positive of the B Battery (B+) while the remaining two are the binding posts for the headset. The negative of the B Battery (B-) is connected to the positive A (A+) binding post, making the use of an extra binding post superfluous.

If the builder intends to use an automobile on his trips, a regular six-volt tube is used, in conjunction with the battery of the machine. The connection may be taken from the dashboard of the automobile by removing the dashboard light and inserting a plug in the socket. The connection should then be run from the plug to the set, the polarity of the wires from the plug being determined from the wiring of the car. To make the set an entirely independent portable outfit, a bulb, using a low filament voltage, such as the W-D-11, must be used. If this arrangement is used, the dry

cell is placed in the compartment just to the right of the panel as is the small block 22 $\frac{1}{2}$ volt B Battery.

The best antenna to be had is a single wire 75 to 100 feet long, strung between two trees, houses, or poles. If a tree is used care should be exercised that no leaves or branches touch the wire as this will make the signals fade.

If the set is to be used on a motor boat a loop antenna may be used, consisting of 4 turns of No. 18 wire on a frame 3 feet square. The ends of the loop are connected to the ground and antenna binding posts of the set. If the boat is a large one an ordinary antenna is used on the boat, the customary connections are used, a ground being obtained by dropping about 20 feet of wire over the side of the boat.

A ground may be obtained, if the set is used on land, by running a wire to a pond, brook or stream, or as a recourse, bury from 25 to 30 feet of the wire under moist ground about six inches deep. If a pipe is handy drive it into the ground about 4 feet and after scraping it bright wrap a piece of tinfoil around the pipe and then twist the ground wire around the tinfoil. This will insure a good contact. If possible, the pipe should be filled with water.

The set is so constructed that after it has been used as a portable set it may be taken out of the satchel and mounted in a handsome polished wooden cabinet, and can be used as a regular receiver in a home. The set can be constructed for less than \$30, using a dry cell tube, the cost including the antenna, phones, and tube. The possibility of using it for more than a portable set makes it worth the expenditure many times. With care exercised in construction astounding results may be obtained, and the reader will no doubt find the set a worth while proposition as an ideal summer receiver, should he decide to construct one.

The writer will be glad to answer questions on construction and operation if addressed to the Technical Department of this magazine.

The Mississippi River is now the dividing line between the "K" calls of the West and the "W" calls of the East, as far as broadcasting stations are concerned. All new calls issued to broadcasting stations east of the Mississippi will begin with "W" and those west with "K," so the stations can be immediately identified as Atlantic or Pacific when the initial letter is heard. The stations already listed under "K" will retain their original calls.



Showing the vacation radio fan starting off with his outfit of receiving set with batteries, aerial, and even cabinet complete, all contained in one small traveling case.

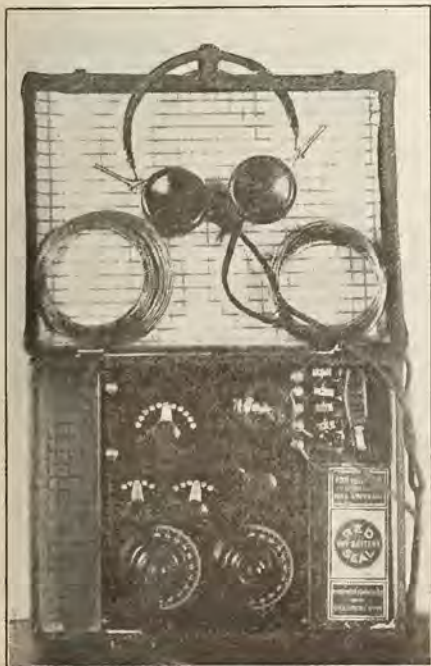
In order to get an idea of the immensity of the weather broadcasting carried on daily, an estimate of the number of words transmitted daily by the Governmental stations was fixed at 8,000. A reduction is made on Sundays, when approximately 6,000 words are handled. At one Naval station, Altana, Illinois, approximately 150,000 words are handled during the lake shipping season, between April 15 and December 15; this is one of the largest traffic schedules of the whole system of 98 stations.

WOC, Davenport and KSD, St. Louis, have published attractive booklets describing their stations and presenting excellent half-tone pictures of studios, operating rooms and entertainers, etc.

"Have they arranged to send money by radio yet?" asked a fan.

"Probably not," replied his wife, "too many people would 'pick it up.'"

Send \$1.00 to Radio Age, 500 N. Dearborn St., Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year.



End of Interference Promised

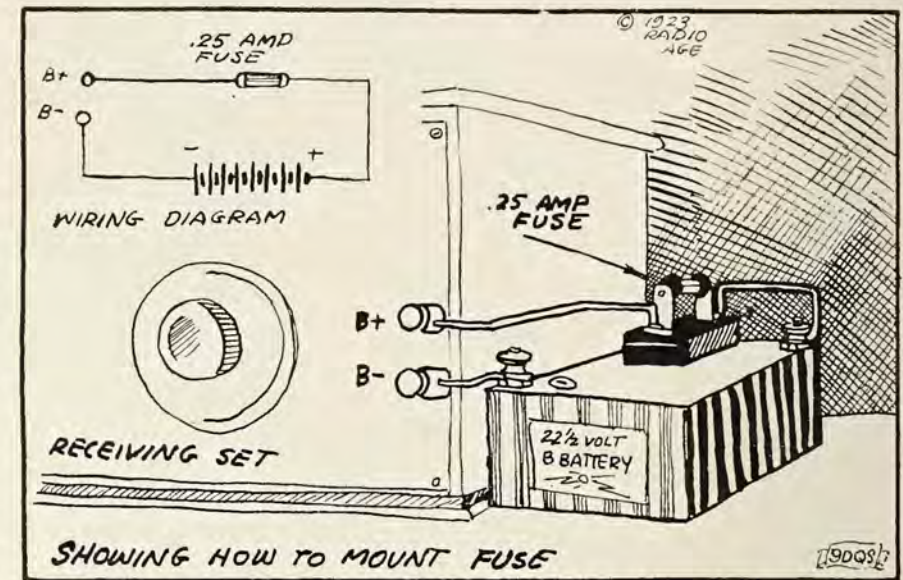
By CARL H. BUTMAN

WASHINGTON, D. C.—Interference, the bugaboo of both radio operators and fans, will be greatly reduced, if not eliminated, by May 15. On that date, the assignment of about thirty-five exclusive wave lengths to some thirty localities, where Class B high-powered broadcasting stations are situated, will go into effect. Wave lengths for Class A stations will also be assigned by districts by May 15, it is hoped.

Although Secretary Hoover is understood to have approved of the tentative allocation of the specific wave lengths to broadcasting stations, it is pointed out that each district radio inspector must now confer with the local operators and owners before the wave lengths are definitely assigned. For this reason the list is not yet made public.

The tentative distribution of broadcasting waves is based on the recommendations of the Second National Radio Conference and is the first step in the application of the wave band allocations made recently.* It will mean that anyone in the United States with a good receiving set will soon be able to pick up each and every high-powered radio broadcasting station and most of his local stations without experiencing the interference which has been prevalent for many months.

Practically every B station will have a National exclusive wave length, between 300 and 345 or 375 and 545, except where there are two or more in a locality, but the waves are assigned to localities rather than stations and will have to be shared in some cities. In four instances, in New York, Philadelphia, Los Angeles and San Francisco, two or three additional wave lengths will also be assigned but they will not be exclusive nationally. Those waves allocated on the Atlantic Coast will be repeated in the Pacific Coast cities. While not exclusive, these additional waves will aid in supplying additional facilities and will scarcely cause interference as the stations will be about 3,000 miles apart. The difference in time of three hours will also tend to eliminate any interferences. As soon as the nine radio inspectors can arrange with the Class B station owners in their districts, authority to broad-



cast will be issued on the specified wave lengths and stations will be required to use them only.

Where two or more stations exist, a time schedule will be arranged until the assignments are made definitely, B stations will continue to operate on 400 meters, and C stations on 360, but by the middle of May it is hoped that all readjustments will be completed and the transfers made. A few radio wave lengths in each district have been reserved because of anticipated interferences with other lines of communication or held for new stations.

Class A Wave Lengths.

By May 15, the nine radio inspectors of the Department will also undertake the reallocation of specific waves to old Class A or new Class C stations in his district now operating on 360 meters. These wave lengths, between 222 and 300 meters, will not be exclusive nationally but will be exclusive in each radio district, giving practically every station a selective wave. Along the borders of adjacent districts, inspectors plan to arrange the allocation of wave lengths so that no material interference will be created due to the assignment of waves in close proximity.

Class C stations now licensed on 360 meters will be permitted to continue the use of this wave length if they so desire, but they will not be permitted to vary the wave length.

The reallocation means much to fans, all of whom should be able to pick up any B station and any of the A stations in his district due

Fusing the "B" Battery

In using both "A" and "B" batteries on the receiving set, one cannot be too careful about getting them connected to the proper terminals when installing the set. Sometimes the binding posts on the cabinet are not marked and it is a very easy matter to make a mistake in the connections. If the "B" battery is so connected that it gets to the filament terminals, the filament will be destroyed, unless the circuit is protected in some way.

Then also, it quite often happens that the wires in the set become accidentally crossed, which will often throw the current from the "B" battery into the filament. A small fuse having a capacity of about 1-4 ampere, inserted in the positive side of the "B" battery circuit, as shown in the drawing will often save the cost of a new set of tubes. If W-D-11 tubes are used, the fuse should have a carrying capacity of only 1-8 ampere.

Amplifying circuits using high pressures of from 65 to 150 volts can be well protected by inserting an ordinary 25 watt, 110 volt lamp in the circuit of the "B" batteries. The resistance of such a lamp is high enough to prevent too much current flowing, in case of a temporary cross, and at the same time is low enough, not to interfere with the amount of current necessary to supply the plate circuit.

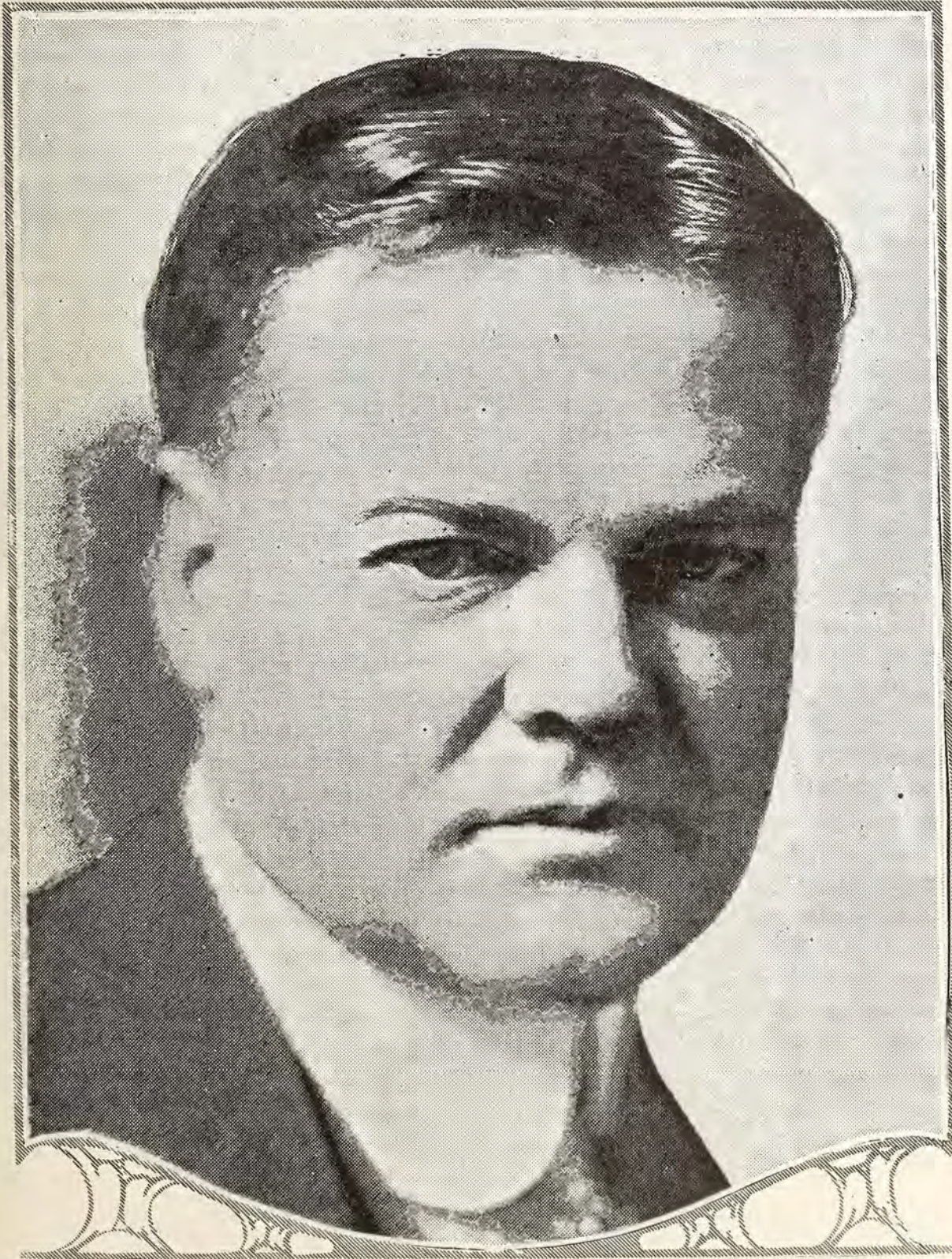
to the allotment of many additional waves.

A great amount of additional work will fall upon the shoulders of the radio inspectors and unless the receiving public, operators and other interests co-operate staying on wave lengths assignment, the work will be delayed and interference will not be overcome for some time.

Details of committees' recommendations are printed elsewhere in this issue.

"Chief Justice" Hoover of Radio

By CARL H. BUTMAN



WASHINGTON, D. C.—Following in the leads of the great outdoor sport and the old favorite evening pastime, radio may take on an arbitrator. Just as Landis has come to have the "last word" in base-ball, and Hayes to write the "finale"

of the movies, so Hoover may soon transmit "VA," the "30" of radio, putting an end to all arguments in the ether.

In calling the recent radio conference, Herbert Hoover offered not only to arbitrate radio disputed, but to make

the necessary regulations which the Senate failed to provide. He has volunteered as a sort of foster father to this new art and industry, and hopes to clear up a threatening atmosphere charged with static. The conference just terminated indicated whole hearted

voluntary support by the several phases of the industry of an administration by him. It only remains for the radio public to co-operate to offset a threatened slump and remove the present broadcasting interference. Incidentally, Hoover's administration in his present capacity would save the industry the cost of a privately paid arbitrator.

In the opinion of Major General George O. Squier, Chief Signal Officer of the Army, than whom radio has no more earnest supporter nor more generous technical contributor, the industry and public should co-operate with Hoover in his every wish.

"The failure of the Senate to pass the White Bill may be a blessing, although we all were disappointed at the time," General Squier said to the writer during the conference. The very lack of law requires a closer co-operation of the various radio activities in order to straighten out difficulties and combat interference, he explained. Co-operation is assured through the fact that manufacturers, engineers, broadcasters, commercial interests and amateurs have voluntarily subscribed to a wave length distribution and agreed to abide by such regulations as Secretary Hoover lays down as necessary. This indicates, he pointed out how close the great family can be brought together when necessary.

The inventor of "Wired-wireless" emphasized the great benefit to radio of a period of unhampered development and operation under voluntarily accepted regulations, instead of hard and fast laws, which could only be remedied by the passage of other laws dependent upon the action of a rather dilatory Congress. Changes in regulations found necessary during a year of such operation could be applied immediately, without reference to Congress.

"The art is advancing so rapidly that we hardly know what to expect next," General Squier said; "to-day radio is a service for the ear, but if the transmission of radio pictures—still and moving—is perfected, the eye may also be served." We must be ready to accept new views and apparatus at a moment's notice; not to do so would place this country in the rear instead of the van of radio progress," he indicated. Since the White Bill was drafted, General Squier said, many new phases had arisen which indicated that the bill was not entirely suitable.

"Secretary Hoover," the General said, "has practically volunteered to administer and arbitrate radio troubles for at least two years—free." As a Cabinet member, his service to the radio interest will not cost a cent, he explained, pointing out that the moving picture industry had found it necessary to secure the services of a former member of the Cabinet at a sum reported to approach \$100,000 a year, and that baseball likewise had a highly-paid arbitrator.

Conflicts or difficulties arising between operators or stations can upon recommendation by Hoover's Advisory Committee be adjusted quickly without

Recommended Wave Allocations

It is recommended that radio stations be assigned specific wave frequencies (wave lengths) within the wave band corresponding to the service rendered as given in the following table.

Throughout this report, both wave frequency and wave length are given. Wave length in meters is 300,000 divided by wave frequency in kilocycles per second.

It is recommended that wave bands marked exclusive be used for no other type of service; those marked non-exclusive can be used for other types of radio communication, as indicated.

Wave Frequency, Kilocycles per second.	Wave Length, Meters.	Service.
Above 2300	Below 130	Reserved. (See Note 1.)
2300	130	Government, CW, exclusive.
(2300)	(130)	Reserved. (See Note 1.)
(2100)	(143)	
2100	143	Government, CW, exclusive.
(2100)	(143)	Reserved. (See Note 1.)
(2000)	(150)	
(2000)	(150)	Amateur, CW, ICW, Ph. exclusive.
(1700)	(176)	Amateur, CW, ICW, Ph. Spk, exclusive.
(1700)	(176)	
(1500)	(200)	
(1500)	(200)	Special amateur, and technical and training schools, CW, exclusive.
(1350)	(222)	
(1350)	(222)	Aircraft, CW, ICW, Ph., non-exclusive.
(1300)	(231)	
(1350)	(222)	Class B broadcasting, Ph, non-exclusive.
(1050)	(286)	(See Note 2.)
(1050)	(286)	Reserved.
(1040)	(288)	
(1040)	(288)	Class A broadcasting, Ph, exclusive.
(1000)	(300)	(See Note 3.)
1000	300	Marine, CW, ICW, Spk, non-exclusive.
(1000)	(300)	(See Note 4.)
(667)	(450)	Class A broadcasting, Ph., exclusive.
667	450	(See Note 3.)
(667)	(450)	Marine, CW, ICW, Spk, exclusive.
(550)	(545)	(See Note 5.)
(550)	(545)	Class A broadcasting, Ph, exclusive.
(500)	(600)	(See Note 3.)
500	600	Marine and aircraft, CW, ICW, Spk, exclusive.
(500)	(600)	Marine and aircraft, CW, ICW, exclusive.
(445)	(674)	(See Note 4.)
445	674	Marine and aircraft, CW, ICW, Spk, exclusive.
(375)	(800)	
375	800	Radio compass, CW, ICW, Spk, exclusive.
(375)	(800)	Marine, Ph, exclusive.
(315)	(952)	
315	952	Government, CW, ICW, Spk, exclusive.
(300)	(1000)	Reserved.
300	1000	Radio beacons, CW, ICW, Spk, exclusive.
(300)	(1000)	Reserved.
(285)	(1053)	
(275)	(1091)	Marine, Ph, exclusive.
275	1091	Government, CW, ICW, non-exclusive.
(275)	(1091)	Marine, Ph, exclusive.
(250)	(1200)	
250	1200	Government, CW, ICW, non-exclusive.
(250)	(1200)	Marine, Ph, exclusive.
(235)	(1277)	
(235)	(1277)	University, college, and experimental, CW, ICW, exclusive.
(230)	(1304)	
(230)	(1304)	Government, CW, ICW, Spk, exclusive.
(190)	(1579)	
(190)	(1579)	Marine and point-to-point, non-government, CW, ICW, Spk, exclusive.
(120)	(2500)	
(120)	(2500)	Government, CW, ICW, Spk, exclusive.
(95)	(3158)	

Note 1.—Available for special licensing by the Department of Commerce.

Note 2.—Not more than six CW amateur stations to be licensed to use wave frequencies above 1,050 kc/s (wave lengths below 286 meters), for communication across natural barriers.

Note 3.—A class A broadcasting station is a station of sufficient power to serve an extensive territory. Fifty territorial wave frequencies approximately 10 kc/s apart are to be assigned by the Department of Commerce to local areas throughout the United States without duplication. The ten sub areas within each of five national zones are to have wave frequencies separated by approximately 50 kc/s.

Note 4.—The 1,000 and 500 kc/s (300 and 600 meter) waves are for calling and distress purposes, with a minimum of traffic.

Note 5.—Mobile service on the 667 kc/s (450 meter) wave is to be stopped between 7 and 11 p. m. local standard time, and to be transferred in so far and as soon as practicable, to wave frequencies below 500 kc/s (wave lengths above 600 meters).

reference to a court of law; new regulations can be instituted without delay and harmonious operation can be maintained between the thousands of transmitting and millions of receiving stations which now spread over the face of the country.

Backing Hoover is an opportunity that the radio industry and public cannot afford to neglect, General Squier believes.

Send \$1.00 to Radio Age, 500 North Dearborn Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year.

The Handy Radio Co., of Moravia, has issued a chart by which names, locations and time schedules of the principal broadcasting stations are presented on one sheet. It is a compact index. Patent rights have been applied for.

The Bureau of Standards will shortly issue Letter Circular 87 entitled "Methods of Measuring Properties of Electron Tubes." It is a technical paper intended to advise manufacturers and engineers how the Bureau makes its tests.

Radio Conference Recommendations

SECRETARY Hoover makes the following announcement:

The recommendations by the Radio Conference represent a step in ideal development of measures for the prevention of interference in public broadcasting.

The report recommends making available all wave lengths from 222 to 545 meters for public broadcasting, the various possible bands to be assigned to different stations so as not only to reduce direct interference but also to build up zonal regions of distribution.

The Department fully accepts the recommendations of the Conference, but there are a number of difficulties in placing the plan abruptly into action: First, the hardship that it may cause to various stations to move arbitrarily to new wave lengths; second, the difficulties introduced by the ship to shore communication which are now working to some extent on 300 meters and also on 450 meters.

The Conference recommended that the ultimate development for ship communication be to assign for the general purpose of shipping the whole wave area from 600 to 800 meters, different bands being allotted within this area for different shipping purposes. The distress signals from ships now work on 600 meters and the radio compass works on 800 meters. The ship to shore communications on 300 and 450 meters are altogether commercial traffic and would be more advantageously carried on with less interruption than to-day if these services were given the entire field around 700 meters.

