The Monthly Service Bulletin of the

NATIONAL BROADCASTERS' LEAGUE

Solely by, of and for Radio Broadcasting Station Owners

President George S. Walker, of the National Broadcasters' League, sent out a call for a convention of the league to take place on January 16, but notices were mailed later informing broadcasters that the meeting had been deferred because of the postponement of the Second National Radio Exposition which was to have been held in Chicago from the 13th to the 20th of January.

It was felt that if a meeting were called during the show many broadcasters could be present as attendants at both functions. A meeting will be held at a later date, and information concerning it will be forwarded to the membership at the earliest moment after the date is set.

New members of the League since the last issue are reported as follows:

Kelley-Duluth Company, Duluth, Minn.; Lennig Bros. & Co., Ninth and Spring Garden streets, Philadelphia, Pa.; Gene Huse, Norfolk Daily News, Norfolk, Neb.; Standard Radio Equipment Co., Fort Dodge, Iowa; D. W. May, Inc., 375 Central Ave., Newark, N. J.; H. J. Paar, 144 Second Avenue, East, Cedar Rapids, Ia.; Chicago Daily News, Chicago, Ill.; Fort Worth Star Telegram, Fort Worth, Texas.

As we were going to press others were coming in through the mail and will be mentioned in the February issue. All these new members are interested in the possibilities of concerted action.

The Secretary has received a letter from the Radio Broadcasting Society of America, in which the following word of cheer is included:

"We are pleased to see that a good, live Broadcasters' League is being developed in the Middle West and wish you all success."

The Copyright "Hold-up"

THE Secretary of the League has received numerous communications regarding the demand of the American Society of Composers, Authors and Publishers, that the owners of copyrighted music be paid a fee by those who broadcast their music, literature and songs.

The majority of broadcasters appear to believe that the American Society of C. A. and P. is out to gouge the broadcaster. At a recent conference in New York, details of which are found elsewhere in this number, the A. S. C. A. P. was plainly told that its demands would not be met by some of the more important broadcasting interests.

Among those who have been discussing the question with the A. S. C. A. P. is Mr. George S. Walker, President of the National Broadcasters' League. Following is a portion of a letter which Mr. Walker addressed to the society in response to the society's elaborate questionnaire:

"The broadcasting of popular song and instrumental music, and reference to same by the broadcasters in naming the music house having these records and music on sale, undoubtedly has gone a long way toward increasing the sales of said sheet music, and records, and in this your society has undoubtedly benefited. You should remember that when a song or instrumental piece is broadcasted, no one can make use of it other than to hear it, and we cannot see for the life of us how your rights under the copyright law are infringed or abridged in any manner. However, as we are neither lawyer, son of a lawyer, or even a relative of a lawyer, we do not assume to say that your lawyers are wrong in their legal opinions. But we do believe that common business horse sense ought to be applied in this situation. We all are trying to recover from the effects of the war; business for none of us is what we would like it to be, and for one concern, set of men or association to deliberately carry out a plan that not only will wreck another industry, but at the same time seriously injure their own, is beyond us.

"However, law is law, and if you have it on your side, it gives you the right and power to drive, and if you elect to drive (broadcasters out of business), then all we can do is submit, take our loss in broadcasting investment and let it go at that. It will be all in a day's work. The results, if unsatisfactory to your interests in the long run, cannot be laid at our door.

"It seems to us that another way out could be found by you, and we venture the suggestion that you could require broadcasting stations to announce the name of the publisher, song writer, composer, etc., before or after the broadcasting of each number, and I believe all broadcasters would be glad to do this; whereas, I think you will find, generally speaking that the broadcasters will resent this present plan of yours as being an attempted holdup, even though it should be shown that you have a legal right to charge for the privilege of using copyrighted pieces.

"In writing as we have we sought to help you rather than antagonize you, and no matter what slant this whole affair may take, we sincerely hope we will retain your friendship, as I wish to assure you now that you have ours."

Important Meeting

THE National Broadcasters' League will be represented at a conference arranged by the Bureau of Standards, United States Department of Commerce, to be held in the Engineering Societies Building, 29 West Thirty-

ninth, New York, on January 12. The purpose of the conference is to discuss the questions:

(1) Shall a formulation of standards for radio apparatus and service (especially broadcasting) be made?

(2) What type of standardization should be initiated; thus what general classes of apparatus or service, or what specific parts should be considered most important to include in such standardization?

As to classes of apparatus: Transmitting apparatus—Complete sets, Parts; Receiving apparatus—Complete sets, Parts (See Appendix I).

As to classes of service: Broadcasting—Primary—radio telegraph, Local—radio telephone; Ship and shore; Aircraft; Point-to-point—Overland, Transoceanic; Amateur; Line radio—On telephone lines, On power-distribution systems.

(3) What features should be covered in formulating standards for radio apparatus?

a. Methods of rating; b. Methods of testing; c. Dimensional standardization— (1) For electrical interchangeability, (2) For mechanical and dimensional uniformity; d. Specifications for general requirements; e. Specifications for purchase; f. Specifications for safety.

(4) Should steps be taken to provide testing facilities?

(5) What procedure shall be recommended for carrying out the conclusions reached by this conference?

(6) What general recommendations should be made to a continuing committee should such a committee be established?

(7) What consideration should be given to related lines of activity?(e. g., standardization of terms and symbols).

Among the organizations which have been invited to attend the conference are the following:

Aeronautical Chamber of Commerce; American Electric Railway Association; American Engineering Standards Committee; American Institute of Electrical Engineers; American Radio Relay League: American Railway Association; American Physical Society; American Telephone & Telegraph Co.; American Society for Testing Materials; American Steamship Owners' Association; Association of Edison Illuminating Companies; Association of Railway Electrical Engineers; Association of Railway and Public Utilities Commissions; Bakelite Corporation; Boy Scouts of America; Chamber of Commerce of U. S.; Charles Williams Stores; Electrical Manufacturers Council—Electrical Manufacturers Club, Electric Power Club, Associated Manufacturers of Electrical Supplies, Radio Apparatus Section; Electrical Supply Jobbers Association; Electrical Testing Laboratories; Federal Specifications Board; Federal Telegraph Co.; General Radio Co.; Institute of Radio Engineers; International Association of Municipal Electricians, Kresge Co., S. S.; Manufacturers Aircraft Association; Montgomery Ward & Co.; National Association of Electrical Contractors and Dealers; National Association of Electrical Inspectors; National Electric Light Association; National Fire Protection Association; National Radio Chamber of Commerce; National Research Council; National Retail Dry Goods Association; New York State Conference of Mayors; Pacific Radio Trade Association; Radio Corporation of America; Sears, Roebuck & Co.; Society for Electrical Development; Tropical Radio Telegraph Co.; Underwriters' Laboratories; U. S. Department of Agriculture; U. S. Department of Commerce; U. S. Navy Department; U. S. Post Office Department; U. S. Shipping Board; U. S. Treasury Department; U. S. War Department; U. S. Independent Telephone Association; Western Association of Electrical Inspectors; Woolworth, F. W. & Co.

Comprehensive report of the action taken at this conference will be published in the bulletin of the National Broadcasters' League in the February number of Radio Age. This is likely to be the most important radio conference since the sessions of last Spring, which also were held under the auspices of the Department of Commerce.

OWNERS of broadcasting station owners 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, Garrick Building, 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.

The Missouri Plan

Recognizing the need for eliminating interferences and duplications of radiophone transmission in this territory, the Missouri Broadcasters' Association has been organized, with Jewell Mayes of Jefferson City as President and Leo Fitzpatrick of Kansas City as Secretary. U. S. Radio Inspector E. R. Bean of the Department of Commerce was present and legalized the new schedules, which went into effect on the morning of November 27, 1922, leaving each station free of interference from other Missouri stations.

The "Missouri Broadcasters' Association" schedules are as follows, 485 meters being used except when otherwise indicated:

The forenoon schedule for each day of the week except Sunday, from eight to 12 o'clock noon, has each period of each hour divided in the same way, namely:

The first 15 *minutes* of each forenoon hour, WOS, the State Marketing Bureau of the Missouri State Board of Agriculture of Jefferson City; for example, from 8:00 to 8:15.

The next 10 *minutes*, WMAJ, Kansas City Drovers Telegram; for example, from 8:15 to 8:25.

The next 15 *minutes*, WHB, Sweeney Automobile School of Kansas City; for example, 8:25 to 8:40.

The next 10 *minutes*, KSD, St. Louis Post-Dispatch; for example, 8:40 to 8:50, KSD as yet does not start until 9:40.

The next 10 *minutes*, WOQ, Western Radio Company of Kansas City; for example, from 8:50 to 9:00.

WDAF, the Kansas City Star, is not in the air before noon.

During the noon hour the schedule is the same as before noon, excepting that WHB will be in the air on 485 meters only from 12:25 to 12:35, going then to 400 meters for the balance of hour. WOQ and KSD have from 12:35 to 1:00 for use on 485 meters as they may see fit.

From 1:00 *to* 2:00 *p. m.*, the schedule runs the same excepting that WOQ is out of the air and WHB sends from 1:25 to 1:40 and 1:50 to 2:00.

At 2 o'clock WOS begins with its usual 15 minutes. WMAJ has the next 15 minutes until 2:30. WHB will be on 400 meters during this hour WOQ is on 485 meters from 2:30 to 3:00.

3:00 *to* 4:00 *p. m.*—WHB, 3 to 3:30; WDAF on 400 meters 3:30 to 4:30.

4:00 *to* 5:00 *p. m.*—KSD, the St. Louis Post-Dispatch.

5:00 *to* 6:00 *p. m.*—WOS, Jefferson City.

6:00 *to* 7:00 *p. m.*—WDF, the Star.

7:00 *to* 8:00 *p. m.*—Western Radio Company WOQ on 485 and Sweeney's WHB on 400 meters.

By an agreed arrangement between the Kansas City broadcasters, the division of time from 12:00 to 3:00 will be varied somewhat on Saturday only.

The night programs of all Missouri stations remain the same as formerly. On Monday, Wednesday and Friday nights WDAF broadcasts on 400 meters and WOS on 360, both beginning at 8 o'clock. WHB broadcasts on 400, Tuesday and Thursday nights, from 8 to 10:30. KSD, each week night, 400 meters, beginning at 8:00. WOQ, Saturday night, 8 to 9, 360 meters.

Sunday—WOQ, 11:00 to 12:00 and 7 to 7:30; WDAF, 4 to 5; WHB, 8:00; WOQ on 360; WDAF and WHB on 400 meters.

Does not this re-arrangement of schedules, eliminating practically all interferences among all Missouri broadcasting stations, make the average receiving set in a Missouri farm home or office worth at least twice as much as it was under the old jangling conflict of radio transmission?

From Missouri State Marketing Association, Bulletin.

Pick-Up Records by Our Readers

Some Crystal Records

A typographical error in the November issue of Radio Age made it appear that George C. Haseltine has picked up a station 6,000 miles distant with a crystal set. The distance, of course, should have been 600 miles. However the mistake was more or less of a blessin disguise. It served to prove that Radio Age has a strong following, for Mr. Haseltine has been flooded with correspondence about the "6,000-mile" performance until he is tired of trying to tell the eager fans how come.

Mr. Haseltine writes the following which will interest all devotees of the crystal:

Fort Stockton, Texas, Dec. 12, 1922.
Editor, Radio Age,
64 West Randolph St., Chicago.
Dear Sir:

In your letter of the 4th inst., you indicated that you would appreciate any more records of long distance reception with a crystal receiver.

Here are a few amateur spark stations that I have heard working this season, using a small loose coupler and the regular crystal hook-up.

