SECOND ANNUAL REPORT

of the

FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

For the Year Ended June 30

1928

Together with

A SUPPLEMENTAL REPORT

For the Period from July 1, 1928
to September 30, 1928

▼

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1928

TABLE OF CONTENTS

PART I

PART II

PART III

SECOND ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION FOR THE YEAR ENDED JUNE 30, 1928, TOGETHER WITH SUPPLEMENTAL REPORT FOR THE PERIOD FROM JULY 1, 1928, TO SEPTEMBER 30, 1928

FEDERAL RADIO COMMISSION,
Washington, D. C., October 26, 1928.

To the Congress of the United States:

The First Annual Report of the Federal Radio Commission covered the period from March 15, 1927 (the date of the first meeting of the commission after its creation under the radio act of 1927), to June 30, 1927. This, the second annual report, might logically have been confined to the year ending June 30, 1928. Since such a report would necessarily have omitted mention of many important developments in the last three months and would not have presented to Congress a complete picture of the present status of the regulation of radio communication, the commission has thought it best to extend the report so as to cover the latest possible date consistent with the time of going to press.

To have separated the report into two distinct periods, i. e., before and after June 30, 1928, would have necessitated the interruption of accounts which should properly be treated consecutively under appropriate headings, and would have decreased its usefulness as a convenient source of reference as to the work accomplished by the commission. The supplemental report has therefore been merged with that for the previous period, but care has been taken to preserve record of dates sufficiently to enable the reader to determine in which of the two periods a particular matter belongs.

Numerous appendices are printed separately as a supplement to this report.

PART I

PERSONNEL AND ORGANIZATION

MEMBERSHIP OF THE COMMISSION

On July 1, 1927, the commission was composed of the following members: Admiral W. H. G. Bullard, chairman (second zone), Orestes H. Caldwell (first zone), Eugene O. Sykes (third zone), Henry A. Bellows (fourth zone), Col. John F. Dillon (fifth zone). Commissioner Dillon died on October 8, 1927; Commissioner Bellows resigned on October 31, 1927; and Commissioner Bullard died on November 24, 1927. The loss of each of these three men was severely felt by the commission, all three of them being of exceptional ability and having expert knowledge in matters over which the commission has jurisdiction.

Sam Pickard, of Manhattan, Kans., who had theretofore served as secretary of the commission, was appointed commissioner from the fourth zone on November 1, 1927. Harold A. Lafount, of Salt Lake City, Utah, was appointed commissioner from the fifth zone on November 14, 1927. Judge Ira E. Robinson was appointed commissioner from the second zone on March 29, 1928. For a period of several months after November 24, 1927, Commissioner Sykes was the only living member of the commission whose appointment had been confirmed by the Senate. The appointments of Commissioners Robinson, Caldwell, Pickard, and Lafount were confirmed by the Senate on March 30, 1928.

At a meeting held on April 5, 1928, the commission elected Commissioner Robinson as chairman.

SECRETARY OF THE COMMISSION

On November 1, 1927, the commission appointed Carl H. Butman, of Washington, D. C., as secretary to succeed Mr. Pickard.

ENGINEERING DIVISION

Prior to August 1, 1928, the commission had no regularly organized engineering division. During the period covered by this report it had had generous assistance from the Bureau of Standards of the Department of Commerce and, particularly, of Dr. J. H. Dellinger, chief of the radio section of that bureau. It also had the assistance, until July 25, 1928, of Capt. S. C. Hooper, of the United States Navy (recently appointed Chief of Naval Communications), who, at the request of the commission, was detailed to assist in a study of the complex technical problems arising in connection with the allocation of channels in the high-frequency band. From time to

time the commission has been generously assisted by John V. L. Hogan, L. E. Whittemore, Prof. C. M. Jansky, jr., R. S. McBride, and Edgar Felix, who have acted as temporary technical advisors. Capt. Guy Hill, Signal Corps, United States Army, was detailed by the War Department at the request of the commission as a technical advisor on April 6, 1928. On August 1, 1928, Dr. J. H. Dellinger was offered and accepted the position of chief engineer of the commission for a limited period of time. Commander Tunis A. M. Craven, of the United States Navy, at the request of the commission, was detailed as a technical advisor on August 27, 1928, to assist Doctor Dellinger. In addition, he has the assistance of four other men of considerable technical experience.

LEGAL DIVISION

The commission had no legal division until June 25, 1928. The Department of Justice from time to time detailed Bethuel M. Webster, jr., Special Assistant to the Attorney General, to assist the commission in the handling of particular hearings and court cases. On June 25, 1928, the position of general counsel was filled by the appointment of Louis G. Caldwell, of Chicago, Ill. He is to be with the commission only a limited period of time. He now has three lawyers assisting him.

LICENSE DIVISION

The preparation and issuance of construction permits and licenses and the keeping of records thereof is intrusted to a license division in charge of George S. Smith. To make possible adequate records of the large number and variety of applications which are received by the commission and of the action of the commission thereon, an extensive filing system has been made necessary.

PRESS SERVICE

The duties of this office are to inform newspaper and magazine correspondents concerning the activities of the Federal Radio Commission, to answer queries relative to the status of the various stations, and on request to supply information and data concerning the radio situation to editors. The press service also prepares and distributes news releases, general orders, and the commission's decisions to the public. G. Franklin Wisner is chief of press service.

OFFICES OF THE COMMISSION

Due to the urgent need of increased space not available in the Department of Commerce Building, the commission sought relief from the Public Buildings Committee, requesting a minimum space of 26 rooms. On July 2, 1928, the commission moved into its new quarters on the fourth floor of the Department of the Interior Building, where it has the use of 20 rooms indefinitely and 3 additional rooms until November 1, 1928. Even with the use of the additional rooms the commission has inadequate space in which to accommodate its personnel and records and is considerably handicapped by this lack of sufficient quarters. Some additional space is being sought.

TOTAL PERSONNEL

The total personnel of the commission as of September 30, 1928, is 57.

FINANCIAL STATEMENT

There follows a summary of appropriations and expenditures for the fiscal year ended June 30, 1928.

Statement showing appropriations and expenditures for the fiscal year 1928

APPROPRIATIONS

Total appropriation July 1, 1927, to January 31, 1928	$50,000.00
Allotment by the Department of Commerce from the appropriation, "Enforcement of Wireless Communication Laws 1928, Symbol No. 68260."	
Appropriation, "First Deficiency Act, fiscal year 1928"	52,186.00
	102,186.00

EXPENDITURES

Total salaries, departmental service	83,977.00
Supplies and material	2,021.00
Communication service	744.00
Printing and binding, etc	698.00
Travel expenses, etc	5,105.00
Total	92,545.00

COMMITTEES OF THE COMMISSION

At a meeting on April 7, 1928, the commission determined upon the following special assignments and classification of responsibilities among the individual commissioners:

Commissioner Robinson, the chairman	Law and forms.
Commissioner Sykes	Hearings and docket. Short and long waves.
Commissioner Caldwell	Technical advances. Short and long waves. Foreign relations.
Commissioner Pickard	Broadcast methods. Studio. Announcing. Relations with press.
Commissioner Lafount	Budget and finance. Office employees. Licensing routine. Cooperation with Commerce Department.

At a meeting held on May 16, 1928, Commissioners Caldwell and Lafount were designated as a committee on the subject of television.

THE FIVE ZONES

For convenient reference a list of the States, Territories, and possessions making up each of the five zones (as provided in the radio act of 1927) is here set forth:

First zone.—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, District of Columbia, Porto Rico, and the Virgin Islands.

Second zone.—Pennsylvania, Virginia, West Virginia, Ohio, Michigan, and Kentucky.

Third zone.—North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Arkansas, Louisiana, Texas, and Oklahoma.

Fourth zone.—Indiana, Illinois, Wisconsin, Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, and Missouri.

Fifth zone.—Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, the Territory of Hawaii, and Alaska.

PART II

BROADCAST BAND

EXTENT OF BROADCAST BAND AND FREQUENCY SEPARATION BETWEEN CHANNELS

The extent of the broadcast band remains as it has been at all times since the creation of the commission; it extends from 550 to 1,500 kilocycles (corresponding to wave lengths from 545 to 200 meters), both inclusive. The commission adopted the policy of reserving this band for broadcasting, and of not extending it to include either higher or lower frequencies, after a series of public hearings held immediately after its organization. The experience of the commission since that time has confirmed it in the wisdom of its policy. The congestion in both the low and the high frequencies is already such as to forbid any extension.

The commission has also maintained its original policy of preserving a 10-kilocycle separation between channels used for broadcasting. Even a 10-kilocycle separation is a compromise with the ideal of good radio reception and any decrease in the separation would lead to disastrous results by way of interference.

Both the policy of the commission with respect to the extent of the broadcast band and its policy with respect to frequency separation were crystallized into definite form in the commission's General Order No. 40, issued and promulgated on August 30, 1928.[1] Under the International Radio Telegraph Convention of 1927 the entire band of 550 to 1,500 kilocycles is assigned to broadcasting, except the frequency of 1,365 kilocycles, on which the licensing of maritime mobile service is permitted. The practice in Europe (which is the only other continent in which broadcasting is sufficiently advanced to serve as a basis for study) is to maintain a frequency separation of 10 kilocycles and, in addition, only one station is permitted to operate on a channel at any one time.

There are thus a total of 96 channels in the broadcast band. Six of these are exclusively reserved for Canadian stations and 11 are shared with Canadian stations, as is shown in the next paragraph.

CHANNELS RESERVED FOR EXCLUSIVE AND SHARED USE BY CANADIAN STATIONS

One of the first acts of the commission on assuming office was to clear six channels which, under an informal understanding arrived at between the Department of Commerce and Canadian representatives, had been reserved for exclusive use by Canada. Prior to that time there were 41 American stations on those channels or so close thereto as to cause serious interference with the Canadian stations.

[1] See Appendix A, Supplement.

Since that time the commission has maintained the policy of keeping these channels clear and, furthermore, of regulating the use of 11 other channels shared by Canadian and American stations. This policy had also been recognized by the Department of Commerce prior to the enactment of the radio act of 1927. The proper regulation of the shared channels necessitates a limitation on the power of stations assigned to these channels on either side of the boundary line. Obviously stations located relatively closely to the boundary line can be assigned only a very small amount of power, while stations located at greater distances, such as in the south of the United States, can safely be authorized to use as much as 500 watts.

The policy of the commission with reference to the exclusive and shared Canadian channels was crystallized in definite form in its General Order No. 40 on August 30, 1928. The frequencies assigned exclusively to Canada are the following: 690, 730, 840, 910, 960, and 1,030 kilocycles. The frequencies assigned for shared use with Canadian stations are the following: 580, 600, 630, 780, 880, 890, 930, 1,010, 1,120, 1,200, and 1,210 kilocycles.

The question of the allocation of broadcasting channels between the United States and Canada can not as yet be regarded as definitely determined. During the past year representatives of Canada have strongly protested against the present basis as being unfair to Canada, and there seems to be a disposition on the part of that country to press a demand for an increased assignment. This was rather forcibly suggested in the course of the North American conference held in Washington, D. C., on August 20 to 25, 1928. The present allocation, however, is based on the respective populations of the two countries. Furthermore, the programs of American stations give extensive service in Canada. The commission believes, therefore, that the allocation as it now stands is fair to Canada and should not be changed. A more scientific choice of frequencies could be made than that now in force. So far there has been no serious problem of interference between broadcasting stations of this and other countries, including Canada, Mexico, and Cuba.

GENERAL ORDERS

During the period from July 1, 1927, to June 30, 1928, the commission issued its General Orders, Nos. 16 to 34, inclusive, and during the period from July 1, 1928, to October 26, 1928, it issued its General Orders, Nos. 35 to 49, inclusive. These orders cover a variety of subjects, some of them being in the nature of rules and regulations and others covering such matters as extension of existing licenses. For convenient reference these orders have been reprinted in chronological order in Appendix A of the Supplement. A few of the orders having to do with other forms of radio service than broadcasting will be referred to under the proper headings.

RENEWALS OF LICENSES

The broadcasting licenses which were in effect on July 1, 1927, had been issued under General Order No. 11 as amended by General Order No. 13. They were effective beginning with June 15, 1927, for a period of 60 days. Applications were required of all stations during that period, the applications consisting of reaffirmations of the truth of the data submitted in the original applications made to

the commission where no change in facts had occurred. Renewal licenses were issued, effective beginning with August 15, 1927, for a period of 60 days, to October 14, 1927, and by General Order No. 18 these licenses were all extended to October 31, 1927. On November 1, 1927, renewal licenses were issued, effective until December 31, 1927. By General Orders, Nos. 21, 22, 23, 25, 27, 33, 35, 36, 38, and 44, these licenses were extended to January 31, March 1, April 1, May 1, June 1, August 1, September 1, October 1, and November 11, 1928, respectively. All stations were required by General Order No. 21 to file, prior to January 15, 1928, renewal applications on forms provided by the commission. These forms were more detailed than those which had previously been used and required additional information on the subject of chain connection, advertising, and nature of program which had not previously been required. It was on the basis of these renewal applications that the proceedings under General Order No. 32, hereinbelow described, were held.

The renewals and extensions issued from time to time have, of course, been subject to many changes in frequency, power, and hours of operation of particular stations. Furthermore, certain stations have gone out of existence and new ones have been licensed.

CHANGES IN ASSIGNMENTS OF FREQUENCY, POWER, HOURS OF OPERATION, ETC., OF BROADCASTING STATIONS PRIOR TO MARCH 28, 1928

On the 90 channels available for broadcasting stations (including the 11 channels shared with Canada) there were, on July 1, 1927, a total of 698 stations in licensed operation, including 16 portables. A portion of them were dividing time, so that the total does not represent the number in simultaneous operation. Appendix B contains a complete list of these stations, arranged alphabetically by call letters, showing the authorized frequency and power of each station and noting cases of division of time. Appendix C (1) shows a comparison of the situation on July 1, 1927, and June 30, 1928.

Extensive changes were made in these assignments between July 1, 1927, and March 28, 1928 (the date on which the Davis amendment became law). These changes were accomplished both by action affecting individual stations (as the result of applications and hearings) and by general reassignments affecting a large number of stations simultaneously. Radio-reception conditions were far from satisfactory as the result of the commission's reallocation of June 15, 1927. The reallocation had succeeded to a marked extent in reducing interference arising from congestion in the larger metropolitan centers, where the stations had been crowded together without adequate frequency separation; it had not, however, succeeded in remedying the heterodyne interference (resulting from two or more stations operating simultaneously on the same channel), which was ruining reception in rural areas, and indeed in all parts of the country. The complaints which deluged the commission immediately made it apparent that changes would have to be effected.

HEARINGS ON APPLICATIONS FOR MODIFICATIONS OF LICENSES

In addition, a large number of stations which were complaining of their particular assignments applied for modifications of their

licenses and participated in hearings. These hearings resulted in a limited number of changes hereinafter briefly summarized.

(*a*) *Hearing on applications for modification of licenses.*—Between July 1, 1927, and March 28, 1928, the commission held a total of 51 hearings on applications of particular broadcasting stations for better assignments with respect to frequency, power, and/or hours of operation. In all cases where a station applied for a particular frequency all stations assigned to that frequency (and in some cases to adjacent frequencies where the stations on these frequencies would be affected) were notified and were accorded the privilege of appearing at and participating in the hearing. In all cases where a station applied for an increase of power without asking a change in frequency all stations assigned to the frequency affected were notified and accorded a similar privilege. In the great majority of cases one or more of the stations so notified availed themselves of the privilege and opposed the applications. The commission guided itself by the test of public interest, convenience, or necessity in determining whether any particular application should be granted, and required the contending stations to make complete showings of their past record of service, their program resources, etc. In a very substantial number of cases the contention was made, with success, that the applicant (or one of the respondents) represented a station located in a State which did not have its fair or equitable share of radio service, and the commission gave full weight to the contention whenever it was made. A summary of the hearings and of the commission's decisions is contained in Appendix C (2).

(*b*) *Changes made in fifth zone as result of inspection trip by Commissioner Bellows.*—By its General Order No. 17, issued on August 16, 1927, the commission authorized each of its members to visit the zone from which he was appointed, at some time between August 20 and October 4, for the purpose of observing the actual conditions of radio reception resulting from the new allocation. The commissioners were authorized to take testimony relating to the stations at any place within the zone.

Commissioner Bellows held hearings in Indianapolis, Ind., and then, because of Commissioner Dillon's illness, proceeded to Denver, Colo., where he held a series of public hearings from September 26 to September 30, 1927. As a result of these hearings the commission ordered extensive changes in the assignments of stations in that vicinity, effective November 1, 1927. These changes are summarized in Appendix C (3).

(*c*) *Clearing of 25 channels.*—With the approach of winter conditions in the fall of 1927 the widespread development of heterodyne interference, in rural areas particularly, made immediate action imperative. On November 14, 1927, the commission, in an effort to ameliorate the situation, issued its General Order No. 19. This order designated the band of channels from 600 to 1,000 kilocycles, inclusive, as a band to be cleared of and maintained free from heterodyne or other interference. Stations then operating on such of those channels as would not be free of interference on November 1 were directed to clear the channels during the pending license period (which terminated on December 31, 1927) by sharing time, controlling power,

controlling frequency, or any other methods. The commission indicated that if cooperation between the stations would not effect the desired result, then the commission would hold hearings, to determine which stations should be relicensed to continue on any particular channel. General Order No. 19 was accompanied by a statement issued by the commission, which is set forth in Appendix C (4). The commission simultaneously ordered a large number of changes to be made in the assignments of stations, effective December 1, 1927. The changes thus ordered are set forth in Appendix C (5). The consequent effect of the order and of the changes made under it was shown by a list of stations published by the commission setting forth the stations assigned to each frequency from 600 to 1,000 kilocycles, inclusive. This statement was entitled "Channels Cleared of Heterodyne Interference and Channels yet Uncleared." It is set forth in Appendix C (6).

(*d*) *Changes made in the fifth zone, effective March 1, 1928.*—By its General Order No. 20, issued November 29, 1927, the commission again authorized each of its members to visit the zone from which he was appointed. This was to be done between November 29, 1927, and February 1, 1928, for the purpose of further observing the actual conditions of radio reception resulting from the new allocation and the character of programs broadcast.

Commissioner Lafount, who had just been appointed, made an intensive and personal survey and study of radio problems in his zone, which includes the Rocky Mountain and Pacific Coast States. Upon his return on January 16, 1928, he made a report, which is set forth in Appendix C (7). In the course of his 8,206-mile trip he interviewed 769 persons representing 102 broadcasting stations out of 122 in the fifth zone; he interviewed 96 persons who desired broadcasting licenses; he interviewed 141 listeners and 74 persons interested in radio privileges in the short-wave band, etc. He made an analysis of the programs of 100 stations in the fifth zone, which is set forth in Appendix C (8). On January 19, 1928, he sent to the stations in his zone a digest of requests which had been made to him by the 102 broadcasters he had interviewed. This digest is set forth in Appendix C (9).

As a result of Commissioner Lafount's studies the commission on February 18, 1928, ordered a large number of changes in station assignments in the fifth zone, effective March 1, 1928. These changes are set forth in Appendix C (10). The reports which followed the putting into effect of these changes indicated that a vast improvement in radio reception had been achieved in that zone.

(*e*) *The third zone.*—Under General Orders, Nos. 16 and 20, Commissioner Sykes had made extensive studies of broadcasting problems in the third zone. The charge had been made that the commission had discriminated against the South. This charge was emphatically denied by the commission, and set forth its attitude on the subject in a letter signed by Admiral Bullard, chairman, made public August 24, 1927. (Appendix C (11).) The underrepresentation of the South was due to purely historical reasons, for which the commission was not responsible. The South did not have its proportionate share of broadcasting stations when the commission came into existence and applications from the South were not as numerous as from the other zones.

CHANGES IN TOTAL NUMBER OF STATIONS

We are discussing separately below the changes in number of stations due to the commission's General Order No. 32 and to the elimination of portable stations and to the new allocation of September 10, 1928. Independently of these actions of the commission 47 broadcasting stations voluntarily surrendered their licenses during the period between March 15, 1927, and June 30, 1928. A list of these stations is contained in Appendix D (1). During the same period a total of 32 construction permits were granted by the commission for new stations, largely in the third zone, and later licenses were granted. A list of applications for construction permits showing those granted, pending, and disapproved, arranged by zones, appears as Appendix D (2). In a number of cases applications were styled as being for construction permits when in reality they were simply for increases of power or changes of location without new apparatus. The above-mentioned lists did not, of course, include the new stations that were licensed or to which construction permits were granted in connection with or shortly after the allocation of September 10, 1928. A complete list of licensed broadcasting stations alphabetically arranged by call letters as of June 30, 1928, is contained in Appendix D (3); and a list of licensed broadcasting stations numerically arranged by frequencies, as of June 30, 1928, is contained in Appendix D (4).

THE DAVIS AMENDMENT

The problems of the commission in endeavoring to achieve better radio reception and at the same time to work toward the "fair, efficient, and equitable radio service" as between the different States and communities, as required by section 9 of the radio act of 1927 before the amendment, were somewhat changed in character by the amendment which became law on March 28, 1928. (Appendix E (1).) It has become popularly known as the Davis amendment. It has as its declared purpose:

> That the people of all the zones * * * are entitled to equality of radio broadcasting service, both of transmission and reception.

It then proceeds to prescribe the methods for attaining the desired equality. These methods are as follows:

> 1. The licensing authority shall, as nearly as possible, make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave lengths, of periods of time for operation, and of station power to each of said zones when and in so far as there are applications therefor; and
>
> 2. Shall make a fair and equitable allocation of licenses, wave lengths, time for operation, and station power to each of the States, the District of Columbia, the Territories, and possessions of the United States within each zone, according to population.

Congress directed that the equality should be carried into effect whenever necessary or proper—

> By granting or refusing licenses or renewals of licenses, by changing periods of time for operation, and by increasing or decreasing station power when applications are made for licenses or renewals of licenses.

The amendment contains a proviso permitting a zone which is over its quota under any of the four headings of prescribed equality to borrow from a zone which is under its quota, the borrowing to be shown in temporary licenses.

Radiobroadcasting service depends in the first instance upon geographical considerations, principally distance and area, and not upon population. Approximately correct figures with regard to population and area of each zone, and of the radius of the largest circle that can be drawn in each zone, are as follows:

	Population	Area	Radius of largest circle
		Square miles	*Miles*
First zone	27, 385, 288	129, 110	250
Second zone	28, 123, 000	247, 517	131
Third zone	28, 088, 618	761, 895	427
Fourth zone	26, 786, 192	658, 148	380
Fifth zone	11, 266, 244	1, 774, 437	725

A given number of broadcasting stations of given power will give much better service to a zone which is small in area than to a zone which is large in area. The commission in working out the proper application of the amendment, desired to take advantage so far as possible of the difference in time between the Atlantic and Pacific coasts, of the daytime operation of stations, of the greater use of Canadian-shared channels which is possible in the South, and other considerations which could not easily be accommodated to mathematical equality. The "borrowing" clause proved to be of practically no assistance in solving the problem, because there were very few cases where a facility due any particular area could be spared from the service of that area.

There was in the commission a difference of opinion as to the intention of Congress with regard to the method of putting the amendment into force. A majority of the commission has construed the amendment as requiring an immediate reallocation of broadcasting facilities so as to attain the prescribed equality. Commissioner Robinson has construed the amendment as indicating a policy to be followed in the future by the commission in gradual steps without calling for any general rearrangement of stations immediately, and that the equalization was to be accomplished "when and in so far as there are applications." There has also been a difference of opinion as to whether the amendment, properly construed, requires an equality in number of licensed broadcasting stations by zone without regard to division of time or whether two or more stations dividing time in one zone may be balanced as against one station occupying full time in another zone.

On June 30, 1928, the broadcasting facilities of the United States were distributed among the five zones approximately as follows:

	Total number of stations	Total frequencies in use	Total power
			Watts
First zone	128	64	228, 135
Second zone	112	53	109, 990
Third zone	116	54	59, 535
Fourth zone	206	73	162, 805
Fifth zone	134	74	67, 145

These figures are of only approximate accuracy but will serve the purpose. They include 13 portable stations which were forced to cease operation beginning with July 1, 1928. They also include under the heading of "Total power" a certain amount due to increases granted to new stations under construction permits or to old stations, particularly in the third zone. Appendix E (2) shows an allocation of radio facilities to the various States and Territories as of June 30, 1928.

VARIOUS PLANS SUBMITTED TO COMMISSION

(*a*) *Various plans presented to the commission for compliance with the Davis amendment.*—The problem of applying the Davis amendment to the approximately 700 existing broadcasting stations was submitted by the commission to a group of experts consisting largely of well-known radio engineers. This group submitted a memorandum to the commission on March 30, 1928, setting forth a plan classifying the 90 broadcasting channels into three groups—"exclusive," "regional," and "local"—apportioning these channels equally to the five zones and in each zone to the States so far as possible, in accordance with the population. The memorandum was accompanied by two sample allocations which differed only in the number of channels assigned to exclusive and regional service, respectively. In one of these it was proposed to allocate 50 channels for rural as well as urban service, each channel to be exclusive, and 36 for regional service with an average of 2½ stations on each channel. In the second the exclusive and regional channels were 30 and 56, respectively. In both cases 4 channels were to be devoted to local stations. The average power contemplated on the local channels was to be 100 watts, on the regional 500 watts, and on the exclusive 20 kilowatts. The memorandum, together with the sample allocations, is set forth in Appendix E (3).

The commission held a conference with a number of radio engineers on April 6, 1928. Dr. J. H. Dellinger, of the Bureau of Standards, acted as chairman of the conference. The broadcasting committee of the Institute of Radio Engineers submitted a report, which is contained in Appendix E (4), likewise favoring the plan of allocation just mentioned and covering other matters of importance for the prevention of interference. The engineers present adopted a resolution favoring the plan calling for 50 exclusive channels and 36 regional channels. This resolution is set forth in Appendix E (5). Doctor Dellinger prepared a summary of the discussion and conclusions of the conference, which is set forth in Appendix E (6).

On April 23, 1928, the commission held a further hearing to permit the radio industry to express its views on the proper method of applying the Davis amendment. The meeting was held largely at the request of the National Association of Broadcasters, the Federated Radio Trades Association, and the Radio Manufacturers' Association. It was attended, however, by a number of persons representing practically all interests concerned directly or indirectly in broadcasting and including a number of the radio engineers who had participated in the previous discussion. A partial list of those present is contained in Appendix M (4). Congressman Davis, the author of the amendment, was unable to be present, but submitted to the commission a letter outlining his views as to its proper application, which

letter is set forth in Appendix E (7). A series of recommendations was made to the commission in a memorandum submitted by the National Association of Broadcasters, the Federated Radio Trades Association, and the Radio Manufacturers' Association, which memorandum is set forth in Appendix E (8). The memorandum, while expressing sympathy with the ideals sought to be attained by the engineers' recommendations, suggested a method of procedure which was calculated to bring about as small a change in existing allocations as was possible, consistent with the requirements of the law, at the same time leaving the way open to a gradual improvement of conditions. Suggestions were also made in a memorandum presented by Louis B. F. Raycroft, vice president of the National Electric Manufacturers' Association (Appendix E (9)), and Louis G. Caldwell, representing several individual broadcasting stations (later general counsel of the commission), the latter suggestions being incorporated in a printed pamphlet which is too long for reprinting in the report. Doctor Dellinger prepared a memorandum discussing the proposals made at the hearing, which is set forth in Appendix E (10). Experts employed by the commission made a tabulation showing the percentages of radio facilities assignable to each State in proportion to population, based upon estimates in the 1928 population prepared by the United States Census Bureau, which gives the total population of the United States as 121,649,342. This is contained in Appendix E (11).

(*b*) *Discontinuance of portable stations.*—Prior to July 1, 1928, there were 13 portable broadcasting stations in licensed operation. Four were in the first zone, 1 in the second zone, none in the third zone, 6 in the fourth zone, and 2 in the fifth zone. They have been a constant source of interference both because of lack of proper equipment and because their changing geographical locations made it impossible to avoid interference arising out of too small a frequency separation as they moved into the vicinity of broadcasting stations assigned to adjacent frequencies. On May 10, 1928, the commission issued its General Order No. 30 to the effect that no licenses or renewals of licenses or extension of existing licenses would be issued to portable broadcasting stations after July 1, 1928, and that on that date such stations would cease operation. By its General Order No. 34 the commission extended the licenses of the portable stations to July 1, 1928, at which date they were to expire. Provision was made for giving these stations a hearing, but at their request the hearing has been continued from time to time and has not yet been held. Since the issuance of General Order No. 30 two of the portable stations have become "anchored" and have been licensed as fixed stations with small amounts of power. A list of portable stations affected by General Orders, Nos. 30 and 34, is contained in Appendix F (1).

(*c*) *General Order No. 32.*—The Davis amendment provided that the required equality of broadcasting service should be carried into effect whenever necessary or proper—

By granting or refusing licenses or renewals of licenses, by changing periods of time for operation, and by increasing or decreasing station power when applications are made for licenses or renewals of licenses.

The commission had before it requests of approximately 700 broadcasting stations for renewals of their licenses prior to January 15, 1928.

Obviously, before it could intelligently fix upon the quota of each zone the commission had to ascertain approximately how many stations were to remain in operation. A list of 164 stations (Appendix F (2)) was made up and required to make a showing that their continued operation would serve public interest, convenience, or necessity. The commission had in its files reports of supervisors and other records of information indicating that it was very doubtful whether any of these broadcasting stations was performing any service entitling it to a renewed license. The procedure followed was that prescribed by section 11 of the radio act of 1927. A hearing was set for Monday, July 9, 1928, at 10 o'clock a. m., at the office of the commission in Washington, D. C. A copy of the letter sent to each station and a list of the stations included in General Order No. 32 is contained in Appendix F (2). An analysis showing the total number of licensed stations in each State and zone as of June 30, 1928, and the number thereof that were included in General Order No. 32 is contained in Appendix F (3). Reference to the last-mentioned appendix will show that in making up the list the commission had under consideration the necessity for reducing the number of stations in the overcrowded zones, particularly the fourth, where 91 of the 164 were located.

During the period between the issuance of General Order No. 32 and the date set for hearings the members of the commission devoted themselves to a study of conditions in the zones most affected. Commissioners Robinson and Caldwell spent June 5 and 6, 1928, in New York City studying the congested New York area.

Commissioners Sykes and Pickard visited various points in the fourth zone and held meetings with broadcasters in Chicago, Ill., on Monday, June 4; in Des Moines, Iowa, on Wednesday, June 6; in Lincoln, Nebr., on Thursday, June 7; and in Kansas City, Mo., on Friday, June 8. Broadcasters from the territory surrounding each of the cities, including the adjacent States, were invited to these conferences. Commissioners Sykes and Pickard discussed with the broadcasters various proposals of consolidations of stations, further division of time, the removal of particular stations to less congested districts, and other plans which would materially reduce the number of channels occupied in the overcongested areas.

(*d*) *Hearings pursuant to General Order No. 32.*—Approximately 110 of the 164 stations appeared before the commission on July 9, 1928, to take advantage of the hearing which had been provided, and about 14 additional stations submitted their cases on affidavits. Thirty-six stations defaulted, but of these four later made a showing before the commission on which their cases were reinstated and considered. Four stations voluntarily surrendered their licenses.

Hearings were held daily throughout the two weeks between July 9 and 21, 1928. After the first day the commission divided into two sections, one presided over by Commissioner Robinson and one by Commissioner Sykes. Hearings were held until late in the evening on nearly every day, with the result that by Friday, July 20, every station desiring a hearing had been accorded full opportunity to present any material evidence. On July 23 evidence was heard by the commission on facts and principles of radio engineering limiting the total number of broadcasting stations that can broadcast

simultaneously in the United States consistently with good radio reception. This testimony was made applicable to each of the cases heard. The witnesses heard by the commission consisted of Dr. J. H. Dellinger, of the Bureau of Standards; John V. L. Hogan, consulting radio engineer of New York; and Prof. C. M. Jansky, jr., of the University of Minnesota. C. W. Horn, radio engineer for the Westinghouse Electric & Manufacturing Co. at Pittsburgh, was called to make a statement as to the present status of synchronization.