In order to make progress in this direction of developing the area from 600 to 800 for ship communication, it is proposed that all ships and all shore stations used for ship communications shall cease using 450 meters between the hours of 7 and 11 p. m., but may use 700 meters at this or any other time. The 300 meters wave length now assigned under the International Convention is very little used and will be used for inland broadcasting, and it is not expected that the ships will avail themselves of the International Agreement in this particular, as it has not proved of practical advantage except to a limited extent.

For internal broadcasting the Department proposes to cooperate with the various stations with a view to developing a systematic assignment of wave lengths to the various stations within the broad confines of the recommendations of the Conference. In order to carry this out without hardship the following classification of stations will be made:

Class A stations—that is, stations equipped to use power not exceeding 500 watts. In this class it is proposed that the radio inspectors, in co-operation with the station owners, shall assign distinctive wave lengths to each station

New Wave Lengths

The following announcement of the Department of Commerce, naming the wave lengths of broadcasting stations by cities is the keynote of the arrangement by which interference, it is hoped, will be eliminated:

By Dept. of Commerce.

The specific wave lengths indicated are in accordance with the plan sent to Radio Inspectors following the recommendations of the Second National Radio Conference. The Radio Inspectors have been instructed to communicate the plan to stations in their districts. Every station which the Department has so far heard from has willingly fallen in with the plan. Of course, it is understood

so far as is possible in the area from 222 to 300 meters. No station will be required to change from 360 unless it so desires.

Class B stations—that is, stations equipped to use from 500 to 1000 watts. In this class it is proposed to similarly offer to license these stations on special wave lengths from 300 to 345 and from 375 to 545 meters, having regard to the maintenance of some ship work on 450 meters as outlined above and again no station will be required to change from 360 unless it so desires.

Class C stations—comprising all stations now licensed for 360 meters. In this class no new licenses will be issued for stations on 360 meters until the plan is entirely realized. Stations which do not wish to move under the general plan may remain at 360 meters, but they will necessarily be subject to some interference at best. It is thought that by the above plan the stations can be gradually brought into accord without hardships.

Under the plan amateurs are given the whole area from 150 to 220, instead of being fixed upon 200 with special licenses at 375. The special licenses hitherto issued for amateurs at 375 will now be issued at 220. Certain special cases will be taken care of otherwise. It is proposed, in cooperation with the amateur associations, to develop an assignment of wave bands in classifications so as to somewhat relieve the present interference among amateurs. It will be remembered that the number of wave bands which can be used among the short wave area assigned to the amateurs is greater in proportion than among the longer wave lengths, and these arrangements expand the area hitherto assigned to amateurs.

The full recommendations of the Conference are published herewith, the recommended allocation of wave lengths

(Continued on page 12)

that any station now operating on 360 meters has the privilege of remaining on that wave length.

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

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

Allocation of Wavelengths.

Class B—Stations Operating and Pending.

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

Radio Conference Recommendations

(Continued from page 11.)

being published in a separate table.

Conference Report

This conference was called by Secretary Hoover to consider what can be done from an administrative point of view to lessen the amount of interferences in radio broadcasting. The meetings were held at the Department of Commerce on March 20 to 24, 1923.

Resolutions

That this conference, and the Department of Commerce subsequently, follow the practice of expressing wave frequency in kilocycles per second, with wave length in meters in parentheses thereafter.

That in assigning a wave band of 10,000 cycles to each Class A broadcasting station they be distributed over five zones throughout the country such that no stations in adjacent zones are closer together in frequency than 20 kilocycles, and that within each zone there be ten stations separated by 50 kilocycles.

That only one wave frequency be assigned to a Class A broadcasting station, which should transmit exclusively on the wave frequency designated and reserved exclusively for that station.

That every broadcasting station should be equipped with apparatus such as a tuned circuit coupled to the antenna and containing an indicating instrument or the equivalent for the purpose of maintaining the operating wave frequency within 2 kilocycles of the assigned wave frequency.

That the Department of Commerce establish qualifications for Class A broadcasting stations, including a general minimum and locally suitable maximum power and a quality of program that will warrant assignment of a territorial wave frequency to each particular station, and that the qualifications be similar to those required of the present class B broadcasting stations.

That the Department of Commerce in its discretion assign Class B broadcasting station licenses in which wave frequencies shall be specified and in which the power ratio between the Class A and B stations shall be at least 2 in so far as is practical for a given locality.

That in granting licenses it is recommended that the Department of Commerce limit the use of power where undue interference would otherwise be caused.

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

That simultaneous re-broadcasting shall be permitted only on a broadcasting wave frequency, and with the authorization of the original broadcaster and of the Department of Commerce.

That the Department of Commerce be requested to insist upon the suppression of harmonic and other parasitic radiation from all radio stations, as for example, by requiring the installation, if necessary, of coupled circuit

transmitters at the earliest feasible date.

That spark transmitting apparatus be replaced as rapidly as practicable by apparatus which will produce a minimum of interference.

That the amateur organizations of the United States study the time requirements of the broadcasting of religious services on Sunday and by mutual arrangement with the broadcasters determine upon silent periods which will make possible the reception of such religious services in any given locality.

That when the government conducts services similar to commercial services for which waves or wave bands have been assigned, the government stations shall use the said waves or wave bands.

That the Government have the exclusive use of a band one kilocycle wide centered at each of the following frequencies, 92, 83, 81, 78, and 76 kilocycles, so far as is consistent with public service generally.

That where a line-radio installation produces interference with the reception of signals from beyond the state such line-radio station shall require a license from the Department of Commerce.

That the subject of interference caused by devices not used for radio communication purposes and which are not subject to the present radio law be referred to the projected Sectional Committee of the American Engineering Standards Committee and that in the meantime the members of the conference offer to the Department of Commerce their cooperation in the solution of such immediate problems as may be of a character in which their aid could be of value.

That, in the judgment of the Second National Radio Conference, the prevention of "wilful or malicious interference," as provided for by Section 5 of the Act of August 13, 1912, and the minimization of interference, as provided for by Article 8 of the International Convention, require that the Department of Commerce shall, in its discretion, withhold or rescind station licenses to transmit on specified wave frequencies, at certain times, and on definite powers, and with certain types of transmitters and when, in the judgment of the Department of Commerce such interference would result or does result; and that it is the clear and manifest intent of Section 1 through 4, and Regulations 10, 12 and 18 of Section 4 of the said Act to give the Department of Commerce such authority to withhold or rescind licenses where such interference will result or does result; and that the Second National Radio Conference believes that a decision by the Courts validating the above views will be greatly in the public interest; and that the Second National Radio Conference expresses its willingness to advise and assist the Department of Commerce in the support of the above resolutions in the event of litigation.

That a copy of the foregoing motion be sent to each concern, organization or association engaged in manufacture of radio equipment, or broadcasting by radio or otherwise interested in radio

communication with a request for an expression of approval or disapproval of the motion and an agreement to abide by its provisions.

That the Second National Radio Conference desires to emphasize the limited facilities available for radio broadcasting, and the uneconomic and tentative basis of present-day broadcasting, and that the Conference urges the consolidation in each locality of those desiring the establishment or maintenance of broadcasting and those interested in broadcasting in that locality; to the end that broadcasting conducted in each neighborhood by such a local association will receive public support and be handled in an economic and permanent fashion.

That the great expansion of radio communication has not been accompanied by a proportional increase in the radio personnel and facilities at the disposal of the Bureaus of Navigation and Standards of the Department of Commerce, and that the resulting strain on the inspection and technical forces of the Department of Commerce has been excessive, and has even forced the omission of important activities and investigations, and that the Second National Radio Conference strongly recommends that additional appropriations be granted to the Department of Commerce for its radio inspection personnel and equipment and for its research personnel and facilities. That a committee of three be appointed to wait upon the Secretary of Commerce to present the urgency of this need and the importance of the early provision of funds for these Bureaus.

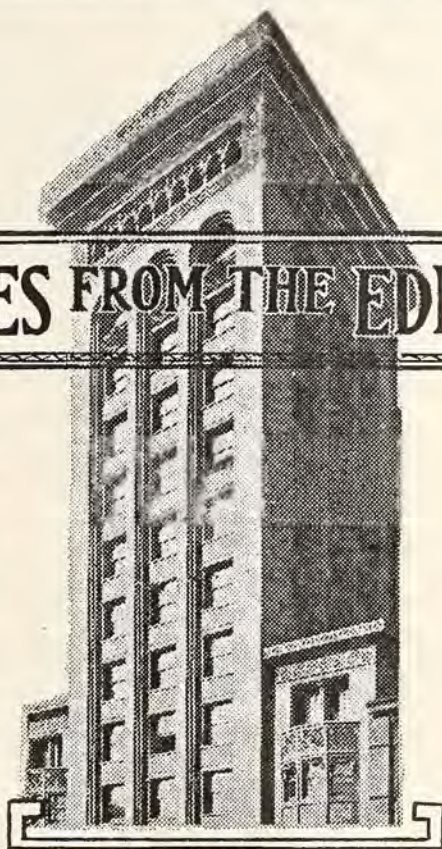
That the present conditions of radio interference with non-local reception and the resulting public dissatisfaction urgently require that the recommendations of the conference be accepted by the Secretary of Commerce and put into early operation by the Department of Commerce.

One-Year Licenses

One of the first things to be done by the Department of Commerce will be the extension of the license periods for broadcasters, from three months to a year. Since the introduction of the White Bill last June, the Department has been extending broadcasters licenses every three months on application, in anticipation of new regulations which would have followed closely upon the enactment of new laws. But the failure of the Senate to pass the Radio Bill precludes new legislation for at least a year and twelve-month licenses will now be issued to save the Department time and work.

There are about four times the operators licenses issued annually today, compared with those issued in 1913. Ten years ago, only 3,682 operators were licensed but in 1922 operators licensed totaled 12,113. Commercial licenses issued increased about 80 per cent, and amateurs licenses were nearly eight times as many. There were issued in 1922, 8,920 amateur licenses, and in 1913 only 1841.

THOUGHT WAVES FROM THE EDITORIAL TOWER



LET us not get excited over the fact that several very rich corporations have agreed to pay royalties to the American Society of Composers and Authors and Publishers for the privilege of broadcasting copyrighted music from stations controlled by those rich corporations.

Broadcasting stations can parry this blow at popularized radio in a very simple way if they will. It is not necessary to stop broadcasting music and it is not necessary to pay the tax.

Some broadcasters declare they already are under heavy expense and are absolutely unable to pay the tax demanded. They get no money for entertaining millions of radio fans and they have asked for none. Quite a considerable number of stations are paying from \$50,000 upward annually for the maintenance of their programs.

The writer has a vision of radio that apparently the responsible heads of the authors and composers have not. It is a vision of a nation of people who are becoming radio lovers and who will not easily be deprived of their evening concerts. It is a vision of a great army of radio enthusiasts including many musicians of ability and even genius.

Then how may the broadcasting of good music be maintained? Here is the answer:

Broadcast the Facts

Let the broadcasting stations make it known to the radio public that the American Society that controls copyrighted music now in vogue is taking a step that will tend to cut off popular musical entertainment in a majority of the stations—that is in those stations unable or unwilling to pay the tax demanded. Then let the stations make an appeal to composers and song writers. Many of them are radio fans. Many of them, for the love of radio, and as a graceful act of disinterested benefit to the millions of other fans, would be willing to dedicate a piece of origi-

nal music or a song to the radio cause.

Not all the musical talent in the United States is represented around Forty-second and Broadway. The jazz tunes of today and the songs of the present hour will be forgotten tomorrow. They are not indispensable. Authors and composers are compelled to face the truth of the old saying, just as others recognize its truth—"nobody is ever missed."

Volunteer song writers and composers of music could copyright their productions and give a release to broadcasting stations that wished to popularize them by radio transmission. An arrangement could be made whereby the National Broadcasters' League, the largest organization of its kind in the world, would publish and distribute such songs and music to broadcasters and then place the songs and music on the market which such broadcasting surely would establish.

Would Pay Royalties

The song writers and composers would receive their royalties on sales as a material recompense and it would not be difficult to induce broadcasters to mention the name and address of the song writers and composers before and after each musical number. That would win fame. It would mean tremendous advertising for the song writers and composers but it would be within the present broadcasting regulations.

And it would save popular music for the radio millions!

Until new music is available the stations can get on very well with the old songs, the old melodies and the beloved classics. We haven't been getting enough of them anyhow.

What do the broadcasters think of this plan? Can they offer any improvements on it? Do they believe it to be desirable and necessary?

What do the music lovers and music producers in radio think of the suggestion?

If you have a thought on the subject, either for or against it please address a letter to the secretary of the National Broadcasting League, 500 North Dearborn Street, Chicago, Illinois.

THE AMERICAN Society of Composers and Authors tried to steal a march on the Broadcasters at the recent second annual National Radio Conference in Washington. The American Society of Composers and Authors has been trying to extort from the broadcasters a generous fee in return for the broadcasting of copyrighted music and songs. Up to date the demand for payment of such a tax has been met with unanimous refusal.

So when the Department of Commerce was holding its radio conference a representative of the Composers and Authors asked that the Department prohibit stations from using copyrighted music and songs unless fees were paid. To this the Department replied that the Government might as well be asked to force the stations to pay rent and to compel the payment of fees for the use of patented radio apparatus. It was decided at this conference that if the composers and authors want these fees badly enough they must go to court.

It is interesting in connection with this to point out how small the return is financially to the broadcaster for his service in entertaining the public. Mr. Howard E. Campbell, radio engineer, told the conferees that the Detroit News, which he represented at the conference, spends \$100,000 annually for its radio activities. Mr. Campbell said that the only return made to the newspaper for this expense was "good will."

Cuba Loses Freedom

"Cuba Libre" may again become a national slogan, if the restrictions placed on public radio operation interfere too much with the independence and pleasure of Cuban radio fans.

There have been no laws or regulations covering either the construction or operation of radio stations in Cuba, until a recent presidential decree divided non-governmental radio stations into five classes, assigning wave lengths and power maxima. All classes of stations—including private receiving sets—were required to be registered prior to March 16; operators licenses are now necessary and bad apparatus is banned.

The decree which will serve until a pending radio law is enacted, provides for the classification of all except commercial and governmental sets as follows:

Class	Wave length (meters)	power (kilowatts)
A—Amateurs, including all receiving sets.....	200	1/2
B—Educational institutions and Experimenters.....	225-275	1/2
C—Colleges & State Institutions.....	300-360	1/2
D—State institutions only.....	400	1/2 to 1
E—Meteorological stations only.....	485*	1/2 to 1

*All receiving sets are rated Class A, regardless of type or size.

All owners of stations within these five classes were ordered to register with the Director General of Communication. After March 16, no station may be used unless the proper permit has been issued. The permits are for a term of one year in the case of Classes A, B, and C, and for five years in the other two classes. Applicants must pass an elementary examination, but it is not believed that this requirement will hamper the issuance of licenses. The Government may, under specified circumstances, require transmitting stations of any of the five classes to cease operation without claiming indemnity.

Transmitting stations of all classes are subject to the regulations of the International Radio Convention signed in London in 1912. The decree prohibits the transmitting of the international distress call "S. O. S." Penalties are provided for the disclosure of any public or government message intercepted by station. Only apparatus capable of transmitting a pure, continuous wave may be used, and the frequency must be constant so as to avoid oscillation.

First Aircraft Licenses

Radio as a safety measure for the protection of pilots and passengers has come into its own in air travel as well as on the sea, where its value was first realized. Seven airplanes and flying boats now are equipped with radio and answer regular calls.

The first American aircraft, other than those of the Army and Navy, which are all radio-equipped but not licensed, to be licensed as a limited commercial station was one belonging to the Airline Transportation Co. of California. The Aeromarine Company followed with the "Buckeye" in December and licensed five more recently. Radio-equipment, officials believe, will make for greater safety in over-sea travel and insure aid when air boats are forced down.

Aircraft Licensed as Limited Commercial Stations on 525 Meters.

KFBI, Airline Arrow, No. 1, Airline Transportation Co., Los Angeles, Calif., August, 1922.

KFBY, Balboa, Aeromarine Airways, Inc., New York City, January 18, 1923.

KFBA, Buckeye, Aeromarine Airways, Inc., New York, December 22, 1922.

KFBF, Gov. Cordeaux, Aeromarine Airways, Inc., New York City, January 18, 1923.

KFBJ, Nina, Aeromarine Airways, Inc., New York City, January 18, 1923.

KFBM, Ponce de Leon, Aeromarine Airways, Inc., New York City, January 18, 1923.

KFBZ, Santa Maria, Aeromarine Airways, Inc., New York City, January 18, 1923.

Panama Stations

An agreement with the Panama Government places the control of all radio in the Canal Zone or in the Republic of Panama under the United States, and the Navy acts for the Government. Panama would like to break this treaty, it is said, and either set up stations of her own or let commercial concessions open stations there. Broadcasting and radiotelephony have accentuated this, and commercial companies desirous of selling their equipments are no doubt behind some of these activities. In order to gratify local desires and to "loosen up" a little on regulations, the Navy has authorized the stations in the Zone to broadcast entertainment programs.

Denver to Haiti

Station KFAF, George S. Walker, owner, claims a long distance record as having been received by an operator in Port Au Prince, Haiti. KFAF has been heard in every state in the union, in Hawaii, in Sitka, Alaska, Cuba, Old Mexico, New Brunswick, Canada and by ships in the Atlantic and Gulf waters. It has been heard also by ships far out in the Atlantic Ocean. It is one of the big privately owned stations that is making good and it is extremely popular.

Germans Pay

In Germany, radio fans, most of whom are bankers and business men have to pay 500,000 marks annually for their radio broadcast service.

A financial and commercial news service has been arranged for broadcasting by the Express Service Company of Berlin, according to information reaching Washington. This private company, financed by Germans, has just secured partial use of the Koenigswusterhausen radio station from the Government for broadcasting international news received via Nauen from the United States, Switzerland, Sweden and other countries.

The news is re-broadcast over a radio phone circuit for about 800 subscribers, principally banks and industrial institutions, in about 200 cities. The company plans to handle New York quotations within ten minutes after their dispatch from this country.

Subscribers rent their receiving sets from the express company, paying an annual rental charge of 200,000 marks and an annual service charge of 300,000 marks. Two and a half hour schedules are maintained every morning and evening.

Lady Bountiful

Radio reception has been greatly simplified in Backus, Minnesota. If the Backus resident is a telephone subscriber he just takes his telephone receiver from the hook and music, drama, sermon or lecture pour out. He has no need to worry about rundown batteries, weak tubes, the intricacies of hook-up or the length or height of his antenna.

Miss Anna Ozier, chief operator for the Backus Telephone company recently wrote WGY, the radio broadcasting station of the General Electric Company, at Schenectady, as follows:

"We have a receiving station here and by putting the horn close to the transmitter and connecting up the farm lines, I have a system now by which the subscribers on our farm lines who have never had an opportunity of getting concerts direct from the air have passed many of these winter evenings enjoying themselves by turn and turn about at the telephone.

"I know of several cases where three or four people have listened in on the same receiver at once. In one case I was surprised by being materially recompensed by a lady who was so much pleased by the concert and the part she thought I took in it, that she brought me a dozen eggs. As she said, it was her way of saying 'thank you'."

Someone has suggested the name of "Radiowners" for those of us who have sets and listen in. Certainly it is better than most of the awkward terms in use today. "Listeners-in" is too long, "Radiophans" or "Radiofans" sounds like the name of an instrument, and we could hardly designate them as "receivers."

The Monthly Service Bulletin of the
NATIONAL BROADCASTERS' LEAGUE

Solely by, of and for Radio Broadcasting Station Owners

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 Western Radio Corporation
 Denver, Col.
President

Arthur E. Ford, E. E.
 State University of Iowa
 First Vice President

W. J. Baldwin, W S Y
 Alabama Power Co.
 Birmingham, Ala.
 Second Vice President

Frederick A. Smith
 Garrick Building,
 Chicago
Secretary

Founded to promote the best interest of Radio Broadcasting stations in the United States and Canada.

Executive Offices, Garrick Building, Chicago, Ill.

DIRECTORS:

T. W. Findley, W L A G
 President and Genl. Mgr
 Findley Electric Co.
 Minneapolis, Minn.

Earle C. Anthony, K F I
 Earle C. Anthony, Inc.
 Los Angeles, Cal.

J. Elliott Jenkins, W D A P
 Midwest Radio Central, Inc.
 Drake Hotel, Chicago, Ill.

Howard E. Campbell, W W J
 The Detroit News,
 Detroit, Mich.

H. A. Trask, K S D
 St. Louis Post Dispatch
 St. Louis, Mo.

Stanley O. Need, W G A H
 The New Haven Electric Co.
 New Haven, Conn.

A. J. Westland, W W L
 Physics Dept. Loyola University
 New Orleans, La.

Frank W. Elliott, W O C
 Palmer School of Chiropractic
 Davenport, Ia.

During the month of March, broadcasters increased to 609, but twenty-nine withdrew and their licenses were cancelled, leaving, with twenty-one new stations licensed, a total of 580 operating stations. Of these, thirty are Class B stations on 400 meters and the balance on 360 meters. There they will remain until applications for transfer to the two new classes are received and they are "sorted" out and assigned new waves by the Department.

A step to eliminate interference between broadcasting stations was taken when the Power Staggered Wavelength Broadcasting Plan was presented by the National Radio Chamber of Commerce to the Hoover conference meeting in Washington to solve broadcasting difficulties.

Briefly, the plan contemplates the use of three major bands of wavelengths. Broadcasting would be divided into three main divisions according to the type of program furnished. Programs covering lectures, talks, reports, etc. would be broadcast on a particular wavelength band. Classical musical programs would be broadcasted on another wavelength band, while popular musical programs would be confined to still another wavelength.

In addition to this assignment of wavelength bands, the country would be divided into Broadcasting Districts. Broadcasting stations would operate simultaneously on the three major wavelength bands above mentioned. The plan has been so worked out that there is ample variation in wavelengths and no two broadcasters will interfere with each other. In fact three broadcasters may operate simultaneously in one district without interference as well as several other broadcasters in accordance with the time Schedule arrangements. The idea back of the whole plan is to give the public what they want when they want it. The receiving sets are tuned to the program desired.