Call	Location	Miles Distance	Date
9 DSD	E. Hutchinson, Kas.	573	Nov. 10
9 AQE	Eldorado, Kans.	592	Nov. 7
9 RR	Lawrence, Kans.	703	Dec. 11
9 BMN	Sedalia, Mo.	777	Oct. 28
9 AOJ	Columbia, Mo.	814	Dec. 11
9 NC	*University City, Mo.		Dec. 11
9 MC	Roodhouse, Ill.	823	Nov 1
9 DAY	Canton, Ill.	999	Dec. 11
9 KY	Polo, Ill.	1073	Dec. 11
9 BM	Chicago, Ill.	1147	Nov. 8

*(Not on map.)

It is not the hook-up that makes this possible, for I use nothing but the regular crystal hook-up such as every one knows, (or should know).

It is partly owing to my isolated situation, no interference from trees, buildings, mountains, etc., a well insulated aerial and lead in, with all connections soldered, a first class ground, and using a small loose coupler, properly wound.

It is an error to put too much wire on the primary; I bring in 200 meter stations with only the first 9 or 10 turns of the primary, and 600 meter ships with 21 to 24 turns.

No one can expect to good long distance work with cheap phones and poor crystal. I use ——— phones, or ———

Very truly,
GEO. C. HASELTINE.

Reinartz Excels

Dear Sir:

Some time ago I built a Reinartz set as outlined by you with the exception of using a 43 plate and 23 plate variable condensor instead of 23 and 11 plate, as per your hook up.

Have two steps of amplification and I want to state that I am getting wonderful results with this set.

Have had set in operation for about two months and have brought in some forty different stations.

I would not exchange a Reinartz for a dozen vario-coupler, variometer hook ups.

On Monday, November 13, 1922, brought in the following stations which I claim is some record: WAAF, Chicago; WBU, Chicago; WGY, Schenectady, N. Y.; WEAF, New York, N. Y.; WJZ, Newark, N. J.; KDKA, E. Pittsburgh, Pa.; WGM, Atlanta, Ga.; WSB, Atlanta, Ga.; WWJ, Detroit, Mich.; WCX, Detroit, Mich.; WHB, Kansas City; WGAF, Kansas City, Mo.; KSD, St. Louis, Mo.; WBAP, Star Telegram, Ft. Worth, Texas; WOC, Davenport, Iowa; WLW, Cincinnati, Ohio; WHAS, Louisville, Ky.; WLAP, Louisville, Ky.; WDAP, Chicago; WGAS, Chicago; WMAQ, Chicago; XYW, Chicago.

This list of stations was brought in from 3:30 p. m. to midnight notwithstanding the fact that we received the entire opera "Aida." Would like to have some vario-coupler, variometer "bugs" shoot at this record.

The aerial used in this test is but 7 feet from ground at one end and 20 feet high on other end (which is bad in end).

Sincerely,
W. G. LEHR,
6842 So. Ada St.,
Chicago, Ill.

Hawaii Gets Detroit

A distance record for the reception of a complete program of radio entertainment was established between the Detroit News broadcasting station, WWJ, and the postmaster of Wailuku, Hawaii, November 23.

On that night The Detroit News Orchestra, which was the first radio orchestra in the world, played "Three O'clock in the Morning" in the studio in the News Building at about midnight, and was heard "clearly and distinctly" in the Hawaiian Islands at about 6:30. The sun is that slow between the two points. The distance is figured at approximately 4,400 miles. It would take sound of a cannon five hours and forty-one minutes to travel from Detroit to Hawaii without the aid of electricity—if that big a sound could be made, which is rather impossible.

But the notes of this music on the wings of radio arrived on the beach of Wailuku in about one fiftieth of a second after leaving the antenna atop The News. Thus were contested the flight of time and the extent of space.

The letter received by The News from the Hawaiian postmaster, A. F. Costa, says, "It sure was some sweet music. There were substantiating witnesses." The report from the postmaster tallies with the station log. Mr. Costa heard the whole program of the orchestra without interruption.

The distance record for a single number of an entertainment program is claimed by Station WGY, owned by the General Electric Company at Schenectady, N. Y., on a report received from Hilo, Hawaii, which is about 4,951 miles from Schenectady, when the distance is calculated on the globe. The distance estimated by WGY on the map was 5,200, but this is subject to correction.

London, England, has heard the station at Newark, N. J., (WJZ), and a ship in the harbor at Cherbourg has heard WGY. These distances are about 3,100 miles.

The Detroit News frequently hears from ships in the Pacific—notably the Easterner, which reports that between Australia and Panama on October 13, 1922, it heard a WWJ concert and "greatly appreciated" it at a distance of 3,500 nautical miles, which is 4,030 ordinary miles.

A letter from the operator aboard the ship Eastener tells of hearing The News complete concerts three successive nights Oct. 11, 12 and 13, while en route from New York to Australia. On the last night the ship was 2,500 nautical miles southwest of Panama, in latitude 9 degrees south, longitude 112 degrees west, and a calculated great circle distance of 3,500 nautical miles from Detroit.

Renting Receivers

Relative to the article entitled "Plan to Popularize Radio," published in last month's Radio Age, Mr. E. L. Russell, proprietor of Colfax Battery Service, Colfax, Ill., writes as follows:

Dear Sir:

"In regard to your "Plan to Popularize Radio," I will say I think enough of it to begin asking questions. Is it not true that the big fault is in the fact that there is nothing to prevent individuals from buying cheap crystal sets outright, or, for that matter, constructing their own, and avoid paying rents? The telephone companies get their compensation for service by owning the lines. Who owns the air? Even if the local broadcaster sold every outfit used the profit would not be sufficient to buy and maintain a broadcasting outfit. Undoubtedly the idea is novel and has merit but the financial scheme looks like a joker. If it was not for the financial draw-back the plan would have been in operation here months ago and we would have written to Mr. H. Gernsback about it, instead of him writing us about it.

"The only solution I see would be to appeal to the local Chamber of Commerce or the like. So far I have not been able to find any institution around here willing to support a local short range broadcasting station."

Questions and Answers

Free Special Service Department, Conducted by Frank D. Pearne

For prompt replies by mail, readers should enclose self-addressed and stamped envelope with their inquiries.

C. P. J., St. Louis, Mo.

Question: I built a Reinartz receiving set, as per your diagram in last months Radio Age. I am not having any results with it on long distance stations. If I get any long distance stations, there is a howl or whistle in the coil or tube all the time. If I put my hand near the dials, or tuning switches, it makes the noise worse. Sometimes I can put my hand in a certain place and if I hold it there I can tune the stations in, but rs soon as I move my hand, it will start to whistle. I have a two-strand aerial about 30 feet long. I have got the 23 plate condenser on the ground side, with the rotating part hooked to the ground and I have got the 43 plate on the aerial side, with the rotating part hooked to the aerial. I have got a .0005 grid condenser hooked between the grid and the coil and I am using a U. V. 200 detector tube. I am not using any amplification at all. Could this be my trouble? If I use a crystal coil in series with the aerial to the tube set, I can get pretty good results. If I do not use this coil, there is a howling noise all the time. I get KSD loud enough to hear all over the room from the phones, without the crystal coil. The crystal coil just works good on long distance stations.

Answer: I think that you can stop some of the howling by lining the back of your panel with tin foil and connecting it to the ground. You can cut away the tinfoil at any place where the instruments on the panel might touch it. Nothing should come in contact with it but the ground wire. If you put your hand near the coil, the whistling would probably cease, but it should not be necessary to use the hand at all. You will find that in getting long distance stations, the rheostat of the detector ube is the most sensitive of all the adjustments. This really should be of the vernier type. I have found it impossible to get distance with these sets without turning down the filament rheostat to a much lower point than that used for local stations. Your statement about the addition of the crystal coil is interesting. This of course adds inductance to your set and would tend to show that there are not enough turns on it. The fact that you don't need the coil when getting local stations means nothing, as at close range the tuning is so broad that you could get them even though there are not enough turns on your coil, but with distance stations it is different. Here you need sharp tuning and if the wave length of the coil was too low on account of not enough wire you would have trouble. You do not need your amplifier to bring in distance, as it will only intensify those sounds which are brought in on the detector. If you are sure your winding is correct according to the drawing, I would advise you to wind another coil, using a few more turns in the aerial and grid coils.

F. L. G., Chicago, Ill.

Question: I have been doing considerable experimenting using the Reinartz circuit described in a late issue of the Radio Age, and have obtained some wonderful results on short wave work. What I would like to know is, can I load this circuit sufficiently to get the large commercial stations, say from 5,000 meters up. If so, where is the proper place to insert the proper inductances? I am planning on using honey-comb coils. Will I need an extra coil in the feed back circuit, that is, in the 60 turn coil?

Answer: This tuner can be loaded very nicely. It is best done by adding a switch point at the beginning of the aerial coil. This is just adding one more contact which is not connected to the coil. Another extra switch contact is added on the extreme end of the grid switch, but not connected to the coil. A honey-comb coil is then connected across these two contact points, with a tap taken off about three quarters of the way from the end on the aerial switch. This tap is then connected to the ground. No additional connection is used on the plate, or tickler coil. With the two switches on these new points long wave reception can be obtained. The length of the waves so received will depend only upon the number of turns in this exterior coil. Several of these may be made, making it possible to tune in on several different wave lengths.

F. G., Pittsburgh, Pa.

Question: Can a spider web Reinartz tuner, as given in Radio Age in September, be used with a Galena Detector and W D 11 tubes (2 of them) as amplifiers with loud speaker attached? If so, what distance would this tune up to? Give hook-up, stating what batteries, kind of transformers, etc., I need. If Reinartz tuner won't work, with crystal detector and W D 11 tubes, what tuner would you recommend? I have at present a double slide tuner, with fixed condenser and Galena detector. What would the probable life of the batteries be for WD 11 tubes? If Reinartz tuner works, with WD11 tubes, would it improve it to have a WD11 tube before the Galena detector, as well as the 2 after? I am told that the WD11 tubes give a smoother tone than the regular vacuum tubes. Is that so?

Answer: The Reinartz tuner can be used for this purpose, but I would advise the use of the long distance crystal set described elsewhere in this issue. The volume will not be so great as would be obtained with the larger tubes but it could be used with a loud speaker. The wave length could be anything you want, depending upon the number of turns on the vario-coupler, and the distance might be anything up to 100 miles, or more. By putting one of these tubes ahead of the crystal, greater distance could be brought in. The WD11 tubes do give a very smooth reception and many users say that they are much better than the larger tubes for detectors, but as amplifiers, they work well, but do not have the volume of the larger tubes. One dry cell will run a tube of this kind for about three months if used for one hour every day. If you use three tubes, three cells connected in parallel would run them for the same length of time.

W. S. J., Quincy, Ill.

Question: I am much interested in the Armstrong super-regenerative circuit built by Mr. Paul B. Coats, as described in the September number of Radio Age. I have had but little experience in building sets and fear the chances for success would be very small, unless I had the assistance showing the arrangement of instruments on panel, etc. Could you give me a sketch of same? The circuit looks very simple on paper, but I learn from wise heads that such is not the case with anything super-regenerative. Would it be feasible to build the circuit with unit panels, such as Sears Roebuck & Co., adding the extra condensers, etc.?

Answer: I am very sorry that I have no panel layout for the Armstrong super-regenerative set which you mention. There are some two or three dozen of these circuits out, and the panels for each one would have to be different. I am sure, however, that if you would write to Mr. Coats, he would oblige you with a sketch of the panel which he is using. His address is 336 W. 47th St., Chicago, Ill. Very few amateurs have been able to make this circuit function, or very few experts for that matter, and those who have done so, say that there are many other circuits which are better for receiving distance than the Armstrong super. The panel arrangement which you mention, would be a very good idea, as it would enable you to try out many different circuits by changing the units about.

Interference Causes Lawsuit

THE question as to whether or not one may use the air and space as provided by the Maker of the universe in a free and untrammeled way is to be decided at an early session of the Livingston county (Ill.) circuit court.

The question as to whether any one person has more liberty in the use of the ether of space has been brought in the case of Edward McWilliams, a resident of Dwight, against Wiley Bergman, also a resident of Dwight, and both ardent amateur radio fans. The case is the first one heard of in the state of Illinois and possibly the first of the amateur sort in the United States.