(*e*) *Decisions in cases heard pursuant to General Order No. 32.*—The commission devoted the weeks following the hearings to a consideration of the evidence (as well as to work on the reallocation which was then in progress). Some time was necessary for the consideration of the evidence because of the fact that each of the two divisions had to examine the evidence heard by the other division. The decisions were all entered during the week commencing August 20. An analysis of the decisions shows that out of the 164 stations cited 81 escaped adverse action by the commission, 12 were substantially reduced in power, 4 were placed on probation, and 5 were left on as the result of consolidations with other stations (2 of these consolidations also involving reductions in power). All told, 62 stations were deleted—4 as the result of surrender of license, 26 as the result of action by the commission, and 32 as the result of default. A list of all cases of adverse actions against the stations is contained in Appendix F (4).

In connection with the announcement of the decisions the commission issued several statements setting forth principles which had guided it in making the decisions. The most important of these statements will be found in Appendix F (5). A statement by the commission relating to public interest, convenience, or necessity is shown as Appendix F (6).

(*f*) *Legal proceedings arising out of decisions under General Order No. 32.*—In only one case has an appeal been taken to the Court of Appeals of the District of Columbia as provided in section 10 of the radio act of 1927. The case is that of Station WTRL, of Midland Park, N. J. Two other stations—WCRW, Clinton R. White, of Chicago and WEDC, Emil Denemark, of Chicago—have had recourse to the courts without appeal. Both stations were reduced in power from 500 to 100 watts. Each has filed a bill in the Federal Court for the Northern District of Illinois, Eastern Division, naming the United States attorney and the local radio supervisor and members of the Federal Radio Commission as defendants. The bills seek to restrain enforcement of the commission's orders by any of the defendants and attack the radio act of 1927 as amended as unconstitutional. Motions on the part of plaintiff for temporary injunction in each case and motions to dismiss on the part of the defendants have been argued and have resulted in (1) the dismissal of the bills as against the commission, (2) denial of the plaintiffs' motion for a temporary injunction, and (3) denial of the United States attorney's motion to dismiss on the face of the bill (for the purpose of requiring him to file an answer and thus completing the record). The court held the radio act of 1927 to be constitutional and valid. Station WCRW has appealed from this decision to the Court of Appeals for the Seventh Circuit.

NEW ALLOCATION

During the months of July and August, 1928, the commission, with the assistance of its engineering division, was endeavoring to work out an allocation of broadcasting stations with respect to frequency, power, and hours of operation that would conform as nearly as possible to the requirements of the Davis amendment. Commissioners Caldwell and Pickard constituted a committee for the purpose, and Commissioner Lafount participated in their work. The best engineering advice in the country was sought and received. Several different plans were crystallized complete in every detail only to fail to meet the approval of the requisite majority of the commission. Finally, however, an allocation was achieved which met with the approval of four members of the commission. Commissioner Robinson voted against it, adhering to his belief that the Davis amendment was not intended to require a reallocation of the entire broadcasting spectrum to be made at one time, and that the equalization was to be a gradual process of changes which were, in the language of the amendment, to be accomplished only "when and in so far as there are applications therefor." He opposed the plan also because it included what, in his opinion, were excessive power assignments to certain stations.

The first step toward putting the new allocation into effect was the issuance of General Order No. 40 (Appendix A), the terms of which were agreed upon only after a majority of the commission had found themselves in agreement on the application of its terms to the existing stations. This order was issued on August 30, 1928. It represented a combination of the plans which had been suggested to the commission from time to time, together with certain concessions which had to be made to the practical necessities of the situation because of the existing number and character of the broadcasting stations. Forty channels were set apart for stations of sufficient power on cleared channels to give good service to rural and remote listeners. These channels were allocated equally, eight to each zone. This type of service corresponds to the type which was called "national" in the plans submitted to the commission by expert engineers in April. Thirty-five channels were set aside for stations of power not to exceed 1,000 watts, to be allocated equally among the zones, each channel to be used—with certain exceptions—by not less than two nor more than three stations. Six channels were set aside for use in all five zones by stations of 100 watts or more; five channels were set aside for use in all five zones by stations having not to exceed 1,000 watts; four channels were set aside for use by stations of 5 kilowatts in two or more zones. By a supplementary General Order No. 42 the power of stations on the 40 cleared channels was limited to 25 kilowatts, with provision for the use of 50 kilowatts during the next license period in order to determine what interference, if any, would result. Commissioner Robinson urged a limitation to 10 kilowatts.

A majority of the commission believes that this plan is the best which could be devised with due regard to existing conditions. It provides, or at least makes possible, excellent radio reception on 80 per cent of the channels. The few other channels will suffer from heterodyne interference except in a small area close to each station.

The general orders were followed by an announcement of the specific assignments of stations with respect to frequency, power, and hours of operation. This new allocation arranged by States was announced on September 10, 1928, to go into effect on November 11 (Appendix G (1)), and was revised on October 16 and 19 (Appendix G (1 *a* and *b*)). The intervening period was considered necessary in order to give the stations affected ample time to make such changes in apparatus and such tests as may be necessary to meet the new requirements. Provision was made by General Order No. 45, issued on September 24, for tests on the new frequencies by all stations during the hours between shortly after midnight and morning. The original allocation (revised) is set forth in Appendixes G (1) and G (1 *a* and *b*), the former being a list of stations arranged by States showing their new and old assignments. The latest revised list setting forth the allocation by channels forms Appendix G (2). The announcement was accompanied by a statement explaining its effect and advising stations not satisfied with their assignments of the method for bringing their claims to the attention of the commission. This statement is set forth in Appendix G (3).

The new allocation was analyzed by Dr. J. H. Dellinger, chief engineer of the commission, in a statement which is set forth in Appendix G (4).

As was to have been expected, there have been a number of complaints against the allocation on the part of particular stations and their adherents. On the whole, however, the complaints have been to date very much less in number than the commission expected. The commission intends to commence hearings on these complaints immediately after October 12, and, if possible, to conclude them prior to November 11. New licenses will be issued corresponding to the allocation and to any changes that may be made as the result of hearings. These licenses are to be effective as of November 11, to terminate on January 31, 1929.

An analysis of the quotas to which the respective States are entitled as to each of the classes of channels, if the Davis amendment is to be applied with mathematical precision, is set forth in Appendix G (5). A certain number of stations were accommodated in the new allocation on the basis of daytime and limited time assignments. General Order No. 41 was issued on September 4, 1928, defining daytime stations.

CONSTRUCTION PERMITS AND NEW LICENSES

Immediately after the new allocation the commission proceeded to act upon the large number of applications for construction permits and for increases in power which it had from existing or prospective broadcasting stations. These were granted only in cases and to the extent to which they could be accommodated under the allocation and the principles thereof which had been adopted by the commission.

RULES AND REGULATIONS

A variety of subjects have been covered by rules and regulations of the commission, promulgated in the form of general orders.[1]

[1] See Appendix A, Supplement.

By its General Order No. 16, issued on August 9, 1927, the commission, while not condemning the practice of using mechanical reproductions such as phonograph records or perforated rolls, required that all broadcasting of this nature be clearly described in the announcement of each number. The commission has felt, and still feels, that to permit such broadcasting without appropriate announcement is, in effect, a fraud upon the public. It is true that in the smaller communities which do not have adequate original program resources the use of phonograph records may fill a need; it is true also that there may be developments in specially produced phonograph records which can be made use of to advantage by radio. On the whole, however, the commission is inclined to believe that the use of ordinary commercial records in a city with ample original program resources is an unnecessary duplication of service otherwise available to the public, and the crowded channels should not be wasted in this manner. General Order No. 49, issued on October 26, 1928, makes more rigid requirements as to announcements of mechanical reproductions.

Section 18 of the radio act of 1927 prohibits any discrimination by broadcasting stations as between regularly qualified candidates for a public office. By its General Order No. 31, issued on May 11, 1928, the commission called particular attention of all stations to this section. It has not yet proved possible, however, to issue definite regulations on the subject. There has been practically no cause for complaint in the conduct of the stations.

A problem with which the commission is faced from time to time is the extent and character of advertising which will be permitted by broadcasting stations. There is a tendency to make a distinction between "direct" and "indirect" advertising, but, obviously, there is no sharp line of demarcation between them. By "direct" advertising is usually meant the mention of specific commodities, the quoting of prices, and soliciting of orders to be sent directly to the advertiser or the radio station. By "indirect" advertising is usually meant advertising calculated simply to create or maintain good will toward the advertiser. In some localities, such as Iowa, direct advertising has assumed very substantial proportions. Soon after the commission was established many objections to such advertising were received by the commission from listeners, and in the first allocation certain of these stations were given only limited facilities. Hearings were held at the request of these stations, and the mass of documentary evidence submitted seemed to show overwhelmingly that a majority of the public in certain areas favored direct advertising by radio of certain products for farm consumption, having the idea that there were economic advantages in this method. One such station submitted evidence showing that it had received over one-half million commendatory letters in one year.

On the other hand, there has been some measure of complaint by competing merchants who do not have broadcasting facilities to the effect that they were placed under an unfair disadvantage by such use of a Government franchise.

The problem is far from being solved. It is manifest that broadcasters must resort to some form of advertising to obtain the revenue

for the operation of their stations. On the other hand, it is equally manifest that the advertising must not be of a nature such as to destroy or harm the benefit to which the public is entitled from the proper use of broadcasting channels. The commission has, of course, no power to censor programs and must proceed cautiously in its regulations on this subject.

As yet no extensive regulations have been established governing the technical operation of broadcasting stations. With the going into effect of the new allocation the commission will be able to devise and put into effect much-needed regulations intended to require broadcasters to keep reasonably abreast of the state of the art. The most important occasion for regulation is frequency stability, namely, the adherence of a station, as nearly as possible, to the exact frequency to which it has been assigned. By its General Order No. 7, issued April 28, 1927, the commission fixed a maximum of one-half kilocycle as the extreme deviation from authorized frequency.

Some experiments have been made on synchronization of broadcasting stations; that is to say, the operation of two or more stations on exactly the same frequency or so closely thereto that the separation is such as not to produce an audible whistle. The nature of the problem, as well as the methods which have been attempted, are outlined in an address by Commissioner O. H. Caldwell before the American Institute of Electrical Engineers in New York on October 14, 1927. (Appendix H.) The information received and investigation made by the commission to date indicate that synchronization on a wide scale is not yet practicable. If and when it is successful the commission's problem of allocation will be immeasurably reduced, because of the increased capacity of each channel with two or more stations broadcasting simultaneously. The commission has adopted the policy of encouraging synchronization, but does not feel that the time is ripe for making any assignment based on it. Experiments have been conducted under authority of the commission by stations WAIU, of Columbus, Ohio, and KMOX, of St. Louis, Mo.; by stations WDRC, of New Haven, Conn., and WAIU; and by stations WTMJ, of Milwaukee, Wis.; WODA, of Paterson, N. J.; WGL, of New York City; KPRC, of Houston, Tex.; WBZ, of East Springfield, Mass., and WBZA of Boston, Mass.; and WSYR, of Syracuse, N. Y., WTMJ being the key station.

POPULARIZING OF HIGHER FREQUENCIES

During the year the commission endeavored to popularize the frequencies just below 1,500 kilocycles by a policy of granting more power to stations on these channels. With the development in the frequency range covered by receiving sets during the last two years there is decreasing basis for complaint against the use of these channels and there is no inherent engineering reason against the use of such channels for broadcasting. Pursuant to this policy, the commission licensed several stations to use substantial power on these channels such as WTFF, at Mount Vernon Hills, Va.; WCSH, at Portland, Me.; WHBN, at Gainesville, Fla.; and WKBW, at Buffalo, N. Y.

CHAIN BROADCASTING

With a comparatively few exceptions the chain stations are independently owned and have no connection with companies owning or interested in the chain broadcasting company other than their arrangements for taking a certain amount of such programs. The commission has never favored chain stations in its assignments because of any affiliations with the chain. It has uniformly selected for the preferred positions such stations as are entitled thereto because of their individual history and standing, their popularity with their audiences, the quality of their apparatus, and their faithful observance of radio rules of the air. It is interesting to note, however, that in many cases stations which were not affiliated with chains at the time they received favorable assignments from the commission thereafter entered upon such affiliations. An example of this is station WEBC, of Superior, Wis. In order to make it certain that President Coolidge would have good radio reception at his summer home, the commission on June 4, 1928, temporarily increased this station's power from 250 to 1,000 watts for evening broadcasting during the summer. Soon after obtaining this increase the station on its own volition affiliated itself with one of the large chains.

By its General Order No. 43, issued on September 8, 1928, the commission sought to limit the use of cleared channels for chain programs by requiring a geographical separation of 300 miles between stations using such programs, except for one hour each evening. The order sought to encourage synchronization by making an exception in case two stations operated on the same frequency. It also made provisions for exceptions in cases of programs of extraordinary national interest. Nevertheless the very drastic effect of the order soon became apparent from the storm of protest from the listening public, and the commission deemed it wise to postpone the effective date of the order from November 11, 1928, to February 1, 1929, in order to give it an opportunity to make further investigation to avoid injustice to listeners.

The commission will observe with particular care the effect of its new allocation of broadcasting stations upon chain broadcasting.

TELEVISION

The recent advances in radio television threaten to create serious problems. The commission has allowed a few broadcasting stations to experiment with television in the broadcast band on their assigned channels on condition that this form of communication be limited to a small amount of time per day and be so conducted as not to cause interference on adjacent channels. There is also a distinct development of television in the high-frequency band. It has been urged upon the commission that it should permit regular television service in the broadcast band as well, because of the fact that a large potential audience is already at hand and in some cases the ordinary receiver can be adapted to receive television by the addition of certain apparatus. Television signals, however, will subject the broadcast listener to objectionable noises. The International Radio Convention limits the broadcasting band to telephonic signals. The

commission has not yet determined its final policy with reference to this subject.

RECEIVING SETS IN THE UNITED STATES

For convenient reference there is appended a table showing the approximate number of receiving sets in use in the United States. (Appendix I.) This table is the result of a nation-wide survey completed in May, 1928, and conducted by Radio Retailing in compliance with the request of the commission. The survey shows a total of nearly 12,000,000 receiving sets in use, serving an audience of more than 40,000,000 people. Appeals for all available statistics were addressed to trade bodies, trade publications, and others in close touch with the industry. The figures show that 7,500,000 standard receiving sets with loud-speaker volume are now in use; they do not include crystal or ear-phone receivers of obsolete type. The survey indicates that the total would approach 12,000,000.

PART III

THE LOW AND HIGH FREQUENCY BANDS

EXTENT OF LOW AND HIGH FREQUENCY BANDS, RESPECTIVELY

By the low-frequency (long-wave) band is usually meant the band from 10 to 550 kilocycles (30,000 to 545 meters); by the high-frequency (short-wave) band, from 1,500 to 23,000 kilocycles (200 to 13.1 meters) and above. As has already been explained, the band between 550 and 1,500 kilocycles (545 to 200 meters) is devoted to broadcasting.

ALLOCATION OF BANDS UNDER THE INTERNATIONAL RADIOTELEGRAPH CONVENTION

The International Radiotelegraph Conference, which was in session from October 5 until November 25, 1927, resulted in the International Radiotelegraph Convention and general regulations relating thereto, to which the United States is a party. The commission was represented at the conference by its then chairman, Admiral Bullard, until his death. The convention goes into effect on January 1, 1929. In addition to a large number of undertakings and regulations, the latter mostly of a technical nature, which must be given effect by appropriate action by the commission, the treaty provided an allocation of the entire range of frequencies from 10 to 60,000 kilocycles to the various kinds of services. This allocation is contained in Appendix J. As will be seen by reference to this appendix, the following kinds of services are recognized in assigning bands: Fixed services, mobile services, fixed services and mobile services, maritime mobile services open to public correspondence exclusively. mobile services not open to public correspondence, fixed services not open to public correspondence, air mobile services exclusively, air fixed services exclusively, radiobeacons, radio-compass services, broadcasting, amateurs, and experimental. There are limited bands in the high frequencies which are "not reserved," and in addition frequencies above 60,000 are "not reserved." The treaty and regulations define, among other things, fixed, mobile, land, ship, aircraft, coast, radiobeacon, radio compass, aeronautical, and broadcasting stations, and the services corresponding to such stations. All these types of stations and services, and a large number of subdivisions of some of them, are being licensed and regulated by the commission under the radio act of 1927, as amended. Each type of station and service presents its own group of problems, many of them being fully equal in importance and difficulty to those arising in the broadcast band.

EXTENSIONS OF LICENSES

Because of the pressing nature of problems in the broadcast band existing at the time of its establishment, the commission was unable to give any degree of concentrated attention to the regulation of other forms of radio communication until the series of hearings and investigations which began in January, 1928 (discussed below). The issuance of licenses to other services was carried on under the supervision of Commissioners Bullard and Dillon, who were more familiar with the needs of these services than the other members of the commission. Comparatively few new licenses were issued, however, and virtually no general rules and policies were adopted until the late spring of 1928.

By its General Order No. 1, issued on March 15, 1927, the commission extended all radio amateur and ship licenses previously issued by the Department of Commerce until further order of the commission. By its General Order No. 3, issued on March 29, 1927, the commission similarly extended all coastal, point-to-point, technical and training, and experimental radio station licenses. By its General Order No. 26, issued on March 27, 1928, the commission stipulated that all licenses covering coastal, point-to-point, technical and training, experimental, ship, and amateur radio stations be terminated on August 31, 1928, and required that, unless already filed, applications for new licenses or renewals in these classes be filed not later than July 31, 1928; it was provided, however, that all formal licenses in these classes issued by the commission for definite periods subsequent to General Orders, Nos. 1 and 3, were not affected by the order. By General Order No. 39, issued on August 22, 1928, the commission extended all licenses covered by General Order No. 26 to November 1, 1928, stipulating, however, that the order should not apply to licenses issued by the commission for periods of time not yet expired. Because of the many hearings and problems having to do with broadcasting stations, the application of the Davis amendment, and the new allocation, another extension has become necessary; General Order No. 47, issued on October 24, 1928, extends the licenses to December 31, 1928. Although, as is below set forth in more detail, a great many hearings have already been held on applications having to do with the high-frequency band, the commission will not be able to give it the attention it should have until after November 11, 1928, at which date it is hoped conditions in the broadcast band will be stabilized.

THE LOW-FREQUENCY OR LONG-WAVE BAND

The low-frequency band (which extends from 10 to 550 kilocycles, the lower extremity of the broadcast band) has presented no particular problems peculiar to it. It has been in use for a long period of time and, in prescribing the allocation of it to various services, the treaty adheres fairly closely to existing practice in the use of the frequencies. In this band will be found most of the frequencies designated for ship use, including channels for distress signals. Inasmuch as nearly all of these stations are equipped with apparatus designed for using these frequencies, it is unlikely that the practice will be changed.

The only demand for high frequencies for these stations is supplementary in nature. There are at present approximately 2,000 licensed ship stations and a considerable number of coast stations subject to regulation by the commission.

All radiobeacon and radio-compass services are likewise to be found on the low-frequency band. This is primarily because of the peculiar characteristics of high frequencies which make them not sufficiently dependable for these services. By "radiobeacon" is meant a special station the transmissions of which are intended to enable a receiving station to determine its bearings or a direction with respect to the radiobeacon. This service is peculiarly important with respect to airplanes. By "radio-compass" station is meant a station provided with special apparatus intended to determine the direction of the emissions of other stations. There are at present two radiobeacon and no radio-compass stations subject to regulation by the commission. The United States Government, however, operates a number of such stations.

There is a limited demand for low frequencies for transoceanic radiotelegraphy and radiotelephony. At present a number of frequencies are being used for the former and two frequencies for the latter under licenses extended or issued by the commission. For radiotelephony a channel of at least 8 kilocycles is necessary; for radiotelegraphy the channels may be as close as one-tenth kilocycle in this band. When it is considered that the entire low-frequency band extends from only 10 to 550 kilocycles the paucity of channels is obvious. They are now, generally speaking, being used to full capacity. For communication purposes, particularly over substantial distances, the tendency is toward the use of high frequencies because of the fact that tremendous power is necessary to cover great distance on the low frequency.

The needs of aeronautics are not yet certain, and further experimentation will be necessary to determine whether the low or high frequencies will best serve the purpose. In the meantime frequencies in both bands are in use, although to a very limited extent.

Under the treaty provision is made for broadcasting stations now using low frequencies in the bands of 160 to 224 kilocycles. This applies only to Europe, where such stations already exist. Other provisions are made for use of this band by other countries, as will be seen by reference to Appendix J.

It is not practicable to set forth in an appendix a list of all the licensed ship or aircraft stations. Appendix K is a list of coastal, radiobeacon, radio-compass, fixed radiotelegraph, and fixed radiotelephone stations on the low-frequency band, where construction permits and licenses have been authorized by the commission.

THE HIGH-FREQUENCY OR SHORT-WAVE BAND

Until within the past two years it had been supposed that the high-frequency band (above 1,500 kilocycles) was virtually useless for practical purposes. The erratic behavior of these frequencies, their well-known skip-distance peculiarities, their property of fading, and technical difficulties in the construction of apparatus had all led to the conclusion that, while they furnished an interesting field for

experimentation and for amateurs, they could not be the basis of reliable service. It was thought, furthermore, that there was an inexhaustible number of channels in this band of frequencies, at least in comparison with any possible demand, and such licensing as had been done was done without reference to character of service, priority as between classes of service, or any orderly plan. Intensive study and experimentation, however, developed the fact that the high frequencies possess peculiarly valuable properties; their characteristics were found to be in accordance with general laws which might be relied upon, and apparatus has been developed capable of transmitting and receiving on these frequencies in a practical way. These frequencies make communication possible at great distances with the use of comparatively small amounts of power; on the other hand the limitations imposed by the present state of the art with respect to the necessary separation between channels make the number of channels less than had been anticipated.

As a result, beginning shortly after the establishment of the commission, a constantly increasing number of applications for the use of these frequencies has flooded the commission, covering a wide variety of services and experiments. The International Radio Conference gave a great impetus to the demand. By the fall of 1927 it began to be apparent that the demand, both potential and actual, far exceeded the supply; that further licensing could not safely take place without extensive investigation by the commission of the properties of these frequencies, their adaptability for various types of service, the comparative characteristics of bands of frequencies within the high-frequency band, the needs and merits of the types of service seeking accommodation in the band, and the application of the standard of "public interest, convenience, or necessity" to these questions. In short, it was necessary to evolve a scientific and orderly plan which would, so far as possible, anticipate the needs of the future and of the progressive science of radio and obtain from the limited number of channels the maximum of benefit for the people of the country. Otherwise, congestion equal to that which has been the root of all evils in the broadcast band would obtain in the high-frequency band.

HIGH FREQUENCY HEARING IN JANUARY

Because of the many hundred applications for channels in the high-frequency band and the fact that, as early as November, 1927, there were several times as many applications as there were available channels, the commission determined to hold a general public hearing. This hearing was announced on November 15, 1927, to take place in Washington on January 17, 1928, and notices were sent to all applicants and to representatives of all classes of service which had indicated an interest in the matter. The purpose of the hearing was to obtain information as to the comparative merits of the different types of service as to scientific facts and principles which must govern the commission, and, generally speaking, as much data as possible to serve as a basis for an intensive study of the problem. A widespread interest was manifested in the hearing, which, because of the large attendance, was held in the auditorium of the New National Museum. A list of those participating in the

deliberations and the interests represented by them is set forth in Appendix L (1).

Practically all the leading radio engineers of the country attended. Upon invitation of the commission, Doctor Dellinger, of the Bureau of Standards, opened the discussion with a statement of the problems faced by the commission in the high-frequency spectrum. (Appendix L 2.) The United States Departments of State, War, Navy, and Commerce were all represented; in addition there were other representatives of the Army and Navy, of the Coast Guard, of the Coast and Geodetic Survey, and of the Bureau of Lighthouses. Inasmuch as, under the provisions of the radio act of 1927 (sec. 6) radio stations belonging to and operated by the United States are not, generally speaking, subject to the commission, and their frequencies are assigned to them by the President, it was necessary to ascertain the needs of all Government stations before undertaking to accommodate private applicants.

The following groups, represented in many cases by eminent radio engineers and lawyers, were called upon in turn and each made an earnest plea for accommodation in the high-frequency band:

Newspaper services.
Communication companies — domestic and transoceanic.
Airplane-operating companies.
Navigation companies.
Railroads.
Department-store chains.
Electric railways.
Interurban bus systems.
Electric power transmission systems.
Lumber companies.
Farm cooperative organizations.
Motion-picture producers.
Police and fire-alarm systems.
Forest and watershed patrols.
Ranch owners.
Remote resorts and hotels.
Operators of facsimile transmission services.
Radio manufacturers.
Mining and oil companies.
Packers and shippers.
Geologists.

Discussion was limited to the claims of groups or types of service for recognition, and consideration of the merits of individual applications was excluded. The representatives were invited to discuss the following propositions:

1. The dependence of such service upon short-wave radio rather than wire or other means.
2. The humane, social, and economic importance of their proposals.
3. The number and positions of channels believed available for such service.
4. Power required and interference likely to be caused to other services and other countries.
5. The probable total number of applications which will be made for such service within the next five years by all applicants in their class.

Early in January the commission had requested Capt. S. C. Hooper, of the United States Navy, head of the radio division, Bureau of Engineering, to prepare a preliminary study of the high-frequency band. Captain Hooper incorporated the results of his study in a paper which he read at the hearing. A copy of this paper will be found in Appendix L (3).

The most dramatic portion of the hearing centered around the conflicts which developed between the communication companies (particularly the Radio Corporation of America and the Mackay interests) and the press services. There were presented to the commission the claims of such strikingly different services as transoceanic and transcontinental communication, railroad needs for communication between locomotives and caboose on a freight train and

between office and switch engine, the claims of oil companies not only for communication purposes but also for prospecting for oil, and of power companies for emergency purposes.

FURTHER STUDY AND INVESTIGATION OF THE HIGH-FREQUENCY BAND

February 20, 1928, Captain Hooper reported to the commission for temporary service as technical adviser. His instructions were to take charge of the frequency spectrum outside the broadcast band, and particularly the high-frequency spectrum, and to make recommendations for allocations. There existed some measure of urgency with regard to the frequencies suitable for long-distance (transoceanic) communication (6,000 to 23,000 kilocycles) in order that these frequencies should not be appropriated by other nations to the disadvantage of the United States, and it was desirable that the allocation be completed within three or four months.

With the assistance of the most competent Government radio engineers, Captain Hooper proceeded to construct a high-frequency allocation structure, bearing in mind the present and future technical capabilities of equipment and operation personnel and the desirability of obtaining the cooperation of other nations in adopting a similar structure. He also prepared recommendations as to priority in types of services. On March 20, 1928, a memorandum incorporating recommendations on high-frequency allocation was presented to the commission, which memorandum will be found in Appendix L (4). One of the questions on which there had been the most marked difference of opinion at the January hearing was as to the proper separation necessary between channels. This question was most important because upon its solution depended the number of channels available. The memorandum recommended, among other things, the establishment of a separation of 0.1 per cent (requiring a frequency stability of 0.05 per cent) of the average frequency of each band, alternate channels only to be used in the immediate future. Accordingly a channel width of 0.2 per cent was thus provided for. This separation was described as adequate for all services except television, for which a band of at least 100 kilocycles is required. On the basis of 0.1 per cent separation there were a total of 398 channels in mobile bands, of which 189 were already in use; 710 channels in the fixed-service bands, of which 412 were already in use; 39 channels in the broadcast bands (for relay broadcasting), of which 19 were already in use. The numbers of 0.2 per cent channels are half of these figures.

A study was then made of the applications for licenses, concentrating attention on the band from 6,000 to 23,000 kilocycles, recognized by the international convention as channels for long-distance communication. Frequencies below 6,000 kilocycles could, in general, because of their smaller interference range, later be assigned in the United States without regard to their use overseas and with regard only to the needs of other nations of the North American Continent and the West Indies. There was no accurate or complete list of established high-frequency stations in foreign countries. A list of the number of frequencies and number of stations used by each nation was prepared; the Bureau of Foreign and Domestic Commerce and

the Department of State were of assistance in this work. The list as of May 12, 1928, is contained in Appendix L (5).

It was also necessary to obtain a list of channels to be occupied by Government stations, which was possible only after a great deal of discussion and agreement on the part of Government departments and on the part of the Interdepartment Radio Advisory Committee. It having become apparent that there were far too few frequencies to meet the demands, the Government departments cut their needs to a minimum. As a result, the President, by Executive order on March 30, 1928 (modified on June 4, 1928), reserved a certain number of frequencies for Government use and furnished the commission with a list thereof. This list is contained in Appendix L (6).

ALLOCATION OF HIGH-FREQUENCY BANDS FOR MOBILE SERVICES

On April 15, 1928, the commission proceeded to act on the applications for mobile licenses in the high-frequency spectrum and to issue licenses. Some consideration was given to a policy of assigning as many ships as possible to each set of frequencies, about 40 to a channel, and of requiring ships and high-frequency coastal stations to have their apparatus calibrated to one or more common frequencies for common interchange of signals.

HEARING ON APPLICATIONS OF FIXED SERVICES FOR TRANSOCEANIC CHANNELS

On April 18, 1928, an informal hearing was held before the commission on the applications of newspaper and press associations for assignments in the high-frequency spectrum. The hearing was attended by representatives of the American Publishers' Committee (composed of a number of newspapers and press associations), the International News Service, the Hearst papers, the New York Times, and the Christian Science Monitor.

On May 14, 1928, a public hearing was held for the purpose of hearing applicants demanding channels in the point-to-point transoceanic portion of the spectrum (6,000 to 23,000 kilocycles). Direct communication between the Atlantic and Pacific seaboards was included, owing to the great distances between coasts. A partial list of those present and of the interests represented by them is set forth in Appendix L (7).

ALLOCATION OF TRANSOCEANIC HIGH-FREQUENCY BANDS FOR POINT-TO-POINT SERVICES

On May 18, 1928, the commission considered an engineering memorandum setting forth general principles to be followed in allocating fixed services in the transoceanic band, together with recommendations concerning the particular applications. The portion setting forth the general principles is contained in Appendix L (8).

On May 24, 1928, the commission allocated 74 high-frequency channels for transoceanic service. Licenses were issued to the Mackay Co., pursuant to construction permits previously issued, cov-

ering 22 channels, and to the Radio Corporation of America, pursuant to construction permits previously issued, covering 29 channels. Construction permits covering the use of the 74 newly assigned channels were issued, as follows:

	Channels
Robert Dollar Co	8
Tropical Radio Telegraph Co	7
American Telegraph & Telephone Co	9
American Publishers' Committee	20
The Mackay Co	15
Radio Corporation of America	15

The commission denied the applications of the Pacific Communication Co. and of the S. P. Radio Co. because, in view of the shortage of channels, the commission felt that public interest, convenience, or necessity would not be served by the granting of the applications. The following table shows the number of transoceanic channels involved in the commission's action:

	Now using	Applied for recently	Approved	Total assigned
Pacific Communications Co		8		
Robert Dollar Co		15	8	8
Tropical Radio Telegraph Co		12	7	7
American Telegraph & Telephone Co	3	9	9	12
American Publishers		22	20	20
The Mackay Co	22	19	15	37
Radio Corporation of America	50	55	15	65
Total	75	140	74	149

On June 2, 1928, the commission approved an allocation of specific channels to the respective applicants, pursuant to its action of May 24, 1928. The allocation included the assignment of new channels and the reassignment of channels to all existing licensed stations in the transoceanic point-to-point bands and is set forth in Appendix L (9). So far as possible, the assignments were made in blocks so as to permit intensive development of more channels by a decrease in the necessary separation between channels. The commission, in making the foregoing decisions, adopted the following principle for its own guidance:

> That competitive service be established where there are competing applications, or an application or applications to compete with already established service, and that in the grant of competing license fairness of competition be established, except that as to an isolated country, which, in the judgment of the commission, will not afford sufficient business for competing wireless lines, only one grant of license shall be made, preferably the first application in priority.

The construction permits issued were made subject to rigid conditions, as follows:

> All construction permits issued for transoceanic high-frequency communications are to be for public service point-to-point stations.
>
> The grantee shall:
>
> (*a*) At any time designated by the commission satisfy the commission of its financial ability to construct the said station and to do the work contemplated under the said permit.