The plan as recommended by the National Radio Chamber of Commerce was originated by Harold J. Power, of Medford Hillside, Mass. Mr. Power is Vice-President of the American Radio and Research Corporation. He was a pioneer in the development of radio, and has devoted much of his time to study of the broadcasting situation.

The following letter was received from the Standard Radio Equipment Co., of Fort Dodge, Iowa. (WEAB)
 March 15, 1923.

Gentlemen:
 We are wondering if something can

OWNERS of broadcasting stations who have not yet joined the National Broadcasters' League, may do so by sending their check for the annual membership fee of \$10 to Frederick Smith, Secretary, 500 N. Dearborn St., Chicago.

Membership will entitle broadcasters to periodical information as to developments in connection with broadcasting, intelligence as to steps taken to eliminate the present almost disastrous interference and news of events in any part of the country affecting broadcasting and broadcasting interests. Also members will receive the official organ of the league for one year.

This nominal fee is required for the cost of issuing circulars and handling the large volume of correspondence. You will find it useful to be associated directly with this clearing house for broadcasting information, which is also a protective institution, offensive and defensive.

be worked out amongst the various broadcasting stations whereby emergency traffic can be handled in better shape than we handled it Monday and Tuesday of this week. (March 11-17.)

Approximately the entire wire service throughout the state of Iowa was demoralized, and Station WGF at Des Moines, WOC at Davenport, and our own Station attempted to handle the traffic and while communication between ourselves and Des Moines was excellent and we worked on a schedule, we seemed to be unable to get any satisfactory arrangement with WOC at Davenport, who were the connecting link to Chicago, and the result was that we put most of our traffic to an amateur at Clinton, Iowa.

While it is not the function of the broadcasting stations to handle this service, we believe that the Broadcasters League should work out with the assistance of the various broadcasting stations a regular relay route which can be used in cases of emergency, and have it understood amongst the various stations as to whom they shall work with in all directions.

Yours very truly,
 STANDARD RADIO
 EQUIPMENT COMPANY.

Station WOC, operated by The Palmer School of Chiropractic, Davenport, Iowa, did some splendid work in assisting the railroad, telephone and telegraph companies in transmitting important dispatches after the serious sleet and snowstorm which disrupted communication throughout the Middle West in March.

All programs were abandoned on Monday and Tuesday, and Station WOC devoted the time to transmitting messages for the railroads in locating "lost" trains and train dispatches, to sending messages for the telephone company to other headquarters to get repair men and supplies, and sending messages relating to sick-

ness and death for telegraph companies to stations they could not reach because the wires were down.

One instance showing the quick results from radiophone, picked at random, was a message sent from Fullerton, Calif., to a man in Illinois, stating that his father had died. The message got as far as Davenport over the wires, but had to be relayed by radio from there. Within fifteen minutes of the time it was broadcast a local party phoned the station that the party was in a Davenport hospital, and the sad news of his father's death was conveyed to him.

Washington's New Station

Practically the whole continent will be able to hear a new broadcasting call, as yet unassigned, when the RCA station at Washington opens up in June. Other than that the station will be of the highest order and latest type, the Radio Corporation refuses to state. Judging from rumors, however, its voice should reach to every corner of the country as well as some of the insular possessions.

The new station is located at 14th St. and Park Road, known in Washington as Mount Pleasant.

Through the co-operation of the Riggs National Bank and Chas. H. Tompkins, two one-hundred foot fabricated steel towers have been erected on the roofs of the Riggs and Tompkins Buildings in the highest section of Washington where they will serve as new and modern landmarks for the Capital.

The towers, tapering networks of steel, have a slight curvature which will give them somewhat the appearance of small Eiffel towers. Their construction is unusual, in that they have three legs instead of the more customary four. This reduces wind resistance and makes for stability. A thirty-six foot cross-arm near the top of each tower supports four antenna wires each twelve feet apart. The distance between the towers is two hundred twenty feet and the effective radiating length of the antenna one hundred sixty feet.

The studio, the reception, transmitting and apparatus rooms are on the second floor of the building. Two motor generator units will insure an adequate power supply and two tube transmitters will make possible flexible, smooth running programs. It is hoped that the station will be in operation and ready to serve Washington and the surrounding territory within two months.

Everybody's Friend

A proud father recently wrote WGY, the Schenectady broadcasting station of the General Electric Company, requesting the station to announce in the air that an eight pound boy had been born to him and that "mother and son "are doing well." Probably every

father who recalls his feelings on the arrival of the first born will sympathize with this man whose desire was just a modern elaboration of the wish of a brand new father to shout the good news from the housetops.

This request is unusual but every broadcasting station is asked to make announcements of matters just as personal as this one. It is interesting because it illustrates the intimate, personal relationship which the radio listener feels exists between him and the radio broadcasting station. To the average listener WGY is not an elaborate mechanical outfit consisting of motor-generator set, transmitting equipment and antenna; it is human, its voice comes out of the night and enters his home, amusing the children, entertaining the grown-ups, relieving pain, monotony and loneliness.

It is not to be wondered therefore that those in charge of broadcasting stations receive warm, personal letters from writers unknown to them, or that requests are made to broadcast matters which are purely personal.

A correspondent recently asked WGY to announce that he, his wife and child were all well. He explained that his parents in a western state have a receiving set and frequently hear WGY and he thought it would be fine for them to hear from their son and his family. The writer ingenuously requested that the announcement be made three successive evenings as his parents might be out one or two evenings but would surely get the message one night out of the three.

Another correspondent asked WGY to find his eight-months-old Airedale pup. He said the children missed the puppy and he gave a description of the animal with its license number.

A Cleveland friend of WGY asked the station to co-operate in his plans for a surprise party. The man and wife to be surprised were radio fans and the writer requested WGY to say "Hello Mr. and Mrs. Blank" at the precise time that Mr. and Mrs. Blank's friends would enter the front door.

An unselfish youth requested WGY to repeat the first act of one of its radio dramas because his brother was late getting home and had missed the opening of the play.

Those who make requests for the broadcasting of purely personal matters are informed that the stations are not permitted, under their licenses issued by the United States Department of Commerce, to put anything into the air that might be interpreted as personal or commercial communication.

Radio Exports

American radio exports in January fell off slightly over those of December. The exact figures were: January \$141,577 against December, \$163,236. During January, the last month for which figures are available, most of these exports went to Canada although large shipments of apparatus went to Australia and Cuba.

California Leads

California still continues to lead in number of broadcasting stations, with fifty-nine in operation, while Texas has climbed to second place with thirty-six. Every state except Mississippi had one or more stations on March 10 when the total of broadcasting stations had reached 588, the highest point since this art was undertaken in September, 1921.

Out of these stations sixty-six represent educational institutions, sixty-seven newspapers and periodicals dispensing information and news as well as entertainment. Several cities, a number of churches, theatres and, of course, many electrical apparatus manufacturers and distributors are also included.

The number of stations in each state follows as of March 10:

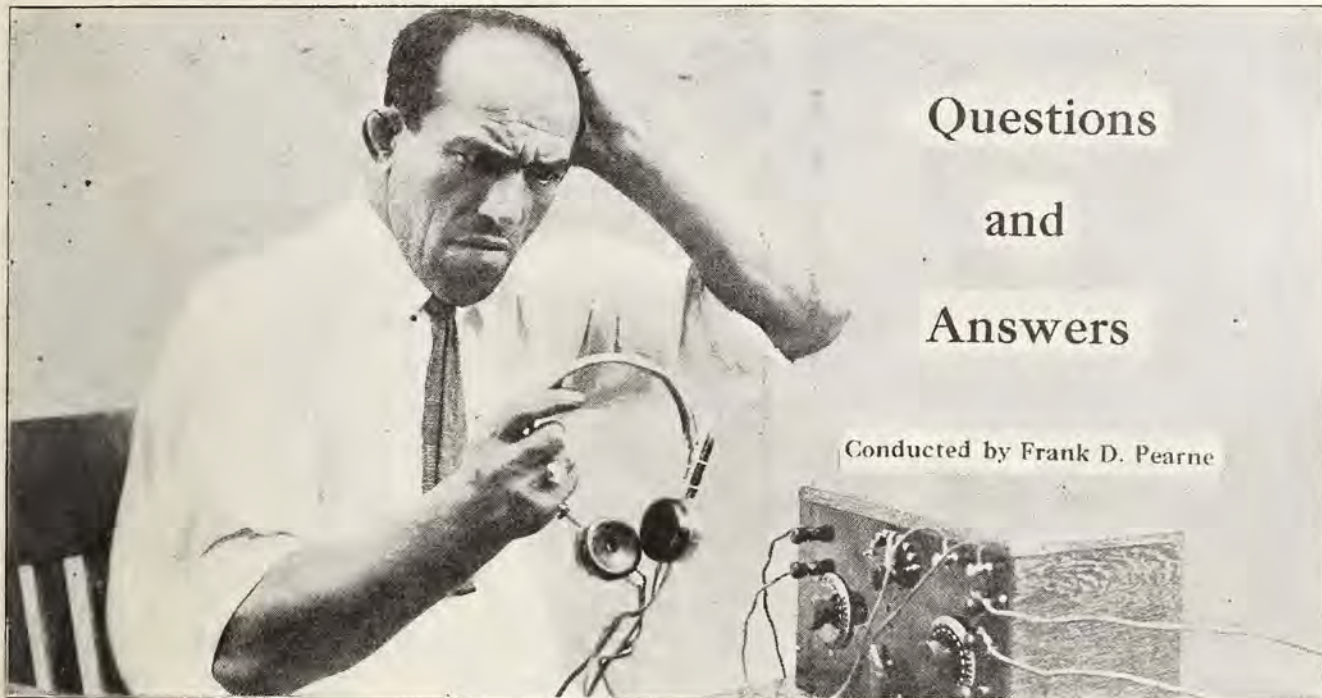
NUMBER OF BROADCASTING STATIONS IN EACH STATE MARCH 10, 1923.

California.....	59	South Carolina	6
Texas.....	36	Alabama.....	5
Ohio.....	31	Arizona.....	5
New York.....	30	Idaho.....	5
Pennsylvania.....	28	Maryland.....	5
Iowa.....	26	Montana.....	5
Missouri.....	25	North Dakota.....	5
Washington.....	24	Tennessee.....	5
Illinois.....	24	Utah.....	5
Nebraska.....	23	Rhode Island.....	4
Kansas.....	19	South Dakota.....	4
Oregon.....	16	Wyoming.....	4
Indiana.....	15	North Carolina.....	4
Colorado.....	15	Virginia.....	4
Michigan.....	14	Delaware.....	3
Minnesota.....	14	Hawaii.....	3
New Jersey.....	13	Maine.....	3
Wisconsin.....	11	Vermont.....	3
Florida.....	11	West Virginia.....	3
Georgia.....	10	New Mexico.....	2
Massachusetts.....	10	Nevada.....	2
Dist. of Columbia	9	Porto Rico.....	2
Oklahoma.....	8	Alaska.....	1
Louisiana.....	8	New Hampshire.....	1
Connecticut.....	7	Mississippi.....	0
Kentucky.....	7		
Arkansas.....	6	Total.....	588

What WGY Spells

Correspondents of WGY, the General Electric Company radio broadcasting station at Schenectady, N. Y., frequently have trouble in spelling the name of the city. English radio fans generally address "General Electric Company, New York and make no attempt to spell "Schenectady." A five year old boy living at North Hoosick, Mass. has happily solved the problem according to the following which appeared in a Massachusetts newspaper:

Fred Stevens of North Hoosick picked up the five-year-old son of Ira Fisk, and gave the boy a lift on the way to school. The juvenile Fisk is noted for his brightness and Mr. Stevens began a quiz. The youngster, of course, spelled "cat" and things of that kind without any trouble, but Mr. Stevens thought he put a poser when he asked the boy if he could spell "Schenectady." "Sure," was the prompt response, "WGY."



Questions and Answers

Conducted by Frank D. Pearne

The puzzled gentleman in the above picture is "Bull" Montana, the comedian star of Metro films. For once "Bull" has found something too tough for him.

Fans who are not subscribers may obtain this service by enclosing 50 cents with their question and the reply will be mailed at once, accompanied by circuit diagram where illustration is needed.

All inquiries should be accompanied by self-addressed and stamped envelope.

The technical department sends out many replies to questions in each day's mail. This service heretofore has been free to all but in order to assure this service to our subscribers this direct reply method hereafter must be restricted to those fans who are on our subscription list.

C. F. F., Minden, Nebraska.

Question: I have a Reinartz set and the reception on distance is fine, but it does not seem to have volume enough when anything is brought in. In making the set, I used two model "B" Crosley condensers. Do you think the using of Crosley condensers as above would bring this trouble?

Answer: These condensers should work very well if they have the proper capacity. You do not state whether or not you are using an amplifier. If not, you should do so.

W. H., Jamaica, L. I.

Question: I would like to construct a loose coupler and would be much obliged to you if you would send me a diagram and instructions for winding one.

Answer: We have no stock copies of this particular piece of apparatus, but fortunately I happen to have a copy with working drawings now on hand, which I am mailing to you.

E. H. B. Indianapolis, Ind.

Question: In the December, 1922, issue, you had an article on making a battery charger for \$3.00. I have made it exactly as described, purchased pure lead and aluminum plates and ammonium phosphate basic pure at \$1.00 per pound. Two and one half pounds was not enough to make a saturate solution, it took four pounds and still it does not work. The lights connected in parallel burn either with or without the positive and negative terminals connected. I am sure I have the right terminals of the lead and aluminum connected as per diagram. Puzzled.

Answer: The lights will burn either with the charging terminals connected

or disconnected, on account of a leakage of the valve action, which cannot be prevented, but they should burn much brighter when these terminals are connected, if everything is right. I am under the impression that you did not get the right chemicals, as some users in Chicago only required one pound of phosphate of ammonium, which costs forty cents per pound and are getting very good results. You do not say as to whether you got any results on the direct current terminals.

P. B. St. Louis, Mo.

Question: As I am a subscriber to your magazine, I would like to have you send me a drawing of a large battery tube set, with which I can get California and farther stations. Please send drawing of the one which you think would be the best for an amateur to make.

Answer: There are so many circuits coming out everyday, for which these long distance claims are made, that I hardly know which one to send you. So that I will make no mistake, I am mailing you several, which ought to cover the distance which you want. However, you will find that your location and aerial will have much to do with the results obtained.

R. N., Omaha, Nebraska.

Question: Would like to hook up three stages of radio frequency to my present Reinartz set, which consists of one stage of radio detector, and one stage of audio. Can you give me this diagram? Also want to use a three coil honeycomb mounting attached, so that I can use honey-comb coils for loading.

Answer: I have drawn a sketch for the circuit described and am mailing it to you. The method of loading the Reinartz circuit is somewhat different from that used on other circuits. I have shown extra contact points in the grid and aerial switches. These are to be connected to the ends of a loading coil, and taps at different points near the center of the coil should be arranged so that a ground connection can be placed on the desired turn. This will be placed on the point giving the best result, as shown.

A. B., Minneapolis, Minn.

Question: I have a Reinartz set with two stages which does not seem to work. I had the set over to two different radio shops and when I got it back and turned on the tubes, all I could hear was noise from the tubes, and the variable condenser did not work. Please send me hook-up of Reinartz set with three jacks.

Answer: As several of our readers have asked for this circuit, I am showing same on this page. Hope it will help you to find the trouble. First of all, make sure that there is no short circuit between the inside and outside coils. This can be determined by putting a piece of paper under the switch levers, in such a way that the circuit is opened to the contact points. Then test with a buzzer and battery, between the contact points of the switch on the inside coil and those of the aerial coil. If the buzzer does not operate, the coils are O. K. If it does operate, then the coil must be rewound. Next, make sure that the plates of the variable condensers do not touch each other, forming a short circuit. See also that the condenser between the first

coil (inside coil) is connected to the outside end and not the starting end. Also the ground connection to the outside coil must be taken off from the 10th or 11th turn of the second coil, not the starting end.

J. L., St. Louis, Mo.

Question: Have noticed several articles in your March issue of Radio Age, of people receiving great distances on Reinartz sets. Would like to know where I could get complete plans for Reinartz, detector unit and two stage amplifier to use with loud speaker. I would also like to know how I can tune out KSD *St. Louis Post Dispatch*, as I am living about three miles from it. I have never built a radio set outside of a double slide crystal set and do not know much about it, but if I can get a hook-up that explains connect ons p'ainly, I am pretty sure I can make one. I have been told that a detector with two stages of amplification will tune out *Post Dispatch*, others have said that it will not, so I am asking your advice.

Answer: You will find it hard to tune out this station, as it is so close that even the finest tuning will not cut it out altogether. The set which you mentioned is as good as most others for close tuning, but the amplification will not help tune them out. You will need this amplification however if you want to use a loud speaker. If you are a subscriber to this magazine look back over the copies of the last few months and you will find all the information necessary to build this set. If not, this office will furnish them at 25c each. The circuit is shown among the questions and answers of this issue.

A. P. H., Chicago, Ill.

Question: On the enclosed hook-up, which is the best way to connect up a 43-plate condenser, in the ground lead, across the secondary, or across the primary? My coupler consists of about fifty-four turns on the primary. What is the wave length of this coupler? Would Atwater Kent coupler give better results? I have not been able to get very great distance with this set. Is my coupler at fault?

Answer: Use the condenser either in the aerial or ground circuit. This should help you get a closer adjustment. The winding on your coupler is O. K. for the ordinary broadcasting wave of 360 meters, but as you say nothing about the type and size of aerial used, it is hard to tell just what the result will be. Not knowing the make of your coupler I cannot give any comparison with the Atwater Kent type.

H. G. B., Chicago, Ill.

Question: I am a constant reader of your magazine, "Radio Age" and have found many interesting subjects in it's leaves. I am quite interested in crystal sets and have built a number of them, all of the old fashioned type. I am looking for something more interesting. I read about Mr. Howes' experience and would like very much to try it, hoping you can assist me a little in the parts I do not understand. I have completed the antenna Mr. Howe described and

now I would like to get down to the instrument. This is what I would like to have you show me, so if you will kindly send me some information in regard to the kind of condenser, vario-coupler, and variometer and other parts that I need, also the hook-up, I will be more than thankful to you for your trouble.

Answer: The parts used in this set are all standard and can be purchased at any radio supply store. Any of the standard type of vario-coupler and variometer may be used. All that is necessary is to ask for the parts as listed on the diagram, a copy of which I am mailing to you. I would suggest however, that the .0025 fixed condenser shown in the diagram be used across the phones, and the one marked as .0025 be changed to a .00025 M. F. I do not know of any more information I can give you, as the diagram plainly shows the circuit.

F. H. Davenport, Ia.

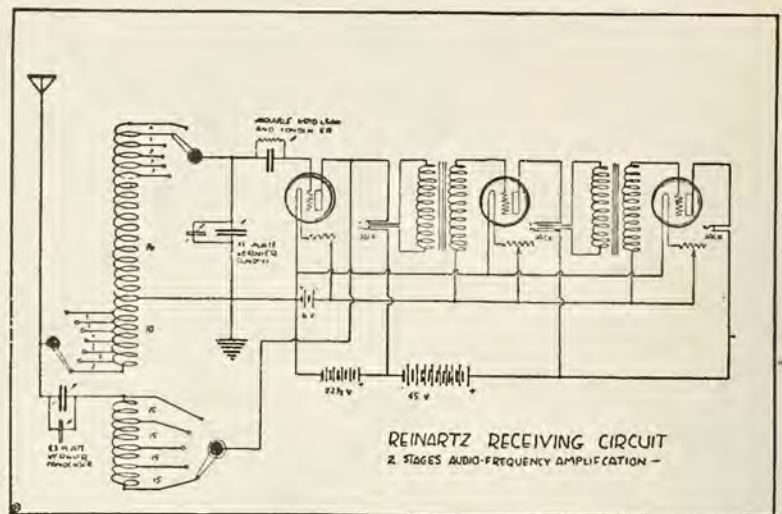
Question: I read an article on long distance crystal sets in your March issue of Radio Age. I was unable to get fifty miles with the hook-up I am sending, although it is overly loud at a distance of six miles. Is it possible to make it receive a distance of at least fifty miles or will I need a different set?

Answer: I have never had any experience with the set which you describe, but the circuit looks as though it ought to be good. I would recommend that you build the long distance set described in the January and February issue of this magazine, as this has a very fine tuning arrangement which makes it possible to get in stations which otherwise could not be heard on a crystal set. Many reports from users of this set indicate that it has a record of many hundreds of miles.

F. M. P. Monticello, Ia.

Question: I am a regular reader of the Radio Age and I get much out of it in the way of radio information. Please send me what you consider the very best hook-up you know of, for all around work. Selective, distance, fine tuning, an all around first class outfit.

Answer: I am mailing you several radio frequency circuits which are said to be the extreme limit in perfection. They will require much more apparatus



than the ordinary sets, but I know you will be pleased with the results. The one using six tubes has been used here in Chicago, and fifteen outside stations have been tuned in during one hour.

J. A. G. Brooklyn, N. Y.

Question: Will you kindly let me know what is wrong with my crystal set? I have trouble trying to tune out the other fellow, that is, I will get WEAF New York; then WJZ Newark will butt in. If I try to tune out WJZ then WEAF will get very faint. Last night I had three stations on, and I had trouble getting one at a time. I am sending you a diagram of my set. I will appreciate if you will give me some information on this matter, that will bring better results.

Answer: I am afraid you are up against a hard proposition if you want to get these stations separated. They all come in on about the same wave length and with the tuning apparatus which you are using, I don't see how you will be able to tune close enough to cut out the interference, especially so, as all these stations are comparatively close to you. I would advise you to get a copy of the circuit given out some time ago, by the *Evening Mail and Home mechanics* of New York. This is a sharp tuning set which might help you.

Good!

An investigation to ascertain whether or not there is a radio trust will soon be launched by the Federal Trade Commission in compliance with the requirements of a House resolution. This resolution directing the Commission to investigate the status of the radio industry to ascertain whether anti-trust statutes were being violated, was received by the Commission recently.