In his bill as filed Mr. McWilliams sets forth the fact that he is interested in radio and has had his residence property in Dwight equipped with wires and apparatus necessary to receive the messages and information sent out by the various radio sending stations of considerable size and in any considerable part of the United States, which apparatus cost him a considerable sum, to-wit $500.

He also states that in Dwight, which is a town of about 2,000 population, there are from fifteen to twenty receiving outfits similar to his own. He states further that he has made a considerable study of radio and receives much emjoyment and pleasure from receiving of market reports, items of current news, concerts and programs which are sent out by the radio sending stations.

The bill then states that one Wiley Bergman, who is also a resident of Dwight, has established a radio sending apparatus and station of great power; that he is not engaged in any business which calls for the sending of messages and communications by radio and does not send messages to any profit to himself.

The bill states further that whenever Bergman's apparatus is in operation in the sending of messages that it interferes with the receiving apparatus of Mr. McWilliams and with the radio apparatus of other residents of Dwight and that their outfits are wholly useless and ineffective regardless of the skill with which they are operated and that Bergman will not and does not confine himself to any regular hours or times for operating his sending apparatus, but starts and operates it at times and hours when he well knows that the other owners of radio outfits in Dwight are receiving concerts, programs, market reports from sending stations in larger cities and that Bergman well knows that the sending stations in Chicago, Davenport, St. Louis, Atlanta and other cities have programs announced in advance to be broadcasted each day and well knows that persons in Dwight are enjoying them and that he does not regard the right of the plaintiff and other persons in receiving these programs but frequently interferes with them and renders them wholly useless.

The bill sets forth that on November 7, election day, that while the plaintiff was receiving the election returns that his apparatus was rendered useless because of the fact that Bergman by reason of his disregard of the rights of the plaintiff so used his sending apparatus that the receiving of the election returns was interfered with and stopped for more than six times in the one day.

The bill states that because of the great development of the radio that a sending station should be so operated and controlled that it will not necessarily make useless the apparatus owned by the various receivers. The bill also states that it is really possible for Bergman to use his sending apparatus at times each day when it will not seriously annoy and inconvenience the plaintiff and the other residents of Dwight in the use and enjoyment by them of their receiving apparatus.

Mr. McWilliams, in his bill, asks that Bergman may be enjoined and restrained from using his radio sending apparatus as to interfere with the rights of the plaintiff to the reasonable use, enjoyment and benefit of his radio receiving apparatus, and so using his sending outfit as to render useless and of small value the receiving outfit, and from so using his sending outfit as to unnecessarily and unreasonably depreciate the value of the plaintiff's property and from using his radio sending outfit at such hours of the day as he well knows are daily used, by the sending stations in the larger cities for the broadcasting of their programs and which he well knows are being received by the plaintiff and other citizens of Dwight. Mr. McWilliams also asks that the right of himself and the rights of the defendant may be fully established.

The case is a unique one and involves some questions of law entirely new. It undoubtedly will be closely watched, both by radio fans throughout the state and country when it comes to trial, but also by attorneys who have not yet experienced such a problem.—From the Pontiac (Ill.) Leader.

Symphony Concerts

Sunday afternoon popular concerts by the City Symphony Orchestra, are being broadcast by the Westinghuse-Radio Corporation station, WJZ, at Newark. These concerts are held at the Manhattan Opera House, 34th Street & 8th Avenue, New York City, and are conveyed to WJZ by a special Western Union wire. The programs consist of gems from the lighter classics together with shorter symphonic poems. Young soloists of real talent and distinction are heard at each performance.

The City Symphony Orchestra, which is maintained by the Musical Society of the City of New York, consists of 83 players carefully selected for their musical talent and symphonic experience. The conductor, Mr. Dirk Foch, a native of Holland and a composer of distinction, has had a successful career as a conductor of symphony concerts and opera in Amsterdam, The Hague, Stockholm, Gothenburg, and other European cities. He conducted several stadium concerts in 1919, a special Carnegie Hall concert in 1920, and was guest conductor of the St. Louis Symphony Orchestra for two concerts in 1921.

The object of the Musical Society of New York is to bring orchestral music of the highest standard within the reach of the general public. It therefore welcomed with enthusiasm the proposal to broadcast its concerts to the hundreds of thousands composing the radio audience and is preparing to make these concerts the finest musical event ever handled by radio. Before each performance a member of the Society discusses the compositions to be heard, and explains their musical significance.

The series of concerts was started late in November.