(*b*) Within 60 days of the date of issuance of construction permit submit to the commission satisfactory evidence of arrangements made for the purchase of transmitting equipment which, in the opinion of the commission, will be capable of transmitting on the assigned frequency to the points designated in the said permit.

(*c*) Within 90 days of the issuance of the said permit submit to the commission a report showing the progress made in establishing receiving and transmitting stations at the points named therein. (In the event a satisfactory showing is not made, the commission reserves the right, in its discretion, to immediately cancel the said permit.)

(*d*) Within six months of the date of the issuance of said permit complete the construction of the station authorized therein and be ready to commence operation thereof.

The commission may, in its discretion, extend the date on which the grantee is required to show progress or of complete construction.

The specific frequency assigned or to be assigned is subject to the right of the United States to assign the same for public service and is, or will be, assigned only for the license period. At the end of any license period for the particular frequency it may be assigned to other public-service stations, in the judgment of the licensing authority.

The commission feels that, as a result of its action in the transoceanic high-frequency spectrum, there are enough licensed companies to insure competition, but not so many as to cause difficulty to the public in making use of the systems.

All the channels assigned have been registered at the international bureau at Berne, Switzerland. To protect the assignments, however, it is necessary that the licensees complete the construction of their stations and begin operation of them at the earliest possible date. The commission feels that it is its duty to exercise considerable vigilance in this direction.

As to the proportion of the total channels available to the world and not in use which the United States would be justified in using, the recommendations made to the commission varied extremely. The commission finally decided upon 25 per cent (on the basis of a separation of 0.1 per cent), but its decision in this respect has not been free from criticism in other countries. It is manifest that no substantial increase in the number of channels appropriated by the United States can be made at least for another year, unless licensees are able and willing to use additional channels between adjacent channels separated on the basis adopted by the commission. The interference area in this part of the frequency spectrum is practically the entire world and continuous use of a channel in one country can not in general be duplicated in another.

LEGAL PROCEEDINGS ARISING OUT OF ALLOCATION OF TRANSOCEANIC HIGH-FREQUENCY CHANNELS

The International Quotations Co. (Inc.) (formerly the S. P. Radio Co.) and Bull Insular Lines (Inc.), both of them unsuccessful applicants for high-frequency assignments, have appealed to the Court of Appeals of the District of Columbia. The statements of the commission setting forth facts and grounds upon which the commission's action in each case was based are set forth in Appendix L (10) and (11). The statements were filed on September 26, 1928, and October 4, 1928, respectively. Hearings on the specific applications were held on May 14, 1928, August 21, 1928, and August 24, 1928, respectively.

HIGH-FREQUENCY BROADCASTING, RELAY BROADCASTING, AND RADIO TELEVISION IN THE BAND 6,000–23,000 KILOCYCLES

In a brief filed with the commission on April 6, 1928, Dr. Alfred N. Goldsmith, chief broadcast engineer of the Radio Corporation of America, explained the purposes and the national and international significance of international relay broadcasting. In another brief filed by him on May 14, 1928, he set forth an outline of the work heretofore accomplished and in contemplation in the field of television. These two briefs are set forth in Appendixes M (1) and (2) as illustrations of the claims which are being made in behalf of those who are most optimistic with regard to the future of these forms of radio communication.

On June 22, 1928, the commission, through its high-frequency committee (Commissioners Sykes and Caldwell), sent a form letter and a questionnaire to each applicant for a license covering such a service in the band in question. (Appendix M (3).) The letter set forth the bands under consideration and their approximate day and night distance ranges, suggestions as to the channels available and the separation necessary, the number of applications received, and a suggested order of priority. Policies in this field have not yet been determined.

LIST OF HIGH-FREQUENCY STATIONS

The commission, through the cooperation of several governmental and commercial agencies, compiled a list of the high-frequency stations of the world. A copy of this list is not included, due to its bulk.

CONTINENTAL HIGH-FREQUENCY BAND (1,500–6,000 KILOCYCLES)

The channels in this band, except for the frequencies just under 6,000 kilocycles, are not considered to have an intercontinental interference range, and their use may be duplicated in different parts of the world. The interference range may, however, affect an entire continent, and consequently it is desirable that an agreement be reached between the United States, Canada, Mexico, Cuba, and the West Indies. Such an agreement would allocate the entire band in question between the various types of service, would determine the standard of separation to be observed, and therefore the number of channels available for each type of service, would determine in which types of service and in which portions of the band there may be duplication of stations, and, with regard to the channels reserved for exclusive use, would determine the number to be assigned to each country.

On August 20, 1928, the commission met with representatives of Canada and Cuba in a preliminary conference, which lasted throughout the week until August 25. Mexico, although invited to send representatives, was not represented. The conference appointed a subcommittee to draft a preliminary report. Doctor Dellinger, Captain Hooper, and Captain Hill acted as the commission's representatives on the subcommittee. The subcommittee made a preliminary report on August 25 and in connection with it submitted a scheme of allocation for consideration. The conference then adjourned for

a period of 90 days to permit adequate study of the proposed allocation. In the meantime it was agreed that for the intervening period the parties to the conference would abide by the provisions of the proposed allocation with respect to mobile stations and would refrain from issuing any licenses to fixed stations which would in any way prejudice the future adoption of the plan.

In the meantime the commission is studying the many intricate problems involved in the making of assignments in this band. The matter is now in too uncertain a condition to make a detailed report possible. Tentative recommendations and suggestions are before the commission from its engineering division covering the entire band and the nature of the services to be assigned to each portion of the band. Among the services being considered are the following: Communication between airplane and ground stations, communication between ships and coastal stations, police departments, marine-calling frequencies, experimental work, geophysical service, railway communication, scientific expeditions and yachts, portable stations, power-company emergency communications, television, experimental and development work, picture transmission, amateurs, and others.

One of the most difficult problems facing the commission will arise in connection with the determination of the proper policies to apply in the field of point-to-point fixed stations in the commercial field for commercial purposes. There are pending before the commission applications on the part of several large concerns desiring to establish public systems of point-to-point radio communication in the United States, duplicating the wire systems between the larger cities. There are also a large number of applications from more or less private interests desiring to set up a more limited system of communication, such as between chain stores, brokers' offices, mail-order houses and their branches, oil companies, mines, and the like. In some cases the applicants ask for these privileges for use in regions and under circumstances where the present wire systems are inadequate or nonexistent. There are thus brought into conflict two opposing interpretations of public interest, convenience, or necessity. One interpretation is that in general the public-utilities test should be applied to the extent that no applicant be licensed unless it has a legal status which obliges it to serve the entire public on an equal basis; this interpretation leads to the duplication of the existing wire systems with one or more radio systems between the larger cities, the chief advantage to the public being that competition will thus be introduced between wire and radio. The other interpretation argues that radio should be employed primarily for services which can not be duplicated by wire as a practical matter and that preference should be given to such uses in assigning the limited number of channels. The public benefit under this theory is indirect, but may be far-reaching in particular cases; this interpretation is the one which is now being followed by Canada.

The commission also has before it the applications of a substantial number of States, municipalities, and semigovernmental agencies desiring channels for various purposes.

In order to enable the commission to give proper weight to the claims advanced by the various classes of service, a large number of hearings have been arranged for, beginning September 25, 1928. These hearings arise on the particular applications, but have been so

grouped as to bring before the commission at one time all applicants of a particular class. Hearings have already been set up to the middle of December and will undoubtedly continue throughout the remainder of the statutory life of the present commission.

The best engineering talent in the country is and will be engaged in the presentation of the problems to the commission. It is believed that an agreement will be reached with the other North American nations so that licensing on a definite basis can commence. On the other hand, no such emergency exists in this field as exists in the case of the transoceanic channels, since no matter what action may be taken by countries in other continents, all the channels in this band may, generally speaking, be used on this continent. The commission has deemed it advisable, therefore, not to act hurriedly in this field, and desires to lay the foundations of its policy on grounds sufficiently firm to permit of an enduring structure.

AMATEURS

There are 16,926 amateur stations licensed. The radio division of the Department of Commerce has generously cooperated with the commission in the handling of amateur-station licenses.

The international convention authorized each Government to assign certain frequency bands to amateur use. The commission has followed the policy of authorizing amateur use of all such bands. The commission has felt that the amateur has sufficiently demonstrated his usefulness, both in furthering the progress of the science of radio and in furnishing service in times of emergency, to justify a liberal policy with regard to his operation.

CONCLUSION

This report has been permitted to assume substantial proportions because of the fact that the commission has felt it necessary to acquaint Congress with the problems with which it is faced. These problems being largely of a technical nature, it has been necessary to explain them somewhat in detail. Furthermore, because of the rapid developments which are taking place in radio communication, a large number of subjects have had to be covered. The likelihood is that, as the art progresses, radio problems will increase rather than decrease. The possibilities of the high-frequency spectrum are almost without limit. The future of such matters as radiotelevision, picture and facsimile transmission, and relay broadcasting can only be matters for speculation. How soon and to what extent the frequency spectrum above 23,000 kilocycles will be developed for practical use is also a matter of guesswork. To what extent future advances will make possible an increasing number of channels and the accommodation of a larger number of stations is unknown.

The commission is convinced, however, that Congress acted wisely in providing for its standard that of public interest, convenience, or necessity, and it is endeavoring to apply this standard to each new set of problems in a manner consistent with the best interest of the entire public, both present and future.

Respectfully submitted.

FEDERAL RADIO COMMISSION.
CARL H. BUTMAN, *Secretary*.

SUPPLEMENT

to

ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

1928

CONTENTS

The following is a list of the appendixes to the Second Annual Report of the Federal Radio Commission, comprising data, lists, and information believed to be valuable to the Congress of the United States and the citizens interested in radio communication:

SUPPLEMENT TO THE SECOND ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION, 1928

APPENDIX A

General Orders, Nos. 16 to 49, issued by the Federal Radio Commission between July 1, 1927, and October 26, 1928. General Orders, Nos. 1 to 15, inclusive, were published in the First Annual Report of the Federal Radio Commission

General Order No. 16

MUST ANNOUNCE MECHANICAL MUSICAL REPRODUCTIONS

Federal Radio Commission,
Washington, D. C., August 9, 1927.

The Federal Radio Commission finds that while the broadcasting of music performed through the agency of mechanical reproductions, such as records or perforated rolls, is not in itself objectionable, the failure clearly to announce the nature of such broadcasting is in some instances working what is in effect a fraud upon the listening public. The commission, therefore, hereby orders that, effective August 21, 1927, all broadcasts of music performed through the agency of mechanical reproductions shall be clearly announced as such with the announcement of each and every number thus broadcast, and that proved failure to make such announcement shall be deemed by the commission cause for action under section 32 of the radio act of 1927.

E. O. Sykes, *Vice Chairman.*

General Order No. 17

Federal Radio Commission,
Washington, D. C., August 16, 1927.

Resolved, That the Federal Radio Commission hereby authorizes each of its members to visit the zone from which he was appointed at some time between August 20 and October 4, 1927, for the purpose of further observing the actual conditions of radio reception resulting from the new allocation, and finds such observation and investigations to be necessary in the public interest.

Each member of the commission is hereby authorized and empowered, both as commissioner and examiner on this inspection, to take any testimony relating to the stations within his zone at any place therein, with power to swear witnesses, employ stenographers, and incur any other expense necessary to facilitate the taking of this testimony.

General Order No. 18

Federal Radio Commission,
Washington, D. C., October 12, 1927.

For the purpose of bringing the 60-day license periods for broadcasting stations into conformity with the calendar months, all broadcasting licenses dated August 15, 1927, and issued for the period of 60 days to October 14, 1927, except as subsequently modified by Special Orders, Nos. 79 to 128, inclusive, or by later licenses already issued, are hereby extended and continued in force until October 31, 1927, at which time new 60-day licenses will be issued.

Special Orders Nos. 79 to 128, inclusive, remain effective as of the dates specified in such orders and until October 31, 1927, at which time new 60-day licenses will be issued.

GENERAL ORDER No. 19

FEDERAL RADIO COMMISSION,
Washington, D. C., November 14, 1927.

1. Designating band of channels to be cleared of heterodynes; and
2. Providing procedure for clearing heterodyning channels—
(*a*) First, by cooperation between stations now on these channels; and
(*b*) By public hearings to determine which station or stations shall be relicensed January 1 for operation on the channel.

In order to improve radio reception throughout the United States, particularly for the very large audience of rural and remote listeners who are situated far outside of the local service range of any broadcasting station, as well as to reduce generally interference from heterodyning between stations, the Federal Radio Commission hereby designates channels from 600 to 1,000 kilocycles, inclusive, as frequencies to be maintained free from heterodynes or other interference.

Stations now operating on any of the channels so designated which are not free of interference as of December 1 are ordered to clear these channels of heterodyning during the present license period by sharing of time, control of power, control of frequency, or any other method which will eliminate mutual interference on their respective channels.

In the case of each channel not freed of heterodyning by such mutual action between stations now sharing that channel the commission, before the expiration of the present license period, will, as provided by law, call a public hearing at Washington for the purpose of determining which stations, in the public interest, shall be relicensed to continue on the channel so as to preserve it in a clear and nonheterodyning condition.

GENERAL ORDER No. 20

FEDERAL RADIO COMMISSION,
Washington, D. C., November 29, 1927.

Resolved, That the Federal Radio Commission hereby authorizes each of its members to visit the zone from which he was appointed, at some time between November 28, 1927, and February 1, 1928, for the purpose of further observing the actual conditions of radio reception resulting from the new allocations and of the character of programs broadcast and finds such observations and investigations to be necessary in the public interest.

Each member of the commission is hereby authorized and empowered, both as commissioner and examiner on this inspection, to take any testimony relating to the stations within his zone at any place therein, with power to swear witnesses, employ stenographers, and incur any other expense necessary to facilitate the taking of this testimony.

GENERAL ORDER No. 21

FEDERAL RADIO COMMISSION,
Washington, D. C., December 1, 1927.

All existing station broadcasting licenses and renewals are hereby extended until and will terminate on January 31, 1928.

All broadcasting stations will make application for new licenses not later than January 15, 1928. Application forms will be mailed to all existing stations about January 1, 1928.

GENERAL ORDER No. 22

FEDERAL RADIO COMMISSION,
Washington, D. C., January 16, 1928.

All existing station broadcasting licenses and renewals are hereby extended until and will terminate at 3 a. m. March 1, 1928.

FEDERAL RADIO COMMISSION.

GENERAL ORDER No. 23

FEDERAL RADIO COMMISSION,
Washington, D. C., February 20, 1928.

All existing licenses to broadcast, subject to such modifications and extensions as may be appended thereto, are hereby further extended for 30 days, to terminate at 3 a. m., April 1, 1928, unless otherwise modified.

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

GENERAL ORDER No. 24

FEDERAL RADIO COMMISSION,
Washington, D. C., March 7, 1928.

For the purpose of clarifying the amateur situation, the Federal Radio Commission has adopted the following definition and regulation:

"An amateur station is a station operated by a person interested in radio technique solely with a personal aim and without pecuniary interest. Amateur licenses will not be issued to stations of other classes."

In accordance with the channels designated for amateur use under the new International Radiotelegraph Convention, the Federal Radio Commission has opened for amateur use the new additional band between 30,000 and 28,000 kilocycles or 9.99 and 10.71 meters. The radio division of the Department of Commerce is hereby authorized to open this band immediately for amateur use.

The Federal Radio Commission has revised the list of radiotelephone bands open for amateur operation to read as follows:

64,000 to 56,000 kilocycles, or 4.69 to 5.35 meters.
3,550 to 3,500 kilocycles, or 84.5 to 85.7 meters.
2,000 to 1,715 kilocycles, or 150 to 175 meters.

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

GENERAL ORDER No. 25

FEDERAL RADIO COMMISSION,
Washington, D. C., March 27, 1928.

All existing licenses to broadcast, subject to such modifications and extensions as may be appended thereto, are hereby further extended for 30 days, to terminate at 3 a. m., May 1, 1928, unless otherwise modified.

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

GENERAL ORDER No. 26

FEDERAL RADIO COMMISSION,
Washington, D. C., March 27, 1928.

All licenses covering coastal, point-to-point, technical and training, experimental, ship, and amateur radio transmitting stations extended by the Federal Radio Commission's General Orders 1 and 3, dated March 15 and March 29, 1927, respectively, are hereby terminated on August 31, 1928.

Applications for new licenses or renewals in these classes must be filed with the Federal Radio Commission not later than July 31, 1928, through the supervisors of radio of the Department of Commerce, unless already filed.

All formal licenses in these classes issued by the Federal Radio Commission for definite periods subsequent to General Orders 1 and 3 are not affected by this order.

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

GENERAL ORDER No. 27

FEDERAL RADIO COMMISSION,
Washington, D. C., April 20, 1928.

All existing licenses to broadcast, subject to such modifications and extensions as may be appended thereto, are hereby further extended for 30 days, to terminate at 3 a. m., June 1, 1928, unless otherwise modified.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 28

FEDERAL RADIO COMMISSION,
Washington, D. C., April 20, 1928.

Under the radio law of 1928, approved by the President March 28, 1928, it is specified that "Allocations shall be charged to the State, District, Territory, or possession wherein the studio of the station is located and not where the transmitter is located."

In this particular it is hereby ordered that no broadcasting station shall move its studio outside of the borders of the State, District, Territory, or possession in which it is located without first making written application to the commission for authority to so move its studio and securing written permission from the commission for such removal. This order does not apply to transfers or removals of studios within the borders of the same State, District, Territory, or possession.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 29

FEDERAL RADIO COMMISSION,
Washington, D. C., May 9, 1928.

It is ordered that a public hearing be held on May 14, 1928, at 10 a. m., at the quarters of the commission, on all applications for public-service licenses in the transoceanic field, and that public announcement be made of this hearing, and that all applicants of the classification referred to be notified to attend and present testimony.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 30

FEDERAL RADIO COMMISSION,
Washington, D. C., May 10, 1928.

It is hereby ordered by the Federal Radio Commission that no licenses or renewal or extension of existing licenses will be issued to portable broadcasting stations after July 1, 1928, and that on that date all portable broadcasting stations will cease operations.

Adopted this 10th day of May, 1928.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 31

FEDERAL RADIO COMMISSION,
Washington, D. C., May 11, 1928.

The Federal Radio Commission calls to the attention of all broadcasting stations section 18 of the radio act of 1927, which reads as follows:

"If any licensee shall permit any person who is a legally qualified candidate for any public office to use a broadcasting station, he shall afford equal opportunities to all other such candidates for that office in the use of such broad-

casting station, and the licensing authority shall make rules and regulations to carry this provision into effect: *Provided*, That such licensee shall have no power of censorship over the material broadcast under the provisions of this paragraph. No obligation is hereby imposed upon any licensee to allow the use of its station by any such candidate."

Any violation of this section of the act will be considered as sufficient ground for the revocation or denial of a radiobroadcasting license.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 32

FEDERAL RADIO COMMISSION,
Washington, D. C., May 25, 1928.

The commission, after an examination of the applications for renewal of station licenses of the below-named stations, has not been satisfied that public interest, convenience, or necessity will be served by granting these applications.

It extends for a period of 60 days the existing licenses of these stations, subject to all modifications and extensions, to terminate at 3 o'clock a. m., August 1, 1928.

The commission fixes Monday, July 9, 10 o'clock a. m., in its offices in Washington, D. C., as the time and place for a hearing for each of these applications.

The stations to which this order applies are as follows:[1]

To Station ——— and others.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 33

FEDERAL RADIO COMMISSION,
Washington, D. C., May 25, 1928.

All existing licenses to broadcast, subject to such modifications and extensions heretofore made, are hereby further extended for 60 days, to terminate at 3 a. m. August 1, 1928, unless otherwise modified.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 34

FEDERAL RADIO COMMISSION,
Washington, D. C., May 25, 1928.

It is hereby ordered that the existing licenses to all portable broadcasting stations, together with modifications thereof, be extended to July 1, 1928, and will expire at 3 a. m. July 1, 1928.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 35

FEDERAL RADIO COMMISSION,
Washington, D. C., July 25, 1928.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on July 25, 1928—

It is ordered that, with the exceptions hereinafter set forth, all existing licenses to broadcast, subject to such modifications and extensions as may be appended thereto, be, and the same are hereby, further extended for a period of 31 days, to terminate at 3 o'clock a. m., eastern standard time, September 1, 1928

---

[1] See Appendix F (2).

This order shall not apply, and no extension of any existing license to broadcast shall be deemed to be granted, with respect to—

1. Any broadcasting station listed in, or later made subject to, General Order No. 32 of this commission, issued on May 25, 1928, the continued use or operation of such station to be subject to such order or orders as the commission may hereafter enter.

2. Any broadcasting station that has heretofore surrendered its license.

3. Any broadcasting station with respect to which there has not been heretofore duly filed with this commission an application for renewal of its existing license.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 36

FEDERAL RADIO COMMISSION,
Washington, D. C., July 26, 1928.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on July 26, 1928—

This order is issued with reference to all broadcasting stations listed in, or later made subject to, General Order No. 32 of this commission, issued on May 25, 1928, excepting the following:

1. Those stations with respect to which pending applications for renewal of licenses have been denied by the commission, such stations having in each case been so notified by order dated July 25, 1928.

2. Those stations that have heretofore surrendered their licenses.

3. Those stations with respect to which there have not been heretofore duly filed with this commission applications for renewal of their existing licenses.

It is ordered that all existing licenses to broadcast of all broadcasting stations listed in, or later made subject to, General Order No. 32 (other than those above excepted) be, and the same are hereby, further extended for a period of 31 days, to terminate at 3 o'clock a. m., eastern standard time, September 1, 1928, subject, however—

1. To such modifications as may heretofore have been appended thereto; and

2. To the condition that this order shall not be deemed or construed as a finding or decision by the commission, or as any evidence whatsoever, that the continued use or operation of any of said broadcasting stations serves, or will serve, public interest, convenience, or necessity, or that public interest, convenience, or necessity would be served by the granting of any pending application for a renewal of license to broadcast with respect to such station, and any licensee subject to this order who shall continue to use or operate a broadcasting station during the period covered by this order shall be deemed to have assented to said condition.

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 37

FEDERAL RADIO COMMISSION,
Washington, D. C., August 22, 1928.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on August 22, 1928—

It is ordered, That in every case where the commission, upon examination of any application for a construction permit, for a station license, for a renewal of a station license, or for modification of a station license, does not reach a decision that public interest, convenience, or necessity would be served by the granting of such application—

1. The secretary of the commission shall forthwith notify the applicant to that effect and shall at the same time notify the applicant of the time and place for a hearing on such application, the time and place to be fixed as hereinafter directed.

2. Unless the commission shall specifically provide otherwise, the place for such hearing shall be at the office of the commission at Washington, D. C.

3. Unless the commission shall specifically provide otherwise, the time for such hearing shall be at the hour of 10 o'clock a. m., on the first Tuesday falling after the lapse of a period of 20 days from the date on which the secretary shall mail such notification to such applicant.

4. No applicant will be heard unless 10 days or more prior to the date set for such hearing he shall have communicated to the secretary a written notice of his desire to be heard by the commission, together with a statement of the approximate time which, in his opinion, the presentation of his case will require. Said notice and said statement may be communicated to the secretary by telegraph.

5. Hearings shall commence at the hour of 10 o'clock a. m. on Tuesday of each week and shall continue throughout the week until the cases set for each Tuesday have all been heard, continued, or otherwise disposed of.

6. Every applicant desiring a continuance of the hearing on his application shall, not later than the day prior to that on which such hearing is set, deliver to the secretary a written motion to that effect (which motion may be made by telegraph), accompanied by a brief statement of his reasons in support of such motion. Such motion may be granted or denied by any member of the commission, or if none of them is present at the office of the commission, then by the secretary; each action with respect to such a motion shall be reported to the commission at its first meeting following such action.

7. The commission may, of its own motion, continue any hearing to a later date.

8. Every person desiring that witnesses be summoned or that the production of books, documents, or papers be compelled shall make written application therefor to the secretary on forms to be provided by the secretary on request.

9. Evidence may be heard by any one or more of the members of the commission. Where a hearing takes place before less than a quorum (i. e., three) of the commission, the applicant shall, upon request duly made in the record, be entitled to present argument in support of his application before a quorum of the commission.

10. Each case will be given a docket number and, so far as possible, such docket number shall be noted on all correspondence, papers, or motions having to do with such case.

IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 38

FEDERAL RADIO COMMISSION,
Washington, D. C., August 22, 1928.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on August 22, 1928—

It is ordered, That with the exception hereinafter set forth all existing licenses to broadcast, subject to such modifications and extensions as may be appended thereto, be, and the same are hereby, further extended for a period of 30 days, to terminate at 3 o'clock a. m., eastern standard time, October 1, 1928.

This order shall not apply, and no extension of any existing license to broadcast shall be deemed to be granted, with respect to any broadcasting station listed in, or later made subject to, General Order No. 32 of this commission, issued on May 25, 1928, the continued use or operation of such station to be subject to such order or orders as the commission may hereafter enter.

[SEAL.]

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 39

FEDERAL RADIO COMMISSION,
Washington, D. C., August 22, 1928.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on August 22, 1928—

It is ordered, That all existing licenses covering coastal, point-to-point, technical and training, experimental, ship, and amateur radio transmitting stations, heretofore extended by the commissions' General Orders 1, 3, and 26,

be, and the same are hereby, further extended for a period of 61 days, to terminate at 3 o'clock a. m., eastern standard time, November 1, 1928. This order, however, is subject to the conditions that it shall not be deemed or construed as a finding or decision by the commission or as any evidence whatsoever that the continued use or operation of any of said stations serves, or will serve, public interest, convenience or necessity, or that public interest, convenience, or necessity would be served by the granting of any pending application for a renewal of any of said licenses; and any licensee subject to this order who continues to use or operate his station during the period covered by this order shall be deemed to have consented to said conditions.

This order shall not apply to any licenses heretofore issued by this commission for periods of time which have not expired, all licensees in such cases to be governed by the terms and conditions of their respective licenses.

[SEAL.]

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

GENERAL ORDER No. 40

FEDERAL RADIO COMMISSION.
Washington, D. C., August 30, 1928.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on August 30, 1928—

The commission has determined that the definite assignment of a band of frequencies for broadcasting, the maintenance of a separation of 10 kilocycles between frequencies used in broadcasting, the reservation of certain frequencies for exclusive use by stations in the Dominion of Canada, and the setting aside of a certain number of other frequencies for shared use by the United States and the Dominion of Canada, all as hereinafter specified in this order, will serve public interest, convenience, or necessity.

The commission has further determined after careful consideration that the allocation of frequencies, of time for operation and of station power, for use by broadcasting stations, to the respective zones, as hereinbelow specified in this order—

(*a*) Is necessary in order to comply in part with the requirements of section 9 of the radio act of 1927, as amended by section 5 of the act of Congress, March 28, 1928, in so far as it requires that the licensing authority shall as nearly as possible, make and maintain an equal allocation of bands of frequency or wave lengths, of periods of time for operation, and of station power, to each of the zones when and in so far as there are applications therefor; and

(*b*) Will promote public interest and convenience and will serve public necessity, in so far as this can be done in a manner consistent with the requirements of said section 9 of the radio act of 1927 as amended by section 5 of the act of Congress, March 28, 1928, and will greatly improve reception conditions in the broadcast band by the elimination of a large portion of the interference which now exists—

It is therefore ordered:

PARAGRAPH 1. That a band of frequencies extending from 550 to 1,500 kilocycles, both inclusive, be, and the same is hereby, assigned to and for the use of broadcasting stations, said band of frequencies being hereinafter referred to as the broadcast band. This order is not to be construed as prohibiting the licensing of maritime mobile services on the frequency of 1,365 kilocycles, as provided by the International Radiotelegraph Convention of 1927.

PAR. 2. That within said broadcast band a separation of 10 kilocycles be maintained between the frequencies assigned for use by broadcasting stations.

PAR. 3. That of the frequencies within said broadcast band (*a*) the frequencies of 690, 730, 840, 910, 960, and 1,030 kilocycles be, and the same are hereby, reserved for use by broadcasting stations located in the Dominion of Canada and shall not be assigned to any broadcasting station licensed by this commission; (*b*) the frequencies of 580, 600, 630, 780, 880, 890, 930, 1,010, 1,120, 1,200 and 1,210 kilocycles be, and the same are hereby, set aside for simultaneous use by broadcasting stations located both in the Dominion of Canada and in the United States, its Territories and possessions, and no station will be authorized by this commission on any of these frequencies with an authorized power which will cause interference at the boundary line between the Dominion of Canada

and the United States of America, or in excess of 500 watts at any place within the United States of America or the Territories of Alaska and Porto Rico.

PAR. 4. That the frequencies within said broadcast band (subject to the foregoing) and periods of time for operation and station power to be used by broadcasting stations on said frequencies be, and the same are hereby, allocated equally to the zones as follows:

A. The following frequencies are allocated to the first, second, third, fourth, and fifth zones, respectively, as below indicated, for use by broadcasting stations, the amount of power to be used by such stations to be determined by further order of the commission:

First zone: 660, 710, 760, 860, 990, 1,060, 1,100, and 1,150 kilocycles.
Second zone: 700, 750, 820, 980, 1,020, 1,070, 1,110, and 1,170 kilocycles.
Third zone: 650, 740, 800, 850, 1,040, 1,080, 1,140, and 1,190 kilocycles.
Fourth zone: 670, 720, 770, 810, 870, 1,000, 1,090, and 1,160 kilocycles.
Fifth zone: 640, 680, 790, 830, 970, 1,050, 1,130, and 1,180 kilocycles.

B. The following frequencies are allocated each for use by not less than two zones, with broadcasting stations in those zones being permitted to operate simultaneously, each station to have an authorized power not to exceed 5 kilowatts, the particular zone entitled to share in the allocation of any particular frequency to be determined by further order of the commission: 1,460, 1,470, 1,480, and 1,490 kilocycles.

C. The following frequencies are allocated for use by not less than two nor more than three zones, the broadcasting stations in those zones being permitted to operate simultaneously, and to have an authorized power not to exceed 1,000 watts, the particular zones entitled to share in the allocation of any particular frequency to be determined by further order of the commission: 580, 590, 600, 610, 620, 630, 780, 880, 890, 900, 920, 930, 940, 950, 1,010, 1,120, 1,220, 1,230, 1,240, 1,250, 1,260, 1,270, 1,280, 1,290, 1,300, 1,320, 1,330, 1,340, 1,350, 1,360, 1,380, 1,390, 1,400, 1,410, and 1,430 kilocycles.

(Except that in those cases where the station locations and powers are such that interference will not be caused four or five zones instead of three zones may share one or more of the foregoing frequencies where practicable.)

D. The following frequencies are allocated for use in all five zones with broadcasting stations permitted to operate simultaneously, each station to have an authorized power not to exceed 1,000 watts: 550, 560, 570, 1,440, and 1,450 kilocycles.

E. The following frequencies are allocated for use in all five zones by broadcasting stations in simultaneous operation with an authorized power not to exceed 100 watts, the number of such stations to be permitted to operate simultaneously in each zone on each of said frequencies to be determined by further order of the commission: 1,200, 1,210, 1,310, 1,370, 1,420, and 1,500 kilocycles.

F. Whenever the word "frequency" is used in the preceding subparagraphs A, B, C, D, and E of this paragraph it is to be understood as connoting periods of full-time operation—that is to say, 24 hours daily—and every allocation herein of a frequency to a particular zone is to be considered as carrying with it an assignment of full-time operation on that frequency to that zone.

PAR. 5. That the allocation hereinbefore ordered in paragraph 4 of this order be, and the same is hereby declared to be, effective on October 1, 1928, at the hour of 3 o'clock a. m., eastern standard time, and that the provisions of paragraphs 1, 2, and 3 be, and the same are hereby declared to be, effective as of the date of the issuance of this order.

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman*.

STATEMENT TO ACCOMPANY GENERAL ORDER NO. 40

FEDERAL RADIO COMMISSION,
Washington, D. C., August 30, 1928.