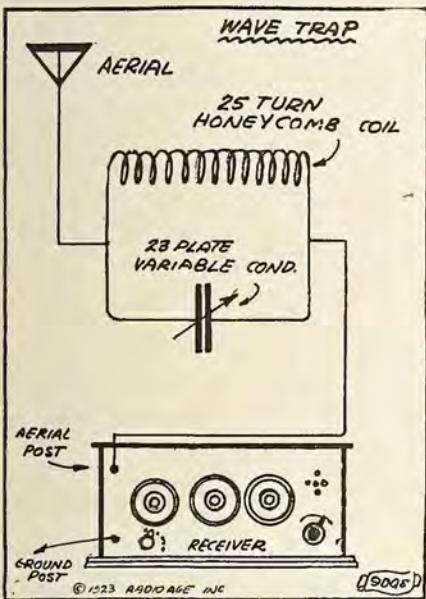
It is understood that a conference of the officials and probably a preliminary investigation will be held before formal action of any sort is taken or witnesses are called. A complete survey of the radio patent field will be undertaken and contracts and agreements will be examined to learn if exclusive rights or special privileges for transmission or reception have been made. No announcement has as yet been made by the Commission.

Little Things That Help

The Wave Trap

THE USE of a wave trap in connection with the receiving set is very often the thing which makes the set a success or failure. It will be found to be of great value, especially on those sets which do not permit sharp tuning.

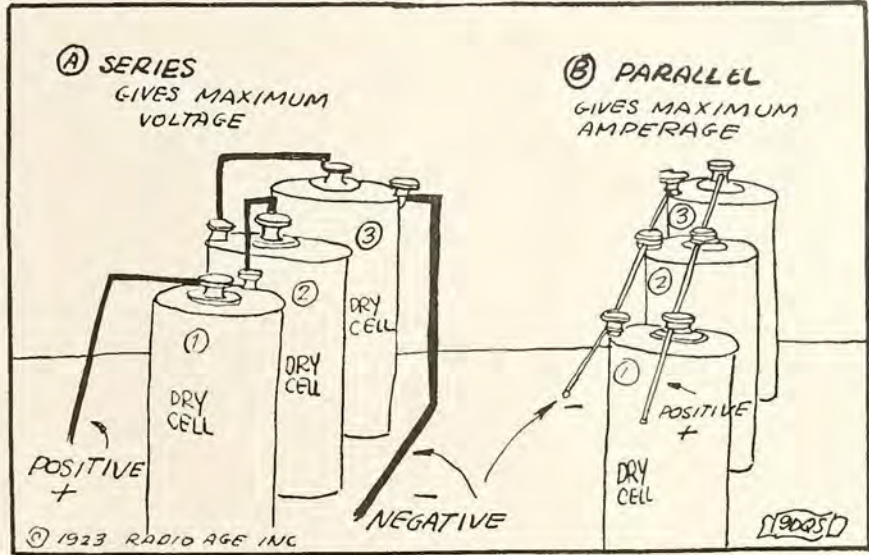
The arrangement of such a trap is shown in the drawing. It consists of a 25 turn honey-comb coil connected in parallel with a variable 23 plate condenser forming an oscillating circuit in itself, which is connected between the aerial and the aerial binding post on the set.



The theory of such a combination works on the principle of absorbing the undesired wave in the trap, allowing the wave which is wanted, to pass on to the set without interference. When using the trap, the variable condenser is adjusted until the circuit is oscillating at the same frequency as the undesired wave, which will absorb it in the trap, and upon slightly re-adjusting the tuner, the desired wave will be found to come in just as clearly as before and the interference will have disappeared.

Of course, if the two waves are exactly the same, this arrangement will not work, but usually there is enough difference in the wave lengths of broadcasting and spark stations to make this trap a very important factor in the operation of the set.

Every day brings to light another use for radio broadcasting. It is now revealed that students of shorthand and typewriting are picking up addresses out of the ether to increase their speed at the typewriter or in writing shorthand symbols of the speaker's words. Those who have had to rely upon the patience of a member of the family or a friend to read to them while they dashed down the dots, dashes and curves, can appreciate the advantage of radio dictation.



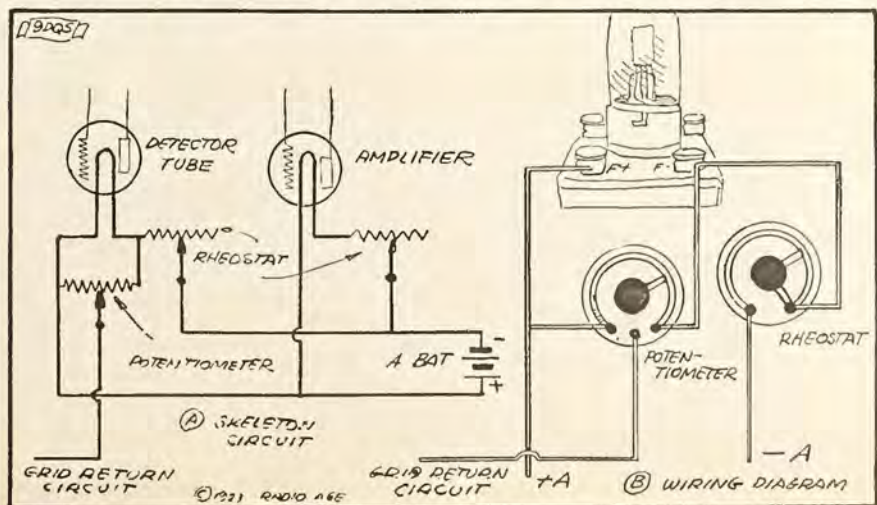
How to Connect Batteries for the Dry Cell Tube

Many of the new dry cell tubes come to a sudden end just because the user does not understand the difference between "series" and "parallel" battery connections. The W-D-11 tube requires one cell of dry battery for proper operation. This dry cell has an electrical pressure of one and one-half volts and will supply the filament current for two or three months before it must be replaced with a new cell. If however, more tubes are added to the set for amplification, the drain on the battery is considerably more. For example, if the set uses three tubes, the life of the cell will be less than one-third of what it would be with one tube. To give the same length of life when more tubes are used, one additional cell should be added for each tube used, but these cells must be connected in PARALLEL, not in series. If connected in series the pressure will be raised 1½ volts for each cell,

which would instantly burn out the filament; but if connected in parallel the pressure will remain the same as one cell, but the current strength will cover three times the life of one cell. For use with the new 201-A or 301-A tubes, the three cells will give a pressure of 4½ volts if connected in series. The cut here shown will give an idea of these two methods of connecting.

Connecting the Potentiometer

Many receiving circuits make use of a potentiometer connected across the terminals of the "A" battery. These usually have a very high resistance and the current consumed in this way does not amount to much if the potentiometer is only left in the circuit while the set is in use, but if it is not disconnected by means of a switch, or at the battery



terminals while the set is not in use, then the battery is continually giving up current all the time, whether the set is in use or not, which of course will, in time, drain the battery.

The accompanying drawing shows a method of connecting the potentiometer in such a way, that when the filament rheostat is turned off, the potentiometer is disconnected from the battery. The slight resistance of the rheostat which is also in the circuit, will have no noticeable effect upon the potential of the potentiometer. This arrangement will serve a good purpose, as the operator may feel sure that no current is being wasted when the set is not in use.

Radio Control at Sea

Washington, D. C.—The Iowa, first radio controlled battleship in the world, went to a gallant death last week in the deep reaches of Panama Bay, sunk by gunfire from her younger but more powerful sister, the Mississippi. Her flag was not flying—naval guns are never trained on the flag, though she was still an American vessel designated as Coast Battleship No. 4. She was sacrificed in the interests of radio-control and naval gunnery.

Her loss amounts to nothing, however, compared with the results of the radio-control experiments carried out successfully, and although she carried some valuable and confidential radio control instruments, the radio experts of the navy say no secrets were lost. They had learned all that was possible about controlling the old battleship, so she was turned over to the gunnery and ordinance experts as a mobile target.

Within a short time, another ship could be fitted with radio control, and it is understood that many improvements are planned. Rumor has it that one of the laid-up destroyers will probably soon be assigned for radio control experiments and equipped with highly improved apparatus. But which of these fast scouts of the navy will be used has not been decided. Only the allotment of funds and a month or two of time are needed, it is understood. Radio equipment is ready awaiting assembly and installation.

By equipping a high-speed vessel, capable of making at least twenty knots for radio control, excellent practice could be given the gunners of the navy, it is said. The ship would be controlled from a mother craft by radio and maneuvered while under fire. One new feature planned for the next radio controlled craft is likely to be armor or some protection for her aerials and sensitive radio-receiving and controlling apparatus, since the early hits in the recent one-sided engagement in Panama Bay damaged the Iowa's controls and she ran wild during her death throes. Radio has come to be very valuable, naval experts assert, in gun-fire exercises of this sort, since by virtue of it live targets can be maneuvered for gunnery training—unthought of and impossible, except by towing, until radio made it practical.

186,000 Miles per Second

Words spoken in a public hall in Schenectady reached a radio listener in San Francisco, Calif., 2,550 miles away, before they were heard by a listener 150 feet from the speaker.

That statement looks a bit fantastic but it is mathematically true. The apparent absurdity becomes reasonable when it is realized that the speed of sound is 1,126 feet per second at a temperature of 68 degrees Fahrenheit and the speed of electrical vibrations or radio waves is 186,000 miles per second.

The listener in the back of the hall in Schenectady, 150 feet from the speaker heard the words in 0.1332 seconds.

A microphone connected to the radio transmitting equipment of WGY, the General Electric Company station, was two feet in front of the speaker and picked up the words in 0.002 seconds.

Time required to transform sound waves into electrical energy, 0.002 seconds.

Time required for electrical vibrations or waves to pass from Schenectady to San Francisco, 0.0137 seconds.

Time required at receiving end to convert electrical vibrations into sound vibrations, 0.001 seconds.

Total elapsed time from the speaker in Schenectady to the radio listener in San Francisco, 0.0187.

Listener in hall heard words in 0.1332 seconds.

San Francisco man heard words 0.1145 seconds sooner.

The period of time elapsing between the spoken word and its reception via radio 2,550 miles away can be illustrated as follows: 0.0187 seconds is time required for a spectator at a baseball game

to hear the impact of bat against ball when he is standing twenty-one feet from the batter.

In the interests of life saving at sea, based upon "SOS" calls, broadcasting stations are cautioned by the Department of Commerce to maintain a careful watch while sending so that they can cease instantly when a distress call is heard and not interfere with the distress signals and messages relating thereto.

This applies particularly on and near the sea coasts. Recently four vessels issued distress calls near Seattle, Washington on the same day but so far as was reported by Inspectors, no broadcasters interfered. The law provides a penalty in the event of interference with "SOS" calls, as is set forth in Section 4, "Act of August 13, 1912."

An Admiral of the Navy in objecting to the suggested licensing of all service radio operators under commercial regulations, said it would be as sensible to require that he and some 6,000 other navigators in the Navy take the Department of Commerce's examination for a Master's license before they would be permitted to carry any passengers on Naval vessels or transports. Which seems to be a good argument.

President Harding is said to have tried out his radio set for the first time during his recent illness, without satisfactory results. He succeeded in getting a local station and one in Newark at the same time, and, being unable to disentangle what sounded like a conference report, he gave up.

It is understood that radio engineers of the Navy will go over the set and demonstrate its capabilities.

Reinartz Book FREE

Reinartz Radio Book with Hook-ups—best book on best circuit—written and illustrated by Frank D. Pearne. If you want one free sign the coupon below and get the book and one year's subscription to Radio Age for \$2.00.

RADIO AGE,
500 North Dearborn St.,
CHICAGO.

Please send me FREE one of your Reinartz Radio Books and send me Radio Age for one year. I want to take advantage of this Special Offer. I enclose \$2.00.

Name.....

City.....

Street and Number.....

Pick-Up Records from Our Readers

Radio Age:

Any amateur of course wants the best set he can get for the money and the best hook up I have just gotten a set like the one I am to describe and used the hook up also that I will draw. This set consists of:

- (1) one 23 plate variable condenser.
- (2) one grid leak and condenser.
- (3) one variocoupler.
- (4) Pair of phones.
- (5) WD 11 Tube and socket (for dry cell use) dry cell.
- (6) one rheostat.
- (7) Tapped "B" battery.
- (9) Switch lever set.
- (11) Phone condenser.
- (12) Phone tip jacks (pair).
- (13) Dry cell.

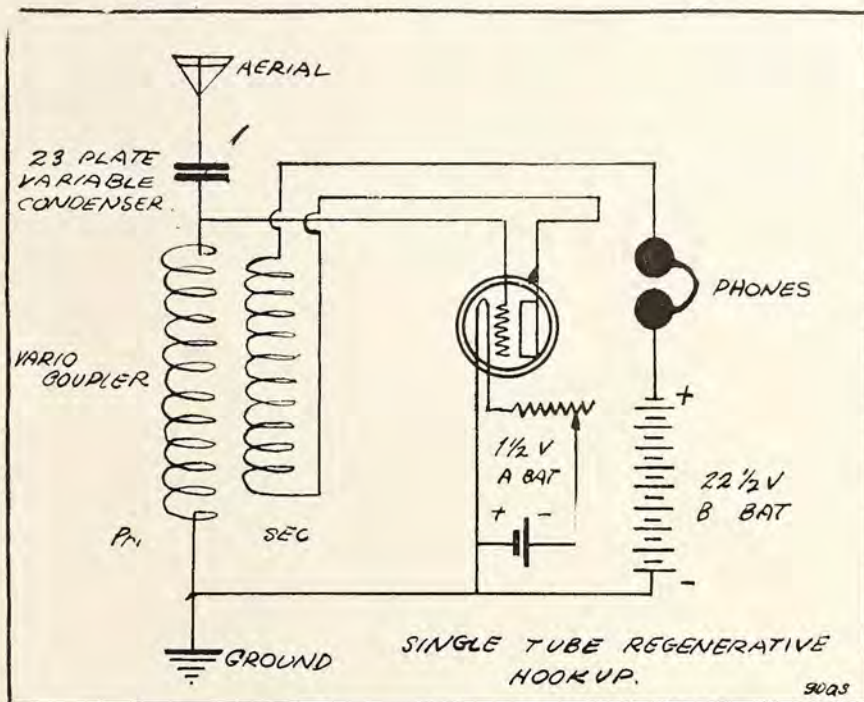
With this set and the diagram on next page the first station I caught was WHB which is Sweeny Auto and Tractor School. WOC was the next station to come in real well.

This is the hook up I used;

(See accompanying cut)

This set cost only \$20.75 complete.

HAROLD LEE,
Box 309, Fosston, Minn.



G. F. McCullough, 451 Fillmore Street, Minneapolis, Minn., writes:

"Have read several numbers of your magazine and find the same to be very interesting, and note that you have a section of "Stations I have Heard," and believe that I have something that will equal any of the performances noted in that section.

"I am using a Reinartz circuit with only one tube, and on the evening of March 23, I succeeded in getting twelve stations outside the Twin Cities and during this time two local stations were broadcasting, but I tuned these out absolutely, and when I tuned in on one station there was no interference from any of the other stations that were broadcasting at the same time.

"The stations I heard were, WLAG, WAAL, BN7, WOC, KYW, WMC, WCX, KDKA, WMAA, WOS, WGY, WDAF, WBM and KFD. I got each of these stations very clearly and all from 7:30 to 9:00 p. m., when I was interrupted by our station the first mentioned above WLAG, and I must admit that when they start broadcasting that it's all off and we have to listen to them or get off the air."

411 West 53rd St.
N. Y. City.

Dear Sir:

Enclosed find some DX work done on a neat home made set costing \$35, but using an exceptionally sensitive circuit.

Have heard following: KHJ, WOC, WDAP, KYW, WHB, WWJ, KSD, WHAS, KDKA, WMAE, WGY, WHAZ, WSB, WJZ, WEA, WOR, WPI, WFI, WOO.

These are only a few of the long distances, as other stations such as

Denver, Cincinnati, Cleveland, Springfield, Mass., Havana, San Juan, Porto Rico, etc., have been heard but am not sure of call letters.

All above stations have been heard on detector only night after night and trip after trip during my week stay in Porto Rico. The work which I can do on detector only using present set and circuit were never done by my former regenerative set and two steps.

Sincerely yours,

C. PREVITI,

Chief Operator, S. S. Ponce.

P. S. Above stations were heard both in summer and winter and wish to say that during summer time atmospheric conditions are fierce in the tropics.

Gentlemen:

Herewith check for one year's subscription to Radio Age and a copy of your booklet "Reinartz Radio" as advertised in your April issue.

I have a Reinartz set, home made, and while I have not accomplished wonders, still, I feel that my results compare favorably with some of those published in your paper. Here is a list of stations as well as I can remember and check up from memorandums made at time of reception:

WGM, Atlanta; WSB, Atlanta; WDAJ, College Park; WCX, Detroit; WBAP, Fort Worth; WDAF, Kansas City; WHB, Kansas City; WOC, Davenport; WNAV, Knoxville; KSD, St. Louis; WJAX, Cleveland; PWX, Havana; WBAD, Minneapolis; WHAS, Louisville; WOI, Ames, Iowa; WAAP, Wichita, Kansas; WBAR, Orange, Texas; WDAP, Chicago, Ill.; WFAA, Dallas; WBAY, New York; WKY, Oklahoma City; WWJ, Detroit; WEA, New York; WGY, Schenectady; WLAG, Minne-

apolis; WJZ, Newark; KDKA, Pittsburgh; WLK, Indianapolis; WLW, Cincinnati; WGAL, Lancaster, Pa.; WOAI, San Antonio; WOS, Jefferson City; WGF, Des Moines; WPAC, Okmulgee; WHA, Madison, Wis.; WSY, Birmingham; WOAW, Omaha, Neb.; WAAC, New Orleans.

These stations were all picked up since the middle of December. Some of them night after night, others occasionally. In addition to the above on March 10 after 11:30 p. m. I caught the Los Angeles Times and a station in Calgary, Alberta. In addition to these I have caught a number of other stations whose call numbers I could not make out and, therefore, did not log. All were caught without any amplification except on March 10, when I caught Los Angeles and Calgary with one stage of audio amplification.

FRANK A. FLECKENSTEIN,
708 Bethel Street, Memphis, Tenn.

Gentlemen:

I have been taking your Radio Age and will say that it is the best Radio Magazine that I have ever seen.

About a month ago I decided to build a Reinartz set so I started one afternoon and at night I had my machine built with two stage amplification. It sure works fine. I have no trouble in bringing in the volume.

I have picked up several stations, about 70 altogether on the North Calgary CFAC, Regina-CKCK, Winnipeg CJOG, in Canada. On the West, Los Angeles KHJ also KFI. On the South, Galveston WHAB, WBAP, WFAA. On the East, Maine, Auburn WMB, WGY, WHAZ, WFA, WJZ, also several others.

I see where several persons have made a record of long distance but I have never

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Major General George O.
Squier, Chief of the
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500 N. Dearborn St.
CHICAGO ILLINOIS

seen where they have made any long distance by using a loop.

I tried out my Reinartz two stages of amplification with a four loop the other night. I could not get any carry-way at all so I thought I would try my loop, and to my surprise I picked up WBAP, WAAP, WHB, WGY, WCAE, KHJ, and without any aerial or loop I picked up WHB.

I think the Reinartz is the best machine that anybody can build for good reception. Now I don't want you to think that I use a stage or two of radio amplification on this circuit for I did not. You can put this in your magazine if you want to.

C. L. JONES,
Indianola, Nebraska.

Editor, Radio Age:

In your Jan-Feb. issue of Radio Age I see a communication to you from W. G. Lehr of Chicago who uses a Reinartz tuner, stating that it gives excellent results, with two-stages audio frequency amplification. He says he would like to see some vario coupler variometer bugs shoot at his record. Well here goes:

Using home made basketball variocoupler and variometer and one stage of audio frequency amplification I have heard the following stations: KLZ, Denver, Colo.; WLAD, Hastings, Nebr.; WHB, Kansas City, Mo.; WOC, Davenport, Iowa; KSD, St. Louis, Mo.; WSB, Atlanta, Ga.; KYW, Chicago, Ill.; WIAO, Milwaukee, Wis.; WJL, Newark, N. J.; WEAK, St. Joseph, Mo.; PWX, Cuban Tel. Co., Havana, Cuba; WLW, Cincinnati, Ohio; WDAW, Atlanta, Ga.; WWJ, Detroit, Mich.; KOP, Detroit Police Dept.; WLC, New London, Conn.; WLK, Indianapolis, Ind.; WEAN, Providence, R. I.; WEAM, Plainsfield, N. J.; WJAF, Muncie, Ind.; WLAG, Minneapolis, Minn.; WAC, Okmulgee, Okla.; WMAB, Oklahoma City, Okla.

Would call your attention to the fact that our longest distance (to Havana) is about 1500 miles, while 4 other stations exceed his results of 850 miles to Fort Worth.

Bear in mind this also is a home-made set, all inductances being made and wiring being done by myself. Also I am using only (1) one stage of amplification.

Let Mr. Lehr read these and weep.
GERARD A. KOCH,
239 Ella St., Pittsburgh, Pa.

Gentlemen:

Am a reader of Radio Age and particularly of "Pick Up Records by Readers." The following is a partial list of stations we have received since we built our set:

WKKA, KFI, KIZ, KFAF, KSD, KWH, KYW, WOC, WMC, WOR, WMAQ, WBAP, WBAC, WSY, WGM, WSB, WLW, WLAL, WIP, WGR, WGY, WHA, WHAP, WHAZ, WIRO, WDAP, WFAA, WCAE, WBU, WAAP, WPA, WPAC, WMAT, WKY, WLAG, WOH, WAAF, WLK, WMAK, WWJ, WCX, WDAJ, WHAI, WJAN, WLAF, WOS, WRR, WAA, WLAZ, WMAC, WMAP, WHAA, 9XAD, 9XM.

JOHN BOOKER, E. Moline, Ill.

Dear Sir:

I notice in your issue of Jan.-Feb. a letter from one W. G. Lehr, wherein he shouts out a challenge to all variometer "bugs" to equal his wonderful (?) reception record. I don't remember the number of stations he received (magazine was burned by accident), but I do remember it took him nine hours (count 'em) to do it.