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

KDKA, E. Pittsburgh, Pa.; Class B station, up to 485 meters; Westinghouse Elec. & Mfg. Co.
KDN, San Francisco, Calif.; Leo J. Meyberg Co.
KDOW, 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.
KDYD, San Diego, Calif.; Carlson & Simpson.
KDYQ, Portland, Ore.; Oregon Inst. Technology.
KDYR, Pasadena, Calif.; Pasadena Star News Pub. Co.
KDYS, Great Falls, Mont.; Class B, 485 meters, Great Falls Tribune.
KDYV, Salt Lake City, Utah; Cope & Cornwell Co.
KDYW, Phoenix, Arizona; Smith Hughes & Co.
KDYA, Honolulu, Hawaii; Honolulu Star Bulletin Co.
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.; Nevada Machinery & Elec. Co.
KDZL, Ogden, Utah; Rocky Mountain Rad. Corp.
KDZM, Centralia, Wash.; E. A. Hollingworth.
KDZP, Los Angeles, Calif.; Newbery Electric Co.
KDZQ, Denver, Colo.; Motor Generator Co.
KDZW, San Francisco, Calif.; Claude W. Gerdes.
KDZX, San Francisco, Calif.; Glad Tidings Tabernacle.
KDZZ, Everett, Washington; Kinney Bros. & Sipprell.
KFAC, Glendale, Calif.; Class B, 845, Glendale Daily Press.
KFAD, Phoenix, Ariz.; Class B, 485, McArthur Bros. Mercantile Co.
KFAE, Pullman, Wash.; State College of Washington.
KFAF, Denver, Colo.; George S. Walker, Western Radio Corp.
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.
KFAS, Reno, Nev.; Reno Motor Supply Co.
KFAT, Eugene, Oregon; 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.
KFAY, Central Point, Ore.; W. J. Virgin Milling Co.
KFBA, Lewiston, Idaho; Ramey & Bryant Radio Co.
KFBB, Havre, Mont.; F. A. Buttrey & Co.
KFBC, San Diego, Calif.; W. K. Azhill.
KFBD, Hanford, Calif.; California Radio Lab.
KFBE, San Louis Obispo, Calif.; R. H. Horn.
KFBG, Tacoma, Wash.; First Presbyterian Church.
KFBH, Marshfield, Ore.; Thomas Musical Co.
KFBJ, Boise, Idaho; Boise Radio Supply Co.
KFBK, Sacramento, Calif.; Kimball-Upson Co.
KFBL, Everett, Wash.; Leese Bros.
KFBM, Astoria, Ore.; Cook & Foster.
KFBQ, Prescott, Ariz.; Savage Elec. Co.
KFBU, Laramie, Wyo.; N. S. Thomas.
KFBV, Colorado Springs, Colo.; Clarence O. Ford.
KFC, Seattle, Wash.; Northern Radio & Elec. Co.
KFCB, Phoenix, Ariz.; Nielson Radio Supply Co.
KFCC, Wallace, Ida.; Auto Supply Co.
KFCD, Salem, Ore.; F. S. Barton.
KFCF, Walla Walla, Wash.; Frank A. Moore.
KFCH, Billinge, Mont.; Elec. Service Station.
KFCK, Colorado Springs, Colo.; Colorado Springe Radio Co.
KFDA, Baker, Ore.; Adler's Music Store.
KFED, Billings Polytechnic Institute, Polytechnic, Mont.
KFDB, San Francisco, Calif.; Mercantile Trust Co., also 400.
KFDD, Boise, Idaho; St. Michael's Cathedral.
KFDS, San Francisco, Calif.; John D. McKee.
KFEB, Taft, Calif.; City of Taft.
KFCQ, Casper, Wyo.; Motor Service Station.
KFDL, Denver, Colo.; Knight Campbell Music Co.
KFDJ, Corvallis, Ore.; Oregon Agri. College.
KFDC, Spokane, Wash.; Radio Supply Co.
KFDF, Casper, Wyo.; Wyoming Radio Corp.
KFEC, Portland, Ore.; Meier & Frank Co.
KFFA, San Diego, Calif.; Dr. R. C. Shelton.
KFCL, Loe Angeles, Calif.; Los Angeles Union Stock Yards.
KFFE, Pendleton, Ore.; Eaetern Oregon Radio Co.
KFEJ, Tacoma, Wash.; Guy Greason.
KFGG, Astoria, Ore.; Astoria Budget.
KFGH, Stanford Univ., Calif.
KFI, Los Angeles, Calif.; Earl C. Anthony, Inc.
KFU, Gridley, Calif.; Ths Precision Shop.
KFV, Yakima, Wash.; Foster-Bradbury Radio Store.
KFZ, Spokane, Wash.; Doerr-Mitchell Elec. Co.
KGB, Tacoma, Wash.; Tacoma Daily Ledger; Wm. A. Mullen's Elec. Shop.
KGF, Pomona, Calif.; Pomona Fixture & Wiring Co.
KGG, Portland, Ore.; Hallock & Watson Radio Service.
KGN, Portland, Ore.; Northwestern Radio Mfg. Co.
KGO, Altadena, Calif.; Altadena Radio Laboratory.
KGU, Honolulu, Hawaii, Waikiki Beach, Marion A. Mulroney; Honolulu Advertiser.
KGW, Portland, Ore.; Oregonian Pub. Co., also 400.
KGY, Lacey, Wash.; St. Martin's College, (Rev. S. Ruth).
KHD, Colorado Springe, Colo.; Class B, 485, C. F. Aldrich; Marble & Granite Co.
KHJ, Los Angeles, Calif.; C. R. Kilcruff & Co.; Times Mirror Co., Class B, 400-485.
KHQ, Seattle, Wash.; Louie Wasmer.
KJC, Los Angeles, Calif.; Standard Radio Co.
KJJ, Sunnyside, Calif.; The Radio Shop.
KJQ, Stockton, Calif.; C. O. Gould.
KJS, Los Angeles, Calif.; Bible Inst. of Los Angeles.
KLB, Pacadena, Calif.; J. J. Dunn & Co.
KLM, Del Monte, Calif.; Noggle Elec. Works.
KLP, Los Altos, Calif.; Colin B. Kennedy Co.
KFDH, Tucson, Ariz.; Univ. of Arizona.
KLS, Oakland, Calif.; Warner Bros.
KLX, Oakland, Calif.; Tribune Pub. Co.
KLZ, Denver, Colo.; Class B, 485, Reynolds Radio Co.
KMAZ, Macon, Ga., Mercer University.
KMC, Reedley, Calif.; Lindsay-Wetherill Co.
KMJ, Fresno, Calif.; 485, San Joaquin Light & Power Co.
KMO, Tacoma, Wash., Love Electric Co.; Tacoma Times.
KNI, Eureka, Calif.; T. W. Smith.
KNJ, Roswell, New Mexico; 485, Roswell Public Utilities Co.
KNN, Los Angeles, Calif.; Bullocke.
KNT, Aberdeen, Wash.; North Coast Producte Co.
KNV, Loe Angelee, Calif.; Radio Supply Co.
KNX, Los Angeles, Calif.; Elec. Lighting Supply Co.
KOA, Denver, Colo.; Y. M. C. A.
KOB, State College, New Mex.; New Mexico College of Agri. & Mechanic Arts.
KOE, Spokane, Wash.; Spokane Chronicle.
KOG, Los Angeles, Calif.; Western Radio Electric Co.
KON, Los Angelee, Calif.; Folzwasser, Inc.
KOP, Detroit, Mich., Detroit Police Dept.
KOQ, Modesto, Calif., Modesto Evening News.
KPD, San Francisco, Calif., Hale Bros.
KQI, Berkeley, Calif., Univ. of California.
KQP, Hood River, Ore., Blue Diamond Elec. Co.; Hood River News.
KQV, Pittsburgh, Pa., Doubleday-Hill Elec. Co.
KQW, San Jose, Calif., Chas. D. Herrold.
KQY, Portland, Ore., Stubbs Elec. Co.
KRE, Berkeley, Calif., Maxwell Electric Co.
KSD, St. Louis, Mo., St. Louis Post-Dispatch.
DSC, San Joes, Calif., O. A. Hals & Co.
KSL, San Francisco, Calif., The Emporium.
KSS, Long Beach, Calif., Preet & Dean Radio Research Lab.
KSU, Wenatchee, Wash., 360 and 485.
KTW, Seattle, Wash., First Presbyterian Church.
KUO, San Francisco, Calif., Examiner Printing Co., San Fran. Examiner.
KUS, Los Angeles, Calif., City Dye Worke & Laundry Co.
KUY, Del Monte Calif., Const Radio Co.
KVQ, Sacrsmento, Calif., James McClatchy; J. C. Hobrecht.
KWG, Stockton, Calif., Portable Wirelese Telephons Co.
KWH, Los Angeles, Calif., 485 also Los Angeles Examiner.
KXD, Modesto, Calif., Herald Publishing Co.
KXS, Los Angeles, Calif., Braun Corp.
KYF, San Diego, Calif., Thearls Music 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.
KYY, San Francisco, Calif., The Radio Telephone Shop.
KZC, Seattle, Wash., Public Market & Dept. Store Co.
KZM, Oakland, Calif., Western Radio Inst.; Preston D. Allen.
KZN, Salt Lake City, Utah, The Deseret News.
KZV, Wenatchee, Wash., Wenatchee Battery & Motor Co.
KZY, San Francisco, Calif., Atlantic-Pacific Radio Supplies Co.
NOF, 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.
WAAD, Cincinnati, Ohio, Ohio Mechanics Inst.
WAAF, Chicago, Ill., Chicago Daily Drovers Journal.
WAAE, St. Louis, Mo., St. Louis Chamber of Commerce.
WAAG, Shreveport, La., Bordeaux Co.; Elliott Electric Co.
WAAH, St. Paul, Minn.; Commonwealth Electric Co.
WAAJ, Boston, Mass., Eastern Radio Inst.
WAAK, Milwaukee, Wis., Gimbel Broe.
WAAM, Newark, N. J., I. R. Nelson Co.
WAAL, Minneapolis, Minn., Minnesota Tribune Co. & Anderson-Beamish Co.
WAAN, Columbia, Mo., Univ. of Missouri.
WAAD, Charleston, W. Va., Radio Service.
WAAP, Wichita, Kans., United Elec. Co.; Otto W. Taylor.
WAAQ, Greenwich, Conn., New England Motor Sales Co.
WAAR, Huntington, W. Va., Groves-Thornton Hdwe. Co.
WAAS, Decatur, Ga., Georgia Radio Co.
WAAT, Jersey City, N. J., Athens Radio Co.
WAAV, Athens, Ohio, Athens Radio Co.
WAAW, Omaha, Neb., Omaha Grain Exchange.
WAAX, Crafton, Pa., Radio Service Corp.
WAAY, Youngstown, Ohio, Yohrling Rayner Music Co.
WAAZ, Emporia, Kansas Hollister-Miller Motor Co.
WAH, El Dorado, Kans., Midland Refining Co.
WAJT, Marshall, Mo., Kelly-Vawter Jewelry Co.
WAJU, Yankton, S. D., Yankton College.
WBAA, W. Lafayette, Ind., Purdus University.
WBAB, Syracuse, N. Y., Syracuse Radio Tel. Co.; Andrew J. Potter.
WBAD, Minneapolis, Minn., Sterling Elec. Co. & Journal Printing Co.
WBAE, Peoria, Ill., Bradley Polytechnic Inst.
WBAJ, Moorestown, N. J., Fred M. Middleton.
WBAG, Bridgeport, Pa., Diamond State Fibre Co.
WBAH, Minneapolis, Minn., The Dayton Co.
WBAJ, Toledo, Ohio, Marshall-Gerken Co.
WBAM, New Orleans, La., I. B. Rennyson.
WBAN, Paterson, N. J., Wireless Phone Corp.
WBAD, Decatur, Ill., James Millikin Univ.
WBAQ, South Bend, Ind., Myron L. Harmon.
WBAP, Fort Worth, Texas, 400 and 485; also Ft. Worth Star Telegram; Worthan-Carter Publishing Co.
WBAU, Hamilton, Ohio, Republican Publishing Co.
WBAV, Columbus, Ohio, 485, also Erner & Hopkins Co.
WBAW, Marietta, Ohio, Marietta College.
WBAX, Wilkes-Barre, Pa., John H. Stenger, Jr.
WBAY, New York, N. Y., American Telephone & Telegraph Co.
WBL, Anthony, Kans., T. & H. Radio Co.
WBS, Newark, N. J., D. W. May, Inc.
WBT, Charlotts, N. C., 485 also 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, Pittsburgh, Pa., Kaufman & Baer Co.
WCAG, New Orleans, La., Daily States Pub. Co.
WCAH, Columbus, Ohio, Entrekin Elec. Co.
WCAI, San Antonio, Texas, Southern Equipment Co.
WCAJ, Univ. Place, Neb., Nebraska Wesleyan University.
WCAK, Houston, Texas, Alfred P. Daniel.
WCAL, Northfield, Minn., St. Olaf College.
WCAM, Villanova, Pa., Villanova Colleges.
WCAO, Baltimore, Md., Sandere & Stayman Co.
WCAP, Kalamazoo, Mich., Kalamazoo College.
WCAQ, Defiance, Ohio, Tri-State Radio Mfg. 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., Philadelphia Radiophone Co.
WCAV, Little Rock, Ark., J. C. Dice Elec. Co.
WCAW, Omaha, Nebr., Woodmen of the World.
WCAX, Burlington, Vermont, University of Vermont.
WCAY, Milwaukee, Wis., Kesselman O'Driscoll Co.
WCAZ, Quincy, Ill., Robt. E. Compton & Quincy Whig-General.
WCE, Minneapolis, Minn., Findley Elec. Co.
WCJ, New Haven, Conn., A. C. Gilbert Co.
WCK, St. Louis, Mo., Stix Baer & 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.
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.
WDAH, El Paso, Texas, Mine & Smelter Supply Co.
WDAI, Syracuse, N. Y., 485 also Hughes Electrical Corp.
WDAJ, College Park, Ga., Atlanta & West Point R. R. Co.
WDAK, Hartford, Conn., Hartford Coursnt.
WDAL, Jacksonville, Fla., 485 also, Florida Times Union.
WDAN, Shreveport, La., Centenary College and Glenwood Radio Corp.
WDAO, Dallas, Texas, Automotive Elec. Co.
WDAP, Chicago, Ill., 485 also, Midwest Radio Central (Inc.).
WDAG, Brownsville, Pa., Hartman-Riker Elec. & Mach. Co.
WDAR, Philadelphia, Pa., Lit Bros.
WDAS, Worcester, Mass., Samuel A. Waite.
WDAU, New Bedford, Mass., Slocum & Kilburn.
WDAV, Muskogee, Okla., Daily Phoenix.
WDAX, 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.
WDV, Omaha, Nebr., John O. Yelser, Jr.
WDY, Roselle Park, N. J., Radio Corp. of America.
WDZ, Tuscola, Ill., James L. Bush.
WEAA, Flint, Mich., Fallain & Lathrop.