General Order No. 40, issued yesterday by the Federal Radio Commission, supplies the official basis for an adjustment in the assignment of the country's broadcasting facilities, under a plan which it is believed will provide an improved standard of radio recepton generally and also distribute the broadcasting channels, powers, and periods of time on the air equally among the five radio zones as directed by the last Congress.

The plan provides for full-time assignments for 100-watt stations equaling in number the total of all other classes of broadcasters put together.

Of the 74 channels made available for high-grade reception, 34 will be assigned for regional service, permitting 125 full-time positions for this type of station, and 40 channels will be assigned to stations with minimum power of 5,000 watts and a maximum to be determined by the commission and announced with the allocation. On these 40 channels only one station will be permitted to operate at any time during night hours, thus insuring clear reception of the station's program up to the extreme limit of its service range. These 40 channels will be assigned eight to each of the five zones, thus insuring wide geographical distribution of the country's higher-power broadcasting facilities to all sections.

On the 34 channels shared by regional stations, ranging in power from 250 to 1,000 watts and assigned 2, 3, or 4 per channel, spacings generally of 1,000 to 1,500 miles have been observed.

Throughout the whole allocation wide geographical spacings have been observed between stations on adjoining channels in order to eliminate objectionable "cross talk."

Summarizing, for "local" stations of 50 to 100 watt ratings 150 full-time positions have been provided, or 30 per zone; 125 regional positions have been provided for 250 to 1,000 watt stations; and 40 positions for stations of 5,000 watts and above. Each full-time assignment available for night use in many instances is shared by two or more stations or transmitters, depending upon the number of licensed stations to be accommodated in the zone or locality.

Recapitulating by zones, the equal division of the foregoing facilities among the five zones will provide each zone with eight full-time assignments for stations of 5,000 watts and above, 24 positions for 500-watt and 1,000-watt stations, and 30 positions for 50-watt and 100-watt stations.

In announcing this plan the commission does so realizing that it may have imperfections, but believes it an approach to an ideal situation which may be reached in the future.

GENERAL ORDER No. 41

FEDERAL RADIO COMMISSION,
Washington, D. C.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on September 4, 1928—

It is ordered that a daytime broadcasting station is hereby defined as a station which under its license from this commission is permitted to operate only during certain designated hours during the daytime and is not permitted to operate at any time when its operation will cause heterodyne interference with other broadcasting stations assigned to the same frequency.

No daytime station will be permitted to operate after the average time for sunset during any particular month, to be determined from time to time by the chief engineer of the commission. The time of such sunset shall be taken with reference to the location of the transmitter of the daytime broadcasting station unless it is the farthest east of the stations assigned to the same frequency; in this event the time shall be taken with reference to the location of the transmitter of the nearest broadcasting station on the same frequency located to the west of such daytime broadcasting station.

[SEAL.] FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 42

FEDERAL RADIO COMMISSION,
Washington, D. C.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on September 7, 1928—

It is ordered, 1. That, except as hereinafter stated, no broadcasting station assigned to any of the frequencies set forth in subparagraph A of paragraph 4

of General Order No. 40 be authorized to use in excess of 25 kilowatts until further order of the commission.

2. That, for the purpose of determining by experiment whether interference will result from the use of a greater amount of power, the commission may authorize the use of not more than 50 kilowatts power by any of such broadcasting stations for the next license period beginning after the date of this order.

3. That, for experimental purposes, the commission may authorize the use of any amount of power in excess of 50 kilowatts, in equal amounts for each zone, by such broadcasting stations at such hours between midnight and morning as may be determined by the commission.

4. That the commission may authorize the use of an amount of power not in excess of twice that above set forth in paragraphs 1 and 2 by the broadcasting stations therein referred to, respectively, for daytime operation only, the exact hours to be determined by the commission.

5. That nothing stated in this order shall be construed as giving any broadcasting station any right or claim to an of the maximum amounts of power hereinabove set forth or to any amount of power in excess of the amount which the commission shall from time to time in each case find best calculated to serve public interest, convenienve, or necessity.

[SEAL.]

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

Attest:
CARL H. BUTMAN.

TO ACCOMPANY GENERAL ORDER NO. 42

FEDERAL RADIO COMMISSION,
Washington, D. C., September 11, 1928.

To all persons holding licenses to broadcast:

The commission has found that certain changes in the frequencies, authorized power, and time of operation of existing broadcasting stations will promote public convenience and interest and will serve public necessity. It has further found that these changes are necessary in order to comply in part with the requirements of section 9 of the radio act of 1927, as amended by section 5 of the act of Congress of March 28, 1928. and with the requirements of General Order No. 40 heretofore issued by the commission on August 30, 1928. These changes are all indicated on the attached list of broadcasting stations.

The list includes certain new stations which have heretofore filed applications for construction permits or for licenses. It also includes increased power assignments to certain existing stations which have applied therefor. In both cases each application has been from a zone, or from a State within a zone, which is below its quota in number of broadcasting licenses, in number of frequencies, in the amount of station power, or in periods of time for operation, and the commission has granted such applications, after first examining them and determining in each case that public interest, convenience, or necessity would be served thereby.

The new allocation is to become effective on November 11, 1928. at the hour of 3 o'clock a. m., eastern standard time. This announcement is not to be construed as a renewal of any existing station license; it is to apply solely to those stations which shall be in existence at the time it goes into effect, whether by reason of renewals of existing licenses or by reason of further extensions of existing licenses or otherwise.

It is the intention of the commission to issue renewal licenses to most of the existing broadcasting stations listed in the attached list on or shortly after October 12, 1928, said licenses to be for a period of 90 days, commencing on November 11, 1928. These licenses will correspond to the data on the attached list with respect to the frequency, the authorized power, and the hours of operation to be assigned to the respective stations. They can not be issued prior to that date because of a provision in the radio act of 1927 forbidding the granting of a renewal of an existing station license more than 30 days prior to the expiration of the original license. The existing licenses are being extended by order of the commission for 42 days from October 1, 1928, to terminate on November 11, 1928, at the hour of 3 o'clock a. m., eastern standard time. This extension of time prior to the effective date of the reallocation will give all broadcasting

stations an opportunity to take such steps as may be necessary to enable them to conform to their new assignment, and also to ask for and obtain from the commission hearings in cases where the assignments are not satisfactory. In a limited number of cases where the commission is not satisfied that public interest, convenience, or necessity would be served by the granting of renewal licenses to existing broadcasting stations the commission will so notify the licensees and hearings will be held before renewals will be granted.

It is the desire of the commission that any broadcasting station which is dissatisfied with its assignment under the reallocation should have an opportunity to be heard and to demonstrate that public interest, convenience, or necessity would be served by a better assignment. In fairness to the stations affected the commission believes that these hearings should, so far as possible, take place prior to November 11, 1928, the effective date of the reallocation. The commission will therefore entertain and accord a hearing on all applications asking for a modification of the renewal licenses, which will be issued on or shortly after October 12, 1928. In order to save time, the commission will permit such applications to be filed prior to that date and will set them for hearing as soon after that date as possible.

All such applications must specify what frequency, power, and/or hours of operation are desired by the applicant; no application will be entertained which fails to comply with this requirement. As soon as the date for hearing is set the commission will notify all broadcasting stations which are directly interested and will give them an opportunity to be heard, as well as the applicant. Where the application is for a change in frequency all broadcasting stations assigned to the requested frequency will be so notified. Where the application is for an increase in power, all broadcasting stations assigned to the frequency on which the proposed increased power is to be used, as well as all stations assigned to adjacent channels that are likely to be affected by the increase, will be so notified. Where the application is for an increase or change in hours of operation, all stations the hours of operation of which would be reduced or changed thereby will be so notified.

Applications should be made on forms to be provided by the commission. It is expected that such forms will be in the hands of the radio supervisors in the near future, but in the meantime they may be obtained by application to the secretary of the commission.

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

GENERAL ORDER No. 43

FEDERAL RADIO COMMISSION,
Washington, D. C.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on September 8, 1928—

It is ordered that, until further order of the commission, no two or more of the broadcasting stations assigned to the frequencies allocated under subparagraph A of paragraph 4 of General Order No. 40 shall, during the period beginning with November 11, 1928, broadcast simultaneously the same identical program for more than one hour daily during the hours between 7 o'clock p. m. and 12 o'clock midnight, local standard time, at the location of the station farthest east, unless—

(*a*) The transmitters of such stations are separated by a distance in excess of 300 miles; or

(*b*) Such stations are operating on the same frequency; or

(*c*) Such stations receive special permission from the commission. This permission will be granted only in the case of programs of extraordinary national interest or of a nature such that public interest, convenience, or necessity would clearly be served by their duplication to a greater extent than is permitted by the foregoing provisions of this order.

All stations participating in a duplication of programs in violation of this order will be held responsible for such violation, as will also any key station from which such duplication of programs proceeds.

[SEAL.]

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 44

FEDERAL RADIO COMMISSION,
Washington, D. C.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on September 8, 1928—

It is ordered that, with the exception hereinafter set forth, all existing licenses to broadcast, subject to such modifications, conditions, and extensions as may be appended thereto, be, and the same are hereby, further extended for a period of 42 days from October 1, 1928, to terminate at 3 o'clock a. m., eastern standard time, November 11, 1928. This order shall not apply, and no extension of any existing license shall be deemed to be granted, with respect to any broadcasting station listed in General Order No. 32, which was ordered to consolidate with any other station, and which shall be notified by the commission prior to October 1, 1928, that its license will not be thus extended.

[SEAL.] FEDERAL RADIO COMMISSION.
By E. O. SYKES, *Acting Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 45

FEDERAL RADIO COMMISSION.
Washington, D. C.

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on September 24, 1928—

For the purpose of permitting broadcasting stations to make such tests as may be necessary to enable them to change to the frequencies assigned to them respectively under the allocation effective on November 11, 1928, and thereafter to maintain said frequency with the degree of accuracy required by the regulations of the commission—

It is ordered that any broadcasting station, the frequency of which has been changed by the new allocation effective on November 11, 1928, be, and it is hereby, permitted, until further order of the commission, to make such tests on its new frequency, provided these tests be conducted at hours when interference will not be caused with the broadcasting of other stations. These tests must be limited to the period between 2 and 7 o'clock a. m., eastern standard time, in the case of stations located east of the Mississippi River, and to the period between 1 and 7 o'clock a. m., mountain standard time, in the case of stations located west of the Mississippi River. Such tests will not be permitted to continue in cases where interference develops. On applications in particular cases, broadcasting stations may obtain leave to make tests and experiments during the daytime if, in the opinion of the commission, interference will not result.

[SEAL.] FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 46

FEDERAL RADIO COMMISSION,
Washington, D. C.

At a session of the Federal Radio Commission held at its office in Washington, D. C., on October 5, 1928—

In order to determine the actual extent of duplication of chain programs on cleared channels, under the reallocation of broadcasting stations, effective November 11, 1928; and

In order that practical experience obtained may indicate the most practical regulatory measures to reduce such duplication:

The Federal Radio Commission hereby postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more

than 300 miles apart, until the end of the next broadcasting-license period, January 31, 1929.

[SEAL.]

FEDERAL RADIO COMMISSION,
By E. O. SYKES, *Acting Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 47

FEDERAL RADIO COMMISSION,
Washington, D. C., October 24, 1928.

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on October 23, 1928—

It is ordered that all existing licenses covering coastal, point-to-point, technical and training, experimental, and ship radio transmitting stations heretofore extended by the commission's General Orders 1, 3, 26, and 39, be, and the same are hereby, further extended for a period of 60 days, to terminate at 3 o'clock a. m., eastern standard time, December 31, 1928. This order, however, is subject to the conditions that it shall not be deemed or construed as a finding or decision by the commission, or as any evidence whatsoever, that the continued use or operation of any of said stations serves, or will serve, public interest, convenience, or necessity, or that public interest, convenience, or necessity would be served by the granting of any pending application for a renewal of any of said licenses; and any licensee subject to this order who continues to use or operate his station during the period covered by this order shall be deemed to have consented to said conditions.

This order is only subject to the following exceptions:

(1) It shall not apply to any licenses heretofore issued by this commission (as distinguished from licenses issued by the Department of Commerce prior to the establishment of the commission under the radio act of 1927, approved on February 23, 1927), all licenses in such cases to be governed by the terms and conditions of their respective licenses from the commission.

(2) It shall also not apply to any existing license for a renewal of which no application shall have been filed prior to November 1, 1928.

[SEAL.]

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 48

FEDERAL RADIO COMMISSION,
Washington, D. C., October 24, 1928.

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on October 22, 1928—

A limited-time broadcasting station is hereby defined as a station which, under its license from this commission, is permitted to operate during hours allowed daytime broadcasting stations as specified in General Order No. 41, and in addition during certain time temporarily not used by the unrestricted station or stations on the same frequency. An example is the use of late evening hours by a limited-time broadcasting station in the West after the closing of an eastern station on the same frequency.

A limited-time broadcasting station desiring to operate after sunset shall so notify the commission, which will ascertain what hours the use of which is not desired by the unrestricted station or stations on the same frequency, and will thereafter authorize the operation of the limited-time station accordingly, subject, however, to the right of said unrestricted station or stations to reclaim the use of such hours upon reasonable notice to the commission and to the limited-time broadcasting station.

A limited-time broadcasting station will not be permitted to operate at any time when its operation will cause heterodyne interference with other broadcasting stations assigned to the same frequency.

[SEAL.]

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

GENERAL ORDER No. 49

FEDERAL RADIO COMMISSION,
Washington, D. C.

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on October 26, 1928—

All broadcasting stations shall announce clearly and distinctly the character of all mechanical reproductions broadcast by them, the announcement to precede each such program item. In such announcements each phonograph record used, whatever its character, shall be described as a "phonograph record"; each piano-player selection used shall be described as played by "mechanical piano player"; every other mechanical reproduction shall be similarly described by the term generally used and understood by the public as meaning such mechanical reproduction.

[SEAL.]

FEDERAL RADIO COMMISSION,
By IRA E. ROBINSON, *Chairman.*

Attest:
CARL H. BUTMAN, *Secretary.*

APPENDIX B

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)

Call letters	Location	Frequency	Power
WAAD	Cincinnati, Ohio	1,120	25
WAAF	Chicago, Ill. (divides time with WBBM, WJBT, and WPCC)	770	500
WAAM	Newark, N. J. (divides time with WGBB)	860	500
WAAT	Jersey City, N. J. (divides time with WGBB, WSOM)	1,220	300
WAAW	Omaha, Nebr. (before 7 p. m. only)	800	500
WABC	Richmond Hill, N. Y. (divides time with WBOQ)	920	2,500
WABF	Pringleboro, Pa	1,460	250
WABI	Bangor, Me	770	100
WABO	Rochester, N. Y. (divides time with WHDC)	1,290	100
WABQ	Philadelphia, Pa	1,150	500
WABR	Toledo, Ohio (divides time with WTAL)	1,070	50
WABW	Wooster, Ohio	1,210	50
WABY	Philadelphia, Pa. (divides time with WFKD)	1,210	50
WABZ	New Orleans, La	1,210	50
WADC	Akron, Ohio	1,010	500
WAFD	Detroit, Mich. (divides time with WTHO)	1,370	250
WAGM	Royal Oak, Mich	1,330	50
WAGS	Somerville, Mass	1,390	5
WAIT	Taunton, Mass	1,400	10
WAIU	Columbus, Ohio (divides time with WEAO)	1,060	5,000
WALK	Willow Grove, Pa	1,490	50
WAMD	Minneapolis, Minn	1,330	500
WAPI	Auburn, Ala	920	1,000
WARS	Brooklyn, N. Y. (divides time with WSDA, WBBC)	1,320	500
WASH	Grand Rapids, Mich	1,170	250
WBIS	Boston, Mass. (daytime only)	990	100
WATT	Boston, Mass	1,490	100
WBAA	West Lafayette, Ind. (divides time with WRM)	1,100	500
WBAK	Harrisburg, Pa. (divides time with WPSC)	1,000	500
WBAL	Baltimore, Md	1,050	3,000
WBAO	Decatur, Ill	1,120	100
WBAP	Fort Worth, Tex. (divides time with WFAA)	600	1,500
WBAW	Nashville, Tenn	1,210	100
WBAX	Wilkes-Barre, Pa. (divides time with WBRE)	1,200	100
WBBC	Brooklyn, N. Y. (divides time with WARS, WSDA)	1,320	500
WBBL	Richmond, Va	1,210	100
WBBM	Chicago, Ill. (divides time with WJBT, WAAF, and WPCC)	770	1,000
WBBP	Petoskey, Mich	1,250	100
WBBR	Rossville, N. Y. (divides time, sharing one-half with WJBI and WEBJ).	1,170	1,000
WBBW	Norfolk, Va	1,270	50
WBBY	Charleston, S. C	600	75
WBBZ	Chicago, Ill. (portable)	1,470	100
WBCN	Chicago, Ill. (divides time with WENR)	1,040	250
WBES	Tacoma Park, Md	1,010	100
WBET	Boston, Mass	1,130	500
WBKN	Brooklyn, N. Y. (divides time with WWRL, WBMS, and WIBI).	1,120	100
WBMS	Union City, N. J. (divides time with WBKN, WWRL, and WIBI).	1,120	100

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
WBMH	Detroit, Mich	1,420	100
WBNY	New York, N. Y (divides time with WHAP and WMSG)	1,270	500
WBOQ	Richmond Hill, N. Y. (divides time with WABC)	920	500
WBRC	Birmingham, Ala	1,230	250
WBRE	Wilkes-Barre, Pa. (divides time with WBAX)	1,200	100
WBRL	Tilton, N. H	1,200	500
WBRS	Brooklyn, N. Y (divides time with WCDA, WCGU, WRST)	1,420	100
WBSO	Wellesley Hills, Mass. (divides time with WDWF)	780	100
WBT	Charlotte, N. C	1,160	[3] 1,000 [2] 500
WBZ	Springfield, Mass	900	15,000
WBZA	Boston, Mass	900	500
WCAC	Mansfield, Conn. (divides with WDRC)	1,090	500
WCAD	Canton, N. Y	820	500 [3] 1,000
WCAE	Pittsburgh, Pa	580	500
WCAH	Columbus, Ohio	560	250
WCAJ	Lincoln, Nebr	860	500
WCAL	Northfield, Minn. (divides time with KFMX)	1,270	500
WCAM	Camden, N. J	1,340	500
WCAO	Baltimore, Md. (divides time with WCBM)	780	250
WCAT	Rapid City, S. Dak	1,210	100
WCAU	Philadelphia, Pa	1,080	500
WCAX	Burlington, Vt	1,180	100
WCAZ	Carthage, Ill	880	50
WCBA	Allentown, Pa. (divides time with WSAN)	1,350	100
WCBD	Zion, Ill. (divides time with WLS)	870	5,000
WCBE	New Orleans, La	1,320	5
WCBH	Oxford, Miss	1,240	100
WCBM	Baltimore, Md. (divides time with WCAO)	780	100
WCBR	Providence, R. I. (portable)	1,400	100
WCBS	Springfield, Ill	1,430	250
WCCO	Minneapolis, Minn	740	[3] 7,500 [4] 5,000
WCDA	Brooklyn, N. Y. (Cliffside, N. J., divides time with WRST, WBRS, WCGU).	1,420	250
WCFL	Chicago, Ill. (divides time with WLTS)	620	1,500
WCGU	Coney Island, N. Y. (divides time with WCDA, WBRS, WRST).	1,420	500
WCLO	Camp Lake, Wis	1,320	100
WCLS	Joliet, Ill. (divides time with WKBB)	1,360	150
WCMA	Culver, Ind	1,160	250
WCOA	Pensacola, Fla	1,200	500
WCOC	Columbus, Miss	1,300	100
WCOM	Manchester, N. H	1,260	100
WCOT	Olneyville, R. I. (divides time with WFCI)	1,330	50
WCRW	Chicago, Ill. (divides time with WFKB)	1,340	500
WCSH	Portland, Me	830	500
WCSO	Springfield, Ohio	1,170	500
WCWK	Fort Wayne, Ind. (divides time with WOWO)	1,310	500
WCWS	Danbury, Conn. (divides time with WICC)	1,400	100
WDAD-WLAC	Nashville, Tenn	1,330	500 [1] 1,000
WDAE	Tampa, Fla	1,120	500
WDAF	Kansas City, Mo	810	1,000
WDAG	Amarillo, Tex	1,140	250
WDAH	El Paso, Tex	1,280	100
WDAY	Fargo, N. Dak	830	250
WDBJ	Roanoke, Va	1,300	250
WDBK	Cleveland, Ohio (divides time with WJAY)	1,320	250
WDBO	Winter Park, Fla	1,040	500 [3] 1,000
WDBZ	Kingston, N. Y. (divides time with WOKO)	1,390	50
WDEL	Wilmington, Del	1,130	100
WDGY	Minneapolis, Minn. (divides time with WRHM)	1,150	500
WDOD	Chattanooga, Tenn	1,220	500
WDRC	New Haven, Conn. (divides time with WCAC)	1,090	250
WDWF	Cranston, R. I. (divides time with WBSO)	800	500
WDWM	Asbury Park, N. J	830	500
WDZ	Tuscola, Ill. (daytime only)	1,080	100
WEAF	New York, N. Y	610	5,000
WEAI	Ithaca, N. Y	620	250
WEAM	North Plainfield, N. J. (divides time with WOAX)	1,250	250
WEAN	Providence, R. I	940	500
WEAO	Columbus, Ohio (divides time with WAIU)	1,060	750
WEAR	Cleveland, Ohio (divides time with WTAM)	750	1,000
WEBC	Superior, Wis	1,240	250
WEBE	Cambridge, Ohio	1,210	10
WEBH	Chicago, Ill. (divides time with WJJD)	820	2,000

[1] 7 a. m. to 7 p. m. [2] After 7 p. m. [3] 6 a. m. to 6 p. m. [4] After 6 p. m.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letter	Location	Frequency	Power
WEBJ	New York, N. Y. (shares one-fourth time with WJBI and WBBR).	1,170	500
WEBQ	Harrisburg, Ill.	1,340	15
WEBR	Buffalo, N. Y.	1,240	200
WEBW	Beloit, Wis.	1,160	500
WEDC	Chicago, Ill. (divides time with WGES)	1,240	500
WEEI	Boston, Mass.	670	500
WEHS	Evanston, Ill.	1,390	100
WEMC	Berrien Springs, Mich. (divides time with WSBT)	1,260	1,000
WENR	Chicago, Ill. (divides time with WBCN)	1,040	500
WEPS	Gloucester, Mass.	1,010	100
WEW	St. Louis, Mo.	850	1,000
WFAA	Dallas, Tex. (divides time with WBAP)	600	500
WFAM	St. Cloud, Minn.	1,190	10
WFBC	Knoxville, Tenn.	1,280	50
WFBE	Cincinnati, Ohio	1,220	250
WFBG	Altoona, Pa.	1,070	100
WFBJ	Collegeville, Minn.	1,100	100
WFBL	Syracuse, N. Y.	1,160	750
WFBM	Indianapolis, Ind.	1,330	250
WFBR	Baltimore, Md.	1,330	100
WFBZ	Galesburg, Ill. (divides time with WRAM)	1,210	50
WFCI	Pawtucket, R. I. (divides time with WCOT)	1,330	50
WFDF	Flint, Mich.	860	100
WFHH	Clearwater, Fla.	820	500
WFI	Philadelphia, Pa. (divides time with WLIT)	740	500
WFIW	Hopkinsville, Ky.	1,070	[3] 1,000 [4] 500
WFKB	Chicago, Ill. (divides time with WCRW)	1,340	500
WFKD	Philadelphia, Pa. (divides time with WABY)	1,210	10
WFLA	Boca Raton, Fla.	1,410	1,000
WFRL	Brooklyn, N. Y. (divides time with WKBQ, WKBO)	1,370	250
WGAL	Lancaster, Pa. (divides time with WKJC)	1,190	15
WGBB	Freeport, N. Y. (divides time with WAAT, WSOM)	1,220	400
WGBC	Memphis, Tenn.	1,080	15
WGBF	Evansville, Ind.	1,270	250
WGBI	Scranton, Pa. (divides time with WQAN)	1,300	250
WGBS	Astoria, Long Island, N. Y. (divides time with WAAM)	860	500
WGCP	Newark, N. J. (divides time with WNJ)	1,070	500
WGES	Chicago, Ill. (divides time with WEDC)	1,240	500
WGHP	Mount Clemens, Mich.	940	750
WGL	New York, N. Y. (1,000 watts 7 a. m. to 1 p. m.) (divides time with WODA).	1,020	500
WGM	Jeannette, Pa.	1,440	50
WGMU	New York, N. Y. (portable; divides time with WRMU)	1,490	100
WGN	Chicago, Ill. (divides time with WLIB)	980	15,000
WGR	Buffalo, N. Y.	990	750
WGST	Atlanta, Ga. (divides time with WMAZ)	1,110	500
WGWB	Milwaukee, Wis.	1,370	500
WGY	Schenectady, N. Y. (divides time with WHAZ)	790	30,000
WHA	Madison, Wis. (divides time with WLBL)	940	750
WHAD	Milwaukee, Wis. (divides time with WTMJ)	1,020	500
WHAM	Rochester, N. Y.	1,080	500
WHAP	New York, N. Y. (divides time with WBNY, WMSG)	1,270	1,000
WHAR	Atlantic City, N. J. (divides time with WPG)	1,100	1,000
WHAS	Louisville, Ky.	650	500
WHAZ	Troy, N. Y. (divides time with WGY)	790	500
WHB	Kansas City, Mo. (divides time with WOQ)	890	500
WHBA	Oil City, Pa.	1,150	10
WHBC	Canton, Ohio	1,270	10
WHBD	Bellefontaine, Ohio	1,350	100
WHBF	Rock Island, Ill.	1,350	100
WHBL	Chicago, Ill. (portable—Carrell)	1,470	100
WHBM	Chicago, Ill. (portable—Carrell)	1,490	100
WHBN	St. Petersburg, Fla.	1,010	10
WHBP	Johnstown, Pa.	1,310	250
WHBQ	Memphis, Tenn.	1,290	100
WHBU	Anderson, Ind.	1,360	15
WHBW	Philadelphia, Pa. (divides time with WIAD)	1,360	50
WHBY	West De Pere, Wis.	1,200	50
WHDI	Minneapolis, Minn. (divides time with WLB)	1,220	500
WHEC	Rochester, N. Y. (divides time with WABO)	1,290	100
WHFC	Chicago, Ill.	1,390	200
WHK	Cleveland, Ohio (daylight 6 to 6: 500 after 6 p. m.)	1,130	1,000
WHN	New York, N. Y. (divides time with WQAO)	760	500
WHO	Des Moines, Iowa	560	5,000
WHPP	New York, N. Y. (divides time with WTRL and WMRJ)	1,450	10
WHT	Chicago, Ill. (divides time with WIBO)	720	5,000
WIAD	Philadelphia, Pa. (divides time with WHBW)	1,360	50

[3] 6 a. m. to 6 p. m. [4] After 6 p. m.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
WIAS	Burlington, Iowa	630	100
WIBA	Madison, Wis	1,250	100
WIBG	Elkins Park, Pa. (Sunday, daytime only)	680	50
WIBI	Flushing, N. Y. (divides time with WBKN, WWRL, WBMS)	1,120	100
WIBJ	Chicago, Ill. (portable—Carrell)	1,490	100
WIBM	Chicago, Ill. (portable—Carrell)	1,490	100
WIBO	Chicago, Ill. (divides time with WHT)	720	5,000
WIBR	Steubenville, Ohio	1,200	50
WIBS	Elizabeth, N. J. (divides with WTRC, WLBX, and WMBQ)	1,470	150
WIBU	Poynette, Wis	1,380	20
WIBW	Chicago, Ill. (portable—Carrell)	1,470	100
WIBX	Utica, N. Y	1,260	150
WIBZ	Montgomery, Ala	1,300	15
WICC	Bridgeport, Conn. (divides with WCWS)	1,400	250
WIL	St. Louis, Mo	1,160	250
WIOD	Miami Beach, Fla	1,210	1,000
WIP	Philadelphia, Pa. (divides with WOO)	590	500
WJAD	Waco, Tex	670	500
WJAG	Norfolk, Nebr	1,050	250 / [1] 500
WJAK	Kokomo, Ind	1,280	50
WJAM	Cedar Rapids, Iowa (divides with KWCR)	780	100
WJAR	Providence, R. I	620	500
WJAS	Pittsburgh, Pa. (divides time with KQV)	1,110	500
WJAX	Jacksonville, Fla	890	1,000
WJAY	Cleveland, Ohio (divides time with WDBK)	1,320	500
WJAZ	Mount Prospect, Ill. (divides time with WMBI)	1,140	5,000
WJBA	Joliet, Ill	930	50
WJBB	St. Petersburg, Fla	870	250
WJBC	LaSalle, Ill	1,320	100
WJBI	Red Bank, N. J. (shares one-fourth time with WBBR and WEBJ)	1,170	250
WJBK	Ypsilanti, Mich	1,360	15
WJBL	Decatur, Ill	1,410	250
WJBO	New Orleans, La	1,140	100
WJBR	Omro, Wis	1,320	100
WJBT	Chicago, Ill. (divides time with WBBM, WAAF and WPCC)	770	500
WJBU	Lewisburg, Pa	1,400	100
WJBW	New Orleans, La	1,260	30
WJBY	Gadsden, Ala	1,280	50
WJBZ	Chicago Heights, Ill	1,440	100
WJJD	Mooseheart, Ill. (divides time with WEBH)	820	1,000
WJPW	Ashtabula, Ohio	1,440	30
WJR-WCX	Pontiac, Mich	680	5,000
WJZ	Bound Brook, N. J	660	30,000
WKAF	Changed to WTMJ, Milwaukee, Wis.	1,020	500
WKAQ	San Juan, P. R	880	500
WKAR	East Lansing, Mich	1,050	500 / [1] 1,000
WKAV	Laconia, N. H	1,340	50
WKBB	Joliet, Ill. (Divides with WCLS)	1,390	150
WKBC	Birmingham, Ala	1,370	10
WKBE	Webster, Mass	1,310	100
WKBF	Indianapolis, Ind	1,190	250
WKBG	Chicago, Ill. (portable)	1,490	100
WKBH	La Crosse, Wis	1,360	500
WKBI	Chicago, Ill	930	50
WKBL	Monroe, Mich	1,460	15
WKBM	Newburgh, N. Y	1,440	100
WKBN	Youngstown, Ohio (divides with WMBW	1,400	50
WKBO	Jersey City, N. J. (divides with WKBQ, WFRL)	1,370	500
WKBP	Battle Creek, Mich	1,410	50
WKBQ	New York, N. Y. (divides with WKBO, WFRL)	1,370	500
WKBS	Galesburg, Ill. (divides with WLBO)	1,380	100
WKBT	New Orleans, La	1,190	50
WKBU	New Castle, Pa. (portable)	1,470	50
WKBV	Brookville, Ind	1,380	100
WKBW	Buffalo, N. Y	1,380	500
WKBZ	Ludington, Mich	1,500	15
WKDR	Kenosha, Wis	930	15
WKEN	Kenmore, N. Y. (formerly WPDQ)	1,470	250
WKJC	Lancaster, Pa. (divides with WGAL)	1,190	50
WKRC	Cincinnati, Ohio	900	500
WKY	Oklahoma City, Okla	1,040	150
WLAP	Louisville, Ky	1,120	30
WLB	Minneapolis, Minn. (divides with WHDI)	1,220	500
WLBC	Muncie, Ind	1,430	50
WLBF	Kansas City, Mo	1,430	50
WLBG	Petersburg, Va	1,400	100