Here is the dope on my set: Standard variometer, variocoupler hook-up, using two variometers and two steps of audio frequency amplification. I built the set myself.

Antennae, one wire 75 feet long, twenty feet high on free and five feet high on lead-in end. Ground to water-pipe; no connections in antennae or ground lead soldered.

Copied from log under date March 6, 1923, 7:30 p. m. to 11:40 p. m., WGY, WIAK, WDAF, WFAG, KSD, WCAS, WHB, WCAL, WHA, WLW, WDAP, WSB, WAAW, WCX.

Copied from log under date February 24, 1923, 7:00 p. m. to 11:05 p. m., 9AQC (Voice), WAAW, WIAK, WJAG, WPA, WHB, WHA, KSD, WFAA, WFAV, WMC, KFAF, WOC, KDYS, WLAG, WPAF.

Now, let me say right here, that the Reinartz set is a knock-out when used on two hundred meter reception and I am building one for that especial purpose. But I will wager a dollar to a doughnut that Mr. Lehr hears every two hundred meter spark in thirty miles of him along with his Bedtime Stories. I never have any trouble from sparks on my set and darn little from broadcasters.

So hoping I have at least equalled Mr. Lehr's record I will QRX for this time.

Yours truly,
ROSS T. HATTON,
(Radio 9GY), 2220 N. 58 St., Omaha,
Nebr.

Dear Sir:

Enclosed find check for \$2.50 for Radio Age for one year. I have been reading it regularly and get more real information from it than from most radio publications three times its size.

I wish to thank you for your answers and good letter of the 15th and am sure you should be the most appreciated voice of the radio fans.

My Reinartz record to date, one tube is: KHJ, KFI, KPO, KDKF, 2XI and CJCG on Saturday night. Others are WFAF, WBT, CKCK, KFAF, & CFCA. I am having a little trouble, though, with even loud nearby city stations dying out, and with tuning in desired stations when there is a "gang on the air."

C. M. LEMBERGER,
Burlington, Ia.

Frank F. Howe, 504 Oakland Avenue, Milwaukee, Wis., writes:

"I wish to say that since your Radio Age for the month of March came out containing a write-up of my loop and crystal receptions I have been receiving letters from all parts of the U. S. This shows that you have some circulation. Congratulations."

Corrected List of U. S. Stations Alphabetically by Call Signals

Complete Each Issue

THE list of broadcasting stations on these pages is brought up to date each month by additions of new stations and deletion of those which have suspended operation. The list is the product of a vast volume of correspondence and its completeness is due in large measure to the assistance of our special news service in Washington, D. C. Suggestions, corrections and additional data will be welcomed from readers. Broadcasters: Send in your program schedules.

Important: Wave lengths in this list should be disregarded. Wave lengths under the new rule are apportioned by cities, as explained elsewhere in this issue.

- IXAD, Pawtucket, R. I. 300 and 600 meters; Special license experimental; Standard Radio & Electric Co.
 KDKA, E. Pittsburgh, Pa.; Class B station, up to 485 meters; Westinghouse Elec. & Mfg. Co.
 KDN, San Francisco, Calif.; Leo J. Meyberg Co.
 KDDW, Steamship America, New York.
 KDPM, Cleveland, Ohio; Westinghouse Elec. & Mfg. Co.
 KDPT, San Diego, Calif.; Southern Elec. Co.
 KDYL, Salt Lake City, Utah; news music, entertainment, Telegram Publishing Co.
 KDYM, San Diego, Calif.; Savoy Theatre.
 KDYQ, Portland, Ore.; Oregon Inst. Technology.
 KDYS, Great Falls, Mont.; Class B, 485 meters, Great Falls Tribune.
 KDYW, Phoenix, Arizona; Smith Hughes & Co.
 KDYX, Honolulu, T. H.; 360 wave length; 12:15 to 1:15 p. m., stock reports and weather; 6:30 to 7:30 p. m., music, lectures; Sunday, 11 a. m. to 12:30 p. m., sermon; Honolulu Star-Bulletin, Ltd.
 KDZA, Tucson, Ariz.; Arizona Daily Star.
 KDZB, Bakersfield, Calif.; Frank E. Seiffert.
 KDZE, Seattle, Wash.; Rhodes Co.
 KDZF, Los Angeles, Calif.; Automobile Club of Southern California.
 KDZG, San Francisco, Calif.; Cyrus Pierce & Co.
 KDZH, Fresno, Calif.; Fresno Evening Herald, Class B, 845.
 KDZI, Wenatchee, Wash.; Electric Supply Co.
 KDZK, Reno, Nev. Wednesday 8 to 9 p. m.; Friday 8 to 9 p. m. Musical and news features; Nevada State Journal, Nevada Machinery & Electric Co.
 KOZZ, Denver, Colorado; Pyte & Nichols.
 KQXX, San Francisco, Calif.; Glad Tidings Tabernacle.
 KDZZ, Everett, Washington; Kinney Bros. & Sippell.
 KFAD, Phoenix, Ariz.; Class B, 485, McArthur Bros. Mercantile Co.
 KFAE, Pullman, Wash.; State College of Washington.
 KFAP, Denver, Colorado; George S. Walker, Western Radio Corporation; musical programs, news items, etc., daily except Tuesday and Sunday, 8 to 9 p. m.; mountain standard time.
 KFAJ, Boulder, Colo.; University of Colorado.
 KFAN, Moscow, Idaho; Electric Shop.
 KFAP, Butte, Mont.; Standard Pub. Co.
 KFAQ, San Jose, Calif.; City of San Jose.
 KFAR, Hollywood, Calif.; Studio Lighting Service Co.
 KFAT, Eugene, Ore. Monday, Wednesday and Saturday 8 to 9 p. m. Music; Sunday 8:30 to 9:15 Church Services; Pacific Radio Co.
 KFAU, Boise, Idaho; Class B, 485, Boise High School.
 KFAV, Venice, Calif.; Abbott Kinney Co.
 KFAW, Santa Anna, Calif.; Class B, 485, Radio Den.
 KFAZ, Central Point, Ore.; W. J. Virgin Milling Co.
 KFBZ, Redding, Calif.; C. H. Weatherill.
 KFBG, Havre, Mont.; Butterfield & Co.
 KFBK, San Diego, Calif.; W. K. Azbill.
 KFBH, Hanford, Calif.; California Radio Lab.
 KFBK, San Luis Obispo, Calif.; R. H. Horn.
 KFBG, Tacoma, Wash.; First Presbyterian Church.
 KFBH, Marshfield, Ore.; Thomas Musical Co.
 KFBK, Sacramento, Calif., 3,000 miles; daily, 3 to 4 p. m. and 6 to 8:30 p. m.; Sunday and Thursday, 8 to 9 p. m.; Kimball-Upton Co. and Sacramento Uranium.
 KFBK, Everett, Wash.; Leese Bros.
 KFBW, Laramie, Wyo.; N. S. Thomas.
 KFCB, Phoenix, Ariz.; Nielson Radio Supply Co.
 KFGD, Salem, Ore.; F. S. Barton.
 KFCF, Walla Walla, Wash.; Frank A. Moore.
 KFCG, Billings, Mont.; Elec. Serv. Station.
 KFCR, Colorado Springs, Colo.; Colorado Springs Radio Co.
 KFCL, Los Angeles, Calif.; Los Angeles Union Stock Yards.
 KFCM, Richmond, Calif.; Richmond Radio Shop.
 KFCQ, Casper, Wyo.; Motor Service Station.
 KFCP, Ogden, Utah; Ralph W. Flygare.
 KFCV, Houston, Tex.; Fred Mahaffey, Jr.
 KFCW, Le Mars, Ia.; Western Union College.
 KFCZ, Omaha, Neb.; Omaha Central High School.
 KFDA, Baker, Ore.; Adler's Music Store.
 KFDB, San Francisco, Calif.; Mercantile Trust Co., also 400.
 KFDD, Boise, Idaho; St. Michael's Cathedral.
 KFDD, Bozeman, Mont.; Everett H. Cutting.
 KFDP, Des Moines, Ia.; Hawkeye Radio & Supply Co.
 KFDE, San Francisco, Calif.; John D. McKee.
 KFDU, Lincoln, Neb.; Nebraska Radio Electric Co.
 KFDV, Fayetteville, Ark.; Gilbreth & Stinson.
 KFDT, Brookings, S. D.; South Dakota State College of Agriculture and Mechanical Arts.
 KFDD, Denver, Colo.; Knight Campbell Music Co.
 KFDD, Corvallis, Ore.; Oregon Agr. College.
 KFDE, Spokane, Wash.; Radio Supply Co.
 KFDF, Casper, Wyo.; Wyoming Radio Corp.
 KFDR, York, Nebraska; Bullock's Hardware & Sporting Goods.
 KFDX, Shreveport, La.; First Baptist Church.
 KFDD, Minneapolis, Minn.; Harry O. Iverson.
 KFEB, Taft, Calif.; City of Taft.
 KFEC, Portland, Ore.; Merer & Frank Co.
 KFED, Tacoma, Wash.; Guy Greenon D. McKee.
 KFEL, Denver, Colo.; Winner Radio Corp.
 KFEP, Denver, Colo.; Radio Equipment Co.
 KFEQ, Oak Nebraska; J. L. Scroggin.
 KFEQ, Oak, Nebraska; J. L. Scroggin.
 KFER, Fort Dodge, Ia.; Auto Electric Service Co. Inc.
 KFEE, Douglas, Wyo.; Entertainment and weather; Radio Electric Shop.
 KFEE, Kellogg, Idaho; Bunker Hill & Sullivan Mining & Construction Co.
 KFEE, St. Louis, Mo.; American Society of Mechanical Engineers.
 KFFA, San Diego, Calif.; Dr. R. C. Shelton.
 KFFE, Pendleton, Ore.; Eastern Oregon Radio Co.
 KFFD, Hillsboro, Oregon; Dr. E. H. Smith.
 KFFP, Moberly, Missouri; First Baptist Church.
 KFFQ, Colorado Springs, Colo.; Markshoffel Motor Co.
 KFFR, Starke, Nev.; Jim Kirk.
 KFFV, Lamoni, Iowa; Graceland College.
 KFFB, Pueblo, Co.; Loewenthal Bro.
 KFGF, Mt. Vernon, Wash.; Buchanan, Stevens & Co.
 KFRH, Stanford Univ., Calif.
 KFGI, Arlington, Oregon; Arlington Garage.
 KFGH, Gunnison, Colo.; Colorado State Normal School.
 KFGH, Hood River, Oregon; P. L. Boardwell.
 KFGH, Neah Bay, Wash.; Ambrose McDue.
 KFGH, Santa Barbara, Calif.; Fallon Co.
 KFHR, Seattle, Wash.; Star Electric & Radio Co.
 Paul Franklin Johnson, Altadena Radio Lab.
 KFI, Los Angeles, Calif. (485 also); radius covers entire U. S. and Canada; Daily, 6:45 to 11 p. m., Sunday 10 to 11 a. m., 4 to 4:30 and 8 to 11 p. m.; entertainment and educational features; station operates three remote control stations; Earle C. Anthony, Inc.
 KFIF, Portland, Ore.; Benson Tech. Student Body.
 KFU, Gridley, Calif.; The Franklin Shop.
 KFV, Yakima, Wash.; Foster-Bradbury Radio Store.
 KFG, Spokane, Wash.; Doerr-Mitchell Elec. Co.
 KGB, Tacoma, Wash., Sunday: 5 to 7:30; Daily: 7 to 9 p. m. (except Thursday) News, Sport bulletins, lectures, entertainment, weather, tide tables, bedtime stories, time, etc.; Tacoma Daily Ledger station operated by the William A. Mullins Electric Co.
 KGG, Portland, Ore.; Hallock & Watson Radio Service.
 KGN, Portland, Ore.; Northwestern Radio Mfg. Co.
 KGD, Altadena, Cal. 2500 miles; every Saturday 8 to 8:30 p. m. Musical program;
 KGU, Honolulu, Hawaii, Waikiki Beach, Marlon A. Mulrony; Honolulu Advertiser
 KGW, Portland, Ore.; Oregonian Pub. Co., also 400.
 KGY, Lacey, Wash.; St. Martin's College, (Rev. S. Ruth).
 KHJ, Los Angeles, Calif., 400 meters, Daily except Sunday: 12:30 p. m. to 1:15 p. m. news and concerts; 7 to 7:30 p. m. Children's Half Hour; 8 to 9:30 p. m. De Luxe program of music, news and educational features; Sunday: 10 to 11 a. m. Scripture reading, sermon, prayer and sacred musical program; Pacific time; Times-Mirror company.
 KHQ, Seattle, Wash.; Louis Wasmer.
 KHJ, Sunnyside, Calif.; The Radio Shop.
 KIJ, Stockton, Calif.; C. O. Gould.
 KIS, Los Angeles, Calif.; Bible Inst. of Los Angeles.
 KLB, Pasadena, Calif.; J. J. Dunn & Co.
 KLM, Del Monte, Calif.; Nogzle Elec. Works.
 KFDH, Tucson, Ariz.; Univ. of Arizona.
 KLS, Oakland, Calif.; Warner Bros.
 KIX, Oakland, Calif.; Tribune Pub. Co.
 KIZ, Denver, Colo.; Class B, 485, Reynolds Radio Co.
 KMAZ, Macon, Ga.; Mercer University.
 KMC, Reedley, Calif.; Lindsay-Wetherill Co.
 KMI, Fresno, Calif. Max. 2578 Miles; Musical program, San Joaquin Light & Power Corp.
 KMD, Tacoma, Wash., Love Electric Co.; Tacoma Times.
 KMI, Eureka, Calif.; T. W. Smith.
 KNI, Roswell, New Mexico, 360, 485, 1000 miles; Every evening at 8; news, weather reports, stock market, concerts and sermons; Roswell Public Service Co.
 KNN, Los Angeles, Calif.; Bullocks.
 KNT, Aberdeen, Wash.; North Coast Products Co.
 KNV, Los Angeles, Calif.; Radio Supply Co.
 KNX, Los Angeles, Calif.; Electric Lighting Supply Co.
 KDA, Denver, Colo.; T. J. C. A.
 KDB, State College, N. Mex. 485 also; time signals and weather reports 12 noon and 10: p. m. mountain time; music and lectures Monday, Wednesday and Friday: 7:30 to 8:30 p. m.; New Mexico College of Agriculture and Mechanical Arts.
 KDE, Spokane, Wash.; Spokane Chronicle.
 KDF, Detroit, Mich.; Detroit Police Dept.
 KDG, Modesto, Calif.; Modesto Evening News.
 KDI, San Francisco, Calif.; Dale Bros.
 KQI, Berkeley, Calif.; Univ. of California.
 KQP, Hood River, Oregon; Apple City Radio Club.
 KQV, Pittsburgh, Pa.; Doubleday-Hill Elec. Co.
 KQW, San Jose, Calif.; Chas. D. Herrold.
 KQY, Portland, Ore. 1,000 miles, Monday, Tuesday, Saturday, 9 to 10 p. m.; Wednesday, Thursday, Friday, 8 to 7 p. m.; Stubbs Electric Co.
 KRE, Berkeley, Calif.; Maxwell Electric Co.
 DSC, San Jose, Calif.; O. A. Hale & Co.
 KSD, St. Louis, Mo.; 1700 miles; 485 meters; grain, livestock, cotton, New York stocks, poultry and butter market, metal market, official weather and news at 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 p. m.; 8 p. m. 400 meters, musical and other features; Pulitzer Publishing Co., St. Louis Post Dispatch.
 KSI, San Francisco, Calif., The Emporium.
 KSS, Long Beach, Calif.; West Coast Radio Research Lab.
 KSU, Wenatchee, Wash., 360 and 485.
 KTW, Seattle, Wash., First Presbyterian Church.
 KUD, San Francisco, Calif., Examiner Printing Co., San Fran. Examiner.
 KUS, Los Angeles, Cal. 500 miles; setting up exercises daily, 7 to 7:30 a. m. and 12:00 noon to 12:30 p. m.; concert, 85 voices, 6 to 6:45 p. m., Wednesdays and Fridays; City Dye Works.
 KUY, Del Monte Calif., Coast Radio Co.
 KWG, Stockton, Cal. Daily Market reports, music and news 4 to 5 p. m.; Music, 2 to 3 p. m. Sunday; Tuesdays and Fridays, music, 8 to 9 p. m. Portable Wireless Telephone Co.
 KWH, Los Angeles, Calif., 485 also Los Angeles Examiner.
 KXD, Modesto, Calif., Herald Publishing Co.
 KYI, Bakersfield, Calif., Alfred Harrell.
 KYJ, Los Angeles, Calif., Leo J. Meyberg Co.
 KYQ, Honolulu, T. H., The Electric Shop.
 KYW, Chicago, Ill., Westinghouse Elec. & Mfg. Co.
 KZC, Seattle, Wash., Public Market & Dept. Stores Co.
 KZM, Oakland, Calif., Western Radio Inst.; Preston D. Allen.
 KZN, Salt Lake City, Utah, The Deseret News.
 KZY, Wenatchee, Wash., Wenatchee Battery & Motor Co.
 NDF, Anacostia, D. C., 412 only, U. S. Navy Dept.
 PWX, Havana, Cuba, Cuban Telephone Co.
 WAI, Dayton, Ohio, McCook Field, U. S. Army.
 WAAB, New Orleans, La., Valdemar Jensen.
 WAAC, New Orleans, La., Tulane Univ.
 WAAC, Cincinnati, Ohio, Ohio Mechanics Inst.
 WAAF, Chicago, Ill., Chicago Daily Drovers Journal.
 WAAE, St. Louis, Mo., St. Louis Chamber of Commerce.
 WAAH, St. Paul, Minn., Commonwealth Electric Co.
 WAAJ, Boston, Mass., Eastern Radio Inst.
 WAAK, Milwaukee, Wis., Gimbel Bros.
 WAAL, Minneapolis, Minn., Minnesota Tribune Co. & Anderson-Beamish Co.
 WAAM, Newark, N. J., 200 miles; musical and code, every week day 11 to 11:55 a. m., 3 to 4 p. m.; Wednesday evenings 8 to 9; I. R. Nelson Company.
 WAAN, Columbia, Mo., Univ. of Missouri.
 WAAP, Wichita, Kans., United Elec. Co.; Otto W. Taylor.
 WAAG, Greenwich, Conn., New England Motor Sales Co.
 WAAT, Decatur, Ga., Georgia Radio Co.
 WAAT, Jersey City, N. J., Jersey Review.
 WAAW, Omaha, Neb., Omaha Grain Exchange.
 WAAY, Youngstown, Ohio, Yohrling Rayner Music Co.

(Continued on next page.)