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

WEAB, Fort Dodge, Iowa, Standard Radio Equip. Co.
WEAC, Terre Haute, Ind., Baines Elec. Service Co.
WEAO, Atwood, Kans., Northwest Kansas Radio Supply Co.
WEAE, Blackaburg, Va., Virginia Polytechnic Inst.
WEAF, New York City, N. Y., Western Electric Co.
WEAG, Edgewood, R. I., Nichols-Hineline-Bassett Lab.
WEAH, Wichita, Kans., Wichita Board of Trade and Lander Radio Co.
WEAI, Ithaca, N. Y., Cornell University.
WEAJ, Vermilion, S. Dak., University of South Dakota.
WEAK, St. Joseph, Mo., Julius B. Abercrombie.
WEAM, North Plainfield, N. J., Burough of N. Plainfield.
WEAN, Providence, R. I., The Shepard Co.
WEAO, Columbus, Ohio, Ohio State Univeralty.
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. Fogarty.
WEAU, Sioux City, Iowa, Davidson Bros. Co.
WEAV, Rushville, Nebr., Sheridan Elec. Service Co.
WEAW, Anderson, Ind., Arrow Radio Lab.
WEAX, 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, Tulaa, Okla., Midland Refining Co.
WEV, Houston, Texaa, 485 also Hurlburt-Still Elec. Co.
WEW, St. Louis, Mo., 485 also St. Louis Univ.
WEY, Wichita, Kansas, 485 also Cosradio Co.
WFAA, Dallas, Texas, 400 and 485 also A. H. Belo & Co.
WFAB, Syracuse, N. Y., C. F. Woese.
WFAC, Superior, Wis., Superior Radio Co.
WFAO, Salina, Kans., Watson Weldon Motor Supply Co.
WFAF, Poughkeepsie, N. Y., H. C. Spratley Radio Co.
WFAG, Waterford, N. Y., Radio Engineering Lab.
WFAH, Fort Arthur, Texaa, 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.
WFAQ, Cameron, Mo., Cameron Radio Co. and Mo. Wesleyan College.
WFAR, Sanford, Me., Hall & Stubbs.
WFAS, Fort Wayne, Ind., United Radio Corp.
WFAT, Sioux Falls, S. Dak. 485; also Argus-Leader.
WFAU, Boston, Mass., Edwin C. Lewis.
WFAV, Lincoln, Nebr., 485 also Univ. of Nebr. Dept. of Elec. Engineering.
WFAW, Miami, Fla., Daily Metropolis.
WFAY, Independence, Kans., Daniels Radio Supply Co.
WFAZ, Charleston, S. Carolina, S. C. Radio Shop.
WFI, Philadelphia, Penn., 400 and 485, also Strawbridge & Clothier.
WFO, Dayton, Ohio, Rike-Kumler Co.
WGAB, Houston, Texas, QRV Radio Co.
WGAC, Brooklyn, N. Y., Orpheum Radio Stores Co.
WGAO, Ensenada, Porto Rico, Spanish-American School of Radio-telegraphy.
WGAH, New Haven, Conn., New Haven Elec. Co.
WGAJ, Shenandoah, 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.
WGAR, Fort Smith, Ark., Southwest American.
WGAS, Chicago, Ill., Ray-di-co Organization, Inc.
WGAT, Lincoln, Nebr., Am. Legion, 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.
WGAZ, South Bend, Ind., South Bend Tribune.
WGF, Des Moines, Iowa, 485, also Register and Tribune.
WGI, Medford Hillside, Mass., 485, also Am. Radio & Research Corp.
WGL, Philadelphia, Pa., Thos. F. J. Howlett.
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.
WHAA, Iowa City, Iowa, State Univ. of Iowa.
WHAB, Galveston, Texas, 300, 485, 600 also Clark W. Thompson (Fellman's Dry Goods Co.)
WHAC, Waterloo, Iowa, Cole Bros. Elec. Co.
WHAO, Milwaukee, Wis., 485 also; Marquette Univ.
WHAE, Sioux City, Iowa, Automotive Elec. Service Co.
WHAF, Pittsburgh, Pa., Radio Elec. Co.
WHAG, Cincinnati, Ohio, Univ. of Cincinnati.
WHAH, Joplin, Mo., John T. Griffin.
WHAI, Davenport, Iowa, Radio Equip. & Mfg. Co.
WHAJ, Bluefield, W. Va., Bluefield Daily Telegraph and E. K. Kitta.
WHAK, Clarksburg, W. Va., Roberts Hdwe. Co.
WHAL, Lansing, Mich., Lansing Capitol News.
WHAM, Rochester, N. Y., Univ. of Rochester.
WHAO, Savannah, Ga., Frederick A. Hill; every evening 8 to 9; Saturday nights, 12:30 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.
WHAV, Wilmington, Del., Wilmington Elec. Spec. Co.
WHAW, Tampa, Fla., Pierce Elec. Co.
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.
WHO, Morgantown, W. Va., W. Va. University.
WHK, Cleveland, Ohio, Warren R. Cox.
WHN, Ridgewood, N. Y., Times Printing & Pub. Co.
WHU, Toledo, Ohio, Wm. B. Duck Co.
WHW, East Lansing, Mich., 485 also Stuart W. Seeley.
WHX, Des Moines, Iowa, Iowa Radio Corp.
WIAA, Waubaca, Wis., Waupaca Civic & Commerce Ass'n.
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 Cortin.
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 also Daily Journal-Stockman.
WIAO, Milwaukee, Wis., School of Engineering.
WIAP, Springfield, Mass., Radio Development Corp.
WIAQ, Marion, Ind., Chronicle Pub. Co.
WIAR, Paducah, Ky., J. A. Rudy & Sons.
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.
WIAX, Lincoln, Nebr., Capitol Radio Co.
WIAY, Washington, D. C., Woodword & Lothrop.
WIAZ, Miami, Fla., Elec. Supply Sales Co.
WIK, McKeesport, Pa., K. & L. Elec. Shop.
WIL, Washington, D. C., Continental Elec. Supply Co.
WIP, Philadelphia, Pa., Gimbel Bros.
WIZ, Cincinnati, Ohio, 485 also Cino Radio Mfg. Co.
WJAB, Lincoln, Nebr., American Radio Co.
WJAC, Joplin, Mo., Redell Co.
WJAO, Waco, Texaa, 485 also Jackson'a Radio Engrng. Lab.
WJAE, San Antonio, Texas, Texas Radio Syndicate.
WJAF, Muncie, Ind., Muncie Press and Smith Elec. Co.
WJAG, Norfolk, Nebr., 485 also Norfolk Daily News.
WJAH, Rockford, Ill., Central Park Amusement Co.
WJAJ, Dayton, Ohio, Y. M. C. A.
WJAK, Stockdale, Ohio, 485 also White Radio Lab.
WJAL, Portland, Me., Victor Radio Corp.
WJAM, Cedar Rapids, Iowa, Evening Gazette.
WJAN, Peoria, Ill., Peoria Star and Peoria Radio Sales Co.
WJAP, Duluth, Minn., Kelley-Duluth Co.
WJAQ, Topeka, Kans., Capper Publications.
WJAR, Providence, R. I., The Outlet Co., J. Samuels & 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, Ohio, Denmison University.
WJH, Washington, D. C., White & Boyer Co.
WJK, Toledo, Ohio, Service Radio Equipment Co.
WJX, New York, N. Y., De Forest Radio Telephone & Teleg. Co.
WJZ, Newark, N. J., 485 also Westinghouse Elec. & Mfg. Co.
WKAA, Cedar Rapids, Iowa, 485 also H. F. Paar.
WKAC, Lincoln, Neb., Star Pub. Co.
WKAO, East Providence, R. I., Charles Looff.
WKAF, Wichita Falls, Texas, W. S. Radio Supply Co.
WKAG, Louisville, Ky., Edwin T. Bruce, M. D.
WKAH, West Palm Beach, Fla., Planet Radio Co.
WKAK, Otemah, Okla., Okfuskee County News.
WKAL, Orange, Texas, Gray & Gray.
WKAM, Hastings, Neb., Daily Tribune.
WKAN, Montgomery, Ala., Alabama Radio Mfg. Co.
WKAP, Cranston, R. I., Duttee W. Flint.
WKAQ, San Juan, Porto Rico, Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich., Mich. Agrl. College.
WKAS, Springfield, Mo., L. E. Lines Music Co.
WKAV, Laconia, N. H., Laconia Radio Club.
WKAW, Beloit, Wisc., Turner Cycle Co.
WKAX, Bridgeport, Conn., Wm. A. MacFarlane.
WKAY, Gainesville, Ga., Brenau College.
WKAZ, Wilkes-Barre, Pa., Landau's Music Co.
WKC, Baltimore, Md., Jos. M. Zamoiski Co.
WKN, Memphis, Tenn., Riecliman-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.
WLAO, Hastings, Nebr., Arvanette Radio Supply Co.
WLAF, Lincoln, Nebr., Johnson Radio Co.
WLAG, Minneapolis, Minn., Cutting & Walsh Radio Corp.
WLAH, Syracuse, N. Y., Samuel Woodworth.
WLAJ, Waco, Texas, 485 also Waco Elec. Supply Co.
WLAK, Bellows Falls, Vt., Vermont Farm Machine Co.
WLAL, Tulsa, Okla., Tulsa Radio Co.
WLAM, Springfield, Ohio, Morrow Radio Co.
WLAN, Houlton, Me., Putnam Hdwe. Co.
WLAO, Scranton, Pa., 485 also R. C. Ehrhardt and J. H. Jones.
WLAP, Louisville, Ky., W. V. Jordan.
WLAQ, Kalamazoo, Mich., A. E. Schilling.
WLAR, Marshalltown, Iowa, Melkel Music Co.
WLAS, Hutchinson, Kans., Hutchinson Grain Radio Co.
WLAT, Burlington, Iowa, Radio Specialty Co.
WLAV, Pensacola, Fla., Elec. Shop, Inc.
WLAW, New York, N. Y., New York Police Dept.
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.
WMAB, Oklahoma City, Okla., Radio Supply Co.
WMAC, Cazenovia, N. Y., C. B. Meredith.
WMAO, Rockport, Mo., Atchinson County Mail.
WMAE, Dartmouth, Mass., Round Hills Radio Corp.
WMAG, Liberal, Kans., Tucker Elec. Co.
WMAH, Lincoln, Nebr., General Supply Co.
WMAJ, Kansas City, Mo., 485 also Drovera Telegram.
WMAK, Lockport, N. Y., Norton Labs.
WMAL, Trenton, N. J., Trenton Hdwe. Co.
WMAM, Beaumont, Texaa, Beaumont Radio Equip. Co.
WMAN, Columbus, Ohio, First Baptist Church.
WMAP, Easton, Pa., Utility Battery Service.
WMAQ, Chicago, Ill., Chicago Daily News.
WMAR, Waterloo, Iowa, Waterloo Elec. Supply Co.
WMAT, 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.
WMAY, St. Louis, Mo., Kingshighway, Presby. Church.
WMAZ, Macon, Ga., Mercer University.
WMB, Auburn, Maine, Auburn Elec. Co.
WMC, Youngstown, Ohio, Columbia Radio Co.
WMH, Cincinnati, Ohio, 485 also Precision Equipment Co.
WMU, Washington, D. C., Doubleday-Hill Electric Co.
WNAB, Bowling Green, Ky., Park City Daily News.
WNAC, Boston, Mass., Shepard Stores.
WNAO, Norman, Okla., Okla. Radio Engineering Co.
WNAF, Enid, Okla., Enid Radio Dist. Co.
WNAG, Cresco, Iowa, Rothert Radio and Electric Shop.
WNAH, Manhattan, Kans., Manhattan Radio Supply Co.
WNAL, Omaha, Nebr., 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., Lennig Bros. Co.
WNAV, Knoxville, Tenn., People's Tel. and Tel. Co.
WNAY, Baltimore, Md., Shipownera' Radio Service.
WNAX, Yankton, S. D., Dakota Radio Apparatus Co.
WNAW, Fortress Monroe, Va., Henry Kunzman.
WNJ, Albany, N. Y., Shotton Radio Mfg. Co., Inc.
WNO, Jersey City, N. J., Wireless Telephone Co. of Hudson Co., N. J.
WOAA, Ardmore, Okla., Dr. Walter Hardy.
WOAC, Lima, Ohio, Maus Radio Co.
WOAE, Fremont, Nebr., Medland College.
WOAF, Tyler, Texas, Tyler Commercial College.
WOAH, Charleston, S. C., Palmetto Radio Corp.
WOAI, San Antonio, Texas, 485 also, Southern Equip. Co.
WOAJ, Parsons, Kans., Erving's Electrical Co.
WOAK, Frankfort, Ky., Collins Hardware Co.
WOAL, Webster Groves, Mo., Wm. E. Woods.
WOAN, Lawrenceburg, Tenn., James D. Vaughan.
WOAR, Kenosha, Wis., Henry P. Lundskow.

(Continued on next page.)

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

WOAS, Middleton, Conn., Bailey'e Radio Shop.
WOAT, Wilmington, Del., Boyd Martell Hamp.
WOAU, Evansville, Ind., Sowder Boiling Piano Co.
WOAV, Erie, Pa., Pa. Nat'l Guard.
WOAX, Trenton, N. J., Franklin J. Wolff.
WOAY, Birmingham, Ala., John W. Wilder.
WOAQ, Portsmouth, Va., Portsmouth Radio Ass'n.
WOAZ, Stanford, Texas, Penick Hughes Co.
WOC, Davenport, Iowa, 400 and 485 also Palmer School of Chiropractic.
WOE, Akron, Ohio, Buckeye Radio Service Co.
WOH, Indianapolis, Ind., Hatfield Elec. Co.
WOI, Ames, Ia., 485 also Iowa State College.
WOK, Pine Bluff, Ark., 485 also Ark. 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 Mo. State Marketing Bureau
WOV, Omaha, Nebr., R. B. Hovell.
WOU, Omaha, Nebr., Metropolitan Utilities.
WOZ, Richmond, Ind., 485 also Palladium Printing Co.
WPA, Fort Worth, Texas, 485 also Fort Worth Record.
WPAA, Wahoo, 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'e Radio Co.
WPAG, Independence, Mo., Central Radio Co.
WPAH, Waupaca, Wis., Wisconsin Dept. of Markets.
WPAJ, New Haven, Conn., Doolittle Radio Corp.
WPAK, Fargo, N. D., North Dakota Agricultural College.
WPAL, Columbus, Ohio, Superior Radio & Tel. Equip. Co.
WPAM, Topeka, Kane., Awerbach & Guettel.
WPAN, Houston, Texas, Levy Bros. Dry Goods Co.
WPAR, Beloit, Kans., R. A. Ward.
WPAT, El Paso, Texas, St. Patrick's Cathedral.
WPE, Kansas City, Mo., Central Radio Co.
WPG, New Lebanon, Ohio, 485 also Nushawa Poultry Farm.
WPI, Clearfield, Pa., Elec. Supply Co.
WPJ, Philadelphia, Pa., St. Joseph'e College.
WPM, Washington, D. C., Thos. J. Williams, Inc.
WPO, Memphis, Tenn., United Equip. Co.
WQAB, Springfield, Mo., Southwest Missouri State Teachers' College.
WQAK, Dubuque, Iowa, Appel-Higley Elec. Co.
WQAL, Mattoon, Ill., Cole County Tel. and Tel. Co.
WQAP, Lincoln, Nebr., Am. Radio Co.
WQAQ, Abilene, Texas, West Texas Radio Co.
WQX, Chicago, Ill., Riverview Park, Walter A. Kuehl.
WRAA, Houston, Texas, Rice Institute.
WRAN, Waterloo, Iowa, Black Hawk Elec. Co.
WRAU, Amarillo, Texas, Daily News.
WRAY, Scranton, Pa., Radio Salee Corp.
WRK, Hamilton, Ohio, Doron Bros. Elec. Co.
WRL, 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.
WRW, Tarrytown, N. Y., Koenig Bros., Tarrytown Radio Research Lab.
WSAJ, Grove City, Pa., Grove City College.
WSAS, Lincoln, Nebr., State of Nebr.
WSAV, Houston, Texas, C. W. Vick Radio Const'n Co.
WSB, Atlanta, Ga., 400 and 485 Atlanta Journal.
WSL, Utica, N. Y., J. & M. Elec. Co.
WSN, Norfolk, Va., Shipowners' Radio Service.
WSX, Erie, Pa., Erie Radio Co.
WSY, Birmingham, Ala., Alabama Power Co.
WTAC, Johnstown, Pa., Penn. Traffic Co.
WTAU, Tecumseh, Neb., Ruegy Battery & Elec. Co.
WTAW, College Station, Texas, Agricultural and Mechanical College of Texas.
WTG, Manhattan, Texas, Kane. State Agri. College.
WTP, Bay City, Mich., Ra-Do Corp.
WVP, New York, N. Y., Signal Corps, U. S. Army.
WWAC, Waco, Texas, Sanger Bros.
WWAX, Laredo, Texas, Worman Bros.
WWB, Canton, Ohio, Daily News Printing Co.
WWI, Dearborn, Mich., Ford Motor Co.
WWJ, Detroit, Mich., 400 485, Evening News.
WWL, New Orleans, La., Loyola Univ.
WWX, Washington, D. C., Post Office Dept.
1XAD, Pawtucket, R. I., Standard Radio & Elec. Co.
2XAI, Newark, N. J., Westinghouse Elec. & Mfg. Co.
2XI, New York City, A. T. & T. Co.
2XJ, 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.