[1] 7 a. m. to 7 p. m.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
WLBH	Farmingdale, N. Y.	1,290	30
WLBI	East Wenona, Ill.	1,260	250
WLBL	Stevens Point, Wis. (divides with WHA)	940	1,000
WLBM	Boston, Mass.	1,300	50
WLBN	Chicago, Ill. (portable)	1,470	50
WLBO	Galesburg, Ill. (divides time with WKBS)	1,380	100
WLBP	Ashland, Ohio.	1,480	15
WLBQ	Atwood, Ill.	1,480	25
WLBR	Belvidere, Ill.	930	15
WLBT	Crown Point, Ind.	930	50
WLBV	Mansfield, Ohio.	1,450	50
WLBW	Oil City, Pa.	1,020	500
WLBX	Long Island City, N. Y. (divides time with WIBS, WMBQ, WTRC).	1,470	250
WLBY	Iron Mountain, Mich.	1,430	50
WLBZ	Dover-Foxcroft, Me.	1,440	250
WLCI	Ithaca, N. Y.	1,210	50
WLIB	Chicago, Ill. (divides time with WGN)	980	500
WLIT	Philadelphia, Pa. (divides time with WFI)	740	500
WLS	Chicago, Ill. (divides time with WCBD)	870	5,000
WLTS	Chicago, Ill. (divides time with WCFL)	620	100
WLW	Harrison, Ohio.	700	5,000
WLWL	New York, N. Y. (divides time with WMCA)	810	1,000
WMAC	Cazenovia, N. Y.	1,350	500
WMAF	South Dartmouth, Mass.	700	500
WMAK	Lockport, N. Y.	550	750
WMAL	Washington, D. C.	990	100
WMAN	Columbus, Ohio.	1,280	50
WMAQ	Chicago, Ill. (divides time with WQJ)	670	1,000
WMAY	St. Louis, Mo.	1,240	100
WMAZ	Macon, Ga. (divides time with WGST)	1,110	500
WMBA	Portable, Newport, R. I.	1,470	100
WMBB	Chicago, Ill. (divides time with WOK)	1,190	500
WMBC	Detroit, Mich.	1,230	100
WMBD	Peoria Heights, Ill.	1,440	250
WMBE	St. Paul, Minn.	1,440	10
WMBF	Miami, Beach, Fla.	780	500
WMBG	Richmond, Va.	1,450	15
WMBH	Portable—E. D. Aber, Chicago	1,470	100
WMBI	Chicago, Ill. (divides time with WJAZ)	1,140	500
WMBJ	Monessen, Pa.	1,290	50
WMBL	Lakeland, Fla.	1,310	50
WMBM	Memphis, Tenn.	1,430	10
WMBO	Auburn, N. Y.	1,360	100
WMBQ	Brooklyn, N. Y. (divides time with WTRC, WIBS, WLBX).	1,470	100
WMBR	Tampa, Fla.	1,190	100
WMBS	Harrisburg, Pa.	1,280	250
WMBU	Pittsburgh, Pa.	1,380	50
WMBW	Youngstown, Ohio (divides time with WKBN)	1,400	50
WMBY	Bloomington, Ill. (divides time with WNBL)	1,500	15
WMC	Memphis, Tenn.	580	500
WMCA	New York, N. Y. (divides time with WLWL)	810	500
WMES	Boston, Mass.	1,420	100
WMPC	Lapeer, Mich.	1,280	30
WMRJ	Jamaica, N. Y. (divides time with WTRL, WHPP)	1,450	10
WMSG	New York, N. Y. (divides time with WBNY, WHAP)	1,270	500
WNAB	Boston, Mass., changed to WASN		
WNAC	Boston, Mass.	850	500
WNAD	Norman, Okla.	1,250	500
WNAL	Omaha, Nebr. (divides time with KOCH, KFOX)	1,160	250
WNAT	Philadelphia, Pa. (divides time with WRAX)	1,040	100
WNAX	Yankton, S. Dak.	990	250
WNBA	Forest Park, Ill.	1,440	200
WNBF	Endicott, N. Y.	1,450	50
WNBH	New Bedford, Mass.	1,150	250
WNBJ	Knoxville, Tenn.	1,450	50
WNBL	Bloomington, Ill. (divides time with WMBY)	1,500	15
WNBO	Washington, Pa.	1,420	15
WNBQ	Rochester, N. Y.	1,480	15
WNBR	Memphis, Tenn.	1,310	20
WNBX	Springfield, Vt.	1,240	10
WNJ	Newark, N. J. (divides time with WGCP)	1,070	500
WNOX	Knoxville, Tenn.	1,150	1,000
WNRC	Greensboro, N. C.	1,340	500
WNYC	New York, N. Y.	570	500
WOAI	San Antonio, Tex.	990	5,000
WOAN	Lawrenceburg, Tenn.	1,050	250
WOAX	Trenton, N. J. (divides time with WEAM)	1,250	500
WOC	Davenport, Iowa	850	5,000
WOCL	Jamestown, N. Y.	1,340	25
WODA	Paterson, N. J. (divides time with WGL)	1,020	1,000

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
WOI	Ames, Iowa (5,000 daytime 6 to 6)	1,130	2,500
WOK	Chicago, Ill. (divides time with WMBB)	1,190	5,000
WOKO	Peekskill, N. Y.	1,390	250
WOKT	Rochester, N. Y.	1,430	500
WOMT	Manitowoc, Wis.	1,350	50
WOO	Philadelphia, Pa. (divides time with WIP)	590	500
WOOD	Grand Rapids, Mich.	1,150	500
WOQ	Kansas City, Mo. (divides time with WHB)	890	250 [1] 500
WOR	Newark, N. J.	710	5,000
WORD	Batavia, Ill. (divides time with WTAS)	1,090	5,000
WOS	Jefferson City, Mo.	640	500
WOW	Omaha, Nebr.	590	1,000
WOWO	Fort Wayne, Ind. (divides time with WCWK)	1,310	1,000
WRCV	Norfolk, Va.	1,430	100
WPCC	Chicago, Ill. (divides time with WBBM, WJBT, WAAF)	770	500
WPCH	New York, N. Y. (divides time with WRNY)	970	500
WPDQ	Changed to WKEN.		
WPEP	Waukegan, Ill.	1,390	250
WPG	Atlantic City, N. J. (divides time with WHAR)	1,100	5,000
WPRC	Harrisburg, Pa.	1,430	100
WPSC	State College, Pa. (divides time with WBAK)	1,000	500
WPSW	Philadelphia, Pa.	1,480	50
WQAA	Parkersburg, Pa.	1,390	500
WQAM	Miami, Fla.	930	750
WQAN	Scranton, Pa. (divides time with WGBI)	1,300	250
WQAO, WPAP	Cliffside, N. J. divides time with WHN)	760	500
WQJ	Chicago, Ill. (divides time with WMAQ)	670	500
WRAF	La Porte, Ind.	1,440	100
WRAH	Providence, R. I.	1,500	250
WRAK	Escanaba, Mich.	1,060	50
WRAM	Galesburg, Ill. (divides time with WFBZ)	1,210	50
WRAV	Yellow Springs, Ohio	880	100
WRAW	Reading, Pa.	1,260	100
WRAX	Philadelphia, Pa. (divides time with WNAT)	1,040	250
WRBC	Valparaiso, Ind.	1,260	250
WRC	Washington, D. C.	640	500
WRCO	Raleigh, N. C.	1,380	250
WREC	Memphis, Tenn.	1,180	50
WREN	Lawrence, Kans. (divides time with KFKU)	1,180	750
WREO	Lansing, Mich.	1,300	500
WRES	Quincy, Mass.	1,380	50
WRHF	Washington, D. C. (day time only)	940	50
WRHM	Minneapolis, Minn (divides time with WDGY)	1,150	1,000
WRK	Hamilton, Ohio	1,460	100
WRM	Urbana, Ill. (1,000 watts before 6 p. m.; divides time with WBAA).	1,100	500
WRMU	New York, N. Y. (portable; divides time with WGMU)	1,490	100
WRNY	New York, N. Y. (divides time with WPCH)	970	500
WRPI	Terre Haute, Ind.	1,440	100
WRR	Dallas, Tex.	850	500
WRRS	Racine, Wis.	950	50
WRSC	Chelsea, Mass.	1,400	15
WRST	Bay Shore, N. Y. (divides time with WCDA, WBRS, WCGU).	1,420	250
WRVA	Richmond, Va.	1,180	1,000
WSAI	Cincinnati, Ohio	830	5,000
WSAJ	Grove City, Pa.	1,340	250
WSAN	Allentown, Pa. (divides time with WCBA)	1,350	100
WSAR	Portsmouth, R. I.	1,190	100
WSAX	Chicago, Ill.	1,476	100
WSAZ	Huntington, W. Va.	1,240	100
WSB	Atlanta, Ga.	630	1,000
WSBC	Chicago, Ill. (divides time with WWAE)	1,290	500
WSBF	St. Louis, Mo.	680	250
WSBT	South Bend, Ind. (divides time with WEMC)	1,260	250
WSDA	New York, N. Y. (divides time with WARS, WBBC)	1,320	250
WSEA	Virginia Beach, Va.	1,370	250
WSIX	Springfield, Tenn.	1,410	150
WSKC	Bay City, Mich.	610	250
WSM	Nashville, Tenn.	880	5,000
WSMB	New Orleans, La.	930	500
WSMK	Dayton, Ohio.	1,010	200
WSOE	Milwaukee, Wis.	1,110	500
WSOM	New York, N. Y. (divides time with WGBB, WAAT)	1,220	500
WSRO	Hamilton, Ohio.	780	100
WSSH	Boston, Mass.	1,200	100
WSUI	Iowa City, Iowa.	710	500
WSVS	Buffalo, N. Y. (divides time with WPDQ)	1,460	50
WSYR	Syracuse, N. Y. (divides time with WMAC)	1,330	500

[1] 6 a. m. to 6 p. m.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
WTAD	Quincy, Ill	1,270	250
WTAG	Worcester, Mass	580	500
WTAL	Toledo, Ohio (divides time with WABR)	1,070	100
WTAM	Cleveland, Ohio (divides time with WEAR)	750	3,500
WTAQ	Eau Claire, Wis	1,180	500
WTAR	Norfolk, Va	1,090	500
WTAS	Batavia, Ill. (divides time with WORD)	1,090	3,500
WTAW	College Station, Tex	970	500
WTAX	Streator, Ill	930	50
WTAZ	Lambertville, N. J	1,360	15
WTHO	Detroit, Mich. (divides time with WAFD)	1,370	250
WTIC	Hartford, Conn	630	500
WTMJ	Milwaukee, Wis. (divides time with WHAD)	1,020	500
WTRC	Brooklyn, N. Y. (divides time with WIBS, WMBQ, WLBX)	1,470	50
WTRL	Midland Park, N. J. (divides with WMRJ, WHPP)	1,450	15
WWAE	Chicago, Ill. (divides time with WSBC)	1,290	500
WWJ	Detroit, Mich	800	1,000
WWL	New Orleans, La	1,090	100
WWNC	Asheville, N. C	1,010	1,000
WWRL	Woodside, N. Y. (divides time with WBKN, WIBI, WBMS)	1,120	100
WWVA	Wheeling, W. Va	770	100
KDKA	East Pittsburgh, Pa	980	30,000
KDLR	Devils Lake, N. Dak	1,300	15
KDYL	Salt Lake City, Utah	1,160	100
KELW	Burbank, Calif. (divides time with KPPC)	1,310	250
KEX	Portland, Oreg	1,350	2,500
KFAB	Lincoln, Nebr. (5,000 before 7 p. m.)	970	2,000
KFAD	Phoenix, Ariz	1,100	500
KFAU	Boise, Idaho (4,000 watts daytime)	1,050	2,000
KFBB	Havre, Mont	1,090	50
KFBC	San Diego, Calif	1,210	100
KFBK	Sacramento, Calif	560	100
KFBL	Everett, Wash	1,340	50
KFBS	Trinidad, Colo	1,280	15
KFBU	Laramie, Wyo	780	500
KFCB	Phoenix, Ariz	1,230	125
KFCR	Santa Barbara, Calif	1,420	50
KFDM	Beaumont, Tex	800	500
KFDX	Shreveport, La	1,270	250
KFDY	Brookings, S. Dak	760	500
KFDZ	Minneapolis, Minn	1,390	10
KFEC	Portland, Oreg. (divides time with KFIF)	1,400	50
KFEL	Denver, Colo	1,210	250
KFEQ	St. Joseph, Mo	1,300	1,000
KFEY	Kellogg, Idaho	1,290	10
KFGQ	Boone, Iowa	1,430	10
KFH	Wichita, Kans	1,220	500
KFHA	Gunnison, Colo	1,180	50
KFHL	Oskaloosa, Iowa	1,410	10
KFI	Los Angeles, Calif	640	5,000
KFIF	Portland, Oreg. (divides time with KFEC)	1,400	50
KFIO	Spokane, Wash. (divides time with KFPY)	1,220	100
KFIQ	Yakima, Wash	1,440	100
KFIU	Juneau, Alaska	1,330	10
KFIZ	Fond du Lac, Wis	1,120	100
KFJB	Marshalltown, Iowa	1,210	15
KFJF	Oklahoma, Okla	1,100	750
KFJI	Astoria, Oreg	1,200	15
KFJM	Grand Forks, N. Dak	900	100
KFJR	Portland, Oreg. (divides time with KTBR)	1,060	100
KFJY	Fort Dodge, Iowa	1,250	100
KFJZ	Fort Worth, Tex	1,200	50
KFKA	Greeley, Colo	750	200
KFKB	Milford, Kans	1,240	[1] 2,500 [2] 1,500
KFKU	Lawrence, Kans. (divides time with WREN)	1,180	500
KFKX	Hastings, Nebr. (divides time with KYW)	570	2,500
KFKZ	Kirksville, Mo	1,330	15
KFLR	Albuquerque, N. Mex	720	100
KFLU	San Benito, Tex	1,270	15
KFLV	Rockford, Ill	1,120	100
KFLX	Galveston, Tex	1,110	100
KFMR	Sioux City, Iowa	680	100
KFMX	Northfield, Minn. (divides time with WCAL)	1,270	500
KFNF	Shenandoah, Iowa (divides time with KMA)	1,110	1,000
KFOA	Seattle, Wash	670	1,000
KFON	Long Beach, Calif	1,240	500
KFOR	Lincoln, Nebr	1,380	100

[1] 7 a. m. to 7 p. m. [2] After 7 p. m.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
KFOX	Omaha, Nebr. (divides time with KOCH, WNAL)	1,160	100
KFOY	St. Paul, Minn	1,050	250
KFPL	Dublin, Tex	1,090	15
KFPM	Greenville, Tex	1,300	15
KFPR	Los Angeles, Calif. (divides time with KFQZ)	1,290	250
KFPW	Carterville, Mo	1,140	50
KFPY	Spokane, Wash. (divides time with KFIO)	1,220	250
KFQA	St. Louis, Mo	930	50
KFQB	Fort Worth, Tex	1,150	1,000
KFQD	Anchorage, Alaska	870	100
KFQU	Holy City, Calif	1,200	100
KFQW	Seattle, Wash	1,380	100
KFQZ	Hollywood, Calif. (divides time with KFPR)	1,290	100
KFRC	San Francisco, Calif	660	500
KFRU	Columbia, Mo	1,200	500
KFSD	San Diego, Calif	680	500
KFSG	Los Angeles, Calif	1,090	500
KFUL	Galveston, Tex	1,160	500
KFUM	Colorado Springs, Colo	1,270	100
KFUO	St. Louis, Mo. (divides time with KSD)	550	500
KFUP	Denver, Colo	1,320	100
KFUR	Ogden, Utah	1,330	50
KFUS	Oakland, Calif. (divides time with KRE)	1,170	50
KFUT	Salt Lake City, Utah	600	50
KFVD	Venice, Calif. (divides time with KGFJ)	1,440	250
KFVE	St. Louis, Mo	1,280	[3] 2,000 [4] 1,000
KFVG	Independence, Kans	1,330	50
KFVI	Houston, Tex	1,260	50
KFVN	Fairmont, Minn	1,310	100
KOW	Denver, Colo	630	250
KFVS	Cape Girardeau, Mo	1,340	50
KFWB	Los Angeles, Calif	830	500
KFWC	San Bernardino, Calif	1,350	100
KFWF	St. Louis, Mo	1,400	250
KFWH	Eureka, Calif	1,180	100
KFWI	San Francisco, Calif	1,120	500
KFWM	Oakland, Calif. (1,000 watts daytime)	1,270	500
KFWO	Avalon, Calif	1,370	250
KWJJ	Portland, Oreg	1,310	50
KFXB	Los Angeles, Calif	1,190	500
KFXD	Jerome, Idaho	1,470	15
KFXF	Denver, Colo	1,060	500
KFXH	El Paso, Tex	1,240	100
KFXJ	Near Edgewater, Colo	1,390	15
KFXR	Oklahoma City, Okla	1,340	50
KFXY	Flagstaff, Ariz	1,460	25
KFYF	Osnard, Calif	1,260	25
KFYR	Bismarck, N. Dak	1,250	250 [3] 500
KGA	Spokane, Wash	1,150	2,000
KGAR	Tucson, Ariz	1,280	100
KGBS	Seattle, Wash	1,480	100
KGBU	Ketchikan, Alaska	1,310	500
KGBX	St. Joseph, Mo	1,040	100
KGBY	Shelby, Nebr	1,480	50
KGBZ	York, Nebr	1,410	100
KGCA	Decorah, Iowa (divides time with KWLC)	1,210	10
KGCB	Oklahoma City, Okla. (divides time with KGFG)	1,390	50
KGCG	Newark, Ark	1,340	100
KGCH	Wayne, Nebr	1,020	250
KGCI	San Antonio, Tex. (divides time with KGRC)	1,360	15
KGCL	Seattle, Wash. (divides time with KPCB)	1,300	50
KGCN	Concordia, Kans	1,440	50
KGCR	Brookings, S. Dak	1,440	15
KGCU	Mandan, N. Dak	1,140	100
KGCX	Vida, Mont	1,230	10
KGDA	Dell Rapids, S. Dak. (daytime only)	1,280	15
KGDE	Barrett, Minn	1,460	50
KGDJ	Cresco, Iowa	1,480	10
KGDM	Stockton, Calif	1,380	10
KGDP	Pueblo, Colo	1,340	10
KGDR	San Antonio, Tex	1,480	15
KGDW	Humboldt, Nebr	1,450	100
KGDX	Shreveport, La	1,410	250
KGDY	Oldham, S. Dak	1,450	15
KGEF	Los Angeles, Calif	1,140	500
KGEH	Eugene, Oreg	1,490	50
KGEK	Yuma, Colo	1,140	[3] 10

[3] 6 a. m. to 6 p. m. [4] After 6 p. m. [3] 7 a. m. to 7 p. m. only.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
KGEN	El Centro, Calif.	1,330	15
KGEO	Grand Island, Nebr.	1,460	100
KGEQ	Minneapolis, Minn.	1,480	50
KGER	Long Beach, Calif. (divides time with KRLO)	1,390	100
KGES	Central City, Nebr.	1,370	10
KGEU	Lower Lake, Calif.	1,320	50
KGEW	Fort Morgan, Colo.	1,370	10
KGEY	Denver, Colo.	1,490	15
KGEZ	Kalispell, Mont.	1,460	100
KGFB	Iowa City, Iowa	1,340	10
KGFF	Alva, Okla.	1,460	25
KGFG	Oklahoma City, Okla. (divides time with KGCB)	1,390	50
KGFH	La Cresenta, Calif. (divides time with KMIC)	1,340	250
KGFI	Fort Stockton, Tex.	1,360	15
KGFJ	Los Angeles, Calif. (divides time with KFVD)	1,440	100
KGFK	Hallock, Minn.	1,340	50
KGFL	Trinidad, Colo.	1,350	50
KGFM	Yuba City, Calif.	1,420	15
KGFN	Aneta, N. Dak.	1,500	15
KGFO	Terre Haute, Ind.	1,470	100
KGFP	Mitchell, S. Dak.	1,410	10
KGFW	Ravenna, Nebr.	1,000	10
KGO	Oakland, Calif.	780	5,000
KGRC	San Antonio, Tex. (divides time with KGCI)	1,360	50
KGRS	Amarillo, Tex.	1,230	150
KGTT	San Francisco, Calif.	1,450	50
KGU	Honolulu, Hawaii	1,110	600
KGW	Portland, Oreg.	610	1,000
KGY	Lacey, Wash.	1,230	50
KHJ	Los Angeles, Calif.	740	500
KHQ	Spokane, Wash.	810	1,000
KICK	Anita, Iowa	650	100
KJBS	San Francisco, Calif.	1,360	50
KJR	Seattle, Wash.	860	2,500
KKP	do	1,130	15
KLDS	Independence, Mo.	1,260	1,500
KLIT	Portland, Oreg.	1,450	10
KLS	Oakland, Calif. (divides time with KZM)	1,220	250
KLX	Oakland, Calif.	590	500
KLZ	Denver, Colo.	1,120	250
KMA	Shenandoah, Iowa (divides time with KFNF)	1,110	1,000 / [5] 2,000
KMED	Medford, Oreg.	1,120	50
KMIC	Inglewood, Calif. (divides time with KGFH)	1,340	250
KMJ	Fresno, Calif.	820	50
KMMJ	Clay Center, Nebr.	1,310	500
KMO	Tacoma, Wash.	1,180	250
KMOX	St. Louis, Mo.	1,000	5,000
KMTR	Los Angeles, Calif.	570	500
KNRC	Santa Monica, Calif.	800	500
KNX	Los Angeles, Calif.	890	500
KOA	Denver, Colo. (10,000 until 7 p. m.)	920	5,000
KOAC	Corvalis, Oreg.	1,110	500
KOB	State College, N. Mex. (divides time with KWSC, KTW)	760	5,000
KOCH	Omaha, Nebr. (divides time with WNAL, KFOX)	1,160	250
KOCW	Chickasha, Okla.	1,190	250
KOIL	Council Bluffs, Iowa	1,080	[4] 4,000 / [6] 2,000
KOIN	Portland, Oreg.	940	1,000
KOLO	Durango, Colo.	1,500	5
KOMO	Seattle, Wash.	980	1,000
KOWW	Walla Walla, Wash.	1,000	500
KPCB	Seattle, Wash. (divides time with KGCL)	1,300	50
KPJM	Prescott, Ariz.	1,400	15
KPNP	Muscatine, Iowa.	710	1,000
KPPC	Pasadena, Calif. (divides time with KELW)	1,310	50
KPRC	Houston, Tex.	1,020	500
KPSN	Pasadena, Calif.	950	1,000
KQV	Pittsburgh, Pa. (divides time with WJAS)	1,110	500
KQW	San Jose, Calif.	1,010	500
KRAC	Shreveport, La.	1,360	50
KRE	Berkeley, Calif. (divides time with KFUS)	1,170	100
KRLD	Dallas, Tex.	650	500
KRLO	Los Angeles, Calif. (divides time with KGER)	1,390	250
KROX	Seattle, Wash. (divides time with KRSC)	1,420	50
KRSC	Seattle, Wash. (divides time with KROX)	1,420	50
KSAC	Manhattan, Kans.	900	500
KSBA	Shreveport, La.	1,120	1,000
KSCJ	Sioux City, Iowa (divides time with KWUC)	1,230	500

[1] 7 a. m. to 7 p. m. [5] 6 a. m. to 6 p. m. [6] Night.

List of licensed broadcasting stations arranged by call letters in effect July 1, 1927 (issued June 15, 1927)—Continued

Call letters	Location	Frequency	Power
KSD	St. Louis, Mo. (divides time with KFUO)	550	500
KSEI	Pocatello, Idaho	900	250
KSL	Salt Lake City, Utah	990	1,000
KSMR	Santa Maria, Calif.	1,100	100
KSO	Clarinda, Iowa	1,320	500
KSOO	Sioux Falls, S. Dak.	1,430	250
KTAB	Oakland, Calif.	1,070	500
KTAP	San Antonio, Tex.	1,310	20
KTBI	Los Angeles, Calif.	1,040	500
KTBR	Portland, Oreg. (divides time with KFJR)	1,060	50
KTCL	Seattle, Wash.	1,080	500
KTHS	Hot Springs, Ark.	780	1,000
KTNT	Muscatine, Iowa (5,000 from 6 to 6)	1,170	3,500
KTSA	San Antonio, Tex. (formerly WCAR)	1,130	2,000
KTUE	Houston, Tex.	1,410	5
KTW	Seattle, Wash. (divides time with KWSC, KOB)	760	1,000
KUJ	Seattle, Wash.	1,500	10
KUOA	Fayetteville, Ark.	1,010	500
KUOM	Missoula, Mont.	800	500
KUSD	Vermillion, S. Dak.	620	250
KUT	Austin, Tex.	1,290	500
KVI	Tacoma, Wash.	1,280	50
KVOO	Bristow, Okla.	860	1,000
KVOS	Seattle, Wash.	1,430	50
KWBS	Portland, Oreg.	1,500	15
KWCR	Cedar Rapids, Iowa (divides time with WJAM)	780	250
KWG	Stockton, Calif.	870	50
KWJJ	Portland, Oreg.	1,310	50
KWKC	Kansas City, Mo.	1,350	100
KWKH	Shreveport, La.	760	1,000
KWLC	Decorah, Iowa	1,210	50
KWSC	Pullman, Wash. (divides time with KTW, KOB)	760	500
KWTC	Santa Ana, Calif.	850	5
KWUC	LaMars, Iowa (divides time with KSCJ)	1,230	1,500
KWWG	Brownsville, Tex.	1,080	500
KXL	Portland, Oreg.	1,360	50
KYA	San Francisco, Calif.	970	500
KYW	Chicago, Ill. (divides time with KFKX)	570	2,500
KZM	Oakland, Calif. (divides time with KLS)	1,220	100

APPENDIX C (1)

Table showing broadcasting stations and power by zones and States as of July 1, 1927, and June 30, 1928

State	July 1, 1927		June 30, 1928	
	Number	Power	Number	Power
Zone 1				
Maine	3	850	3	5,350
New Hampshire	3	650	3	1,050
Vermont	3	160	2	110
Massachusetts	19	18,980	18	18,910
Connecticut	5	1,600	5	2,100
Rhode Island	7	1,950	7	1,800
New York	58	56,240	49	128,140
New Jersey	24	48,580	25	53,925
Delaware	1	100	1	250
Maryland	5	3,550	5	5,700
District of Columbia	3	650	3	1,150
Porto Rico	1	500	1	500
Virgin Islands				
Total	132	133,810	122	218,985
Zone 2				
Pennsylvania	45	39,705	44	59,845
Virginia	10	3,365	12	13,330
West Virginia	2	200	5	710
Ohio	22	25,140	28	25,345
Michigan	23	10,925	19	9,960
Kentucky	3	1,030	3	6,500
Total	115	80,365	111	115,690

Table showing broadcasting stations and power by zones and States as of July 1, 1927, and June 30, 1928—Continued

State	July 1, 1927		June 30, 1928	
	Number	Power	Number	Power
Zone 3				
North Carolina	4	2,250	6	7,600
South Carolina	1	75	2	90
Georgia	3	2,000	7	2,770
Florida	13	6,660	12	10,950
Alabama	5	1,325	5	1,325
Tennessee	15	8,295	16	22,990
Mississippi	2	200	5	935
Arkansas	3	1,600	8	2,465
Louisiana	12	3,385	13	6,830
Texas	30	15,465	33	21,465
Oklahoma	9	2,825	10	11,175
Total	97	44,080	117	88,595
Zone 4				
Indiana	16	4,215	18	7,465
Illinois	63	69,470	58	87,640
Wisconsin	19	6,085	20	6,385
Minnesota	17	9,630	16	13,795
North Dakota	6	730	6	780
South Dakota	9	1,405	9	2,345
Iowa	25	23,465	24	26,690
Nebraska	18	8,570	16	8,570
Kansas	7	3,850	9	4,150
Missouri	23	14,515	22	15,315
Total	203	141,935	198	173,085
Zone 5				
Montana	4	660	5	910
Idaho	3	2,260	4	2,325
Wyoming	1	500	1	500
Colorado	17	6,830	16	9,860
New Mexico	2	5,100	2	5,050
Arizona	5	765	5	840
Utah	5	1,215	4	5,600
Nevada[1]				
Washington	25	11,325	23	11,475
Oregon	15	5,490	14	7,065
California	54	24,570	50	83,110
Hawaii	1	600	2	750
Alaska	3	610	3	610
Total	135	59,925	129	128,095
Portables	16	1,500	13	1,160

[1] Station KOH, authorized Oct. 25, 1928.

Table showing number of broadcasting stations in each zone, with total power in each zone as of July 1, 1927, and as of June 30, 1928

	July 1, 1927		June 30, 1928	
	Stations	Total power	Stations	Total power
Zone 1	132	133,810	122	218,985
Zone 2	115	80,365	111	115,690
Zone 3	97	44,080	117	88,595
Zone 4	203	141,935	198	173,085
Zone 5	135	59,925	129	128,095
Total	682	460,115	677	724,450
Portables	16	1,500	13	1,160

APPENDIX C (2)

Summary of hearings on applications for modification, etc., of licenses heard between July 26, 1927, and January 27, 1928, and decisions in so far as announced

Date of hearing:

July 26, 1927—On application of WFRL (now WLTH), Brooklyn, N. Y., for change of frequency from 1,370 to 1,170 kilocycles. Stations notified: WBBR, WEBJ, WJBI. Granted, Special Order No. 57.

On application of WFBE, Cincinnati, Ohio, for increase of power from 250 to 500 watts. Stations notified: WLB, WHDI, KFH, WSOM, WGBB, WDOD, WAAT. Appeared, but asked that it be indefinitely postponed.

July 27, 1927—On application of WSMK, Dayton, Ohio, for increase of power from 200 to 500 watts. Stations notified: WBES, WWNC, KUDA, WEPS. Hearing postponed.

On application of WIAD, Philadelphia, Pa., for increase of power from 50 to 100 watts. Stations notified: WAAT, WSOM, WGBB, WFKD, and WABY. Granted, Special Order No. 56.

July 28, 1927—On application of WTAL, Toledo, Ohio, for increase of power from 100 to 1,000 watts. Stations notified: WFIW, WFBG, WGCP, WNJ, WEAD, WAIU. Hearing canceled.

On application of KXL, Portland, Oreg., for change of frequency from 1,360 to 770 kilocycles. Stations notified: KTW, KWSC, KGO. Denied, Special Order 60.

On application of KEX, Portland, Oreg., change of frequency from 1,250 to 770 kilocycles and increase of power from 2,500 to 20,000 watts. Stations notified: WBBM, KTW, KWSC, KGO. Denied, Special Order 61.

On application of KJR, Seattle, Wash., for increase of power from 2,500 to 20,000 watts. Stations notified: KVOO, KNX, KFWB, KWG. Denied, Special Order 61.

On application of KGA, Spokane, Wash., for change of frequency from 1,150 to 550 kilocycles and increase of power from 2,000 to 20,000 watts. Stations notified: KFBK, KMTR. Denied, Special Order 61.

July 28, 1927—On application of KYA, San Francisco, Calif., for increase of power from 500 to 1,000 watts. Stations notified: KOMO–KPSN. Denied, Special Order 61.

August 2, 1927—On application of WCAM, Camden, N. J., for change of frequency from 1,340 to 1,000 kilocycles. Stations notified, KMOX, WBAK, WPSC, WCAM. Denied, Special Order 70.

On application of WCGU, New York City, for change of frequency from 1,420 to 1,020 kilocycles. Stations notified: WGL–WODA. Denied, Special Order 73. Allotted 1,370 kilocycles, divided WKBQ and WKBO.

On application of WMBS, Harrisburg, Pa., for change of frequency from 1,280 to 1,000 kilocycles and increase of power from 250 to 500 watts (after 6 p. m.). Stations notified: KMOX, WBAK, WPSC, WCAM. Denied, Special Order 71.

On application of WHK for change of frequency from 1,130 to 880 kilocycles and increase of power from 1,000 (500 after 6 p. m.) to 2,500 watts. Canceled.

August 3, 1927—On application of WJKS, Gary, Ind., for time divided (1,290 kilocycles). Stations notified: WWAE–WSBC. Granted, Special Order 72. Time divided with WSBC.

On application of WRAX, Philadelphia, Pa., increase of power from 250 to 500 watts night and 1,000 watts daytime. Stations notified: WODA, WLBW, WGL, WDBO, WNAT, WBAL. Denied, Special Order 75. Given 1,410 kilocycles, 250 watts full time.

July 29, 1927—On application of WMBG, Richmond, Va., for change of frequency from 1,450 to 1,360 kilocycles. Station notified: WSEA. Granted, Special Order 62.

On application of KLDS, Independence, Mo., for change of frequency from 1,260 to 650 kilocycles and increase of power from 1,500 to 5,000 watts. Stations notified: KRLD, WHAS, KICK, WOS. Denied, Special Order 63.