Corrected List of U. S. Stations Alphabetically by Call Signals

- WAAZ, Emporia, Kans.; Daytime 100 miles; nite 500-1000 miles; each Tuesday and Thursday from 7 to 8 p. m. Acknowledge all communications at 7:15 p. m. The Hollister Miller Motor Co.
- WAJT, Marshall, Mo., Kelly-Vawter Jewelry Co.
- WAJU, Yankton, S. D., Yankton College.
- WBAA, W. Lafayette, Ind., Purdue University.
- WBAD, Minneapolis, Minn., Sterling Elec. Co. & Journal Printing Co.
- WBAE, Peoria, Ill., Bradley Polytechnic Inst.
- WBAF, Moorestown, N. J., Fred M. Middleton.
- WBAG, Bridgeport, Pa., Diamond State Fibre Co.
- WBAM, Minneapolis, Minn., The Dayton Co.
- WBAM, New Orleans, La., L. B. Bennettson.
- WBAN, Paterson, N. J., Wireless Phone Corp.
- WBAD, Decatur, Ill.; 100 miles; occasional music; sermons; James Millikin Univ.
- WBAX, Fort Worth Tex. 400-485; 4000 miles; Markets and News; Feature concert Monday to Friday inclusive; 9:30 p. m. to 10:45 p. m. Central Time; Quiet nights Saturday and Sunday. The Star-Telegram.
- WBAQ, South Bend, Ind., Myron L. Harmon.
- WBAU, Hamilton, Ohio, Republican Publishing Co.
- WBAV, Columbus, Ohio, 485, also Erner & Hopkins Co.
- WBAW, Marietta, Ohio, Marietta College.
- WBAZ, Wilkes-Barre, Pa., John H. Stenger, Jr.
- WBL, Anthony, Kans., T. & H. Radio Co.
- WBS, Newark, N. J.; Radius 500 mi.; Musical and Educational, week days: 10:30 to 11 a. m.; 1:00 to 1:15 p. m.; 2:15 to 2:30 p. m.; 7:30 to 8:30 p. m.; Sundays, 9 to 10:30 a. m.; 1 to 3 p. m.; D. W. May, Inc.
- WBT, Charlotte, N. C.; 1200 miles; 11 a. m. weather report 485; 4:30 p. m. mechanical music; 8 p. m. Market Report; 1:30 Tuesday and Friday regular concert; 7:30 p. m. Sunday Church Southern Radio Corp.
- WBU, Chicago, Ill., City of Chicago.
- WBZ, Springfield, Mass., Westinghouse Elec. & Mfg. Co.
- WCAB, Newburgh, N. Y., Newburgh Daily News; Newburgh News Printing & Pub. Co.
- WCAC, Fort Smith, Ark., John Fink Jewelry Co.
- WCAD, Canton, N. Y., St. Lawrence University.
- WCAE, Pittsburg, Pa., 400 meters; 12:30 news and reports; 3:30 weather reports; 4:15 Closing Market reports; 7:30 Late news and lecture; 8:30 musical programs; Kaufmann Beer Co.
- WCAG, New Orleans, La., Daily States Pub. Co.
- WCAM, Columbus, O., Daily program 11:30 to 12:30; Every Tuesday evening at 7, musical program; C. A. Entelrein Electric Co.
- WCAL, San Antonio, Texas, Southern Equipment Co.
- WCAL, Univ. Place, Neb., Nebraska Wesleyan University.
- WCAK, Houston, Texas, Alfred P. Daniel.
- WCAL, Northfield, Minn., St. Olaf College.
- WCAM, Villanova, Pa., Villanova College.
- WCAN, Baltimore, Md., Sanders & Stayman Co.
- WCAR, San Antonio, Texas, Alamo Radio Elec. Co.
- WCAS, Minneapolis, Minn., Wm. H. Dunwoody Industrial Inst.
- WCAT, Rapid City, S. Dak., 485 also South Dakota School of Mines.
- WCAU, Philadelphia, Pa. 485 also; 1000 miles; Daily 10:30 a. m.; 2:30 p. m.; 8:30 p. m.; regular concert 10 to 12 noon; Tuesdays, Fridays, Saturdays; Durham & Co., Inc.
- WCAV, Little Rock, Ark., J. C. Dice Elec. Co.
- WCAW, Omaha, Neb., Woodmen of the World.
- WCAX, Burlington, Vermont, University of Vermont.
- WCAY, Milwaukee, Wis., Kesselman O'Driscoll Co.
- WCE, Minneapolis, Minn., Pindley Elec. Co.
- WCK, St. Louis, Mo., Str. Beer & Fuller.
- WCM, Austin, Texas, Univ. of Texas.
- WCN, Worcester, Mass., 485 also Clark University.
- WCX, Detroit, Mich., Detroit Free Press.
- WDAC, Springfield, Ill., Ill. Watch Co.
- WDAD, Lincoln, Neb., Central Kansas Radio Supply.
- WDAE, Tampa, Fla., 485 also Tampa Daily News.
- WDAF, Kansas City, Mo., 400 and 485, also Kansas City Star.
- WDAG, Amarillo, Texas, K. Laurence Martin.
- WDAG, Brownsville, Pa., Hartman-Riker Elec. & Mach. Co.
- WDAH, El Paso, Tex.; Trinity Methodist Church.
- WDAI, Syracuse, N. Y., 485 also Electric Corp.
- WDAK, College Park, Ga., Atlanta & West Point R. R. Co.
- WDAK, Hartford, Conn., Hartford Courant.
- WDAL, Jacksonville, Fla., 485 also, Florida Times Union.
- WDAD, Dallas, Texas, Automotive Elec. Co.
- WDAP, Chicago, Ill., markets, 485; concerts 360; Daily on all business days: 9:30 a. m. receipts and shipments; estimated car lots; local weather report; opening futures market in wheat, corn, oats, soy, barley, pork, lard and ribs. 10 a. m. Future quotations, live stock receipts and prices; 10:30 a. m. futures quotations; 11 and 11:30 a. m. same; 12 noon, futures and cash grain prices; 12:30 and 1 p. m. futures quotations; 1:20 p. m. closing futures quotations and high and low for day. Cash grain prices. Gross bids for cash grain to arrive. 8 p. m. closing quotations; news items. On Saturdays closing prices at 12:05 p. m. instead of 1:20 p. m. Visible supply changes sent when posted. Regular concert schedule 10 p. m. Tuesdays, Thursdays Saturdays. Sunday evenings 9 p. m. and 10 p. m. Chicago Board of Trade official station.
- WDAR, Philadelphia, Pa.; Lit Brothers.
- WDAS, Worcester, Mass., Samuel A. Waite.
- WDAU, New Bedford, Mass., Sloum & Kliburn.
- WDX, Centerville, Iowa, First Nat'l Bank.
- WDAY, Fargo, N. D., Kenneth M. Hance.
- WDM, Washington, D. C., Church of the Covenant.
- WDT, New York, N. Y., Ship Owners Radio Service.
- WDZ, Tuscola, Ill., James L. Bush.
- WEAA, Flint, Mich., Fallis & Lathrop.
- WEAB, Fort Dodge, Iowa, Standard Radio Equip. Co.
- WEAD, Atwood, Kans., Northwest Kansas Radio Supply Co.
- WEAE, Blacksburg, Va., Virginia Polytechnic Inst.
- WEAF, New York City, N. Y., Electric Co.
- WEAG, Edgewood, R. I., Nichols-Helmsline-Bassett Lab.
- WEAH, Wichita, Kans., Wichita Board of Trade and Lander Radio Co.
- WEAL, Ithaca, N. Y., Cornell University.
- WEAJ, Vermilion, S. Dak., University of South Dakota.
- WEAK, St. Joseph, Mo., Julius E. Abercrombie.
- WEAM, North Plainfield, N. J., Borough of N. Plainfield.
- WEAN, Peoria, Ill., R. I. The Shepard Co.
- WEAD, Columbus, Ohio, Ohio State University.
- WEAP, Mobile, Ala., 485 also Mobile Radio Co.
- WEAQ, Berlin, N. H., Y. M. C. A.
- WEAR, Baltimore, Md., Balt. American & News Pub. Co.
- WEAS, Washington, D. C., The Hecht Co.
- WEAT, Tampa, Fla., John J. Foxarty.
- WEAU, Sioux City, Iowa, Davidson Bros. Co.
- WEAW, Rushville, Neb., Sheridan Elec. Service Co.
- WEAY, Little Rock, Ark., T. J. M. Daly.
- WEAY, Houston, Texas, Will Horwitz, Jr.
- WEAZ, Waterloo, Iowa, Donald Redmond.
- WEB, St. Louis, Mo., The Benwood Co., Inc.
- WEH, Tulsa, Okla., Midland Refining Co.
- WEY, Houston, Texas, 485 also Hurburt-Still Elec. Co.
- WEW, St. Louis, Mo., 485 also St. Louis Univ.
- WEW, St. Louis, Mo., 360 and 485; Market and weather reports at 9 a. m. 10 a. m. 2 p. m.; no other regular program; St. Louis University.
- WEY, Wichita, Kansas, 485 also Conrado Co.
- WFAA, Dallas, Texas, 400 and 485 also A. H. Belo & Co.
- WFAW, Miami, Fla., 1500 miles; 7:30 to 9 p. m. concerts including Arthur Pryor's Band evenings and W. J. Bryan Sunday School, Sunday a. m.; Miami Daily Metropolis & Electrical Equipment Co.
- WEAB, Syracuse, N. Y., C. F. Wessa.
- WFAC, Superior, Wis., Superior Radio Co.
- WFAF, Poughkeepsie, N. Y., H. C. Spratley Radio Co.
- WFAG, Waterford, N. Y., Radio Engineering Lab.
- WFAM, Port Arthur, Texas, Elec. Supply Co.
- WFAJ, Asheville, N. C., Hi-Grade Wireless Instrument Co.
- WFAK, Brentwood, Mo., Domestic Electric Co.
- WFAM, St. Cloud, Minn., 485 also Granite City Elec. Co. and Times Pub. Co.
- WFAN, Hutchinson, Minn., 485 also Hutchinson Electric Service Co.
- WFAZ, Cameron, Mo., Cameron Radio Co. and Mo. Wesleyan College.
- WFAT, Sioux Falls, S. Dak., 485; also Argus-Leader.
- WFAU, Boston, Mass., Edwin C. Lewis.
- WFAV, Lincoln, Neb., 485 also Univ. of Nebr. Dept. of Elec. Engineering.
- WFAY, Independence, Kans., Daniels Radio Supply Co.
- WFAZ, Charleston, S. Carolina, S. C. Radio Shop.
- WFAZ, Philadelphia, Penn., 400 and 485, also Strawbridge & Clothier.
- WGAC, Brooklyn, N. Y., Orpheum Radio Stores Co.
- WGAD, Eisenstadt, Porto Rico, Spanish-American School of Radio-telegraphy.
- WGF, Des Moines, Iowa 300 miles; Musical and entertainment Tuesday and Friday 7:30 p. m.; Church Services Sunday at 5 p. m. or 7:45 p. m. as announced; Special programs as announced Register and Tribune.
- WGAH, New Haven, Conn., New Haven Elec. Co.
- WGAJ, Shuadonab, Iowa, W. H. Gass.
- WGAK, Macon, Ga., Macon Elec. Co.
- WGAL, Lancaster, Pa., Lancaster Elec. Supply & Construction Co.
- WGAM, Orangeburg, S. C., Orangeburg Radio Equip. Co.
- WGAN, Pensacola, Fla., Cecil E. Lloyd.
- WGAQ, Shreveport, La., Glenwood Radio Corp.
- WGAH, Fort Smith, Ark., Southwest American.
- WGAJ, Lincoln, Neb., Am. Lecton Dept. of Nebr.
- WGAU, Wooster, Ohio, Marcus G. Limb.
- WGAV, Savannah, Ga., B-H Radio Co.
- WGAW, Altoona, Pa., Ernest C. Albright.
- WGAX, Washington Court House, Ohio, Ohio Radio Elec. Co.
- WGAY, Madison, Wis., North Western Radio Co.
- WGAJ, South Bend, Ind., South Bend Tribune.
- WGI, Medford Hillsdale, Mass., 485, also Am. Radio & Research Corp.
- WGL, Philadelphia, Pa., Thos. F. J. Hewitt.
- WGM, Atlanta, Ga., 400 only, Atlanta Constitution.
- WGR, Buffalo, N. Y., 485 also Federal Tel. & Teleg. Co.
- WGV, New Orleans, La., Interstate Elec. Co., 485 also.
- WGY, Schenectady, N. Y., 400 and 485 also General Elec. Co.
- WHA, Madison, Wis., 485 also Univ. of Wis.
- WHA, Iowa City, Ia.; 500 miles; 8:30 p. m. Monday, instruction; Tuesday, concert Wednesday, popular lecture; Friday, University News; public lectures and concerts irregularly; State University of Iowa.
- WHAB, Galveston, Texas, 300, 485, 600 also Clark W. Thompson (Fellman's Dr. Goods Co.)
- WHAC, Waterloo, Iowa, Cole Bros. Elec. Co.
- WHAD, Milwaukee, Wis., 485 also; Marquette Univ.
- WHA, St. Louis, Mo., 485 also; Automobile Elec. Service Co.
- WHAG, Cincinnati, Ohio, Univ. of Cincinnati.
- WHAM, Joplin, Mo.; radius, 1381 mi. Concerts, markets, weather, etc. Tuesday and Thursday evenings: 8 to 10; Daily except Sundays: 10 a. m. to 2 p. m.; Saturday night special: 11 to 12:30; Hafer Supply Co.
- WHAI, Davenport, Iowa, Radio Equip. & Mfg. Co.
- WHAL, Buffalo, W. Va., Buffalo Telegraph and E. K. Kitts.
- WHAJ, Clarksburg, W. Va., Roberts Hdwe. Co.
- WHAL, Lansing, Mich., Lansing Capitol News.
- WHAM, Rochester, N. Y., 485 also; Daily—Weather report 2:40 p. m.; Organ 2:45, 5:00, 6:45; Orchestra 3:00, 7:00; Bed-time stories, Sport results, Business reports and market reports, the latter on 485 meters, 7:15 p. m. Sunday—Radio Chapel Service, 3:15 p. m.; University of Rochester.
- WHAO, Savannah, Ga., Frederick A. Hill; every evening 8 to 9; Saturday nights, 12:30 to 1:30 a. m.
- WHAP, Decatur, Ill., Dewey L. Otta.
- WHAQ, Washington, D. C., Semmes Motor Co.
- WHAR, Atlantic City, N. J., Paramount Radio & Elec. Co.
- WHAS, Louisville, Ky., Courier Journal and Louisville Times Co.
- WHAW, Wilmington, Del., Wilmington Elec. Spec. Co.
- WHAZ, New Orleans, La., Gustave A. De Corin.
- WHX, Des Moines, Iowa; 300 miles; 5:45 p. m. to 6:15 p. m. Daily; 8:00 p. m. to 10 p. m. Wednesday evenings; Central Standard time; Iowa Radio Corp.
- WHAY, Huntington, Ind., Huntington Press.
- WHAZ, Troy, N. Y., 400 only, Rensselaer Polytechnic Inst.
- WHB, Kansas City, Mo., 400 and 485 also Sweeney Auto & Tractor School.
- WHB, Morgantown, W. Va., W. Va. University.
- WHK, Cleveland, Ohio, Warren R. Co.
- WHN, Ridgewood, N. Y., Times Printing & Pub. Co.
- WHU, Toledo, Ohio, Wm. B. Duck Co.
- WIAB, Rockford, Ill., Joslyn Automobile Co.
- WIAC, Galveston, Texas, 485 also Galveston Tribune.
- WIAD, Ocean City, N. J., Ocean City Yacht Club.
- WIAE, Vinton, Iowa, Mrs. Robt. E. Zimmerman.
- WIAF, New Orleans, La., Gustave A. De Corin.
- WIAG, Norfolk, Neb.; 485 also; 200 miles News and Markets 12:15, 3:30 and 5:30 p. m. The Huse Publishing Co. The Norfolk Daily News.
- WIAH, Newton, Iowa, Continental Radio & Mfg. Co.
- WIAI, Springfield, Mo., Heer Stores Co.
- WIAJ, Neenah, Wis., Fox River Valley Radio Supply Co.
- WIAK, Omaha, Neb.; 485, 7:45 a. m. Livestock receipts; 9:16 a. m. Livestock receipts and weather forecast for Nebraska and Iowa. Livestock market; 12 m. cattle, hog and sheep market; 1:50 p. m. rainfall and temperature report and weather forecast for Nebraska and Iowa; market details; 3:50 p. m. complete market reports and estimated receipts for next day; Daily Journal-Stockman.
- WIAD, Milwaukee, Wis., School of Engineering.
- WIAP, Springfield, Mass., Radio Development Corp.
- WIAQ, Marion, Ind., Chicago Pub. Co.
- WIAR, Paducah, Ky., Musical 3:30 to 4 p. m. and 7 to 8 p. m. except Sundays Paducah Evening Sun; Albert Bennett, operator.
- WIAS, Burlington, Iowa, Hawk-Eye Home Elec. Co.
- WIAT, Tarkio, Mo., Leon T. Noel.
- WIAU, Le Mars, Iowa, Am. Trust & Savings Bank.
- WIAV, Binghamton, N. Y., N. Y. Radio Lab.
- WIAW, Saginaw, Mich., Saginaw Radio & Elec. Co.
- WIAZ, Washington, D. C., Woodward & Lothrop.
- WIAZ, Miami, Fla., Elec. Supply Sales Co.
- WIK, McKeenport, Pa., K. & L. Elec. Shop.
- WIL, Washington, D. C., Continental Elec. Supply Co.
- WIP, Philadelphia, Pa., Gimbel Bros.
- WIZ, Cincinnati, Ohio, 485 also Radio Mfg. Co.
- WIAB, Lincoln, Neb., American Radio Co.
- WIAD, Waco, Texas, 485 also Jackson's Radio Engrng. Lab.
- WJAF, Muncie, Ind.; 1800 miles; 7:30 to 8 Monday, Wednesday, Friday evening, music; 8:30 to 7 p. m. Saturday, music; 3:30 to 4 every afternoon, News; 10:30 to 12 M. Sundays, Church service. Smith Electric-Muncie Press.
- WJAJ, Dayton, Ohio 200 miles; Sunday 8:40, 9:15 Religious; Wednesday 9:15, 9:45 Entertainment; Friday 9:15 to 9:45 Entertainment. Y. M. C. A.
- WJAK, Stockdale, Ohio, 485 also White Radio Lab.
- WIAM, Cedar Rapids, Iowa, Evening Gazette.
- WIAN, Peoria, Ill.; Daily Except Sunday: 9 a. m. Peoria Livestock; 9:15 a. m. special weather information; 11:30 a. m. weather, opening livestock and market quotations; 1:30 p. m. closing livestock and markets, official weather information; 2 p. m. special reports during season; Tuesdays, Thursdays and Saturdays, 9:15 p. m. special concerts as announced; one musical number precedes each broadcasting; Peoria Evening Star.
- WJAP, Duluth, Minn. 1500 miles; Sunday 11 a. m. 12:30 p. m. Church Service and organ recital; First Methodist Church, Rev. Chas. N. Pace, Pastor. Monday 8: p. m. to 9 p. m. musical; Thursday 8 p. m. to 9 p. m. musical; Kelley Duluth Co.
- WJAW, Topeka, Kans., Chamber & Brothers.
- WJAT, Providence, R. I., The Outlet Co., J. Samuets & Bros.
- WJAS, Pittsburgh, Pa., Pittsburgh Radio Supply House.
- WJAT, Marshall, Mo., Kelley-Vawter Jewelry Co.
- WJAX, Cleveland, Ohio, 485 also Union Trust Co.
- WJAZ, Chicago, Ill., Chicago Radio Lab.
- WJD, Granville, O.; 100 miles, music by Denison Conservatory, educational lectures and discussions; Denison University.
- WJH, Washington, D. C., White & Boyer Co.

(Continued on next page.)