Weather Broadcasting

By Washington Radio News Service

RADIO telegraphy, although an invaluable factor for several years in receiving and sending data on weather to and from ships, was not recognized until recently as a medium for the general dissemination of forecasts, writes Prof. C. F. Marvin, Chief of the U. S. Weather Bureau, in his report to Secretary of Agriculture Wallace.

The use of radio by the bureau throughout the country was limited because of the necessity of using code, he explains. "With the introduction of radio telephony, which makes it possible for anyone to receive the message in spoken words, the broadcasting of information over the interior has increased enormously," he declares. A year ago the daily forecasts of the Weather Bureau were broadcast from 12 stations in seven states, principally by radio telegraphy, whereas on July 1, 1922, 98 stations in thirty-five states were carrying daily weather forecasts and warnings chiefly by radio telephone.

All broadcasts are sent out from Governmental, commercial and private stations, at no expense to the bureau. A special wave of 485 meters has been assigned by the Department of Commerce, and to avoid interference and duplication, only two stations in a city are licensed to transmit the weather information, although many others would gladly cooperate. It is estimated that at the end of the year twenty-five per cent of the licensed broadcasting stations were engaged in distributing this valuable meteorological information. The broadcasts are supplied the radio stations from neighboring meteorological stations by telephone. Undoubtedly the service could be placed on more efficient basis and materially extended, the Chief of the bureau states, if funds were available for telegraphing information to radio stations not now included in the system, and engaging more employes.

The value of radio-telegraphy in this special service has been demonstrated, Professor Marvin declares, pointing out that its future usefulness "cannot be estimated." Farmers by the thousands who do not get a forecast service by the telegraph or through the daily press and for whom code broadcasting was of little use installed receiving sets during the year. They now obtain the weather forecasts and warnings, so important in their occupations, as promptly as do business interests in urban communities. A great future increase in rural receiving stations is inevitable, the weather officials believe.

Another important accomplishment in radio work during the past year was the inaguration of a program of broadcasting the twice daily forecasts, cold wave, frost and other warnings and information issued for the states lying in the Chicago and Washington forecast districts. From April to November a summary of weather conditions as they affect the crops during the week preceding is also included. This service began in June, 1922. Radio-telegraphy and high wave-lengths are utilized, as telegraphy is more reliable for long range transmission. The radio receiving stations, equipped for high wave reception, receive a direct service thereby, and local radio-phone stations are enabled to broadcast for their districts. Material extensions were also made during the year in the radio bulletin service for the benefit of marine and aviation interests. The Chief of the Weather Bureau is gracious in his thanks to the officials of the Naval Communications Service for assistance rendered.

CLASSIFIED ADVERTISEMENTS

Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 19th of month for succeeding month's issue.

HELP WANTED.

Men—Women—Girls over 17 wanted. U. S. Government steady positions. $100 to $195 month. Quick sure raise. Paid vacation. Short hours. Common education sufficient. Experience unnecessary. Write immediately for free list of positions now open. Franklin Institute, Dept. M117, Rochester, N. Y.

SALESMEN.

Salesmen that have been or are calling on electrical or radio trade, see Mr. Rice, 6311 N. Clark St., Chicago.

PUBLICATIONS.

RADIO MANUAL, everything the beginner should know. How to build and operate an inexpensive receiving set. Sixty-four pages, thirty illustrations. Twenty cents. Postpaid. Raydio Publishing Company, Caxton Building, Cleveland, Ohio.

FOR SALE

I have nine Federal Jr. crystal sets. List $25. Will sell lot for $100. J. M. G. Care RADIO AGE.

CRYSTALS

TESTED GALENA CRYSTALS from our own mines shaped and tested at the mine in best standard hookup—direct to user. A real crystal—not a pinhead. Twenty-five cents postpaid, five for $1.00 to group buyers. Ozark Crystal Co., Box 1, Morrellton, Mo.

N. A. A. Starts in New Year

NAA, the great Naval Radio Station at Radio, Va., near Arlington, becomes the Government's chief broadcasting station for official information on January 3. On that date, all regular broadcasting previously handled by NOF, the radio experimental station of the Navy at Anacostia, will be transferred. Thereafter NOF will resume its experimental and research work, which may include the broadcasting of the Navy and Marine Band music in the interest of modulation tests.

A special wave length of 710 meters from the Government and public broadcasting band has been assigned to NAA by Secretary Hoover on December 15, at the request of the Inter-Departmental Radio Committee. This was done in order that the several regular circuits of the Army and Navy located there may be operated simultaneously without interference which occurred when phone broadcasting was undertaken on the lower governmental wave lengths from the main antenna.

The new radiophone transmitting set was especially made for NAA at the Naval Radio Laboratory at Anacostia. It is based on the master oscillator, power-amplifier system, and employs six 250 watt tubes, giving an output of 1 1-2 K. W. The apparatus is arranged so that the waves from 400 to 2,200 meters can be used in transmitting and the power is derived from a 2 K.W., generator. When transmitting on 710 meters, a special single wire antenna stretched from the top of one of the 400 foot towers is used. This new circuit does not interfere with any of the other circuits although used simultaneously. The height of the antenna gives practipractically the same efficiency as the low-lying, multiple-tuned antenna used at Anascostia.

When transmitting on the high-wave length, 2,050 meters, the large antenna will be used and other circuits will be interrupted temporarily. The design of this special set will permit of excellent modulation for the sending of speech and even music, Naval radio engineers say.

Transmitting ranges will vary with the season and in the day and night, but it is expected that a range of several thousand miles can be attained in night time transmission during the winter months, although this may fall off in the day time sending during the summer months to a 250 miles radius.

Recent broadcasts of the President's congressional address are reported to have been heard as far west as Chicago and Detroit, which speaks well for the work of NOF on 427 meters. Basically the new set for Arlington is built up on the results of radio-telephone broadcasting experiments conducted from Anacostia and a knowledge gained from the operation of the well-known set at NOF.

Crystal Sets Hold On

There is a movement, particularly in large centers of population, toward the use of crystal sets in preference to vacuum tube sets.

In the case of the vacuum tube set, radio fans are familiar with all the difficulties that are encountered. When either the "A" battery or the "B" battery runs down, there is trouble and the trouble is not so easy for the amateur to find. When tubes burn out, there is additional expense—and just before they burn out, there is a great deal of distortion, which prevents the hearer from receiving a perfect rendition of what is going on at the broadcasting station.

In the case of the crystal set, however, the buyer makes his purchase for $15.00 or $25.00, strings up his aerial, connects his ground lead, adjusts the crystal and immediately is able to "listen in." While it is true that greater distance than 25 to 50 miles in not obtainable, nevertheless, that which is heard over the crystal set is an absolutely faithful and actual rendition of the voice or music at the broadcasting station. There is no oscillation, squeaking or squealing, which is so characteristic of regenerative tube sets.

Many radio enthusiasts have several types of sets in their homes and it is often a fact that when an important speech or symphony concert is being broadcast from a station 25 to 50 miles from the operator's home, the operator connects up his crystal set rather than the vacuum tube set. With a good pair of telephones to his ears and with a good make of crystal set, the operator can hear perfect exactness the tone quality of music with all its beautiful shadings or he can hear the voice intonations and enunciation of the speaker in a manner quite unobtainable with tube reception.

All this costs him no more than $15.00 to $25.00 for a complete outfit, including antenna equipment and telephones. There are no replacements, nothing to wear out, no batteries to re-charge, no tubes to be bought and if he is satisfied with receiving the nearby stations, his set should cost him practically nothing for upkeep.

On the subject of crystal sets, it should be noted that there are on the market crystal sets with a wave length range from 180 to 3,000 meters. Most of the old type sets have a wave length range of 150 to only 800 meters and some even as low as 500 meters. As soon as Congress passes the new law recommended by the Radio Board, broadcasting will be done on much higher wave lengths and several stations can be operated in the same locality at the same time, so that a good crystal set should have a wave length range at least going up to 2,000 meters and will be able to receive the broadcasted material which will undoubtedly be sent on higher wave lengths than the 360 meter wave length, to which they were formerly restricted.

Most crystal sets do not have a variable condenser and this should be compensated for by having two binding posts on the crystal set, one for long antenna and one for short antenna. The former should have an antenna condenser connected in series with the aerial lead. In fact, a variable condenser does not give maximum efficiency in a crystal set.

Tapped coils are usually preferable to sliding tuners, as sliding tuners frequently wear out or become short circuited. A tapped coil set is a life long investment. With two binding posts, one for long antenna and one for short antenna, the operator will be able to accommodate his set to the conditions possibly limited and to which his antenna can be erected.

There are good crystal sets on the market embodying these features with a tapped coil and variometer adjustment for fine tuning. With the variometer, the price is usually in the neighborhood of $25.00,—the variometer being built into the set and two binding posts provided for different antenna lengths. The $15.00 sets do not, as a rule, have any other adjustment than the tapped coil. The buyer should select one with a wave length of at least 2,000 meters, otherwise, this winter, he will not be able to get broadcasting at a higher wave length.

What Hoover Says Radio Needs

(*Continued from page 15.*)

radio wave lengths, especially those used between ship and shore stations, is pointed out by Secretary Hoover in his report, attention being called to the fact that the last conference was in 1912 when the United States had but one trans-oceanic station in operation. This matter, however, has the attention of the State Department, which is now organizing the personnel of a representative governmental committee to draw up agenda for the next international convention on electrical communication to be held at Paris next spring.

In summing up Mr. Hoover says:

"To close an efficient administration of the radio service is imperative if we are to maintain its efficiency as a life-saving agency on shipboard, a means of commercial communication, and of instruction and entertainment for our people. To perform this work we must have an experienced and expert personnel. To secure and retain such men the service must be provided with adequate funds to meet the increasing demands of commercial enterprises for qualified men."

Radio at Sea

The United Fruit Company announces the inaguration of a ree medical radio service from its hospitals in the various countries of Central America and from its passenger ships to all ships at sea. So far as the United Fruit Company and its subsidiary companies are concerned, this service is available without charge to ships of all nationalities through the following radio stations operated by the United Fruit Company or the Tropical Radio Telegraph Company:

For ships' call letters see International Radio Call Letter List or List of Radio Stations of the United States.