Date of hearing—Continued.

August 4, 1927—On application of WTAD, Quincy, Ill., for increase of power from 250 to 500 watts. Stations notified: WCAL, KFMX, WGBF, KFDX. Denied, Special Order 79. Given 500 6 a. m. to 7 p. m.; 250 after 7.

On application of KOW for increase of power from 250 to 1.500 watts. Stations notified: WSB, WIAS, WTIC. Denied. Special Order 188.

August 5, 1927—On application of WJAS, Pittsburgh, Pa., for unlimited time. Station notified: KQV. Denied, Special Order 80.

On application of WSEA, Virginia Beach, Va. Stations notified: WCX, NAA, WEEI. Hearing canceled.

On application of WSEA, Virginia Beach, Va., for change in frequency from 1,370 to 580 kilocycles. Stations notified: WIP, WOO, WTAG, WCAE, WMG. Denied, Special Order 81. Given 1,140 kilocycles. Divided time with WTAR.

August 9, 1927—On application of WICC, Bridgeport, Conn., to move station to Sport Hill, near Bridgeport. Notified: Editor Bridgeport Times-Post, Howard L. Shaff, town counsel, Boardman & Gaout, Bridgeport. Granted, Special Order 83; 500 watts in new location.

On application of WORD, for change in frequency from 1,000 to 720 kilocycles. Stations notified: WHT, WIBO. Postponed.

August 10, 1927—On application of WFBM, Indianapolis, Ind., for change in frequency from 1,330 to 1,090 kilocycles and increase in power from 250 to 1,000 watts. Stations notified: WTAS, WORD, WDRC, WCAC, WTAR, WWL. Granted, but given 250 watts until transmitter is moved out of congested area. Divided time with WKBF.

August 11, 1927—On application of KMA, Shenandoah, Iowa, requesting time division with WSUI on 710 kilocycles. Stations notified: KPO, WSUI, WOR, WHT, WIBO. Denied. Special Order 90.

August 12, 1927—On application of WBNY, New York City, requesting change of frequency from 1,270 to 920. Stations notified: WABC, WBOQ. Denied, Special Order 85.

On application of WGL, New York City, request to displace WPCH, for change in frequency from 1,020 to 970 kilocycles and increase in power from 500 to 1.000 watts. Stations notified: WPCH, WRNY, WTAW, KFAB. Postponed.

August 16, 1927—On application of KOIL, Council Bluffs, Iowa, for change in frequency from 1,080 to 760 kilocycles. Stations notified: KTW, KWSC, KWKH, KOB, RFDY, WHN, WBBM, WTAM, WQAO, WPAP. Denied, Special Order 89.

August 17, 1927—On application of WHBW, Philadelphia, Pa., for increase in power from 50 to 100 watts. Stations notified: WSAN, WCAM, WIAD, WCBA, WSEA, WTAZ, WMBO. Granted, Special Order 91.

August 12, 1927—On application of WHAP, New York City, for change of frequency from 1,270 to 920 kilocycles. Stations notified: WABC, WBNY. Denied, Special Order 86.

On application of WEBJ, New York City, for change of frequency from 1,170 to 920 kilocycles. Denied, Special Order 84.

October 4, 1927—On application of WBAW, Nashville, Tenn., for increase in power from 100 to 10,000 watts. Stations notified: WCAT, WABW, WLCI, WFBC, WBBL, WFKD, KGCA, KFEL, WABZ, WFBE, KFJB, WIOD, WABY, WDOD, WEBE, WRAM, WFBZ, KWLC, WMAY. Denied but given frequency of 1,250 kilocycles, 500 watts; divided time WOAN, Special Order 199.

On application of WLBX, Long Island City, N. Y., for change in frequency from 1,070 to 1,470. Stations notified: WNJ, WGCP. Indefinitely postponed.

October 5, 1927—On application of KLDS, Independence, Mo., for increase in power from 1,500 to 5.000 watts. Stations notified: WHAD, KFLX, KOAC, WSOE, WMAZ, WGST, KQV, WJAS. Denied, Special Order 196.

On application of WCOT, Providence, R. I., for change in frequency from 1,330 to 1,130 and increase in power from 50 to 100 watts. Stations notified: WNOX, WOI, WHK, KTSA, KKP, WDEL. Hearing canceled.

October 6, 1927—On application of WJBL, Decatur, Ill., for change in frequency from 1,410 to 1,050 kilocycles and increase in power from 250 to 1,500 watts. Stations notified: WENR, WBCN, WFIW, KFOY, WOAN, KFAU, WKAR, WBAL, WJAG, KLCN. Denied, Special Order 195.

Date of hearing—Continued.

October 6, 1927—Continued.

On application of WGES, Chicago, Ill., for change in frequency from 1,240 to 770 kilocycles. Stations notified: WBBM, WAAF, WJBT, WWVA, WABI. Postponed.

On application of WCMA, Culver, Ind., for increase in power from 250 to 500 watts. Stations notified: WBT, WIL, KDYL, KFUL, KFOX, KOCH, WNAL, WEBW, WFBL. Granted, Special Order 197.

October 11, 1927—On application of WORD, Batavia, Ill., for change of frequency from 1,090 to 720 kilocycles. Stations notified: WENR, WAAF, WBBM, WJBT, WTAS, WHT, WIBO, WFBM, WKBF. Denied, Special Order 207.

October 12, 1927—On application of WGES–WEDC, Chicago, Ill., for change of frequency from 1,240 to 770 kilocycles. Stations notified: WBBM, WJBT, WABI, WAAF, WWVA. Hearing canceled.

October 13, 1927—On application of KWKH, Shreveport, La., for unlimited time. Stations notified: KMA, WHN, KTW, KWSC, KOB, KFDY, WTAM, WBBM, KTHS, WQAO, WPAP. Also for increase of power from 1,000 to 10,000 watts. Licensed 3,500 watts one-half time. Special Orders 229 and 231.

October 12, 1927—On application of WOKO, Peekskill, N. Y., for change of frequency from 1,390 to 1,150 and increase in power from 250 to 500 watts. Stations notified: WNBH, WRHM. WDGY, WABQ, KGA, WOOD, WHBA, WFBL, WBBR, WEBJ, WLTH, WBKN, WWRL, WIBL, WBMS. Denied, Special Order 194.

On application of WSAZ, Huntington, W. Va., for increase in power from 100 to 250 watts. Stations notified: WEBR, WFCI, WNBX, KFKB, WEDC, WGES, WEBC, KFON. Postponed.

October 26, 1928—On application of WABQ, Philadelphia, Pa., for change of frequency from 1,340 to 1,150 kilocycles. Stations notified: WCAU, WCAM. Denied, Special Order 210.

October 27, 1927—On application of WHAZ, Troy, N. Y., for change of frequency from 790 to 550 kilocycles (after November 1). Stations notified: WMAK, WGY. Hearing canceled.

November 1, 1927—On application of WSAZ, Huntington, W. Va., for increase in power from 100 to 250 watts. Stations notified: WEBR, WFCI, WNBX, KFKB, WEDC, WGES, WEBC, KFON. Denied.

On application of KSCJ, Sioux City, Iowa, for change of frequency from 1,230 to 1,170 kilocycles and increase in power from 1,000 watts day and 500 watts night to 2,500 watts (full time). Stations notified: KTNT, WCSO, KRE, KFUS, WBBR, WASH, WEBJ, WLTH.

November 2, 1927—On application of WTAL, Toledo, Ohio, for increase of power from 100 to 1,000 watts. Stations notified: WFBG, WGCP, WNJ, KTAB, WFIW, WEAO, WAIU. Denied, Special Order 200; given 250 watts on 1,250 kilocycles.

On application of WDGY, Minneapolis, Minn., for change of frequency from 1,150 to 1,050 kilocycles. Stations notified: WKAR, WBAL, KFAU, WOAN, KFOY, WJAG, KLCN, KMMJ, WENR, WBCN. Denied, Special Order 201.

November 3, 1927—On application of WSBT, South Bend, Ind., for change of frequency from 1,260 to 570 kilocycles. Stations notified: WNYC, KYW, KMTR, WCAE, WMC. Denied, Special Order 202, granted 750 kilocycles.

On application of KFVE, St. Louis, Mo., requesting full time. Stations notified: KSD, KFUO, KMOX. Denied, Special Order 203.

November 8, 1927—On application of WHT, Chicago, Ill., protesting division of time with WORD, WIBO. Stations notified: WORD, WIBO. Denied, Special Order 206.

November 9, 1927—On application of WIBS, Elizabeth, N. J., for change of frequency from 1,470 to 1,070 kilocycles and increase of power from 150 to 500 watts. Stations notified: WGCP, WNJ. WMAL. Denied, Special Order 208.

On application of WMAL, Washington, D. C., for change of frequency from 1,240 to 1,070 kilocycles and increase of power from 250 to 500 watts. Denied frequency, but granted increase in power; Special Order 209.

Date of hearing—Continued.

November 28, 1927—On application of WBKN, Brooklyn, N. Y., for change of frequency from 1,120 to 1,500 kilocycles. Stations notified: WGCP, WNJ, WAAM, WBMS, WIBI, WWRL, WBKN. Denied, Special Order 216.

November 29, 1927—On application of WJJD, Mooseheart, Ill., requesting permission construct and operate 20 kilowatt station. Stations notified: WEBH, WFLA, WCAD, KMJ, WSAI, WDAY, WEEI.

November 28, 1927—On application of WWRL, Woodside, N. Y., requesting to remain on same frequency (ordered to 1,500 kilocycles by commission). Denied, Special Order 217.

On application of WBMS, Union City, N. J., request to remain on frequency (ordered to 1,500 kilocycles by commission). Denied, Special Order 218.

January 12, 1928—On application of KTNT, Muscatine, Iowa, for increase of power from 2,000 watts to 10 to 14 kilowatts. Stations notified: WCSO, WBBR, KFUS, KRE, WEBJ, WLTH, WASH.

January 16, 1928—On application of WJPW (C. R. Cummins), request for construction permit at Erie, Pa. Station notified: WJPW. Request change of frequency from 1,350 to 1,250 kilocycles. Hearing on charge WJPW moved from Ashtabula to Erie without authority. Removal authorized by Special Order 230.

January 20, 1928—On application of WBKN, Brooklyn, N. Y., for change of frequency from 1,500 to 1,320 kilocycles. Stations notified: WBBC, WARS, WSDA, WJAY, WCBE, WWAE, WCLO, WJBC, KSO, KFUP, KXRO, WFJC, WAIZ, KGHB, WTHS. Hearing canceled.

January 27, 1928—On application of WAAM, Newark, N. J., for change of frequency from 1,120 to 1,020 kilocycles and increase in power from 250 to 5,000 watts. Stations notified: WGL, WODA, WTMJ, KPRC, WLBW, KGCH, KGDW, KGEZ, WCGU. Postponed until February 9.

APPENDIX C (3)

Changes in assignments of broadcasting stations in and near Denver, Colo., effective November 1, 1927

As a result of Commissioner Bellows's public hearings held in Denver, Colo., from September 26 to 30, 1927, the commission on October 12, 1927, ordered the following changes, effective November 1, 1927:

"The application of Station KLZ for permission to move its transmitter from Denver to Dupont, Colo., is approved, and as soon as this move is completed Station KLZ is authorized to operate on 750 kilocycles (399.8 meters) with a maximum power output of 1,000 watts.

"Station KOW, Denver, is transferred from 630 kilocycles (475.9 meters) to 1,210 kilocycles (247.8 meters), with a minimum power output of 250 watts, and is ordered to divide time equally with Station KFEL, which is likewise assigned to 1,210 kilocycles, with a maximum power of 250 watts.

"Station KFXF, Denver, will remain on its present frequency of 1,060 kilocycles (282.8 meters), but with a maximum power output of 250 watts, and is ordered to divide time equally with Station KFUM, Colorado Springs, Colo.

"Station KFUM, Colorado Springs, Colo., is assigned to a frequency of 1,060 kilocycles, dividing time equally with Station KFXF, and with a maximum power output of 1,000 watts.

"Station KOA, Denver, is authorized to operate on its present frequency of 920 kilocycles (325.9 meters), with a maximum power output of 5,000 watts between 6 a. m. and 6 p. m. and of 2,500 watts between 6 p. m. and 6 a. m. The commission fully recognizes the admirable service rendered by Station KOA and the desirability of giving this station greatly increased power if its transmitter is moved, but holds that the location of its transmitter in relation to the residential section of Denver is not such as to make the use of more than 2,500 watts at night in the public interest.

"Station KGEY, Denver, is authorized to change its location to Westminster Hill and to increase its power from 15 watts to 250 watts on its present frequency of 1,490 kilocycles (201.6 meters).

"Station KFXJ, Edgewater, Colo., is authorized to increase its power from 15 watts to 50 watts on its present frequency of 1,390 kilocycles (215.8 meters).

"Station KFKA, Greeley, Colo., is transferred from 750 kilocycles to 550 kilocycles (545.1 meters), with its present power of 200 watts.

"Station KFUR. Ogden, Utah, is authorized to move its transmitter to a new location midway between Ogden and Salt Lake City, and to increase its power from 50 watts to 500 watts on its present frequency of 1,330 kilocycles (225.4 meters).

"Station KGEW, Fort Morgan, Colo., is authorized to increase its power from 50 watts to 200 watts between the hours of 6 a. m. and 6 p. m., local standard time, and to 100 watts from 6 p. m. to 6 a. m., on its present frequency of 1,370 kilocycles (218.8 meters)."

APPENDIX C (4)

Statement issued by the commission, to accompany General Order No. 19, on November 14, 1927, designating a band of cleared broadcasting channels

[To accompany General Order No. 19, designating a band of "clear broadcasting channels"]

FEDERAL RADIO COMMISSION,
Washington, D. C., November 14, 1927.

A comprehensive plan to set aside the broadcasting channels from 600 kilocycles to 1,000 kilocycles, as a band to be maintained free of heterodynes, whistles, and other radio interference, was announced by the Federal Radio Commission to-day in issuing General Order No. 19.

The initial step in this plan calls for the transfer, effective December 1, 1927, of approximately 25 stations which have hitherto acted as ether "jam logs" within the present restricted channels, causing most of the heterodyning interference. This action will by that date clear 26 channels. Some ten additional channels scattered within the nonheterodyning band will be cleared by cooperation among broadcasters or upon the basis of public hearings.

Such clearing of channels by cooperation between stations may be accomplished, it is believed, by several methods: Stations interfering can of course divide time. Or they can reduce their respective power output to avoid heterodyning. Or they can arrange to synchronize their frequencies accurately so that no heterodyne will result. Or certain stations can apply for transfer to other channels. The commission specifies no particular method.

The reception condition of each channel will be under the observation of several thousand scattered expert listeners throughout the United States, including members of the American Radio Relay League, who are cooperating with the commission by reporting interference at regular intervals.

In the case of any channel in the 600 to 1,000 kilocycle frequency band which has not been cleared before the date of expiration of the present license, December 31, the commission, precedent to renewing any licenses on that channel (except temporarily pending the decision of the commission) will call a public hearing at Washington to determine which station or stations can in the public interest be licensed on that channel, no renewals being granted except after the hearings. As the dates for these hearings will be set coincident with the December 31 expiration date, it should be possible to complete all hearings during the first week or two of January and so have the final "clean-up" of the United States "cleared" channels completed by January 15. The other six channels within the 600 to 1,000 kilocycles cleared band are, of course, assigned to Canada, and have always been maintained well clear of heterodyning by the Canadian authorities.

While the 600 to 1,000 kilocycle band has thus been set aside for clearing within the next 60 days, the commission's efforts to free channels of heterodyning are not being confined to these limits. Instead it is hoped to clear certain channels on both sides of the restricted bands, extending the clearing on the side of the higher frequencies into the 1,100's and 1,200's. Already a number of channels have been freed of heterodyning in these marginal bands. This clearing will continue, and eventually the channels so cleared will by transfers be

consolidated so that a continuous band of nonheterodyning channels will be secured throughout a large section of the dials, for the satisfactory service of regional and national radio audiences.

Radio adjustment in the status of broadcasting stations will clear approximately 26 wave lengths of all heterodyning interference. Most of the changes have been made upon the basis of numerous and persistent reports of interference from listeners since the advent of good reception weather.

Broadcasters who are parties to placing annoying interference, instead of programs, on their respective channels are not looked upon as serving public interest, convenience, or necessity. Instead of creating good will for themselves certain radio stations have become extremely unpopular due either to blanketing or heterodyning interference, complaining letters indicate.

Those who receive orders from the commission this week to adjust their broadcasting status in the interest of better reception conditions, or any other station dissatisfied with its lot, may upon application to the commission contest the place of any broadcaster occupying a more desirable position. It is believed, however, that in the interest of better radio few objections will be registered.

APPENDIX C (5)

Changes authorized by the commission in assignment of stations as of December 1 in furtherance of General Order No. 19

To put General Order 19 into effect the commission adopted Special Order 211, as follows:

In order to promote public convenience or interest or to serve public necessity, it is hereby ordered that changes be made in the operations of the stations listed below, effective at 6 o'clock a. m., local standard time, December 1, 1927.

WBBY. Charleston, S. C., transferred from 600 kilocycles, 75 watts to 1,200 kilocycles, 75 watts.

WBAP. Fort Worth, Tex., transferred from 600 kilocycles, 1,500 watts, sharing with WFAA to 600 kilocycles, 5,000 watts, sharing with WOAI.

WFAA. Dallas, Tex., transferred from 600 kilocycles, 500 watts, sharing with WBAP to 550 kilocycles, 500 watts, full time.

KFUT. Salt Lake City, Utah, transferred from 600 kilocycles, 50 watts to 1,200 kilocycles, 50 watts.

WOAI. San Antonio, Tex., transferred from 940 kilocycles, 5,000 watts to 600 kilocycles, 5,000 watts, sharing with WBAP.

WJAR. Providence, R. I., transferred from 800 kilocycles, 500 watts, to 620 kilocycles, 500 watts.

WCSH. Portland, Me., transferred from 620 kilocycles, 500 watts to 590 kilocycles, 250 watts.

WSUI. Iowa City, Iowa, transferred from 630 kilocycles, 500 watts, full time, to 630 kilocycles, 500 watts daylight, pending final disposition.

WHAS. Louisville, Ky., transferred from 650 kilocycles, 500 watts to 930 kilocycles, 500 watts.

WCAE. Pittsburgh, Pa., transferred from 580 kilocycles, 500 watts to 650 kilocycles, 500 watts.

KFDY. Brookings, S. Dak., transferred from 680 kilocycles, 500 watts to 550 kilocycles, 500 watts.

WPTF. Raleigh, N. C., transferred from 720 kilocycles, 500 watts to 550 kilocycles, 500 watts.

KLZ. Denver, Colo., transferred from 750 kilocycles, 500 watts to 1,010 kilocycles, 500 watts night, 1,000 watts daytime.

WMBF, Miami Beach, Fla., transferred from 780 kilocycles, 500 watts, full time, to 780 kilocycles, 500 watts, sharing with WQAM.

WQAM. Miami, Fla., transferred from 930 kilocycles, 750 watts, full time, to 780 kilocycles, 750 watts, sharing with WMBF.

WCAO. Baltimore, Md., transferred from 780 kilocycles, 250 watts, sharing with WCBM, to 1,330 kilocycles, 250 watts, sharing with WCBM.

WCBM. Baltimore, Md., transferred from 780 kilocycles, 100 watts, sharing with WCAO, to 1,330 kilocycles, 100 watts, sharing with WCAO.

WSRO. Middletown, Ohio, transferred from 780 kilocycles, 100 watts to 1,270 kilocycles, 100 watts.

WCAJ. Lincoln, Nebr., transferred from 790 kilocycles, 500 watts, full time, to 790 kilocycles, 500 watts, daytime only.
WSAI. Cincinnati, Ohio, transferred from 830 kilocycles, 5,000 watts, full time, to 830 kilocycles, 5,000 watts, sharing with WOS.
WOS. Jefferson City, Mo., transferred from 710 kilocycles, 500 watts to 830 kilocycles, 500 watts, sharing with WSAI.
KFBU. Laramie, Wyo., transferred from 700 kilocycles, 500 watts to 620 kilocycles, 500 watts.
WDAY. Fargo, N. Dak., transferred from 830 kilocycles, 250 watts night, 500 watts daytime, to 550 kilocycles, 250 watts night, 500 watts daytime, sharing with KFDY.
KWTC. Santa Ana, Calif., transferred from 850 kilocycles, 5 watts to 1,350 kilocycles, 100 watts, sharing with KFWC.
WOO. Philadelphia, Pa., transferred from 590 kilocycles, 500 watts, sharing with WIP to 860 kilocycles, 500 watts, sharing with WIP and WGBS.
WIP. Philadelphia, Pa., transferred from 590 kilocycles, 500 watts, sharing with WOO, to 860 kilocycles, 500 watts, sharing with WOO and WGBS.
WCAZ. Carthage, Ill., transferred from 880 kilocycles, 50 watts to 1,200 kilocycles, 50 watts.
WWVA. Wheeling, W. Va., transferred from 890 kilocycles, 250 watts to 580 kilocycles, 250 watts.
WAPI. Auburn, Ala., transferred from 920 kilocycles, 1,000 watts to 880 kilocycles, 1,000 watts, sharing with WJAX.
WJAX. Jacksonville, Fla., transferred from 890 kilocycles, 1,000 watts to 880 kilocycles, 1,000 watts, sharing with WAPI.
WHB. Kansas City, Mo., transferred from 890 kilocycles, 500 watts, sharing with WOQ, to 880 kilocycles, 500 watts, sharing with WOQ.
WOQ. Kansas City, Mo., transferred from 890 kilocycles, 250 watts night, 500 watts daytime, sharing with WHB to 880 kilocycles, 250 watts night, 500 watts daytime, sharing with WHB.
WSM. Nashville, Tenn., transferred from 880 kilocycles, 5,000 watts to 890 kilocycles, 5,000 watts.
WSMB. New Orleans, La., transferred from 930 kilocycles, 750 watts to 1,010 kilocycles, 750 watts.
KICK. Atlantic, Iowa, transferred from 930 kilocycles, 100 watts, full time, to 930 kilocycles, 100 watts, daytime only.
WIAS. Ottumwa, Iowa, transferred from 930 kilocycles, 100 watts, full time, to 930 kilocycles, 100 watts, daytime only.
WEAN. Providence, R. I., transferred from 940 kilocycles, 500 watts to 1,090 kilocycles, 500 watts.
WGHP. Detroit, Mich., transferred from 940 kilocycles, 750 watts to 1,080 kilocycles, 750 watts, sharing with WKAR.
KOIL. Council Bluffs, Iowa, transferred from 1,080 kilocycles, 2,000 watts to 940 kilocycles, 5,000 watts, sharing with KFAB.
KFAB. Lincoln, Nebr., transferred from 970 kilocycles, 2,000 watts to 940 kilocycles, 5,000 watts, sharing with KOIL.
WNAX. Yankton, S. Dak., transferred from 250 watts, 930 kilocycles to 1,080 kilocycles, 250 watts, daytime only.
WPSC. State College, Pa., transferred from 1,000 kilocycles, 500 watts, sharing with WBAK, to 1,000 kilocycles, 500 watts, sharing with WBAK, daytime only.
WBAK. Harrisburg, Pa., transferred from 1,000 kilocycles, 500 watts, sharing with WPSC, to 1,000 kilocycles, 500 watts, sharing with WPSC, daytime only.
WKAQ. San Juan, P. R., transferred from 890 kilocycles, 500 watts to 930 kilocycles, 500 watts.
WNJ. Newark, N. J., transferred from 1,070 kilocycles, 500 watts, sharing with WGCP, to 1,120 kilocycles, 250 watts, sharing with WGCP and WAAM.
WGCP. Newark, N. J., transferred from 1,070 kilocycles, 500 watts, sharing with WNJ, to 1,120 kilocycles, 250 watts, sharing with WNJ and WAAM.
WBKN. New York City, transferred from 1,120 kilocycles, 100 watts, sharing with WWRL, WBMS, and WIBI, to 1,500 kilocycles, 100 watts, sharing with WWRL, WBMS, and WIBI.
WWRL. Woodside, Long Island, N. Y., transferred from 1,120 kilocycles, 100 watts, sharing with WBKN, WBMS, and WIBI, to 1,500 kilocycles, 100 watts, sharing with WBKN, WBMS, and WIBI.
WIBI. New York City, transferred from 1,120 kilocycles, 100 watts, sharing with WWRL, WBMS, and WBKN, to 1,500 kilocycles, 100 watts, sharing with WWRL, WBMS, and WBKN.

WBMS. New York City, transferred from 1,120 kilocycles, 100 watts, sharing with WWRL, WIBI, and WBKN, to 1,500 kilocycles, 100 watts, sharing with WWRL, WIBI, and WBKN.

WABC. New York City, transferred from 920 kilocycles, 2,500 watts, night, 5,000 watts, daytime, sharing with WOBQ, to 970 kilocycles, 2,500 watts, night, 5,000 watts, daytime, sharing with WOBQ.

WOBQ. New York City, transferred from 920 kilocycles, 500 watts, sharing with WABC, to 970 kilocycles, 500 watts, sharing with WABC.

WGBS. New York City, transferred from 860 kilocycles, 500 watts, sharing with WAAM, to 860 kilocycles, 500 watts, sharing with WIP and WOO.

WAAM. Newark, N. J., transferred from 860 kilocycles, 500 watts, sharing with WGBS, to 1,120 kilocycles, 250 watts, sharing with WNJ and WGCP.

WPCH. Jersey City, N. J., transferred from 970 kilocycles, 500 watts, sharing with WRNY, to 920 kilocycles, 500 watts, sharing with WRNY.

WRNY. New York City, transferred from 970 kilocycles, 500 watts, sharing with WPCH, to 920 kilocycles, 500 watts, sharing with WPCH.

WHT. Chicago, Ill., transferred from 720 kilocycles, 5,000 watts, sharing with WIBO and WHAZ to 980 kilocycles, 5,000 watts, sharing with WIBO and WHAZ.

WIBO, Chicago, Ill., transferred from 720 kilocycles. 500 watts, sharing with WHAZ and WHT to 980 kilocycles, 500 watts, sharing with WHAZ and WHT.

WHAZ. Troy, N. Y., transferred from 720 kilocycles, 500 watts, Mondays only, sharing with WIBO and WHT to 980 kilocycles, 500 watts, Mondays only, sharing with WIBO and WHT.

WGN–WLIB, Chicago, Ill., transferred from 980 kilocycles, 15,000 watts to 720 kilocycles, 15,000 watts.

WLIB–WGN, North Elgin, Ill., transferred from 980 kilocycles, 500 watts to 720 kilocycles, 500 watts.

WKBI, Chicago, Ill., transferred from 930 kilocycles, 50 watts to 1,390 kilocycles, 50 watts, sharing with WHFC.

WHFC. Chicago, Ill., transferred from 1,390 kilocycles, 200 watts, full time, to 1,390 kilocycles, 200 watts, sharing with WKBI.

WJBA, Joliet, Ill., transferred from 930 kilocycles, 50 watts to 1,210 kilocycles, 50 watts.

WTAX, Streator, Ill., transferred from 930 kilocycles, 50 watts to 1,210 kilocycles, 50 watts.

WRRS, Racine, Wis., transferred from 930 kilocycles, 50 watts to 1,210 kilocycles, 50 watts.

WLBR, Belvidere, Ill., transferred from 930 kilocycles, 15 watts to 1,210 kilocycles, 15 watts.

WLBT. Crown Point, Ill., transferred from 930 kilocycles, 50 watts to 1,210 kilocycles, 50 watts.

WKDR, Kenosha, Wis., transferred from 930 kilocycles, 15 watts to 1,210 kilocycles, 15 watts.

Explaining its action in General Order 19, the commission issued the following statement:

"The foregoing list of changes in the status of certain broadcasting stations which have been occupying positions on the dial between 600 and 1,000 kilocycles, the band designated to be cleared of interference, represents the Federal Radio Commission's interpretation of its responsibility, fixed by law, for providing the great listening public of America, with its investment of many millions in radio receivers, an opportunity to use and enjoy good reception.

"Stations adversely affected in some instances must be martyrs to the cause of better radio. If the commission has erred in its difficult task of deciding relative merits of the broadcasters, recourse may be had in the form of a public hearing for any station believing it has the facts to substantiate its claim for more favorable consideration.

"But, fortified with conclusive proof that reception in many instances is being more or less competely ruined by interference and with the fact that listeners, during the winter months at least, desire to select distance as well as local stations, the commission, believing the listeners' interest paramount, will pursue a definite and unremitting policy of correcting the broadcasting situation toward that end.

"Few broadcasters, it is believed by the commission, will make demands which obviously can not, in the public interest as specified by law, be granted.

"Regarding divisions of time requested, the commission feels that a distinct service is rendered to any station which is encouraged to broadcast fewer hours under clear reception conditions rather than full time with its signals at most points utterly valueless."