Corrected List of U.S. Stations Alphabetically by Call Signals

- WJX**, New York, N. Y., De Forest Radio Telephone & Teleg. Co.
WJZ, Newark, N. J., 485 also Westinghouse Elec. & Mfg. Co.
WKA, Cedar Rapids, Ia. (485 also); Daily: weather reports, crop reports, government reports; Mondays, Thursdays and Saturdays: music; H. F. Paer.
WKAU, Lincoln, Neb., Star Rub. Co.
WKAF, Wichita Falls, Texas, W. S. Radio Supply Co.
WKAM, West Palm Beach, Fla., Plant Radio Co.
WKAK, Okemah, Okla., Oklahoma County News.
WKAL, Orange, Texas, Gray & Gray.
WKAN, Montgomery, Ala., Alabama Radio Mfg. Co.
WKAP, Cranston, R. I., Dutee W. Flint.
WKAQ, San Juan, Porto Rico, Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich., Mich. Agril. College.
WKAS, Springfield, Mo., L. E. Lines Music Co.
WKAS, Laconia, N. H., Laconia Radio Club.
WKAW, Beloit, Wisc., Turner Cycle Co.
WKAX, Bridgeport, Conn., Wm. A. MacFarlane.
WKAY, Gainesville, Ga., Brenau College.
WKC, Baltimore, Md., Jos. M. Zamolski Co.
WKN, Memphis, Tenn., Richman-Crosby Co.
WKY, Oklahoma City, Okla., 485 also Oklahoma Radio Shop.
WLZ, Fairfield, Ohio, U. S. Army.
WLAC, Raleigh, N. C., N. C. State College.
WLAG, Minneapolis, Minn., Cutting & Walsh Radio Corp.
WLAN, Syracuse, N. Y., Samuel Woodworth.
WLAI, Waco, Texas, 485 also Waco Elec. Supply Co.
WLAL, Bellows Falls, Vt., Vermont Farm Machine Co.
WLAK, Tulsa, Okla., Tulsa Radio Club.
WLAN, Houlton, Me., Putnam Hdw. Co.
WLAP, Louisville, Ky., W. V. Jordan.
WLAQ, Kalamazoo, Mich., A. E. Schilling.
WLAS, Hutchinson, Kans., Hutchinson Grain Radio Co.
WLAT, Burlington, Iowa, Radio Specialty Co.
WLAV, Pensacola, Fla.; daily musical program, 8 to 9 p m; The Electric Shop.
WLAW, New York, N. Y., Arrow Radio Lab.
WLAX, Greencastle, Ind., Greencastle Community Broadcasting Station.
WLAY, Fairbanks, Alaska, Northern Commercial Co.
WLAZ, Warren, Ohio, Hutton & Jones Elec. Co.
WLB, Minneapolis, Minn., Univ. of Minn.
WLK, Indianapolis, Ind., 485 also Hamilton Mfg. Co.
WLW, Cincinnati, Ohio, 485 also Crosley Mfg. Co.
WMA, Anderson, Ind., Arrow Radio Lab.
WMAA, Oklahoma City, Okla., Radio Supply Co.
WMAC, Cozenovia, N. Y., 750 miles; music 11: p m; Cleve B. Meredith.
WMAD, Rockport, Mo., Atchinson County Mall.
WMAE, Dartmouth, Mass., Round Hills Radio Corp.
WMAH, Liberal, Kans., Tucker Elec. Co.
WMAI, Lincoln, Neb., General Supply Co.
WMAJ, Kansas City, Mo., 485 also Drovers Telegram.
WMAK, Lockport, N. Y., Norton Labs.
WMAL, Trenton, N. J., 100 miles; 7:30 to 9 p m, Mondays and Thursdays, musical programs, lectures etc; Trenton Hardware Co.
WMAM, Beaumont, Texas, Beaumont Radio Equip. Co.
WMAN, Columbus, Ohio, First Baptist Church.
WMAP, Easton, Pa., Utility Battery Service.
WMAQ, Fair Store Building, Chicago; 4:35 to 5 p m, daily; 7 to 7:30 p m, Monday, Wednesday, Friday and Saturday; 7 to 8 p m, Tuesday and Thursday; 9:15 to 10 p m, daily; Chicago Daily News and Fair Department Store.
WMAR, Waterloo, Iowa, Waterloo Elec. Supply Co.
WMAU, Duluth, Minn., Paramount Radio Corp.
WMAV, Auburn, Ala., Polytechnic Inst.
WMAW, Wahpeton, N. D., Wahpeton Elec. Co.
WMAX, Ann Arbor, Mich., K. & K. Radio Supply Co.
WMAZ, St. Louis, Mo., 100 miles; Religious services Sunday, 11 a m and 8 p m; Tuesday at 7 p m; Kingshighway Presbyterian Church.
WMAA, Macon, Ga., Mercer University.
WMM, Cincinnati, Ohio, 485 also Precision Equipment Co.
WMMU, Washington, D. C., Doubleday-Hill Electric Co.
WMB, Bowling Green, Ky., Park City Daily News.
WMB, Boston, Mass.; Monday 4 to 5 p m. (silent at night) Tuesday 4 to 5 p m. and 7 to 8:30 p m, Wednesday 4 to 5 p m, 9:30 to 11 p m, Thursday 4 to 5 and 7 to 8:30 p m, Friday 4 to 5 and 8 to 9:30 p m, Saturday 4 to 5 and 9:30 to 11 p m. The Shepard Stores; J. J. Fanning, announcer; Samuel Curtis, operator.
WNAD, Norman, Okla., Okla. Radio Engineering Co.
WNAM, Manhattan, Kans., Manhattan Radio Supply Co.
WNAL, Omaha, Neb., R. J. Rockwell.
WNAN, Syracuse, N. Y., Syracuse Radio Telephone Co.
WNAP, Springfield, Ohio, Wittenberg College.
WNAQ, Charleston, S. C., Charleston Radio Elec. Co.
WNAS, Austin, Texas, Radio Corp.
WNAT, Philadelphia, Pa., 1000 miles; Talks, Radio Information, music, Chapel Service. Wednesday 7:30 p m; Saturday 7:30 p m; Sunday 2:30 and 4:30; Every day 12:15, 1 p m, Lennig Bros. Co.
WNAV, Knoxville, Tenn., People's Tel. and Tel. Co.
WNAY, Baltimore, Md., Shipowners' Radio Service.
WNBA, Yankton, S. D., Dakota Radio Apparatus Co.
WNAB, Fortress Monroe, Va., Henry Kunzman.
WNI, Albany, N. Y., Shotton Radio Mfg. Co., Inc.
WNO, Jersey City, N. J., Wireless Telephone Co. of Hudson Co., N. J.
WOOA, Ardmore, Okla.; radius 1,500 miles; Tuesdays and Fridays: musical and educational programs; Dr. Walter Hardy; station operated by G. H. Reitz.
WOAC, Lima, Ohio, Maus Radio Co.
WOAE, Fremont, Neb., Medland College.
WOAF, Tyler, Texas, Tyler Commercial College.
WOAH, Charleston, S. C., Palmetto Radio Corp.
WOAI, San Antonio, Tex. 485 also; daily except Sunday 10:30, 12:15, 3, 6 p m, News, market, weather reports; Wednesday, Concert 7:30 to 8:30 p m; Sunday evening concert 9:30 to 10:30 p m; Southern Equipment Co. and The Evening News and The Express.
WOAJ, Parsons, Kans., Irving's Electrical Co.
WOAK, Frankfort, Ky., Collins Hardware Co.
WOAL, Webster Groves, Mo., Wm. E. Woods.
WOAN, Lawrenceburg, Tenn., James D. Vaughan.
WOAQ, Omaha, Neb., 100 miles; Woodmen of the World.
WOAR, Portsmouth, Virginia; Portsmouth Kiwanis Club.
WOAR, Kenosha, Wis., Henry P. Lundskow.
WOAS, Middleton, Conn., Bailey's Radio Shop.
WOAT, Wilmington, Del., Boy's Mail House.
WOAU, Evansville, Ind., Sower Bolling Piano Co.
WOAV, Erie, Pa., Pa. Nat'l Guard.
WOAX, Trenton, N. J., Franklin J. Wolff.
WOAW, Omaha, Neb., 100 miles, Woodmen of the World.
WOAZ, Stanford, Texas, Penick Hughes Co.
WOB, Davenport, Ia., 485 meters; time signals, 10:55 a m; weather 11 a m; 360 meters, 11:05 opening market, news, agricultural programs; 12:00 noon, chimes concert; 2:00 p m, closing stocks and markets; 3:50 p m, educational talk; 5:45 p m, chimes concert; 6:35, sandman's visit; 7:00 musical program; 8 p m, lecture; Sundays, religious and musical and religious features, 9 a m to 10 p m; Palmer's School of Chiropractic.
WOI, Ames, Ia., 485 also Iowa State College.
WOK, Pine Bluff, Ark., concerts Tuesday and Friday evenings beginning at 9; Sunday, song series and sermons from churches at 11 a. m. and 7:30 p. m., Arkansas Light & Power Co.
WOO, Philadelphia, Pa., 400 and 485 also, John Wanamaker.
WOQ, Kansas City, Mo., 485 also Western Radio Co.
- WOR**, Newark, N. J., 400 only, L. Bamberger & Co.
WOS, Jefferson City, Mo. 485 also; first fifteen minutes of every hour from 8: a m to 2: p m; 5 p m, markets and music, 360 meters; Monday, Wednesday, Friday nights, 8 to 9:30 concerts; no Sunday program; Missouri State Marketing Bureau.
WOY, Omaha, Neb., R. B. Howell.
WOU, Omaha, Neb., Metropolitan Utilities.
WOZ, Richmond, Ind., 485 also Palladium Printing Co.
WPA, Fort Worth, Texas, 485 also Fort Worth Record.
WPA, Wabash, Neb., Anderson & Webster Elec. Co.
WPAB, State College, Pa.
WPAC, Okmulgee, Okla., Donaldson Radio Co.
WPAD, Chicago, Ill., Wieboldt & Co.
WPAF, Council Bluffs, Iowa, Peterson's Radio Co.
WPAG, Independence, Mo., Central Radio Co.
WPAH, Waupaca, Wis., Wisconsin Dept. of Markets.
WPAJ, New Haven, Conn., Deolittle Radio Corp.
WPAK, Fargo, N. D., North Dakota Agricultural College.
WPAL, Columbus, Ohio, Superior Radio & Tel. Equip. Co.
WPAM, Topeka, Kans., Awerbach & Guettel.
WPAP, Winchester, Ky., Theo. D. Phillips.
WPAQ, Frostburg, Md., General Sales & Eng. Co.
WPAK, Wilmington, Del., Radio Installation Co., Inc.
WPAK, Beloit, Kans., B. A. W.
WPAS, Amsterdam, N. Y., J. & M. Electric Co.
WPAT, El Paso, Texas, St. Patrick's Cathedral.
WPAU, Moorhead, Minn., Concordia College.
WPAV, Laurium, Mich., Paul Tinetti & Sons.
WPAX, Thomasville, Ga., S. W. Radio Co., J. R. Shumate, Jr.
WPAY, Bangor, Me., Bangor Radio Laboratory.
WPAZ, Charleston, W. Va., Dr. John B. Koeb.
WPE, Independence, Mo.
WPG, New Lebanon, Ohio 1500 miles; Program exclusive for the farmer; 12 to 12:15 p m News Flashes; 6 to 6:30 p m, News, Markets; 8 to 9:45 Monday and Wednesday; music and farm program. Nushawg Poultry Farm.
WPI, Clearfield, Pa., Elec. Supply Co.
WPM, Washington, D. C., Thos. J. Williams, Inc.
WPM, Memphis, Tenn., United Equip. Co.
WSPC, Clemson College, S. C.; Clemson Agriculture College.
WQA, Parkersburg, Pa., 1500 miles, 10:30 p m every evening. Horace A. Beale, Jr.
WQAB, Springfield, Mo., Southwest Missouri State Teachers' College.
WQAC, Amarillo, Texas, E. B. Gish.
WQAD, Waterbury, Conn., Whitall Electric Co.
WQAE, Springfield, Vt., Moore Radio News Station.
WQAF, Sandusky, Ohio, Sandusky Register.
WQAG, Lebanon, N. Y., Brock-Anderson Elect. Eng. Co.
WQAJ, Ann Arbor, Mich., Ann Arbor Times-News.
WQAK, Dubuque, Iowa, Appel-Higley Elec. Co.
WQAL, Mattoon, Ill., Cole County Tel. and Tel. Co.
WQAM, Miami, Fla., Electrical Equipment Co.
WQAA, New York, N. Y., Calvary Baptist Church.
WQAP, Lincoln, Neb., Am. Radio Co.
WQAR, Abilene, Texas, West Texas Radio Co.
WQAS, Maucle, Ind., Press Publishing Co.
WQAT, Lowell, Mass.; Prince-Walter Company.
WQAU, Westhampton, Va.; Radio Equipment Corp.
WQAV, Greenville, S. C.; Huntington & Guerry, Inc.
WQAW, Scranton, Pa., Scranton Times.
WQAX, Washington, D. C.; Catholic University.
WQAY, Peoria, Ill.; Radio Equipment Co.
WQAZ, Canton, Neb., Canton Music & Furniture Co.
WQA, Greensboro, North Carolina; Greensboro Daily News.
WQA, Chicago, Ill., Riverview Park, Walter A. Kuehl.
WRAB, Houston, Texas, Rice Institute.
WRAC, Savannah, Ga.; Savannah Board of Public Education.
WRAC, Mayville, N. D., State Normal School.
WRAD, Marion, Kansas, Taylor Radio Shop.
WRAP, Providence, R. I.; Stanley N. Reed.
WRAK, Escanaba, Mich., Economy Light Co.
WRAL, St. Croix Falls, Wis.; Northern States Power Co.
WRAM, Carthage, Ill., Robert E. Compton & Carriage College.
WRAN, Galesburg, Ill., Lombard College.
WRAN, Waterloo, Iowa, Black Hawk Elec. Co.
WRAU, St. Louis, Mo., Radio Service Co.
WRAP, Winter Park, Fla.; Winter Park Electric Construction Co.
WRAS, McLeanboro, Ill.; Radio Supply Co.
WRAU, Amarillo, Texas, Daily News.
WRAV, Yellow Springs, O., Antioch College.
WRAY, Scranton, Pa.; 360 and 485 ml.; radius 400 mi.; Sunday Chapel service; Wednesday: Selective Musical program, 8:15 to 10; Saturday: 8:15 to 11; Radio Sales Corp.
WRB, Hamilton, Ohio, Doron Bros. Elec. Co.
WRB, Schenectady, N. Y., Union College.
WRM, Urbana, Ill., Univ. of Ill.
WRP, Camden, N. J., Federal Inst. of Radio Telg.
WRR, Dallas, Texas, 485 also City of Dallas, Police and Fire Signal Dept.
WRT, Tarrytown, N. Y., Koenig Bros., Tarrytown Radio Research Lab.
WSAA, Marietta, O., B. S. Sprague Electric Co.
WSAB, Cape Girardeau, Mo., Southeast Mo. State College.
WSAC, Clemson College, S. C.; Clemson Agricultural College.
WSAH, Chicago, Ill.; G. Leonard, Jr.
WSAJ, Grove City, Pa., Grove City College.
WSAL, Brookville, Ind.; Franklin Electric Co.
WSAP, New York City; Seventh Day Adventist Church.
WSAS, Lincoln, Neb., State of Neb.
WSAT, Plainview, Texas, The Plainview Electric Co.
WSAV, Houston, Texas, C. W. Vick Radio Const'g Co.
WSB, Atlanta, Ga., 400 and 485 Atlanta Journal.
WSL, Utica, N. Y., J. & M. Elec. Co.
WSY, Birmingham, Ala., Alabama Power Co.
WTAC, Johnstown, Pa., Penn. Traffic Co.
WTAS, Elgin, Ill.; George D. Carpenter.
WTAU, Tecumseh, Neb., Ruegy Battery & Elec. Co.
WTAW, College Station, Texas, Agricultural and Mechanical College of Texas.
WTB, Manhattan, Texas, Kansas State Agri. College.
WTP, Bay City, Mich., Radio Corp.
WVP, New York, N. Y., Signal Corps, U. S. Army.
WWAC, Waco, Tex.; 3000 miles; Weather forecasts 11 a m daily; musical concerts, daily, 1:30 p m and on Wednesday and Saturday evenings at 8; Sanger Bros.
WWAD, Philadelphia, Pa., Wright & Wright, Inc.
WWAJ, Columbus, O.; Columbus Radio Club.
WWAK, Laredo, Texas, Worman Bros.
WWAN, Chicago, Ill.; Marigold Gardens.
WWB, Canton, Ohio, Daily News Printing Co.
WWI, Dearborn, Mich., Ford Motor Co.
WWJ, Detroit, Mich., 400 485, Evening News.
WWL, New Orleans, La.; Musical and Educational; Loyola University; operated by Dept. of Physics.
WWX, Washington, D. C., Post Office Dept.
WXAI, Newark, N. J., Westinghouse Elec. & Mfg. Co.
XXI, New York City, A. T. & T. Co.
XXI, Deal Beach, N. J., Amer. Tel. & Telg. Co.
3XW, Parkersburg, Pa., Horace A. Beale, Jr.
3YN, Washington, D. C., Nat'l Radio Inst.
9ARU, Louisville, Ky., Darrell A. Downard.

Deaf Pupils "Hear" Music by Radio

PUPILS and instructors at the State School for the Deaf were enthusiastic today over the fact that deaf children heard by radio in an experiment conducted by The Times at the school last night.

A score of children, some of them rated entirely deaf and others almost completely deaf, responded to the experiment, many being able to hear fairly clearly.

Isabelle Schaible, a pupil, heard music for the first time. Others were able to hear and distinguish between speaking and music, but Isabelle responded more completely than the others.

She sat with a radio headpiece over her ears. Her face almost shouted in her excitement. The strains of a dance orchestra were being received from a local station.

Instructors, pupils and visitors crowded about and watched her. She started beating time to the music with her foot. Any doubt that she was hearing was dispelled.

Isabelle, whose home is at Lafayette, has been deaf from childhood. Instructors rated her "completely deaf."

The experiment in the use of radio in aiding the deaf to hear was conducted with the cooperation of J. F. Connell of the Capitol Radio Supply Company, 52 W. New York St., who installed the set and operated it, and O. M. Pittenger, superintendent of the school.

Signals When Music Starts

Isabelle could distinguish nothing when the set was tuned into a concert at Detroit. But when the loud tones of a local dance orchestra came through the phones she immediately responded, signaling with her hands to an instructor that she heard music.

When the music stopped and an announcer started talking she signaled she could not hear a sound, although persons with normal hearing listening in on other sets could hear perfectly.

A score of pupils, whose hearing was in all stages to complete deafness, submitted to the experiment. Only four or five did not respond. A number considered deaf could distinguish between speaking and music.

The first two pupils with whom the experiment was tried were Gertrude McKnight of Carmel and Mary Monfreda of Indianapolis. When the phones were placed to their ears their faces brightened. They expressed the opinion it was "fine" and could distinguish between speaking and music.

Leon Heinrich, South Bend, an advanced pupil, put the receivers to his ears. His face was a study for a moment.

"I can hear something like a street car," he said.

Instructors expressed the opinion he had felt the vibrations of a street car and the vibrations of the headset felt the same.

Compared to Phonograph

On the second test, when an Indian-

apolis station was sending, the pupil accurately and repeatedly distinguished between music and talking. He has been deaf since he was 5 years old.

Many of the children declared they were listening to a phonograph when the music was being played. It was explained that while some possibly had sufficient hearing to distinguish phonograph music, others had recognized the vibrations of the radio music as similar to those of the phonograph.

"I hear a merry-go-round," one little girl exclaimed the moment the phones were put to her ears.

Gladys Heavenridge of Muncie, listed as having no hearing, insisted she could detect sound. Julia Gulley of Winchester could distinguish accurately between music and speaking. Another girl said she could feel vibrations but did not believe she was hearing.

Some of the boys heard so well they were loathe to relinquish the receivers. They were listed as having partial hearing but not sufficient to go to ordinary schools.

Cleatus Greenwald, a pupil, said he could hear distinctly. He could distinguish between musical instruments and could distinguish speaking. Edgar Lloyd, who was listed as having some hearing, heard well, as did Ivan Lynch of Frankfort. Both boys repeatedly listened in and appeared to enjoy it.

Howard Paust of Richmond, deaf since he was a year old, heard when the Indianapolis station came in, but could not hear stations farther away. Joe Miller, another pupil, could distinguish between music and speaking.

Deaf Since Babyhood

Deaf since babyhood, Helen Skelton of Terre Haute insisted she could detect sound. Lola Atwood of Vincennes could feel vibrations, but did not think she was hearing.

Dorothy Jones of Anderson and Walter Brady of Muncie did not respond. Some of the instructors who have no hearing said they could detect nothing.

Intense interest in the experiment was expressed by instructors and pupils alike. They gathered around the receiving set and whenever any one succeeded in hearing there were smiles and congratulations.—[Felix F. Bruner in the Indianapolis Times.

For the Blind

A pathetic letter from a blind man in Highmore, S. D., was received by the Department of Commerce asking which branch of the Government was distributing radio receiving sets to blind people. The Department radio officials were forced to reply that the Department had no sets to distribute and knew of no appropriation from which such donations could be made.

It occurred to the Government officials, however, that there was an opportunity for some charitable organization to perform a great public service

for those who cannot see. Most blind, they point out, have no means of receiving information or instruction except when they are read to. Since radio offers an audible means of instruction and entertainment and 570 broadcasting stations furnish programs free during practically every hour of the day, Government radio experts urge that a fund be started from which inexpensive radio receiving sets could be purchased for those unfortunates who are forced to spend their days in darkness. Radio broadcasters are furnishing the material, and some believe there are individuals or organizations who will bring these broadcasts to the ears of those who need them most of all.

Radio and Religion

Convincing proof of the value of broadcasting religious services was received by WGY, the Schenectady broadcasting station of the General Electric Company from a blind woman living in East Orleans, Mass., near Cape Cod. The paper was creased under each line of writing, and it was evident that the creased line was used by the writer to guide her pencil as she wrote the following appreciation:

Dear Sir:

"I am writing you a few lines this beautiful morning to tell you how much I enjoyed your good sermon Sunday afternoon, also the singing of 'Just As I Am,' and others. I heard every word of the sermon and singing, which was fine. I could hear just as plain as though you were in the room.

"What a wonderful invention. A friend and kind neighbor took me to his house to hear the radio. I am an old woman, almost seventy-five years old. Have been stone blind over twelve years, have not seen one ray of light. I take care of a crippled husband who is over eighty, cannot walk a step alone. I dress and undress him every day and wait on him. Sometimes the way seems dark, but my dear Heavenly Father gives me strength every day, and at night I say I am a day nearer home. I go to church or Sunday school and do enjoy it so much. I gave myself into God's hands over fifty years ago and he has never failed me yet. I always trust Him. He knows what is best for me. Pardon me for writing, but I did want to thank you for that service. May God bless you is the prayer of your friend.

Signed "....."

P. S. It is one of the most wonderful of all inventions to know that I can sit here in an easy chair way down on old Cape Cod and hear such lovely sermons and singing. God bless the man that invented it. I hope to hear you again sometime.

Signed "....."

Sifer Lemoine, radio engineer of the Royal Swedish telegraph Board, is in the United States studying the American radio systems and to confer with Government radio officials.

Jewett Buys DeForest

Outright purchase of the entire business, good will and patents of the DeForest Radio Telephone and Telegraph Co. is announced by President E. H. Jewett of the Jewett Radio and Phonograph Co., of Detroit.

Associated with Edward Jewett in the purchase are Theodore Luce, former Detroitier now associated with the New York and Chicago bond house of A. C. Allyn; Frank W. Blair, President of the Union Trust Co. of Detroit; H. M. Jewett, President of the Paige-Detroit Motor Car Company; and several other capitalists and radio experts.

As the result of the purchase, the Detroiters come into possession of 181 radio patents, among them the basic rights to the three-electrode audion bulb, which is an essential part of every long distance radio receiving or sending set. All other tube manufacture is conducted by virtue of license under DeForest patents. Among the other patents are several others covering radio equipment in general use, as well as a large number representing more recent development and research by Dr. Lee DeForest, and embodying startling new developments in the radio field.

The purchase also includes the fine new plant of the DeForest Company at Jersey City, the largest individual plant in the world devoted solely to radio manufacture, at which DeForest inventions are manufactured commercially. No announcement was made of the amount of money involved in the transaction.

Dr. DeForest remains with the company under a long-time contract as consulting engineer and is now, according to Mr. Jewett, giving a large share of his attention to the perfection of equipment by which the human voice is synchronized and reproduced in connection with moving pictures, thus adding a startling widened range of interest to the hitherto silent drama.

"Dr. DeForest is really the father of modern radio," commented Mr. Jewett in discussing the transaction. "Without his contributions to the art, commercial radio would not be possible. Like most inventive geniuses, the commercial side of his work has been distasteful and he is glad to turn over this factor to our group. It is our intention to make the name DeForest as significant to the general public of the best and the most advanced in radio, as it stands today among the experts. In accordance with this policy we will put behind the DeForest products every bit of Detroit enthusiasm and merchandising ability within our power.

"The affairs of the DeForest Company will be administered from Detroit, though we have no plans for any immediate change in the personnel or operating methods of the Jersey City factory.

"It is also possible that the DeForest purchase may eventually result in a large addition to the manufacturing facilities of the Jewett plants at Allegan."

High School Map

The radio amateur and broadcasting listener of Central Illinois will without doubt be interested to know that the Radio Research official staff of Springfield (Ill.), has copyrighted and is now putting on the market an up to date map of radio broadcasting stations in the United States. This is indeed a very high class map of great value to any radio amateur and novice. This map will retail at twenty-five cents each.

The map is put out in blue-print form, being made from a tracing that was drawn by members of the High School Radio Club. A great deal of hard and patient effort has been put forth in the preparation of this map and the completed product has certainly made a nit with radio amateurs and broadcasting listeners. The reader will perhaps be interested to know that when the drawing was completed some blue-prints were made from same and a sample map taken to each local dealer and a ready evidence of its merits can be judged by the fact that not only many amateurs complimented the map but forty maps were sold in thirty minutes.

One of the unique features of this map is a series of concentric circles, covering

the United States, with Springfield as the center. The circles scale one hundred miles apart, thus enabling any listener to determine at once the approximate distance from which he is listening to a concert in any direction.

Radio Needs Trained Men

Radio is sweeping the country like wild fire. Thousands of dollars are being spent for expensive outfits. RADIO EXPERTS are needed everywhere to keep this equipment in order and to sell and install new outfits.

Be a Radio Expert

I will train you quickly and easily in your spare time, to become a RADIO EXPERT so you can install, construct, repair and sell Radio equipment. I am a Graduate Electrical Engineer and from actual experience I will give you exactly what you must know to make the really big money in radio.

FREE My Consultation Service to you is FREE. This outside help which I gladly give you is, in itself, worth more than the small cost of the Complete Course.

START NOW

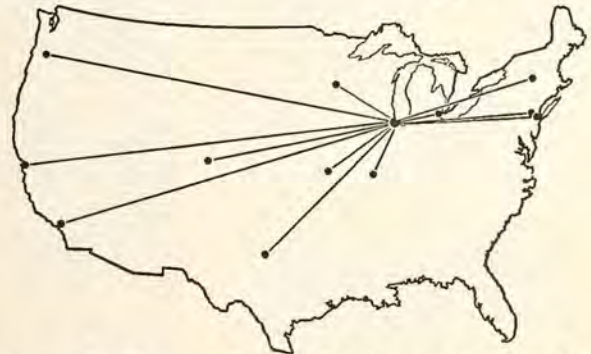
Don't let others beat you to the big money. Start now and within a few weeks' time I will train you at home, at an amazingly low cost, to become a RADIO EXPERT. Write for "Radio Facts" sent free without obligation.