Radiograms requesting medical advice should be signed by the captain of the ship and should state briefly, but clearly, the symptoms of the person afflicted. Such radiograms should be addressed "Unifruitco" (name of place) and may be sent to any of the United Fruit Company's hospitals listed below:

Santa Marta, Colombia.
Port Limon, Costa Rica.
Almirante, Panama.
Tela, Honduras.
Puerto Castilla, Honduras.
Puerto Barrios, Guatemala.

All United Fruit Company passenger steamships carry doctors, and free medical service may be procured by radio from any of them by a radiogram addressed "Ship's Doctor," followed by the name of the steamship. This free medical service is established, primarily, for the benefit of ships not carrying doctors. However, should occasion require, ships' doctors may hold consultation by radio with the United Fruit Company ships' doctors and hospital staffs. The physicians and surgeons comprising the medical staff of the United Fruit Company and its subsidiaries are thoroughly qualified, but in view of the fact that radio medical advice to ships at sea is given free and without an opportunity for a personal examination of the patients by them no responsibility will be assumed by either the company and its subsidiaries or the physicians or surgeons giving the advice as to its accuracy or for error in the receipt or transmission of any message sent or received in connection therewith. It is requested that when sending medical advice radiograms radio operators check them "(number of words) DH Medico." "DH Medico" radiograms will be given preference over all other radiograms, excepting SOS calls, throughout the radio service of the United Fruit Company and subsidiary companies.

Description for a Loading Coil for Simple Set

(*Continued from page 12.*)

is thus entirely disconnected from the receiving set and should be removed some distance from it. The operation of the receiving set is then exactly the same as described in Circular No. 120. In order to receive messages transmitted at wave frequencies less than 500 kilocycles per second (wave lengths over 600 meters) the loading coil is again connected as shown in Fig. 1A and the switches on the loading coil panel are adjusted so that the proper number of turns is included in the circuit. The switches on the panel of the original receiving set are set so that they include all the wire on the coil, (i. e., set switch arm Y on contact point 10 and switch arm V on contact point 8, Fig. 1A. See also Fig. 3, p. 10, Circular No. 120). The switch D on the loading coil panel is set to the extreme left on contact O, and the switch arm C is rotated slowly over its entire range. If signals are not heard, the switch arm D is set on the next contact to the right and the switch arm C is again rotated over all of its contacts. If the signals are still not heard, the switch arm D is placed on the contact to the extreme right and the switch C again rotated over its contacts. When the transmitting station is heard, the signals may be improved by adjusting the right-hand switch arm V of the original receiving set, and the same time changing slightly the setting of the switch arm C.

Use With Two-Circuit Set.

The loading coil as described herein has been found quite satisfactory in extending the wave length range of the single-circuit receiving set. The experimenter may be interested to try various ways in which to extend the wave length range of the two-circuit set. For the general guidance of the experimenter, the following methods will give results, with varying degrees of satisfaction: Use of the loading coil in one of the two circuits and no loading in the other (this means that one of the circuits will not be tuned to the wave); use of loading coil in the primary, together with a fixed condenser (See Bureau of Standards article in this issue) in parallel with the variable condenser; use of loading coil in one of the two circuits and winding more wire on the coil in the other circuit.

Approximate Cost.

The parts listed below are those used in the loading coil. The receiving set parts are listed in Circular No. 120. The two sets of parts constitute a complete receiving equipment which has a rather wide range of wave frequencies as explained in the first part of this circular. The approximate cost of the complete equipment is therefore the sum of the amount given below and the amount given in Circular No. 120.

5 Ounces No. 28 copper wire, double cotton covered	$0.80
2 battery clips	.20
2 switch knobs and blades, complete	1.00
14 switch contacts, nuts and washers	0.60
1 cardboard box (5 3-8" dia. x8" long)	
3 binding posts	0.45
Wood for panel and base	
Paraffin	
Total	3.05

Fixed Condenser for Simple Sets

(*Continued from page 11.*)

shunt condenser has a capacity of approximately 0.0015 microfarad (1500 micromicrofarads).

Approximate Cost of Parts.

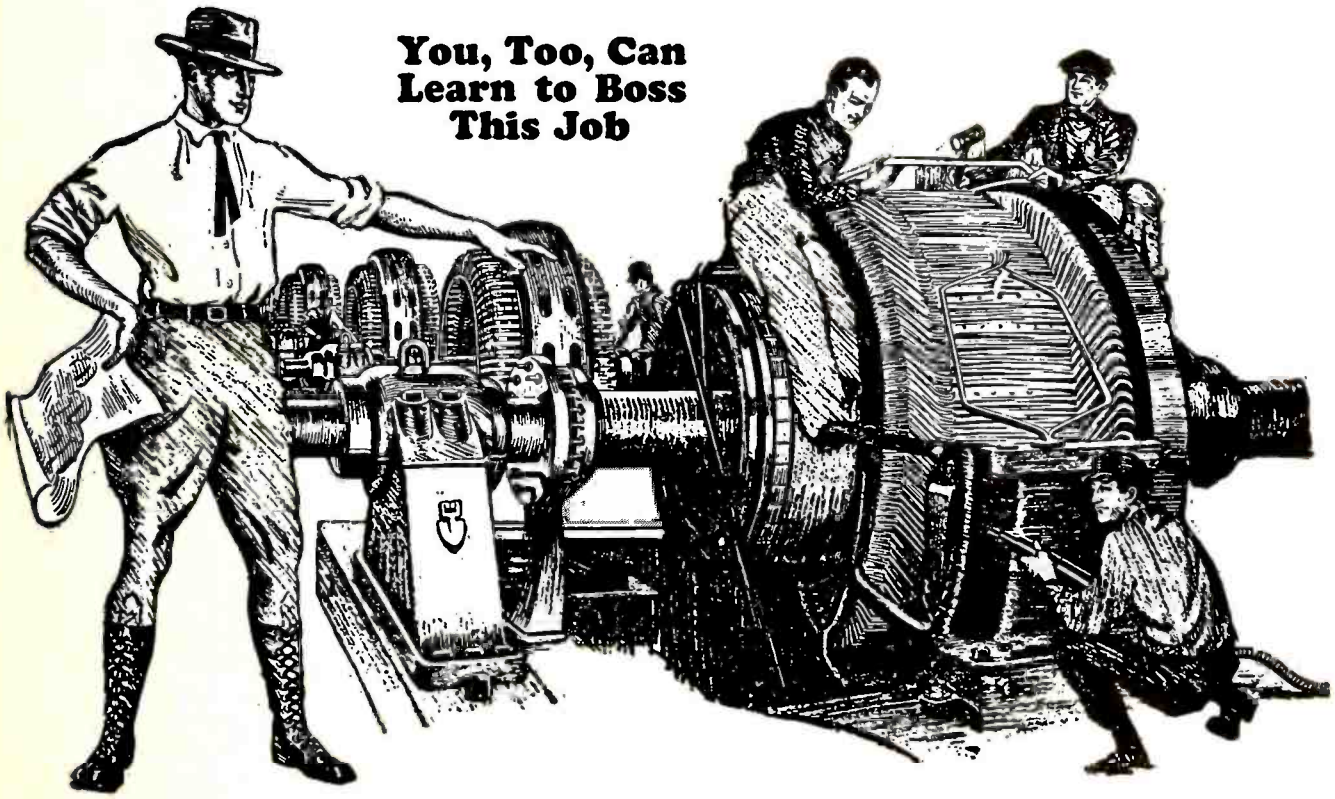
Series-Antenna Condenser.

2 metal strips (copper, brass or aluminum)	$0.10
3 sheets of mica (if used)	.20
1 binding-post (any type)	.10
6 wood-screws	.10
2 small wooden blocks	
Paraffin	
Paper	
Total	$0.50

Telephone-Shunt Condenser.

About 40 sq. inches of heavy tin-foil	$0.25
2 screws for mounting condenser	.05
2 small pieces of heavy cardboard or thin wood	
Paraffin	
Paper	
Total	$0.30

Be a Certificated Electrical Expert



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The "Cooke" Trained Man is the "Big Pay" Man

500,000 At Radio Wedding

AN UNIQUE wedding ceremony was performed when George Albert Carver, of Swissvale, Pa., and Miss Bertha Annie McMunn, of Pitcairn, Pa., were married recently in an especially constructed glass radio booth during the Pittsburgh Electrical Exposition at Motor Square Garden, Pittsburgh.

The occasion was the first time on record that a couple were married by radio, and the wedding was witnessed by one of the largest assemblages that ever attended such an event, for, in addition to the 10,000 persons who attended the electrical exposition to see and hear the public ceremony, several thousand more "listened in" on their radio receivers.

It is difficult to estimate the exact number of "wedding guests" but it is certain that at least 500,000 persons "attended," if not in person, at least by ear, the wedding of Mr. and Mrs. Carver, which was performed by the Rev. J. Hankey Colclaugh, pastor of the Pitcairn, Pa., Presbyterian Church.

The wedding was a part of an electrical exposition held in Pittsburgh, in November. News of the radiophone wedding ceremony had been broadcasted for weeks before and also had appeared in all the Pittsburgh newspapers. As a result, when the couple, with their attendants and parents, appeared at Motor Square Garden for the ceremony they found the large hall packed with an eager throng and many thousands clamoring vainly for admission.

The ceremony was held in an especially constructed sound-proof glass booth, which, as the illustration shows, permitted an unobstructed view of the ceremony. This glass booth contained a radiophone pick-up connected by direct telephone line with the powerful Westinghouse radiophone station, KDKA, at East Pittsburgh, about nine miles away. In this manner, words spoken in the glass booth were broadcasted by the KDKA broadcasting apparatus.

A large receiver was also installed in a hotel across the street from Motor Sqaure Garden, and to this was attached in parallel a number of loud speakers. This radio receiver picked-up the message broadcasted from KDKA and the loud speakers multiplied its volume ins de the hall. By this arrangement, the audience at the electrical exposition could see a man speaking and hear his address by radio at the same time.

This unique arrangement was what made the wedding a history-making event. Nothing like it had ever been done before and, of course, it attracted an enormous crowd.

As the bridal party entered the booth on the night of the wedding, the KDKA orchestra, sitting in the broadcasting studio nine miles away, started the wedding march. The strains of this beautiful music came in clearly through the loud speakers in the exposition hall.