APPENDIX C (6)

Channels cleared of heterodyne interference and channels yet uncleared between 600 and 1,000 kilocycles, effective as of December 1, 1927

	Watts
600 kilocycles; 499.7 meters (Canadian shared) (cleared):	
WBAP. Fort Worth, Tex. (divides with WOAI)	5,000
WOAI. San Antonio, Tex. (divides with WBAP)	5,000
610 kilocycles; 491.5 meters (cleared):	
KGW. Portland, Oreg	1,000
WEAF. Bellmore, N. Y	50,000
620 kilocycles; 483.6 meters (not cleared):	
WJAR. Providence, R. I	500
WCFL. Chicago, Ill. (divides with WLTS, WEMC)	1,500
WLTS. Chicago, Ill (divides with WCFL, WEMC)	100
WEMC. Berrien Springs, Mich. (divides with WLTS, WCFL)	1,000
KUSD. Vermillion, S. Dak	250
WTAW. College Station, Tex. (divides with KFDM)	500
KFDM. Beaumont, Tex. (divides with WTAW)	500
KFBU. Laramie, Wyo	500
630 kilocycles; 475.9 meters (Canadian shared) (cleared):	
WSB. Atlanta, Ga	1,000
WSUI. Iowa City, Iowa (daytime only)	500
640 kilocycles; 468.5 meters (cleared):	
WRC. Washington, D. C	500
KFI. Los Angeles, Calif	5,000
650 kilocycles; 461.3 meters (not cleared):	
WNAC, WBIS. Boston, Mass	500
KRLD. Dallas, Tex. (divides with WRR)	500
KFNF. Shenandoah, Iowa (daytime only)	2,000
WCAE. Pittsburgh, Pa	500
WRR. Dallas, Tex. (divides with KRLD)	500
KUOM. Missoula, Mont	500
660 kilocycles; 454.3 meters (cleared):	
WJZ. Bound Brook, N. J	30,000
KFRC. San Francisco, Calif	1,000
670 kilocycles; 447.5 meters (cleared):	
WMAQ. Chicago, Ill. (divides with WQJ)	1,000
WQJ. Chicago, Ill. (divides with WMAQ)	500
KFOA. Seattle, Wash	1,000
680 kilocycles; 440.9 meters (cleared):	
WJR—WCX (2 call letters), Pontiac, Mich	5,000
WIBG. Elkins Park, Pa. (Sunday, 6 a. m. to 6 p. m.)	50
KFSD. San Diego, Calif	500
WAAW. Omaha, Nebr. (6 a. m. to 6 p. m.)	500
700 kilocycles; 428.3 meters (cleared):	
WLW—	
1 transmitter at Harrison, Ohio	5,000
1 transmitter at Cincinnati, Ohio	500
WMAF. South Dartmouth, Mass. (summer months only)	500
710 kilocycles; 422.3 meters (cleared):	
WOR. Newark, N. J	5,000
KPO. San Francisco, Calif	1,000
720 kilocycles; 416.4 meters (cleared):	
WGN. Chicago, Ill. (divides with WLIB)	500
WLIB. North Elgin, Ill. (divides with WGN)	15,000
KHJ. Los Angeles, Calif	500
740 kilocycles; 405.2 meters (not cleared):	
WLIT. Philadelphia, Pa. (divides with WFI)	500
WFI. Philadelphia, Pa. (divides with WLIT)	500
WCCO. Minneapolis, Minn. (7,500 watts day)	5,000

	Watts
750 kilocycles: 399.8 meters (cleared):	
WEAR. Cleveland, Ohio (divides with WTAM)	1,000
WTAM. Cleveland, Ohio (5,000 watts day) (divides with WEAR)	3,500
760 kilocycles; 394.5 meters (not cleared):	
KMA. Shenandoah, Iowa (divides with KWKH)	1,000
WHN. New York City (divides with WQAO, WPAP)	500
WQAO, WPAP. Cliffside, N. J. (divides with WHN)	500
KTW. Seattle, Wash. (divides with KWSC, KOB)	1,000
KWSC. Pullman, Wash. (divides with KTW, KOB)	500
KWKH. Shreveport, La. (divides with KMA)	1,000
KOB. State College, N. Mex. (7,500 watts to 6 p. m.) (divides with KWSC, KTW)	5,000
770 kilocycles; 389.4 meters (cleared):	
WBBM. Chicago, Ill. (divides with WJBT, WAAF)	5,000
WAAF. Chicago, Ill. (divides with WJBT, WBBM)	500
WJBT. Chicago, Ill. (divides with WBBM, WAAF)	500
WABI. Bangor, Me. (Sunday only)	100
780 kilocycles; 384.4 meters (Canadian shared) (not cleared):	
WQAM. Miami, Fla. (divides with WMBF)	750
WMBF. Miami Beach, Fla. (divides with WQAM)	500
KGO. Oakland, Calif	5,000
WBSO. Wellesley Hills, Mass	100
KTHS. Hot Springs, Ark	1,000
790 kilocycles; 379.5 meters (cleared):	
WCAJ. Lincoln, Nebr. (daytime only)	500
WGY. Schenectady, N. Y	50,000
800 kilocycles; 374.8 meters (cleared):	
KNRC. Santa Monica, Calif	500
WOC. Davenport, Iowa	5,000
810 kilocycles; 370.2 meters (not cleared):	
WDAF. Kansas City, Mo	1,000
KHQ. Spokane, Wash	1,000
WLWL. Jersey City, N. J. (divides with WMCA)	1,000
WMCA. Hoboken, N. J. (divides with WLWL)	500
820 kilocycles; 365.6 meters (not cleared):	
WEBH. Chicago, Ill. (divides with WJJD)	500
WJJD. Mooseheart, Ill. (divides with WEBH)	1,000
KMJ. Fresno, Calif	50
WEEI. Boston, Mass	500
830 kilocycles; 361.2 meters (cleared):	
WSAI. Cincinnati, Ohio (divides with WOS)	5,000
WOS. Jefferson City, Mo. (divides with WSAI)	500
KFWB. Los Angeles, Calif	500
850 kilocycles; 352.7 meters (cleared):	
WWJ. Detroit, Mich	1,000
WEW. St. Louis, Mo. (6 a. m. to 6 p. m.)	1,000
860 kilocycles; 348.6 meters (not cleared):	
WOO. Philadelphia, Pa. (divides with WIP, WGBS)	500
WGBS. Astoria, Long Island, N. Y. (divides with WIP, WOO)	500
WIP. Philadelphia, Pa. (divides with WOO, WGBS)	500
KVOO. Bristow, Okla	1,000
KJR. Seattle, Wash. (divides with KXA)	2,500
KXA. Seattle, Wash. (divides with KJR)	500
870 kilocycles; 344.6 meters (cleared):	
WLS. Chicago, Ill. (divides with WCBD)	5,000
WCBD. Chicago, Ill. (divides with WLS)	5,000
KWG. Stockton, Calif	50
KFQD. Anchorage, Alaska	100
880 kilocycles; 340.7 meters; Canadian shared (not cleared):	
WAPI. Auburn, Ala. (divides with WJAX)	1,000
WJAX. Jacksonville, Fla. (divides with WAPI)	1,000
WHB. Kansas City, Mo. (divides with WOQ)	500
WOQ. Kansas City, Mo. (5 to 6 p. m.) (divides with WHB)	250
890 kilocycles; 336.9 meters; Canadian shared (cleared):	
WSM. Nashville, Tenn	5,000
KNX. Los Angeles, Calif	500

	Watts
900 kilocycles; 333.1 meters (not cleared):	
KFQB. Fort Worth, Tex. (divides with WJAD)	1,000
WJAD. Waco, Tex. (divides with KFQB)	500
WBZ. East Springfield, Mass	15,000
WBZA. Boston, Mass	500
KSAC. Manhattan, Kans	500
KFJM. Grand Forks, N. Dak	100
KSEI. Pocatello, Idaho	250
WHA. Madison, Wis. (divides with WLBL)	750
WLBL. Stevens Point, Wis. (2,000 watts to 6 p. m.) (divides with WHA)	1,000
920 kilocycles; 325.9 meters (not cleared):	
KOA. Denver, Colo. (5,000 watts to 8 p. m.)	2,500
WRNY. New York City (divides with WPCH)	500
WPCH. Hoboken, N. J. (divides with WRNY)	500
930 kilocycles; 322.4 meters (Canadian shared) (cleared):	
WRHF. Washington, D. C. (to 7 p. m. only)	150
WHAS. Louisville, Ky	500
KICK. Atlantic, Iowa (daytime only) (divides with WIAS)	100
WIAS. Ottumwa, Iowa (daytime only) (divides with KICK)	100
WKAQ. San Juan, P. R	500
940 kilocycles; 319 meters (cleared):	
KOIL. Council Bluffs, Iowa (divides with KFAB)	5,000
KFAB. Lincoln, Nebr. (divides with KOIL)	5,000
KOIN. Portland, Oreg	1,000
950 kilocycles; 315.6 meters (cleared):	
KDKA. Pittsburgh, Pa	50,000
KPSN. Pasadena, Calif	1,000
970 kilocycles; 309.1 meters (cleared):	
KYA. San Francisco, Calif	500
WABC. New York City (5,000 watts to 6 p. m.) (divides with WBOQ)	2,500
WBOQ. New York City (divides with WABC)	500
980 kilocycles; 305.9 meters (cleared):	
WHT. Chicago, Ill. (divides with WIBO, WHAZ)	5,000
WIBO. Chicago, Ill. (divides with WHT, WHAZ)	500
WHAZ. Troy, N. Y. (Monday nights only)	500
KOMO. Seattle, Wash	1,000
990 kilocycles; 302.8 meters (cleared):	
WGR. Buffalo, N. Y	750
KSL. Salt Lake City, Utah	1,000
1,000 kilocycles; 299.8 meters (cleared):	
KFWO. Avalon, Calif	250
KMOX. St. Louis, Mo	5,000
WPSC. State College, Pa. (daytime only) (divides with WBAK)	500
WBAK. Harrisburg, Pa. (daytime only) (divides with WPSC)	500
KOWW. Walla Walla, Wash	500

The commission on November 19, 1927, issued the following statement and above list of cleared and uncleared channels in the 600–1,000 kilocycle band:

"The broadcasting picture in the nonheterodyning band of channels, 600 to 1,000 kilocycles, as it will appear December 1, when the Federal Radio Commission's recent transfers become effective to clear up 25 channels, is shown in the accompanying list. This is but the first step in securing good reception on this band, the second move being to clear up the remaining 10 or 11 channels, either through cooperation between stations before January 1, or through hearings beginning with that date, precedent to the granting of new licenses on those channels.

"A glance through the accompanying list of channels, 25 of which will be cleared as of December 1, shows that the newly designated band includes important stations scattered throughout the entire United States. Over these cleared channels it will thus be possible for rural and remote listeners to pick up stations in all sections of the country. Listeners with a particular taste for DX will also find the tracks cleared for them all the way across the continent in the case of several of the Pacific coast stations which have adequate power to deliver a signal in the East under good reception conditions.

"For example, on 640 kilocycles, when station WRC at Washington shuts down at 10.30 or 11 o'clock, the entire Nation can test out its long-distance receiving sets on KFI, the 5,000-watt broadcaster at Los Angeles, Calif.

"Another test for distance hounds will be the 5,000-watt pair, WBAP and WOAI, at Fort Worth and San Antonio, Tex., respectively.

"San Francisco can be heard for three hours after Newark shuts down on 710 kilocycles. And Portland will come in on WEAF's wave length after the big Long Island transmitter has closed for the night.

"KOA, Denver, Colo., as a mile-post for cross-continental radio tourists, will be heard when two 500-watt stations in New York City are off. And Porto Rico, which shares Louisville's channel, will prove a long-distance southern test when the Kentucky broadcaster has closed down.

"Four cleared channels have been provided for four high-powered New York stations—WEAF, WJZ, WOR, and WABC—the last-named assignment becoming effective with the December 1 changes, in order to secure for this 5,000-watt transmitter a cleared channel across the continent.

"Chicago has been assigned some five cleared waves, and while this is the largest number given to any single community it must be remembered that Chicago, by its central location, is in a position to furnish programs for the entire United States, both east and west, and for this reason, considered from the standpoint of the tremendous audience of remote listeners surrounding Chicago, it was deemed desirable that this number of cleared channels be freed for the Chicago broadcasters.

"Other centrally located cities in the Middle West, such as Cincinnati, St. Louis, Cleveland, and Detroit, are also given the opportunity to share with Chicago in providing radio programs for the great Mississippi Valley and central western audience.

"The South is particularly well represented in this picture of cleared channels, Atlanta, Ga., Nashville, Tenn., Louisville, Ky., as well as Fort Worth and San Antonio, Tex., having been assigned cleared frequencies.

"With 25 channels cleared, effective December 1, and with the remaining 11 channels in the 600–1,000 band to be cleared before licenses are renewed on those channels in January, it is the purpose of the Radio Commission to bring to the remote and rural listeners during the present winter season as high a degree of reception as is possible, an improvement corresponding to that accomplished for city and local listeners by the commission's earlier actions."

APPENDIX C (7)

Report of Commissioner Lafount on radio problems of the fifth zone, dated January 16, 1928

Commissioner Lafount's report on radio problems of the fifth zone, made after his return on January 16, 1928:

"While reception in the West is generally good, it is a fact that the rural districts do not come within the service range of many stations, and people in those sections get fair reception in cold weather, but little radio, if any, in summer.

"The rural listener in the West also has little choice of programs, due to the fact that radio stations in the fifth zone, which embrace two-fifths of the area of the United States, have been allocated only 65,000 watts power, while the stations in the other zones have power aggregating 525,000 watts. Perhaps too much thought has been given to population and not enough to area in the allocation of power and frequencies.

"My investigation disclosed the necessity for making some changes in allocations to stations in the fifth zone, and I shall, in due time, make a number of recommendations which, I believe, will improve radio reception in the West.

"Regarding chain programs, they only occupy a small portion of the time on a very few stations in the West. High-powered stations in the East and Middle West cause much interference for stations in the fifth zone on the same channels or near-by channels.

"Listeners in the fifth zone object to direct advertising over the radio, much of which is being done now in this zone during the day, but little during the evening.

"The people in the West apparently do not consider such programs of public interest, convenience, or necessity. My observation convinces me that the listeners want sponsored programs of a high class clean entertainment, educational features with a reasonable amount of religious discussion. Better and more selective sets are replacing the old obsolete sets so that reception is rapidly improving."

APPENDIX C (8)

Analysis of programs of 100 stations in the fifth zone prepared by Commissioner Lafount

Weekly average of hours on the air		54
Chain programs	hours	1
Studio programs	do	25
Mechanical programs (records, etc.)	do	7
Orchestras by remote control	do	4
Religion	do	8
Education and lectures other than on farm subjects	do	5
Farm reports, talks, etc	do	3
Weather and stock reports	do	1
Total	do	54

APPENDIX C (9)

Digest of requests made by 102 stations of the fifth zone in January, 1928, presented by Mr. Lafount

JANUARY 19, 1928.

Forty-nine stations requested increased power, which would, if granted, increase the power of stations in the fifth zone from 65,000 watts to 145,000 watts.

Forty-one stations desire to retain their wave length but want other stations operating on a frequency near theirs moved.

Seventeen stations report interference with or from other stations and ask for some relief.

Nine stations request change of frequency.

Twenty stations now dividing time request discontinuance of this practice, stating that they can not make stations pay operating on half time.

Six stations, if granted power increase, will move transmitters out of town.

Six station owners admitted that they may not be of public interest, convenience, or necessity.

Forty-one applicants for new stations interviewed and discouraged.

Total increase of hours on the air if stations now dividing time were not required to do so, and if all stations operated as many more hours as they stated they intend to, 2,400 hours per week, or an increase of 48 per cent broadcasting hours in the fifth zone.

Broadcasters ask for items referred to above. The listeners are asking the opposite. Perhaps their position is expressed best in one of the many telegrams received from the fifth zone, which reads as follows:

"Cut off 700 stations February 1. Have better than average radio set. Can start at bottom dial and get from three to five stations every point dial from 6 to 10 o'clock night. Radio sets useless, as can not get any station over 30 seconds at time. Certainly rotten."

The above is typical of hundreds of letters received by the commission.

It must be obvious that the task assigned to me of reducing the number of broadcasting stations in the fifth zone is going to be rather difficult in view of the above requests. Also you will realize the study necessary to enable the commission to act intelligently upon the radio problems in the West. Therefore please be patient. Any delay should not be considered Government "red tape," but time required to work out an extremely perplexing problem.

Some stations will have to divide time and the broadcasting hours must be reduced, not increased; otherwise radio reception will be greatly impaired instead of improved.

The object of this brief statement is only to assure you that as soon as time will permit suggestions will be made that will, in our judgment, be in the best interest of the public.

APPENDIX C (10)

Changes in assignments of stations in the fifth zone as of March 1, 1928

As a result of Commissioner Lafount's studies on February 18, 1928, the commission ordered the following changes in the fifth zone, effective March 1, 1928, which brought about a vast improvement in radio reception, according to reports reaching the commission:

KGHA. Pueblo, Colo., George H. Sweeney and N. S. Walpole, issued construction permit to erect new station, specifying 1,430 kilocycles, 500 watts.

KPOF. Denver, Colo., Pillar of Fire (Inc.) (8.9 miles from Denver post-office building), granted construction permit, specifying 1,490 kilocycles, 500 watts, with limited time.

KSL. Salt Lake City, Utah, Radio Service Corporation (about 6 miles due west), granted construction permit, specifying 990 kilocycles, 5,000 watts, with unlimited time.

KOAC. Corvallis, Oreg., Oregon State Agricultural College, issued construction permit, specifying 1,110 kilocycles, 270.1 meters, 1,000 watts, operating daily to 8 p. m.

KEJK. Los Angeles, Calif., Freeman Lang (formerly Freeman Lang and A. B. Scott), issued construction permit, specifying 1,190 kilocycles, 250 watts, operating from 6 p. m. to 10 p. m. only on Mondays, Tuesdays, Thursdays, and Fridays.

KGEN. El Centro, Calif., E. R. Irey and F. M. Bowles, granted construction permit, specifying 1,330 kilocycles, 100 watts, with limited time.

KELW. Burbank, Calif., Earl L. White, granted construction permit specifying 1,310 kilocycles, 500 watts.

KOOS. Marshfield, Oreg., KOOS Radio Sales & Service (Inc.), issued construction permit specifying 1,450 kilocycles, 50 watts.

KXL. Portland, Oreg., KXL Broadcasters (Inc.), operating on 1,360 kilocycles 50 watts, issued construction permit to increase its power to 100 watts.

KEX. Portland, Oreg., Western Broadcasting Co., operating on 1,250 kilocycles, 239.9 meters, 2,500 watts, changed to 1,080 kilocycles, 277.6 meters.

KFBC. San Diego, Calif., Dr. Arthur W. Yale, operating on 1,210 kilocycles, 247.8 meters, 100 watts, full time, changed to sharing with KFWC.

KFBK. Sacramento, Calif., Kimball-Uppson Co., operating on 560 kilocycles, 535.4 meters, 100 watts, changed to 1,090 kilocycles, 275.1 meters, 100 watts, from 6 p. m. to 10 p. m. only on Tuesdays, Wednesdays, Thursdays, and Saturdays, sharing with KTBI.

KFBL. Everett, Wash., Leese Bros., operating on 1,340 kilocycles, 223.7 meters, 50 watts, full time, changed to sharing with KXRO.

KFBU. Laramie, Wyo., Bishop N. S. Thomas, 500 watts, operating on 620 kilocycles, 485.6 meters, full time, changed to share with KFUM.

KFCR. Santa Barbara, Calif., Santa Barbara Broadcasting Co., operating on 1,420 kilocycles, 211.1 meters, 50 watts, full time, changed to operating daily to 10 p. m. only, 100 watts.

KFEC. Portland, Oreg., Meier & Frank Co., operating on 1,400 kilocycles, 214.2 meters. 50 watts, sharing with KFIF, changed to operating daily to 7 p. m. only, full time.

KFEL. Denver, Colo., Eugene P. O'Fallon (Inc.), operating on 1,210 kilocycles, 247.8 meters, 250 watts, sharing with KOW, changed to 1,320 kilocycles, 227.1 meters, 250 watts, sharing with KFUP.

KFHA. Gunnison, Colo., Western State College, of Colorado, operating on 1,180 kilocycles, 254.1 meters, 50 watts, full time, changed to 1,200 kilocycles, 249.9 meters, 50 watts, sharing with KFKA.

KFIF. Portland, Oreg., Benson Polytechnical School, operating on 1,400 kilocycles, 214.2 meters, 50 watts, sharing with KFEC, changed to 1,310 kilocycles, 228.9 meters, 50 watts, sharing with KTBR.

KFIO. Spokane, Wash., North Central High School, operating on 1,220 kilocycles, 245.8 meters, 100 watts, sharing KFPY, sharing with KFPY and KGY.

KFJI. Astoria, Oreg., E. E. Marsh, operating on 1,200 kilocycles, 249.9 meters, 15 watts, sharing with KMED, changed to sharing with KWJJ.

KFJR, Portland, Oreg., Ashley C. Dixon & Son, operating on 1,060 kilocycles, 282.8 meters, 100 watts, sharing with KTBR, granted 500 watts power and full time.

KFKA. Greeley, Colo., Colorado State Teachers College, operating on 1,200 kilocycles, 249.9 meters, 200 watts, full time, granted 1,000 watts 6 a. m. to 6 p. m. and 500 after 6, sharing with KFHA.

KEPY. Spokane, Wash., Symons Investment Co., operating on 1,220 kilocycles, 245.8 meters, 250 watts, sharing with KFIO, changed to sharing with KGY and KFIO.

KFQZ. Hollywood, Calif., Taft Radio & Broadcasting Co. (Inc.), operating on 1,290 kilocycles, 232.4 meters, 100 watts, sharing with KEPT, granted 250 watts power.

KFSG, Los Angeles, Calif., Echo Park Evangelistic Association, operating on 190 kilocycles, 275.1 meters, 500 watts, changed to 1,190 kilocycles, 252 meters, sharing with KRLO.

KFUM. Colorado Springs, Colo., W. D. Corley, operating on 1,060 kilocycles, 282.8 meters, 1,000 watts, sharing with KFXF, changed to 620 kilocycles, 483.6 meters, sharing with KFBU.

KFUP. Denver, Colo., Fitzsimons General Hospital, operating on 1,320 kilocycles, 227.1 meters, 100 watts, full time, changed to sharing with KFEL.

KFVD. Venice, Calif., W. J. & C. I. McWhinnie, operating on 1,440 kilocycles, 208.2 meters, 250 watts, sharing with KGFJ, changed to 1,390 kilocycles, 215.7 meters, sharing with KGER.

KFWC. Ontario, Calif., Lawrence E. Wall, operating on 1,350 kilocycles, 222.1 meters, 100 watts, sharing with KWTC, changed to 1,210 kilocycles, 247.8 meters, sharing with KFBC.

KFWI. San Francisco, Calif., Radio Entertainments (Inc.), operating on 1,120 kilocycles, 267.1 meters, 500 watts, full time, limited to 10 p. m. daily.

KFWO. Avalon, Calif., Lawrence Mott, operating on 1,000 kilocycles, 299.8 meters 250 watts, full time, limited to 10 p. m. daily.

KFXF. Denver, Colo., Pikes Peak Broadcasting Co., operating on 1,060 kilocycles, 283.8 meters, 250 watts, sharing with KFUM, given full time.

KFXJ. Edgewater, Colo., R. G. Howell, operating on 1,390 kilocycles, 215.7 meters, 50 watts, changed to 1,430 kilocycles, 209.7 meters, 50 watts, sharing with KGHF.

KGCL. Seattle, Wash., Archie Taft and Louis Wasmer, operating on 1,300 kilocycles, 230.6 meters, 50 watts, sharing with KPCB, granted increase in power to 100 watts.

KGEF. Los Angeles, Calif., Trinity Methodist Church, operating on 1,140 kilocycles, 263 meters, 500 watts, granted 1,000 watts, sharing with KGFH.

KGER. Long Beach, Calif., C. Merwin Dobyns, operating on 1,390 kilocycles, 215.7 meters, 100 watts, sharing with KRLO, changed to sharing with KFVD.

KGEW, Fort Morgan, Colo., city of Fort Morgan, operating on 1,370 kilocycles, 218.8 meters, 100 watts, night, and 200 watts, day, full time, changed to sharing with KOW.

KGFH. La Crescenta, Calif., Frederick Robinson, operating on 1,340 kilocycles, 223.7 meters, 250 watts, sharing with KMIC, changed to 1,140 kilocycles, 263 meters, sharing with KGEF, and operating from 6 p. m. to 10 p. m. only, Mondays, Wednesdays, Fridays, and Saturdays.

KGFJ. Los Angeles, Calif., Ben S. McGlashan, operating on 1,440 kilocycles, 208.2 meters, 100 watts, sharing with KFVD, changed to 1,410 kilocycles, 212.6 meters, 100 watts, full time.

KGHF, Pueblo, Colo., Philip G. Lasky and J. H. Albert, operating on 1,430 kilocycles, 209.7 meters, 250 watts, full time, changed to sharing with KFXJ.

KFTT. San Francisco, Calif., Glad Tidings Temple and Bible Institute, operating on 1,450 kilocycles, 206.8 meters, 50 watts, full time, changed to 1,360 kilocycles, 220.4 meters, 50 watts, sharing with KJBS.

KGY. Lacey, Wash., St. Martins College, operating on 1,230 kilocycles, 243.8 meters, 50 watts, full time, changed to 1,220 kilocycles, 245.8 meters, 50 watts, sharing with KEPY and KFIO.

KJBS. San Francisco, Calif., Julius Brunton & Sons Co., operating on 1,360 kilocycles, 220.4 meters, 50 watts, granted 100 watts power, sharing with KGTT.

KKP. Seattle, Wash., city of Seattle, Harbor Department, operating on 1,130 kilocycles, 265.3 meters, 15 watts, changed to 1,480 kilocycles, 202.6 meters, 15 watts, sharing with KRSC and KVL.

KLS. Oakland, Calif., Warner Bros., operating on 1,220 kilocycles, 245.8 meters, 250 watts, sharing with KZM, changed to sharing with KRE.

KMED. Medford, Oreg., W. J. Virgin, operating on 1,200 kilocycles, 249.9 meters, 50 watts, sharing with KFJI, changed to 1,450 kilocycles, 206.8 meters, 50 watts, sharing with KOOS, operating daily to 9 p. m.

KMIC. Inglewood, Calif., James R. Fouch, operating on 1,430 kilocycles, 223.7 meters, 250 watts, sharing with KGFH, given full time this frequency.

KMJ. Fresno, Calif., the Fresno Bee, operating on 820 kilocycles, 365.6 meters, 50 watts, full time, limited to 10 p. m. daily.

KMO. Tacoma, Wash., KMO (Inc.), operating on 1,180 kilocycles, 254.1 meters, 250 watts, granted 500 watts power.

KMTR. Hollywood, Calif., KMTR Radio Corporation, operating on 570 kilocycles, 526 meters, 500 watts, limited until 10 p. m. daily.

KOAC. Corvallis, Oreg., Oregon State Agricultural College, operating on 1,110 kilocycles, 270.1 meters, 500 watts, limited to 8 p. m. daily.

KOW. Denver, Colo., Olinger Corporation Broadcasting, operating on 1,210 kilocycles, 247.8 meters, 250 watts, sharing with KFEL, changed to 1,370 kilocycles, 218.8 meters, 250 watts, sharing with KGEW.

KPCB. Seattle, Wash., Pacific Coast Biscuit Co., operating on 1,300 kilocycles, 230.6 meters, 50 watts, sharing with KGCL, granted 100 watts.

KPLA. Los Angeles, Calif., Pacific Development Radio Co., operating on 1,190 kilocycles, 252 meters, 500 watts, changed to 1,040 kilocycles, 288.3 meters.

KPPC. Pasadena, Calif., Pasadena Presbyterian Church, operating on 1,310 kilocycles, 228.9 meters, 50 watts, sharing with KELW, changed to 950 kilocycles, 315.6 meters, 50 watts, sharing with KPSN.

KPSN. Pasadena, Calif., Pasadena, Star-News Publishing Co., operating on 950 kilocycles, 315.6 meters, 1,000 watts, full time, changed to sharing with KPPC.

KRE. Berkeley, Calif., First Congregational Church, operating on 1,170 kilocycles, 256.3 meters, 100 watts, sharing with KFUS, changed to 1,220 kilocycles, 245.8 meters, 100 watts, sharing with KLS.

KRSC. Seattle, Wash., Radio Sales Corporation, operating on 1,420 kilocycles, 211.1 meters, 50 watts, changed to 1,480 kilocycles, 202.6 meters, sharing with KVL and KKP.

KSMR. Santa Maria, Calif., Santa Maria Valley Railroad Co., operating on 1,100 kilocycles, 272.6 meters, 100 watts, full time changed to sharing with KWTC.

KTBI. Los Angeles, Calif., Bible Institute of Los Angeles, operating on 1,040 kilocycles, 288.3 meters, 500 watts, changed to 1,090 kilocycles, 275.1 meters, 1,000 watts, sharing with KFBK.

KTBR. Portland, Oreg., M. E. Brown, operating on 1,060 kilocycles, 282.8 meters, 50 watts, sharing with KFJR, changed to 1,310 kilocycles, 228.9 meters, 50 watts, sharing with KFIF.

KTW. Seattle, Wash., First Presbyterian Church, operating on 760 kilocycles, 394.5 meters, 1,000 watts, sharing with KWSC and KOB, changed to sharing with KWSC only.

KVI. Tacoma, Wash., Puget Sound Radio Broadcasting Co., operating on 1,280 kilocycles, 254.2 meters, 50 watts, changed to 1,260 kilocycles, 238 meters, 250 watts, operating daily until 9 p. m.

KVL. Seattle, Wash., Arthur C. Daily, operating on 1,480 kilocycles, 202.6 meters, 100 watts, full time, changed to sharing with KKP and KRSC.

KVOS. Bellingham, Wash., L. Kessler, operating on 1,430 kilocycles, 209.7 meters, 50 watts, granted 250 watts.

KWG, Stockton, Calif., Portable Wireless Telephone Co., operating on 870 kilocycles, 344.6 meters, 50 watts, full time, changed to operating daily to 10 p. m.

KWJJ. Portland, Oreg., Wilbur Jerman, operating on 1,310 kilocycles, 228.9 meters, 50 watts, changed to 1,200 kilocycles, 249.9 meters, 50 watts, sharing with KFJI.

KWSC. Pullman, Wash., State College of Washington, operating on 760 kilocycles, 394.5 meters, 500 watts, sharing with KTW and KOB, changed to sharing with KTW only.

KXRO. Aberdeen, Wash., KXRO (Inc.), operating on 1,320 kilocycles, 227.1 meters, 50 watts, changed to 1,340 kilocycles, 223.7 meters, sharing with KFBL.

KYA. San Francisco, Calif., Pacific Broadcasting Corporation, operating on 850 kilocycles, 352.7 meters, 500 watts, changed to 830 kilocycles, 361.2 meters, 1,000 watts.

KFUS. Oakland, Calif., Dr. L. L. Sherman, operating on 1,170 kilocycles, 256.3 meters, 50 watts, sharing with KRE, changed to 1,440 kilocycles, 208.2 meters, 50 watts, sharing with KFQU and KZM.

KFQU. Holy City, Calif., W. E. Riker, operating on 1,200 kilocycles, 249.9 meters, 100 watts, full time, changed to 1,440 kilocycles, 208.2 meters, 100 watts, sharing with KFUS and KZM.

KGDM. Stockton, Calif., E. F. Peffer, operating on 1,380 kilocycles, 217.3 meters, 10 watts, limited to 9 p. m.

KLIT. Portland, Oreg., Lewis Irvine Thompson, operating on 1,450 kilocycles, 206.8 meters, 10 watts, changed to 1,500 kilocycles, 199.9 meters, 10 watts, sharing with KUJ and KWBS.

KUJ. Seattle, Wash., Puget Sound Radio Broadcasting Co., operating 1,500 kilocycles, 199.9 meters, 10 watts, full time, changed to sharing with KLIT and KWBS.

KWBS. Portland, Oreg., Schaeffer Radio Co., operating on 1,500 kilocycles, 199.9 meters, 15 watts, full time, changed to sharing with KLIT and KUJ.

KZM. Oakland, Calif., Preston D. Allen, operating on 1,220 kilocycles, 245.8 meters, 100 watts, sharing with KLS, changed to 1,440 kilocycles, 208.2 meters, 100 watts, sharing with KFUS and KFQU.

KELW. Burbank, Calif., Earl L. White, operating on 1,310 kilocycles, 228.9 meters, 250 watts, sharing with KPPC, granted unlimited time on this frequency (February 20, 1928).

APPENDIX C (11)

Letter of Admiral Bullard relative to broadcasting in the South, dated August 24, 1927

ADMIRAL BULLARD'S LETTER OF AUGUST 24, 1927

The attitude of the commission toward broadcasting in the South was set forth in a letter by the late Admiral Bullard, addressed to a critic who charged that section was being discriminated against, made public August 24, 1927. It follows:

"It must be apparent that the number of stations existing when the Federal Radio Commission came into being was a matter which could not be controlled in any manner whatsoever.

"The Federal Radio Commission is not in any manner acting against the interest of Southern States in their desire to have broadcasting stations, and the commission can not accept the statement that the South is being badly treated by the Radio Commission. I assure you that such is not the case, when only last week permits were granted to at least eight new stations in the Southern States and not a single one in the North.

"The commission is quite aware of the section of the radio act of 1927 which intimated that stations should be allotted on an equitable basis among States, and that is one of the dominating features of the action of the commission at this time; and surely a station should not be deprived of its license simply because it does not happen to be in a Southern State. It is a fact that the Southern States are not particularly well represented in the broadcasting field, but it is also a fact that this commission can not be held responsible for that state of affairs, because if the people of the South do not want broadcasting stations and do not make application for them the commission can not take any action whatsoever."