A. G. MOHAUPT, Electrical Engineer
American Electrical Association
 Dept. 28-5 4511 Ravenswood Ave. Chicago

WRITE TODAY

What One Tube Did In a Single Evening

- New York City
- Newark, N.J.
- Detroit, Mich.
- Kansas City
- Minneapolis
- Denver
- St. Louis
- Los Angeles
- San Francisco
- Portland, Ore.



Loud Speaker Was Used!

Typical of the amazing results that are being secured daily with the new Erla Duo-Reflex circuit, using but a single vacuum tube, is the experience of Dr. G. Edwin Farley, of Beverley Hills, Ill., who writes:—

"Between 9 p.m. and 2 a.m., Dr. Duff, a friend of mine, and I, listened to New York City, Newark, Troy, Detroit, Stanford, Tex., Kansas City, Minneapolis, Denver, St. Louis, Los Angeles, San Francisco, and Portland, —all, with the exception of the last, very clear and loud. Most were heard on the loud speaker."

The basis of this new circuit, and the mainspring of its efficiency, is the Erla radio frequency transformer. Free diagrams of the circuit, with notes regarding its construction, are available. Ask your dealer or write.

ERLA Electrical Research Laboratories
 Dept. M, 2515 Michigan Ave., Chicago



Erla radio frequency transformers greatly improve the range and power of any receiving set, incorporating utmost efficiency and value. Results guaranteed. List, \$4

Watch for June Contest Announcement

Symbols Used in Radio Diagrams

CROSSED WIRES, NOT JOINED		VOLTMETER	
JOINED WIRES		GALVANOMETER	
RESISTOR		CRYSTAL DETECTOR	
RESISTOR, VARIABLE		ELECTRON TUBE (THREE-ELECTRODE)	
INDUCTOR		TELEPHONE RECEIVER	
INDUCTOR-VARIABLE		TELEPHONE TRANSMITTER (MICROPHONE)	
INDUCTOR ADJUSTABLE		BUZZER	
INDUCTOR, IRON CORE		SPARK GAP, PLAIN	
MUTUAL INDUCTANCE, OR INDUCTIVE COUPLER		ANTENNA, CONDENSER OR OPEN TYPE	
INDUCTIVE COUPLER, WITH VARIABLE COUPLING		COIL ANTENNA	
TRANSFORMER		KEY	
		SINGLE POLE, SINGLE THROW KNIFE SWITCH	
BATTERY		SINGLE POLE, DOUBLE THROW KNIFE SWITCH	
LONG LINE, POSITIVE ELECTRODE SHORT LINE, NEGATIVE ELECTRODE		DOUBLE POLE, SINGLE THROW KNIFE SWITCH	
VOLTAGE DIVIDER		DOUBLE POLE, DOUBLE THROW KNIFE SWITCH	
GROUND		TRIPLE POLE, SINGLE THROW KNIFE SWITCH	
CONDENSER AUDIO-FREQUENCY		TRIPLE POLE, DOUBLE THROW KNIFE SWITCH	
CONDENSER RADIO-FREQUENCY		REVERSING SWITCH	
CONDENSER, VARIABLE			
AMMETER			

Radio on Pacific

Although there are thirteen cables on the Atlantic, one cable only connects the United States with the Far East—that of the Pacific Commercial Company.

This cable has a limited capacity and is out of commission frequently for months at a time, due to the coral formation on the ocean's bottom between Guam and Manila. There has been some talk of another Pacific cable, but the physical conditions of the bottom are such that the laying of a second cable is a very expensive proposition. With the increasing facilities offered by radio, it is doubtful if the necessary money could be subscribed to finance such an undertaking, naval experts believe.

The Navy has several radio circuits across the Pacific, the giant of which, both in length and volume of traffic, is that from San Francisco to Cavite in the Philippines. About one-third of all traffic goes clear across the Pacific and the other two-thirds is relayed at Honolulu or Guam or both. There is a half hourly schedule between San Francisco and Honolulu so that this service is practically continuous. Commercial traffic cannot be accepted at the San Francisco Naval Station for Honolulu, although it is handled by points beyond Honolulu. Press traffic only is carried between San Francisco and Honolulu. Across the Pacific, Naval stations are located at Honolulu, Guam and Cavite and reaching to the southward, there is one at Tutuila in the Samoan Islands. From Guam to Japan, messages are transmitted by cable, although there is no reason why radio could not be used if Japan would open its stations to such messages.

In Alaska, the principal Naval radio stations are at Sitka, Ketchikan, Seward, Kodiak, Cordova, Dutch Harbor and

St. Paul. As the Alaska cable is often out of commission, this chain is frequently called upon to accept commercial messages for the northwest. The Naval radio station at Cavite is in communication with French Indo-China and the Dutch East Indies, and a commercial traffic agreement with the respective administrations exists. Northward from Cavite are the circuits to Peking and Shanghai, the Vladivostok station having been returned to the Russians in November, 1922. Eastbound trans-Pacific traffic is sent direct from Cavite to San Francisco, this circuit having been in operation for more than two years.

Under a resolution adopted at the Washington Limitation of Armament Conference, the use of the two China circuits is limited to government traffic. Just why or by whom this was put in can only be surmised, for now China cannot even receive press by radio from America.

Radio "Letters"

France has introduced a new method of communication which combines the postal and radio service with her colonies. On Jan. 13, there was established "radio letters" which, when printed clearly, may be mailed to the transmitting station radioed to a receiving station and there mailed to their destinations. The charge is said to include postage at both ends of the route and two-thirds of the regular radio charges. The minimum involved a rate applicable to a twenty-word message. Radio letters follow the regular radiograms daily or are moved the second day as day messages.

Italy Progresses

The volume of radio traffic in Italy has increased at a surprising rate during the past four years, Trade Commissioner Osborne at Rome reports. In 1919, Italian statistics show only 50,000 words were transmitted, but it is now estimated that in 1923 this will increase to seven million words.

This month a new station at Coltano, Italy will be opened for Commercial traffic and direct communication between New York and Rome will probably be established. To-day this traffic is handled via Berlin, Paris or London.

Development in Brazil

Communication by means of radio telephony has been established between Son Paulo and Rio de Janeiro, following earlier unsuccessful attempts which were said to have failed on account of atmospheric difficulties, Assistant Trade Commissioner M. A. Cramer, reports to the Department of Commerce.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year.

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What's
on
Tonight?"**

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Programs of lead-
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We want representatives in every community to obtain subscribers for Radio Age. Excellent opportunity for radio enthusiasts to make good money quickly. Write Radio Age, Inc., 64 West Randolph Street, Chicago, Ill.

BOOKS

If you have not bought your Rehnartz Book, fully illustrated with hook-ups and clear description of how to make this popular circuit, send \$1.50 in money order or check and we will send you the booklet "Rehnartz Radio" and place you on the subscription list of Radio Age for six months. Address Radio Age, 64 West Randolph Street, Chicago, Ill.

RADIO OUTFIT AND SUPPLIES

Radio Solder for construction and repairing radio outfits. Three six inch bars 25c postpaid. Hamilton Lead Company, Hamilton, Ohio.

Passengers on Moving Street Car Talk by Radio With Power House

SUCCESSFUL tests of carrier current, as a means of communication between moving street cars and the power station on the Third Avenue Railway to New York City, were recently completed by the General Electric Company. This is the first time that a moving trolley car has been able to keep in constant communication with headquarters and marks a new advent in this new science.

At the suggestion of the Third Avenue Railway, this new use of carrier current was tried. A transmitting and receiving set, similar to that used in any radio broadcasting station, was installed in the Brook Avenue sub station in the Bronx and a similar set was installed in one of the street cars. The messages, as broadcast from either the car or the sub station, instead of flying in all directions through space, were confined to the trolley wire, thus insuring privacy and direction of signals. Other advantages of carrier current over ordinary radio were the absence of static and the fading of signals. Persons who listened in and talked, either from the moving car or the power station, were unanimous in declaring the voice was as clear and distinct as any conversation they had heard over an ordinary land telephone.

In addition to being a means for instantaneous communication between headquarters and a trolley car, the same apparatus can be installed on an emergency or repair wagon. Then when this wagon is sent out on some trouble, by merely connecting the lead from the carrier current set to the trolley whether there is power in the wire or not, the workmen can be kept in constant touch with the repair barn. So as not to be dependent on trolley current, the telephone set is operated from storage batteries, which in turn operate a motor generator set, thus supplying the necessary energy for the vacuum tube transmitter and receiver.

On the New York street car, three fifty-watt Radiotrons were used for sending and an ordinary receiving set with one detector tube and two amplifiers of the UV 201 type for receiving signals. The two transmitters operated on a different wave length and by this means it was possible to carry on a two way conversation at the same time, just as is possible on the land telephone. Since these wave lengths were greater than 15,000 meters, there was no possibility of any interference with other broadcasting stations. Then too, the signals were confined to the immediate vicinity of the trolley wire so closely that even though a person had a receiving set tuned to this high meter wave length installed in his home along the route of the car he would be unable to hear any of the conversations.

Walter J. Quinn, electrical engineer

of the Third Avenue line, in speaking of the tests, said:

"Operating delays usually occur through unforeseen causes such as fires, accidents and traffic congestion. Even with the best telephone service time is lost in reaching emergency crews and other employes who are charged with the duty of maintaining schedules and clearing up trouble. Where such employes are beyond reach of immediate telephone facilities, additional time is required in dispatching messengers for them. To improve this condition it seemed most logical to use the trolley wires and feeders of the system as a channel for the broadcasting of signals and messages, and with this in mind the General Electric Company and the Third Avenue Railway have been jointly experimenting for several months.

"The wires and feeders form a network covering the entire system which furnishes ready means on contact with all strategic points and also the means by which emergency motor vehicles may instantly make contact and be placed in communication with the central dispatching point. I think the tests concluded this week substantiate my belief, that the carrier current telephone will do just what we have been seeking."

This is the third use carrier current has been put to thus far by the General Electric Company. About a year ago it was first used to operate a street lighting system at Little Nahant, Mass., six miles from the power station at Lynn. Last fall it was successfully used in transmitting a telephone conversation over a 70,000 volt transmission line for a distance of forty miles out of Baltimore, Md. These tests were made with fifty-watt sets. Larger sets of 250-watt are being built by the General Electric Company which will make it possible to greatly extend the distances.

RADIO DEFIES STORM

Recently when a sleet storm which raged through the Middle West disabled telegraph wires, broadcasting station KYW of the Westinghouse Electric & Manufacturing Company aided news agencies, railroads, and brokerage concerns in relieving the ensuing distress.

Radio then returned to its original role as one of the protectors of public safety and, by broadcasting over a wide area warnings, orders, and news dispatches, enabled trains to be located and newspapers to come out on time and give out of town traders up-to-the-minute stock information which enabled them to put through valuable deals.

As soon as the storm was known to have spread over a wide area and reports began to come in that telegraph wires were down all through the Middle West, the officials in charge of Station KYW began to receive numerous requests from the managers of railroads and the press

associations for assistance in dispatching trains and spreading news. Although not organized for this relief work, a temporary system of communication was established by Walter C. Evans, chief operating engineer of KYW in which the broadcasting station's powerful code transmitting set was put to use.

In a short time the code set was broadcasting over a wide area an appeal to broadcasting stations and amateurs located in the western portion of the Middle West to be on the watch for wrecked trains and those which were behind schedule. The persons hearing the call were instructed to communicate immediately with KYW, giving the station all available information. News began coming in at once by way of the other. Included in the first signals received was the information that a train running on a single track line had been wrecked and passengers and crew were in distress. Telegraph signals were also received from train operators telling of damage and where help was needed.

With this information officials of the Illinois Central railroad and the Chicago, Milwaukee and St. Paul railroad at once got into communication with the places at which train service was halted and by radio transmitted orders that soon straightened out a tangled situation.

Then word was received that because of wrecked telegraph lines the Belvidere, Ill., Republican and the Sterling, Ill., Gazette were severed from the news agencies. Late news bulletins were, therefore, read from the studio and the newspapers were enabled to fill their columns. According to letters received from the various editors all the broadcast news bulletins came in clearly enabling them to make all their issues on time.

In the meantime as this relief work was being broadcast, Chicago brokers also reported that many clients in the Middle West were without accurate trading information. This situation was relieved when KYW greatly increased the scope of its daily market service.

The manner in which KYW met the emergency has greatly increased the value of the radio telephone in the eyes of those who for a short time were dependent upon its service, for it proved that radio could "carry on" despite the fury of the elements, which in the past have played such havoc with public safety.

FREE! WITH HOOK-UPS!

REINARTZ RADIO, most popular booklet of year, sent postpaid with one year's subscription to Radio Age for only \$2.00. This is Special Offer for May. Get one while they last. Send currency, check or money order to Radio Age, 500 N. Dearborn Street, Chicago, Ill.

(See coupon on page 20.)

Radio in Czechoslovakia

Three radio-telegraph stations are now in operation in Czechoslovakia, and six are under construction, according to Consul Winans at Prague. The station of Brno, Moravia, opened for business last month, establishing communication with the Swiss radio station at Berne; a regular schedule is now maintained three times daily.

Czechoslovakia's principal radio-telegraph station is at Prague, the Capital, where a ten K.W. set has been in operation since June, 1920. Another smaller station is maintained at Vinghrady, which serves the airplanes flying between Prague, Warsaw and Vienna. Exchange rates and press reports are also handled by this service for the state.

At Kbely, near Prague, a 1 KW station is nearing completion for special service to the aviation field at Kbely and public service. Carlsbad, or Karlovy, another 1 KW set is being installed principally to handle traffic during the "cure" season.

A 5 KW station is in course of construction at Podebrady, Bohemia, which will eventually become the center of Czechoslovakian service. At this place there will also be erected a second station with two 50 KW generators to be used for international communication. It will be ready for opening next year. Moravaska Ostrava is to have a station for serving the air route and general business in this industrial center. Kosice, Slovakia, has underway another 5 KW station for general service, and a 5 KW set is planned for Bratislava, Slovakia, for the International Danube Commission and Danube shipping.

Danish Radio Laws

The wireless telephone has arrived in Denmark, according to Consul-General Letcher. He reports to the Department of Commerce that it is hoped radio telephony, now that its advantages have been clearly demonstrated there, will soon leave the experimental stage and enter into practical service.

Experiments to acquaint the public with this modern means of communication began in August, with direct wireless communication between Copenhagen and a Scandinavian-American Line ship off the coast of Norway while enroute to the United States. Recently the Danish Radio Company, which has installed nearly all the radio equipment on ships of that country, established radiophone communication between one of the Copenhagen telegraph news bureaus and Helsingør, about thirty miles away.

A delay in the natural development in the popular field has been caused through the fact that national laws forbid the use of all amateur radio telephone and telegraph apparatus. In spite of this law, however, there are said to be about 1,000 radio amateurs in Denmark. Several firms and institutions have succeeded in securing permission to

operate for technical purposes. Nothing will be done to open the air to amateurs and public broadcasters, it is said, until after the International Radio Communications Conference meets in the spring.

Prospects for future developments in Denmark are believed to be good, if laws permitting the use of amateur apparatus are enacted.

Radio in Japan

Several Japanese private concerns are now permitted to broadcast Government reports, speeches and music by radio, the Government having relaxed its rigid policy, advices from Japan to the Department of Commerce state. Only a few financially sound companies in Tokyo and Osaka, and perhaps one or two other large cities, will be licensed. A broadcasting tax is required by the Government after April 1. The companies charge subscribers a fee for the service rendered, which the Government will collect, returning a percentage to the broadcasters. Individual users of broadcasting and receiving sets will not be permitted to communicate with each other, it is stated. Complete receiving sets will cost between twenty and thirty yen, or between \$10 and \$15, it is anticipated by Japan experts.

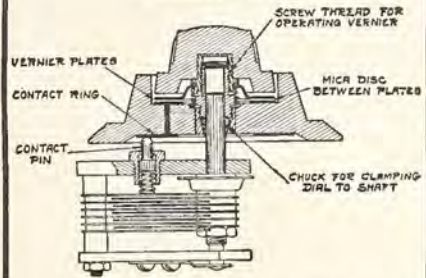
Radio on Aircraft

The air traffic commissioner of Denmark recently ruled that all airplanes must be equipped with wireless telephone apparatus. This is held as an important advance in both aviation and communication in Denmark. It is a progressive step not yet taken in the United States. Although ships of the sea must be so equipped, aircraft do as they please. After many accidents in aerial traffic over sea routes, with some loss of life, two aerial navigation lines have voluntarily begun to equip their aircraft with radio as a safety precaution. Rear Admiral Moffett, Chief of the Naval Bureau of Aeronautics, pointed out the necessity of radio equipment or at least pigeons on all aircraft several months ago. All Army and Naval planes are radio-equipped, at least when on long distance trips, and in addition carry pigeons.

H. A. Trask, director of the broadcasting activities of KSD, the *St. Louis Post-Dispatch*, is a tireless worker for the interests of the host of fans who own receiving sets. Among the many good ideas developed in the St. Louis station is the publication of a record of broadcasting stations, printed on heavy paper, a feature of which is a chart for tunings, making it possible for the receiving set operator to enter thereon the dial readings at which he heard the various stations. This of course makes it possible to go back to the same tunings by merely resetting the rheostats to conform with the entries on the record. A time-saver and a happy thought for the fans who want to scamper around the radio map with the greatest possible speed.

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High-Speed Radio

Successful experiments in high speed radio transmission between Army Message Center in the Munitions Building at Washington have just been completed. With new commercial apparatus, capable of sending mechanically from a perforated tape up to a speed of 100 words a minute and recording the messages in a saw-toothed ink line on a tape, a reception speed of sixty-five words a minute has been achieved. After a little practice, Signal Corps experts say, their operators will be able to mechanically copy the received messages visually as well as by ear, and in this way a great saving of time will be made in clearing traffic.

The Signal Corps is planning to adopt high speed systems such as commercial companies are using in trans-Atlantic work for trans-continental messages, and may order new mechanical radio equipment capable of operation at the rate of 200 words a minute. The practical value lies in the fact that when static interfering and only a few clear hours a day are available, a great number of prepared high speed messages can be sent through in a short time. The transcribing on message blanks can be done after reception by several operators.

An addition to the Army Radio Net was made in March when the Fort Bragg, N. C., radio station WZG was put in operation. A new 5KW tube set has replaced the single tube set at Fort McPherson, Atlanta, which was not powerful enough to operate over the Appalachian Range. A new station with high powered tube transmitters will be completed in Fort Leavenworth, Kans., in August, and Fort Douglas, Utah, will also soon have new high-powered equipment.

High speed transmitting and receiving apparatus will also be installed between Washington, Fort Leavenworth, and Fort Douglas, and possibly at Fort Sam Houston, Tex. In good winter weather, when static does not interfere, it is expected that Washington can clear traffic to Fort Douglas, Utah, but in the summer it will probably be necessary to relay through Fort Leavenworth, Kan.

The Signal Corps is now assigning waves lying within the bands recently allocated to the Government by Secretary Hoover's conference, in this way cooperating toward decreasing the interference so prevalent.

Engineer for Bureau

Dr. August Hund, of Berkeley, Calif., has been appointed as electrical engineer in the radio section of the Bureau of Standards, Department of Commerce. Dr. Hund is a Doctor of Engineering, having graduated from the Technische Hochschule, Karlsruhe in 1913. He served two years under Steinmetz in the General Electric Company, and is the author of a technical book on frequency measurements. For the past several years he has been doing graduate work at the University of California.

New Loud Speaker

A loud speaker with a non-metallic sounding board is introduced by the Pathe Phonograph & Radio Corporation. It is claimed for this instrument that it reproduces exactly the sounds sent out by the broadcasting station,



whereas the large diaphragm on the "Pathe" gives a loud and clear signal from all its surface. The instrument is exceptionally light and is of attractive appearance. In Japan finish it retails at \$22 and in nickel finish, at \$24. Further information may be obtained by addressing Trade Editor, Radio Age.

Radio in Cabinet?

The creation of a Department of Communications including radio is suggested in the report on the Re-organization of the Executive Departments submitted to the Joint Committee of Congress by the President recently.

The Committee headed by Mr. Walter F. Brown, suggests that the Post Office Department be re-named the Department of Communications and that it include an Assistant Secretary for Telephone and Telegraph, including radio.

In the report Mr. Brown says in part: "The only important change contemplated is the addition of a bureau (to the Post Office) to develop and extend telephone and telegraph communications, including wireless, for the general public benefit."

Apparently the Navy would retain its communication system as would the Signal Corps, but it is evident that radio regulation would be transferred from the Commerce Department to the Department of Communication, although the Bureau of Navigation, under which the radio section operates today, is left in the Commerce Department.

Although the report is labelled as recommended by the President, his letter of transmittal states that with few

exceptions, the changes have the sanction of the Cabinet, and adds that it is his hope that the suggestions will be of assistance to the Committee. Further than that, the President does not appear to urge its adoption.

Baseball Talks

Three addresses of interest to every baseball fan and of special interest to the American boy were broadcast from WGY, the General Electric Company's Schenectady radio station, Friday evening, March 9. John A. Heydler, president of the National Baseball League spoke on "Helpful Hints on Baseball for the American Youth;" Col. T. L. Houston, part owner of the New York Yankees, discussed "Baseball as a Business," and William O. McGeehan, sporting editor of the New York Herald, had something to say about Babe Ruth and the home-run king's efforts for a come-back. All three addresses were photographed by the Pallophotophone in New York recently.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of Radio Age published monthly at Mount Morris, Ill. for April, 1923.
State of Illinois } ss.
County of Cook }

Before me, a notary public in and for the State and county aforesaid, personally appeared Frederick A. Smith, who, having been duly sworn according to law, deposes and says that he is the Editor of the Radio Age and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Radio Age, Inc., 64 W. Randolph St., Chicago, Ill.; Editor, Frederick A. Smith, 64 W. Randolph St., Chicago, Ill.; Business Managers, M. B. Smith, 64 W. Randolph St., Chicago, Ill.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.) Radio Age, Inc., 64 W. Randolph St., Chicago; Frederick A. Smith, 64 W. Randolph St., Chicago; M. B. Smith, 64 W. Randolph St., Chicago; J. H. Lohbeck, St. Louis, Mo.

3. That the known bondholders, mortgages, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is— (This information is required from daily publications only.)

Frederick A. Smith.
Sworn to and subscribed before me this 23rd day of March, 1923.
Seal, Harriet Dillon,
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