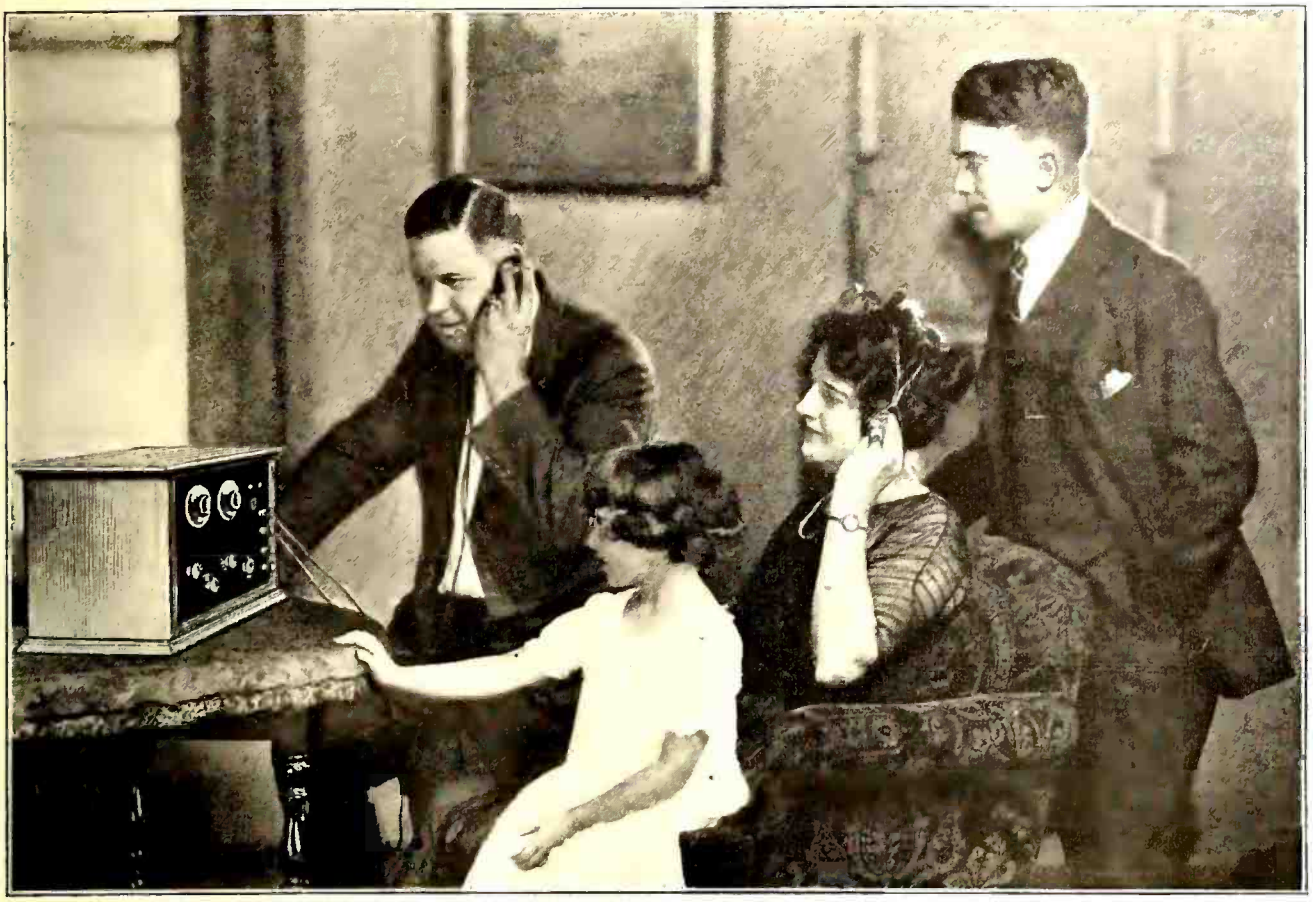
The minister then took his place with his back towards the crowd assembled below and, with the bride and groom and their attendants grouped on either side of the transmitter, the ceremony started.

It was soon finished, but during the brief form not a sound was made by the 10,000 or more persons who had assembled to witness it. The glass booth was the object of all eyes and the loud speakers the only audible sound.

There was something weird about the whole ceremony. Spreading out above the audience were the rows of brightly lighted booths. To the rear was a completely equipped electrical home, shining in its newness. Directly in front was an electric fountain, playing its myriads of flashing lights and changing colors upon the scene. The whole picture was shortlived but wonderful while it lasted. Directly the ceremony was over, the bride and groom bowed and then dashed from the booth to start their honeymoon journey.

As a wedding gift, the exhibitors at the electrical exposition gave the couple every domestic electrical appliance possible to use in a home. More than $1,200 worth of electrical appliances, which included among other things, an electric range, a dishwasher, table lamp, desk lamp, iron, hot plate, vacuum sweeper, toaster, washer, toaster stove, table stove, waffle iron, curling iron, cup heater, and other suitable gifts, were placed in a special booth and delivered to the couple after the ceremony.

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



"SENSITONE" Regenerative Radio Receiving Set

$15

DOWN AND $10.00 PER MONTH

Immediate Shipment

Manufactured under Armstrong License, U. S. patent No. 1,113,149 and pending letters of patent No. 807,388.

READ THESE TESTIMONIALS!

Seaton, Ills., December 22, 1922.

Harold R. Waken Co.
Chicago, Ills.

Dear Sirs:

Following is a report of the different stations I received on the Sensitone Detector, and all came in very clear, on the 21st.

Ft. Worth, Texas	Memphis, Tennessee.
Davenport, Iowa.	Dallas, Texas.
Cincinnati, Ohio.	St. Louis, Mo.
Indianapolis, Ind.	Louisville, Ky.
Pittsburg, Pa.	Schenectady, N. Y.
Kansas City, Mo.	Denver, Colo.
Chicago, Ills.	Newark, N. Y.
Atlanta, Ga.	Detroit, Mich.
	Minneapolis, Minn.

I did not go to bed until 3 a. m. next morning. Certainly is a fine machine. Hope to add Amplifiers and Loud Speaker in near-future. I am getting stations that other radio bugs here in town don't get. 12 radio sets in town at present. 400 population, and lots of bugs here. You can use my name if you choose.

Yours truly,

Telegrapher, M. & S. T. L. R. R. — D. E. HAIST, Seaton, Ills.

Harold R. Wakem and Co.,
Chicago.

Dear Sirs:

Last night was the first night that I tried my Sensitone, and here are some of the stations that I heard very well: Houston, Texas; Denton, Texas; Fort Worth, Texas; St. Louis; Dallas News; Cincinnati; Atlanta Journal, Detroit News.

I heard ever so many others, that I just tuned in or out as they interested me or not. Now, don't you think that's a good start for a green beginner? According to what I have read I am living in the "home" of static, and I am sure there was lots of it yesterday, as it was very warm, and we had a lighting storm also.

I listened in to the St. Louis Post-Dispatch for over an hour, as their concert was fine, and everything was clear. Yesterday afternoon at three I heard Houston, Tex., very well.

Detroit is a mighty long distance from here, so I consider your set a marvel.

With all good wishes for the coming season I beg to remain Yours sincerely,

REV. JOS. J. BOUDREAUX.

December 13, 1922, 9:49 p. m.
DB 841, 49 Collect NL., Lubbock Tex 13
Harold R. Wakem & Co., Chicago, Ill.

In answering queries relative distance performance be explicit without fear quote this telegram first night's program included Detroit News, Drake Hotel, Chicago, Kansas City, Davenport, Atlanta, Paducah, Ky., Los Angeles, San Antonio, Houston, Ft. Worth, Oklahoma City, entire cotton, cattle, hog, sheep markets from Kansas City, Two p. m.: Is more than satisfactory with thirty foot aerial. W. H. WARD, Theriot, Louisiana, December 16, 1922.

ONLY 500 SETS SOLD ON THE EASY-PAY PLAN

We are making this rather costly investment in order to get 500 sets in the hands of that number of influential families, so that, when we put our goods in the hands of dealers, they may have enthusiastic SENSITONE boosters nearby to whom they can refer their future prospective buyers.

Fill out the coupon, attach check or money order for $15.00. Set will be shipped at once by express. Those who delay will be too late.

Harold R. Wakem & Co.
900 Washington Blvd. CHICAGO

HAROLD R. WAKEM & CO.,
900 W. Washington Blvd., Chicago, Ill.

Enclosed you will find $15.00 as first payment, upon receipt of which you will send me your complete Sensitone Radio Receiving Set, as described above. After I have used the set for thirty days, I agree to send you $10.00 and the same amount every thirty days thereafter, until the full purchase price of $95 is paid. This set is to remain the property of Harold R. Wakem & Co. until payments are completed.

Signed.....

Street address.....

City.....

In the spaces below give the names of two references, (banks or business houses preferred).

Name and Address.....

Name and Address.....

Burgess, the *Radio* Battery
—construction fully patented

When you buy a Burgess "B" Battery you get more than long life, noiselessness, high capacity and moderate price. You get also Burgess special radio construction, perfected by wireless specialists and fully patented! This exclusive ***radio*** construction is found in no other battery on the market to-day.

What does this mean to users of radio batteries? It means clear receiving. It means lowest cost per hour of service. It means long shelf life and highest current capacity. It means that Burgess "B" Batteries are the best radio batteries it is possible to produce. Don't take our word for it—***ask any radio engineer.***

Leading manufacturers of radio equipment specify "Burgess." Burgess "B" Batteries are handled by all progressive jobbers and dealers. "Look for the Black and White Stripes." And if your dealer doesn't handle Burgess "B," just address:

BURGESS BATTERY COMPANY

Engineers—Dry Batteries—Manufacturers

Offices and Warehouses at:

CHICAGO, ILL., 111 W. Monroe St. NEW YORK, N. Y., 50 Church St. BOSTON, MASS., 136 Federal St.
ST. PAUL, MINN., 2362 University Ave. KANSAS CITY, MO., 2109 Grand Ave. MADISON, WIS., Main and Brearly Sts.

In Canada: BURGESS BATTERIES, Ltd.
Winnipeg, Toronto, Montreal

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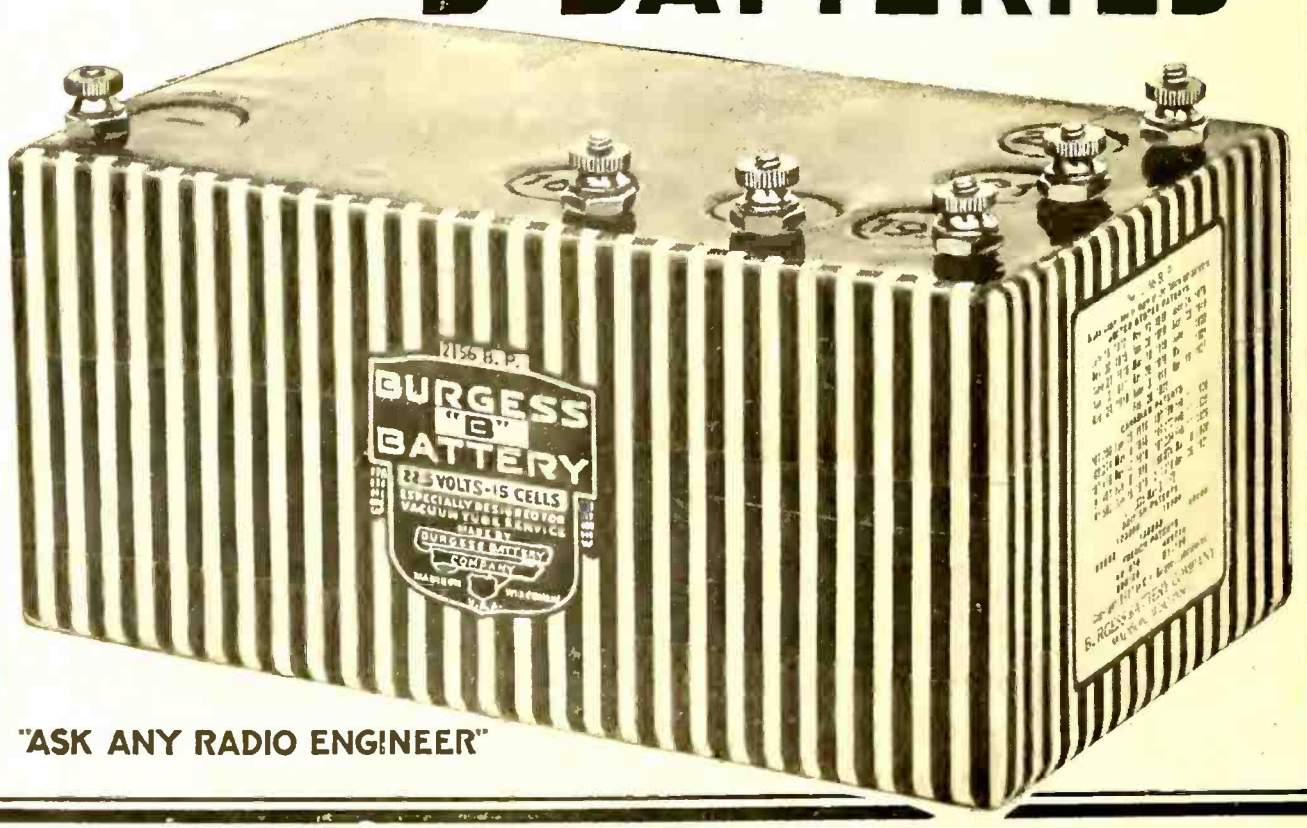
"B" BATTERIES



"ASK ANY RADIO ENGINEER"