APPENDIX D (1)

List of broadcasting stations surrendering licenses during the period between March 15, 1927, and June 30, 1928

Zone	Symbol	Location	Kilocycles	Watts	Date
3	WQBA	Amorc College, Tampa, Fla	1,260	250	May 9, 1928
2	WRAV	Antioch College, Yellow Springs, Ohio	1,010	100	Nov. 23, 1927
2	WKBU	Harry K. Armstrong, New Castle, Pa	1,470	50	Sept. 7, 1927
4	KFVN	Carl E. Bagley, Fairmont, Minn	1,310	100	Sept. 7, 1927
2	WQAA	Horace A. Beale, jr., Parkesburg, Pa	1,390	500	Dec. 5, 1927
3	KFXH	W. S. Bledsoe, El Paso, Tex	1,240	125	Sept. 7, 1927
3	WFLA	Boca Raton Radio Corporation, Boca Raton, Fla	1,410	1,000	Aug. 5, 1927
1	WEAM	Borough of North Plainfield, N. J	1,140	250	May 9, 1928
5	KROX	N. D. Brown and W. J. Calsamalia, Seattle, Wash	1,420	100	July 1, 1927
5	KFYF	Carl's Radio Den, Oxnard, Calif	1,260	25	Aug. 16, 1927
1	WEAI	Cornell University, Ithaca, N. Y	620	250	Sept. 7, 1927
1	WCOM	City of Manchester, N. H	1,260	100	Sept. 7, 1927
1	WSDA	The City Temple, Brooklyn, N. Y. (combined with station WARS) (now WSGH).	1,320	250	Sept. 15, 1927
5	KGEU	L. W. Clement, Lower Lake, Calif	1,320	50	Dec. 12, 1927
1	WHAR	Cook's Sons (Inc.), Atlantic City, N. J	1,100	750	Dec. 12, 1927
2	WLBP	Robert A. Fox, Ashland City, Ohio	1,480	15	Aug. 19, 1927
4	KFOY	Maurice Gordon Goldberg, St. Paul, Minn. (combined with WAMD to form KSTP).	1,030	250	Apr. 30, 1928
4	WBCN	Great Lakes Radio Broadcasting Co., Chicago, Ill. (combined with station WENR).	1,040	250	Apr. 7, 1928
5	KOLO	Gerald K. Hunter, Durango, Colo	1,500	5	Sept. 7, 1927
4	WMBY	Robert A. Isaacs, Bloomington, Ill	1,500	15	Sept. 2, 1927
5	KGFM	George W. Johnson, Yuba City, Calif	1,420	15	Dec. 5, 1927
1	WKBM	John Wilbur Jones, Newburgh, N. Y	1,440	100	Sept. 7, 1927
1	WDBZ	Kingston Chamber of Commerce, N. Y	1,390	50	Nov. 4, 1927
1	WABO	Lake Avenue Memorial Baptist Church and Society, Rochester, N. Y. (combined with WHEC).	1,290	100	Aug. 18, 1927
5	KFIQ	I. M. Miller, M. D., Yakima, Wash	1,440	100	Sept. 7, 1927
2	WMBU	Paul J. Miller, Pittsburgh, Pa	1,380	50	Sept. 3, 1927
4	KGFP	Mitchell Broadcast Co., Mitchell, S. Dak	1,410	100	Jan. 5, 1928
1	WQAE	Edmund B. Moore, Springfield, Vt	1,200	50	July 29, 1927
5	KOWW	Frank A. Moore (Inc.), Walla Walla, Wash	1,000	500	Dec. 2, 1927
3	KGCG	Moore Motor Co., Newark, Ark	1,340	100	July 31, 1927
5	KFWH	F. Wellington Morse, Eureka, Calif	1,180	100	Sept. 7, 1927
4	WAMD	National Battery Broadcasting Co., Minneapolis, Minn. (combined with KFOY to form KSTP).	1,350	500	Apr. 30, 1928
4	KGDJ	R. R. Rathert, Cresco, Iowa	1,480	10	Nov. 25, 1927
2	WREO	Reo Motor Car Co., Lansing, Mich	1,300	500	Sept. 12, 1927
2	WABR	Scott High School, Toledo, Ohio	1,070	50	Sept. 7, 1927
2	WHBA	C. C. Shaffer, Oil City, Pa	1,150	10	Apr. 26, 1928
1	WBIS	The Shepard Stores, Boston, Mass. (combined with WNAC).	990	100	Nov. 1, 1927
4	WNBL	Harvey R. Storm, Bloomington, Ill	1,500	15	Dec. 21, 1927
4	WOK	Trianon (Inc.), Homewood, Ill. (combined with WMBB).	1,190	5,000	Nov. 1, 1927
5	KFBS	Trinidad High School, Trinidad, Colo	1,260	15	Aug. 9, 1927
3	WCBH	University of Mississippi, Oxford, Miss	1,240	100	Sept. 12, 1927
5	KFLR	University of New Mexico, Albuquerque	720	100	July 18, 1927
3	KFVI	Headquarters troop, Fifty-sixth Cavalry Brigade, Houston, Tex., deleted.	1,260	50	May 22, 1928
2	WKBL	Monrona Radio Manufacturing Co., Monroe, Mich	1,460	15	May 18, 1928
2	WTHO	W. J. Thomas Broadcasting Co., Detroit, Mich	1,370	250	Sept. 7, 1927
4	KOCH	Central High School, Omaha, Nebr	1,160	250	Mar. 1, 1928
4	WLBR	Rockford Broadcasting Corporation, Rockford, Ill	930	150	Mar. 1, 1928

APPENDIX D (2)

List of construction permits granted to broadcasting stations between July 1, 1927, and June 30, 1928, showing also applications pending and applications disapproved

ZONE 1

	Power	Received
APPLICATIONS GRANTED		
	Watts	
WRBH. New Hampshire Broadcasting Corporation, Manchester, N. H.	500	Feb. 17, 1928
WNBZ. Smith & Mace, Saranac Lake, N. Y.	10	Aug. 31, 1927
APPLICATIONS PENDING		
Robert S. Ament, New York, N. Y.	10	Apr. 11, 1928
E. Brandt Boylan, Wilmington, Del.	100	May 10, 1928
Cumberland Electric Co., Cumberland, Md.	50	Mar. 28, 1928
Galvin Radio Supply Co., Wildwood, N. J.	500	June 10, 1927
Lockport Light, Heat & Power Co., Lockport, N. Y.	100	Apr. 20, 1928
Radio Manufacturers Show Association, New York		Sept. 8, 1927
United Broadcasting Co., Boston, Mass.	5,000	May 1, 1928
APPLICATIONS DISAPPROVED		
Clark University, Worcester, Mass.	100	May 19, 1927
John Haren, Schuylerville, N. Y.	100	July 13, 1927
Herman Knoll, New York, N. Y.	150	Apr. 21, 1927
Earl Allison Merryman, Washington, D. C.	50	Sept. 3, 1927
Northern New England Radio Corporation, Augusta, Me.	5,000	Oct. 31, 1927
Poughkeepsie Industrial League, Poughkeepsie, N. Y.	1,000	Apr. 18, 1927
Radio Service Laboratory, Utica, N. Y.	15	Apr. 4, 1927
Irving S. Simpson, Little Falls, N. Y.	10	Apr. 25, 1927
Union Furniture Co., Plainfield, N. J.	150	Apr. 22, 1927

ZONE 2

	Power	Received
APPLICATIONS GRANTED		
	Watts	
WQBJ. John Raikes (owner, Willow Beach Club), Clarksburg, W. Va.	65	Nov. 19, 1927
WRBX. Richmond Development Corporation, Roanoke, Va.	1,000	Sept. 14, 1927
WOBR. Harl Smith, Shelby, Ohio	10	May 9, 1927
APPLICATIONS PENDING		
James A. Bennett, Chester, Pa.	100	Feb. 1, 1928
Bristol Radio Co. (Inc.), Bristol, Va.	50	Apr. 12, 1928
J. Smyser Brunhouse, York, Pa.	250	Apr. 22, 1927
Carr-Cooper Radio Co., Petersburg, Va.	100	Apr. 3, 1928
Frank Byre Copple, Chester, Pa.	200	Jan. 16, 1928
Clement W. Hanbury, jr., Norfolk, Va.	500	Oct. 12, 1927
Holt-Rowe Novelty Co., Fairmont, W. Va.	250	May 14, 1928
W. F. Kisner, Fairmont, W. Va.	200	May 24, 1928
John Joseph Laughlin, Easton, Pa.	5	Sept. 10, 1927
Griffin W. Mossbarger, Louisville, Ky.	500	May 22, 1928
The Northwestern Radio & Instrument Co., Lima, Ohio	250	May 10, 1928
Dr. Lake Polan, Huntington, W. Va.	150	May 7, 1927
Chas. C. MacLeod, Calumet, Mich.	75	Feb. 11, 1928
Johnson Music Store, Ironwood, Mich.	15	Apr. 23, 1927
Virginia Broadcasting Co., University, Va.	5,000	Apr. 24, 1928
APPLICATIONS DISAPPROVED		
Herman Edwin Burns, Martinsburg, W. Va.	100	Apr. 21, 1927
Clarke Electric Co., Danville, Va.	100	July 28, 1927
F. W. Dobbs, Fenton, Mich.	15	May 16, 1927
Highway Mission Tabernacle, Philadelphia, Pa.	250	May 23, 1927
Wm. A. Hunt, jr., Cambridge, Ohio	50	Apr. 6, 1927
Mackinac Broadcasting Association, Mackinac Island, Mich.	1,000	Mar. 13, 1928
George L. Seibel, Easton, Pa.	125	June 8, 1927
Rev. John W. Sproul, Pittsburgh, Pa.	50	Nov. 28, 1927
Steinman & Steinman (Inc.), Lancaster, Pa.		Aug. 30, 1927

List of construction permits granted to broadcasting stations between July 1, 1927, and June 30, 1928, showing also applications pending and applications disapproved—Continued

ZONE 3

	Power	Received
APPLICATIONS GRANTED		
	Watts	
WQBA. Amorc College, Tampa, Fla	250	Oct. 12, 1927
KGHI. Berean Bible Class, Little Rock, Ark	15	Sept. 21, 1928
KGKL. M. L. Cates, Georgetown, Tex	100	Sept. 22, 1927
KGKB. Eagle Publishing Co., Goldthwaite, Tex	50	July 27. 1928
KGJF. First Church of the Nazarene, Little Rock, Ark	250	Dec. 30, 1927
KGHX. Fort Bend County School Board, Richmond, Tex	50	Nov. 21, 1927
WGCM. Gulf Coast Music Co. (Inc.), Gulfport, Miss	15	Dec. 14, 1927
KGKO. Highland Heights Christian Church, Wichita, Falls, Tex	250	Apr. 20, 1927
WQBC. I. R. Jones, Utica, Miss	100	Aug. 31, 1927
WRBI. Kents Furniture and Music Store, Tifton, Ga	20	Apr. 16, 1927
KFYO. Kirksey Bros. Battery & Electric Co., Breckenridge, Tex	15	Mar. 3, 1928
WRBU. A. J. Kirby Music Co., Gastonia, N. C	50	May 10, 1928
KGHG. Charles W. McCollum, McGehee, Ark	50	Dec. 19, 1927
WRBL. R. E. Martin, Talbotton Avenue, Columbus, Ga	50	Feb. 6, 1928
WRBW. Paul S. Pearce, 2011 Green Street, Columbia, S. C	15	Feb. 7, 1928
WRBQ. J. Pat Scully Association I. R. E., Greenville, Miss	100	Aug. 20, 1927
WOBT. Tittsworth's Radio and Music Shop, Union City, Tenn	15	Apr. 6, 1927
WRBT. Wilmington Radio Association, Wilmington, N. C	50	Oct. 12, 1927
WRBJ. Woodruff Furniture Co., Hattiesburg, Miss	10	May 7, 1927
KGHO. John Milford Baldwin, El Paso, Tex	50	Mar. 3, 1928
APPLICATIONS PENDING		
Claude V. Andrews, Union City, Tenn	10	Apr. 7, 1927
Athletic Supply Co., Raleigh, N. C	10	June 18, 1928
Babin & Boyett Radio Co., Trees, La	50	Apr. 14, 1928
Lynn Bigler, Miles, Tex	10	June 18, 1928
Birmingham Electric Battery Co., Birmingham, Ala	50	Apr. 13, 1928
Blackwell Tribune Publishing Co., Blackwell, Okla	50	May 24, 1928
Brown Battery Service, Ensley, Ala	15	June 18, 1928
Bry-block Mercantile Co., Memphis, Tenn	100	July 2, 1928
Christian Church, Dyersburg, Tenn	50	Oct. 7, 1927
Columbia Radio Broadcasting Corporation, Columbia, S. C	500	May 24, 1928
R. H. Cornelius, Fort Worth, Tex	1,000	May 10, 1928
C. C. Crawford, Haynesville, La	50	Aug. 5, 1927
Dr. Edward H. Cunningham, San Antonio, Tex	20	May 4, 1928
Dadswell Publishing Co., St. Petersburg, Fla	250	May 29, 1928
Doughty-Stevens Co., Greenville, Tenn	10	June 18, 1928
Lyman M. Edwards, Enid, Okla	500	June 8, 1927
Elk Radio & Electric Shop, Elk City, Okla	250	June 7, 1927
Charles C. Euler, Powderly, Ala	15	Mar. 24, 1928
Feazel Motor Co., Ruston, La	1	Oct. 10, 1927
Theodore J. Fitzsimmons, Wichita Falls. Tex	500	Apr. 5, 1928
The Full Gospel Tabernacle, Tulsa, Okla	500	June 2, 1927
William Allison Fuller, Cocoa, Fla	100	May 16, 1928
Dolies Goings, Rome, Ga	100	Apr. 17, 1928
Raymond Gillespie, Cedar Grove, La	5	Mar. 13, 1928
Raymond Craddock Hammett, Sylacauga, Ala	50	Apr. 17, 1928
E. M. Haynes, Raleigh, N. C	500	Apr. 19, 1928
Wade A. Hilliard, Childress, Tex	150	May 16, 1928
Hobart Chamber of Commerce, Hobart, Okla	10	May 21, 1928
Holloway Music House, Monroe, N. C	50	Apr. 9, 1928
Home Appliances Corporation, Fort Myers, Fla	250	Sept. 28, 1927
Chandler L. Klotz, McComb, Miss	50	Mar. 24, 1928
C. O. Lorenz, San Antonio, Tex	100	Feb. 6, 1928
Bert Alvin Lynch, jr., Blytheville, Ark	25	May 10, 1928
Matthewson-Pelz Music Co., Marshall, Tex	15	Mar. 6, 1928
Lionel L. Meyer, Shreveport, La	50	June 4, 1928
Mississippi Agricultural and Mechanical College, Oktibbeha County, Miss	250	June 21, 1928
Moeller's Radio Shop, Bastrop, La	100	Apr. 3, 1928
Wm. Pharr Moore and Roger Bruce, Lumber, Tampa, Fla	25	Apr. 27, 1928
Municipal broadcasting station, Dunnellon, Fla	250	June 18, 1928
Jack Murdock, Apalachicola, Fla	15	Mar. 24, 1928
The Music Shoppe, J. L. Echols and J. W. Fondren, Goose Creek, Tex	100	May 29, 1928
Wayne M. Nelson, Winston-Salem, N. C	100	May 10, 1928
A. H. Nigocia, New Orleans, La	5	Mar. 6, 1928
Joe E. Phelps, Little Rock, Ark	500	May 24, 1928
S. Ernest Philpitt & Son, Miami, Fla	25	Apr. 27, 1928
Richard Preece, jr., St. Petersburg, Fla	25	May 9, 1928
Radio Home (Inc.), St. Petersburg, Fla	7½	Apr. 17, 1928
Radio Service Co., Galveston, Tex	7.5	Mar. 13, 1928
The Radio Service Co., of Oklahoma City, Okla	15	Nov. 21, 1927
T. A. Reville, jr., Amarillo, Tex	20	Apr. 30, 1928
Rio Grande Review, Fabeus, Tex	100	May 14, 1928
Robb & Stucky Co., Fort Myers, Fla	100	May 2, 1927
W. J. Schueler, Dyersburg, Tenn	15	Mar. 17, 1928
John Ronald Sheen, Lenoir, N. C	250	May 31, 1928

List of construction permits granted to broadcasting stations between July 1, 1927, and June 30, 1928, showing also applications pending and applications disapproved—Continued

ZONE 3—Continued

	Power	Received
APPLICATIONS PENDING—continued		
	Watts	
Silver's Electric Station & Garage (Inc.), Enid, Okla	15	Apr. 7, 1928
L. A. Sims, Tulsa, Okla	250	Nov. 11, 1927
Sam H. Slate, Gouldbusk, Tex	7½	Apr. 24, 1928
Southeastern Broadcasting Corporation, Douglas, Ga	500	Apr. 23, 1928
Southern Radio Manufacturing Co., Daytona Beach, Fla	100	Mar. 19, 1928
South Carolina Radio Shop, Charleston, S. C	50	Apr. 7, 1928
Tennessee Broadcasting Association, Nashville, Tenn	150	Feb. 11, 1928
H. L. Treft, Cleveland, Miss	20	June 21, 1928
J. W. Walker Music Co., El Dorado, Ark	100	Mar. 24, 1928
Whitaker Radio Sales Co., Bradenton, Fla	15	May 21, 1928
Elbert Wood, Morrison, Tenn	15	Jan. 23, 1928
P. P. Denham Music Store, Paris, Tex	250	Apr. 11, 1928
Wynne Radio Co., Raleigh, N. C	50	Mar. 17, 1928

ZONE 4

APPLICATIONS GRANTED		
	Watts	
KGFX. Dana McNeil, Pierre, S. Dak	200	
APPLICATIONS PENDING		
Leslie G. Call, Springfield, Mo	50	May 21, 1928
E. V. Coleman, De Smet, S. Dak	10	Jan. 3, 1928
L. P. Courson Company, Mason City, Iowa	50	May 2, 1928
Wilbur Richard Cramer, Omaha, Nebr	250	Mar. 24, 1928
Ralph M. Dennis, Ashland, Wis	100	Apr. 11, 1928
First Baptist Church, El Dorado, Kans	10	Feb. 1, 1928
General Lighting Co., Anderson, Ind	50	Jan. 9, 1928
Harold K. Jones, Terre Haute, Ind	15	Apr. 30, 1928
Franklin E. Keller, St. Joseph, Mo	50	May 2, 1928
Royal E. Kratt, Sheldon, N. Dak	15	Dec. 9, 1927
Rev. Anthony V. Marchesano, Rockford, Ill	15	Dec. 19, 1927
T. W. Meiklejohn Co., Fond du Lac, Wis	1,000	Apr. 30, 1928
Otis C. Metzger, Grand Junction, Iowa	30	Mar. 13, 1928
M. E. Overholt, Martinsville, Ill	15	Apr. 3, 1928
Oscar B. Robey, Anderson, Ind	100	Jan. 6, 1928
Rolla Commercial Club, Rolla, N. Dak	10	Mar. 13, 1928
Alvin J. Swaney, jr., Grand Junction, Iowa	150	Do.
Paul J. Vielguth, Salina, Kans	500	June 18, 1928
Clarence Jesse Windisch, Louisburg, Kans	50	Apr. 30, 1928
Radio Service, Mott, N. Dak	30	Jan. 17, 1928
Kansas Wesleyan University, Salina, Kans	250	Apr. 5, 1928
APPLICATIONS DISAPPROVED		
W. J. Allen, Salina, Kans	15	Nov. 14, 1927
Stanley Richard Barnett, Taylor, Nebr	8	Apr. 30, 1927
H. W. Biermann, Newton, Iowa	15	Apr. 7, 1927
Broz & Dunder, Prague, Nebr	100	Apr. 23, 1927
Charles W. Bullimore, Morrowville, Kans	15	Aug. 17, 1927
Call Bond & Mortgage Co., Sioux City, Iowa	100	Mar. 28, 1927
Capitol Theatre, Litchfield, Ill	100	Jan. 23, 1928
Chamber of Commerce, East St. Louis, Ill	1,200	Apr. 20, 1927
Evangelical Lutheran Synod, River Forest, Ill	500	May 31, 1927
Eye, Nose, and Throat Specialists, Ahern Building, Wayne, Nebr	10	July 30, 1927
Farmer-James Co., Story City, Iowa	500	Apr. 8, 1927
Louis V. Feldman, Pipestone, Minn	25	May 28, 1927
Robbins C. Foster, Racine, Wis	250	Oct. 7, 1927
Full Gospel Assembly, Sedalia, Mo	250	May 13, 1927
Marion E. George, Roscoe, Mont	10	May 2, 1927
Heart of the Ozarks Broadcasting Co., Springfield, Mo	500	Aug. 25, 1927
John Louis Herzog, Amboy, Ill	20	May 12, 1927
Geo. H. Hocket Post, No. 127, the American Legion, Anderson, Ind		Apr. 28, 1927
Indianapolis Broadcasting Co., Indianapolis, Ind	1,000	Apr. 15, 1927
Iowa Falls Community Club, Iowa Falls, Iowa	15	May 18, 1927
Albert P. John, Chicago, Ill	50	Mar. 3, 1928
Kansas Wesleyan University, Salina, Kans	1,000	July 1, 1927
Edward L. Kavli, Minneapolis, Minn	100	Apr. 14, 1927
Louis E. Madison, St. Joseph, Mo	5	Apr. 21, 1927
Roy G. Makinson, Butte, Mont	1,000	June 4, 1927
Forrest Martz, Grundy Center, Iowa	30	June 8, 1927
The Monarch Co. (Inc.), Webster City, Iowa	500	June 23, 1927
Roy A. Nelson & Geo. M. Katz, St. Louis Park, Minn	15	Apr. 9, 1927

List of construction permits granted to broadcasting stations between July 1, 1927, and June 30, 1928, showing also applications pending and applications disapproved—Continued

ZONE 4—Continued

	Power	Received
APPLICATIONS DISAPPROVED—continued		
	Watts	
North Side Divine Science Church, St. Louis, Mo	500	Apr. 30, 1927
Orpheum Theater, Webster City, Iowa	50	Apr. 27, 1927
Irving T. Patridge, Milbank, S. Dak	50	May 4, 1927
Red Oak Radio Corporation, Red Oak, Iowa	500	Apr. 27, 1927
Hans Rudolph Reschetritz, President, Liberty Radio Research Laboratory Co., Cedar Rapids, Iowa	30	June 22, 1927
J. A. Reuter, Garrison, N. Dak	15	Apr. 4, 1927
Ray W. Rodgers & J. Wm. Everman, Trenton, Mo	1,000	May 6, 1927
St. Paul Broadcasting Co., St. Paul, Minn	5,000	Apr. 23, 1927
Joseph Edward Schradder, Crookston, Minn	10	Apr. 18, 1927
Shannon & Son, Fairbury, Nebr	30	Mar. 20, 1928
Union Poultry Co., La Porte City, Iowa	10	Nov. 2, 1927
John J. Von Arb, Seneca, Kans	100	May 10, 1927
Wardrobe Cleaners & Dyers, Springfield, Minn	200	Feb. 27, 1928
Iverson C. Wells, Chicago, Ill	500	Apr. 9, 1927
Steve Worley Motor Co., Richmond, Ind	75	Dec. 23, 1927

ZONE 5

APPLICATIONS GRANTED		
	Watts	
KGHL. Northwestern Auto Supply Co., Billings, Mont	250	Dec. 20, 1927
KGHF. Philip G. Lasky and J. H. Albert, Pueblo, Colo	250	June 2, 1927
KGHD. Raymond S. Nash, Missoula, Mont	5	Feb. 17, 1928
KGCM. Jay Peters, Inglewood, Calif	100	Aug. 2, 1927
KGHB. Radio Sales Co., Honolulu, Hawaii	250	Aug. 8, 1927
KGHA. Geo. H. Sweeney and N. S. Walpone, Pueblo, Colo	500	Dec. 9, 1927
APPLICATIONS PENDING		
W. K. Azbill, San Diego, Calif	100	June 21, 1929
R. J. Birchett, Los Angeles, Calif	500	June 9, 1928
Broughton Jewelry Store, North Bend, Oreg	10	June 5, 1928
Bryan Bible League, Turlock, Calif	50	Apr. 25, 1928
Fernac School of Languages, San Francisco, Calif	15	Apr. 11, 1928
Radio Forum of the Sacramento Valley, Sacramento, Calif	1,000	May 4, 1928
Samuel Remillard, Albuquerque, N. Mex	75	Apr. 30, 1928
Stanley M. Soule, Twin Falls, Idaho	250	Apr. 25, 1928
C. D. Terry, Santa Monica, Calif	1,000	Apr. 21, 1928
W. A. Mentch, Twin Falls, Idaho	50	May 16, 1928
APPLICATIONS DISAPPROVED		
Kenneth B. Aldrich, Portland, Oreg	30	July 13, 1927
Affiliated Broadcast Corporation, Oakland, Calif	1,000	Apr. 26, 1927
California Hotel (Frank J. Solt, owner), San Bernadino, Calif	100	Nov. 9, 1927
California Transit Co., Oakland, Calif	50	Jan. 23, 1928
Capital Broadcasting Co., Salem, Oreg. (J. R. Hughes and K. B. Aldrich, copartners)	100	Jan. 11, 1928
Russell G. Davis, San Francisco, Calif	100	Apr. 5, 1928
Reginald Gooding Field, Honolulu, Hawaii	20	Mar. 3, 1928
Theodore P. Fox, Cheyenne, Wyo	200	Oct. 26, 1927
John K. Haddaway, doing business as Haddaway Manufacturing Co., Los Angeles, Calif	50	Apr. 18, 1927
Hancock Oil Co., Signal Hill, Calif	100	Jan. 23, 1928
L. L. Jackson and New Richmond Hotel, Seattle, Wash	250	Apr. 26, 1927
James W. Kerwin, Lowell, Ariz	1,000	Sept. 26, 1927
George Francis Bell King, Los Angeles, Calif	500	July 11, 1927
Lee Bros., Modesto, Calif	----------	Oct. 22, 1927
Loyola College Radio Station (Inc.), Los Angeles, Calif	1,000	Apr. 6, 1927
Will J. Madole, portable, fifth zone, Oakland, Calif	100	Apr. 30, 1928
Robert W. Murray, Glendale, Calif	100	Mar. 21, 1928
Pacific Northwest Educational Society (Inc.), Seattle, Wash	500	Apr. 18, 1927
Sherwood H. Patterson, pastor, Englewood, Colo	100	Apr. 15, 1927
C. W. Roberts, Paonia, Colo	250	Apr. 16, 1927
Sacramento Music and Radio Trades Association, Sacramento, Calif	1,000	Nov. 26, 1927
Paul M. Segal, Denver, Colo	250	Jan. 16, 1928
C. M. Setser, Portales, N. Mex	50	June 8, 1927
Table Supply Co., Casper, Wyo	200	Aug. 15, 1927

APPENDIX D (3)

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WAAD	Cincinnati, Ohio	Ohio Mechanics Institute	25	1,300	230.6
WAAF	Chicago, Ill.	Drovers Journal Publishing Co. (WBBM-WJBT).	500	770	389.4
WAAM	Newark, N. J.	WAAM (Inc.) (WGCP-WNJ)	250	1,120	267.7
WAAT	Jersey City, N. J.	Bremer Broadcasting Corporation (WGBB-WEVD).	300	1,220	245.8
WAAW	Omaha, Nebr.	Omaha Grain Exchange (5 a. m. to 6 p. m. only).	500	680	440.9
WABC	Richmond Hill, N. Y.	Atlantic Broadcasting Corporation (WBOQ) (5,000 watts 6 a. m. to 6 p. m.).	2,500	970	309.1
WABF	Kingston, Pa.	Markle Broadcasting Corporation.	250	1,460	205.4
WABI	Bangor, Me.	First Universalist Church (Sunday only).	100	770	389.4
WABO-WHEC	See WHEC-WABO.				
WABW	Wooster, Ohio	College of Wooster	50	1,210	247.8
WABY	Philadelphia, Pa.	J. Magaldi, jr. (WFKD)	50	1,210	247.8
WABZ	New Orleans, La.	Coliseum Place Baptist Church (WJBW).	50	1,260	238.0
WADC	Akron, Ohio	Allen T. Simmons	1,000	1,260	238.0
WAFD	Detroit, Mich.	Albert B. Parfet Co.	100	1,300	230.6
WAGM	Royal Oak, Mich.	Robert L. Miller	50	1,330	225.4
WAIT	Taunton, Mass.	A. H. Waite & Co. (Inc.)	10	1,400	214.2
WAIU	Columbus, Ohio	American Insurance Union (WEAO).	5,000	1,060	282.8
WAIZ	Appleton, Wis.	Irving Zuelke (Inc.)	100	1,320	227.1
WALK	Willow Grove, Pa.	Albert A. Walker	50	1,490	201.2
WAPI	Auburn, Ala.	Alabama Polytechnic Institute (WJAX).	1,000	880	340.7
WASH	Grand Rapids, Mich.	Baxter Laundries (Inc.)	250	1,170	256.3
WATT	Portable.	Edison Electric Illuminating Co.	100	1,490	201.2
WBAA	Lafayette, Ind.	Purdue University (WRM)	500	1,100	272.6
WBAK	Harrisburg, Pa.	Pennsylvania State Police (WPSC) (6 a. m. to 8 p. m. only).	500	1,000	299.8
WBAL	Glen Morris, Md.	Consolidated Gas, Electric Light & Power Co.	5,000	1,050	285.5
WBAO	Decatur, Ill.	James Milliken University	100	1,120	267.7
WBAP	Fort Worth, Tex.	Carter Publications (Inc.) (KTHS).	5,000	600	499.7
WBAW	Nashville, Tenn.	Waldrum Drug Co. (WOAN)	5,000	1,250	239.9
WBAX	Wilkes-Barre, Pa.	John H. Stenger, jr. (WBRE)	100	1,200	249.9
WBBC	Brooklyn, N. Y.	Brooklyn Broadcasting Corporation (WSGH-WSDA) (construction permit issued for 250 only).	500	1,320	227.1
WBBL	Richmond, Va.	Grace Covenant Presbyterian Church.	100	1,280	234.2
WBBM	Glenview, Ill.	Atlass Investment Co. (WJBT WAAF).	5,000	770	389.4
WBBP	Petoskey, Mich.	Petoskey High School	100	1,250	239.9
WBBR	Rossville, N. Y.	Peoples Pulpit Association (WEBJ-WLTH).	1,000	1,170	256.3
WBBW	Norfolk, Va.	Ruffner Junior High School (WTAR-WPOR).	100	1,270	236.1
WBBY	Charleston, S. C.	Washington Light Infantry	75	1,200	249.9
WBBZ	Portable (temporarily Ponca City, Okla.).	C. L. Carrell	100	1,470	204.0
WBES	Salisbury, Md.	Tom F. Little	100	1,130	265.3
WBET	Medford, Mass.	Boston Transcript Co. (WSSH)	500	1,040	288.3
WBIS-WNAC	See WNAC-WBIS.				
WBMH	Detroit, Mich.	Braun's Music House	100	1,420	211.1
WBMS	Union City, N. J.	WBMS Broadcasting Corporation (WCLB-WGOP-WWRL).	100	1,500	199.9
WBNY	New York, N. Y.	Baruchrome Corporation (WMSG-WHAP).	500	1,270	236.1
WBOQ	Richmond Hill, N. Y.	Atlantic Broadcasting Corporation (WABC).	500	907	309.1
WBOW	Terre Haute, Ind.	Banks of Wabash Broadcasting Association.	100	1,440	208.2
WBRC	Birmingham, Ala.	Birmingham Broadcasting Co. (Inc.).	250	990	302.8
WBRE	Wilkes-Barre, Pa.	Louis G. Baltimore (WBAX)	100	1,200	249.9
WBRL	Tilton, N. H.	Booth Radio Laboratories	500	1,290	232.4
WBRS-WCDA	See WCDA-WBRS.				

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WBSO	Wellesley Hills, Mass.	Babson's Statistical Organization (Inc.) (6 to 6, 12 midnight to 12:30.)	100	780	384.4
WBT	Charlotte, N. C.	C. C. Coddington (Construction permit for 5,000 watts issued).	750	1,160	258.5
WBZ	East Springfield, Mass.	Westinghouse Electric & Manufacturing Co.	15,000	900	333.1
WBZA	Boston, Mass.	do	500	900	333.1
WCAC	Storrs, Conn.	Connecticut Agricultural College (WTIC).	500	560	535.4
WCAD	Canton, N. Y.	St. Lawrence University (6 a. m. to 6 p. m., 1,000 watts).	500	1,230	243.8
WCAE	Pittsburgh, Pa.	Kaufman & Baer Co.	500	650	461.3
WCAH	Columbus, Ohio.	Commercial Radio Service Co. (WMAN).	250	1,280	234.2
WCAJ	Lincoln, Nebr.	Nebraska Wesleyan University (6 a. m. to 6 p. m. only).	500	790	379.5
WCAL	Northfield, Minn.	St. Olaf College (WDGY)	500	1,050	285.5
WCAM	Camden, N. J.	City of Camden (WFAN)	500	1,340	223.7
WCAO	Baltimore, Md.	Monumental Radio (Inc.) (WFBR).	250	1,230	243.8
WCAP	Asbury Park, N. J.	Radio Industries Broadcasting Co. (WOAK) (1,000 watts 6 to 6).	500	1,250	239.9
WCAT	Rapid City, S. D.	South Dakota State School of Mines.	100	1,210	247.8
WCAU	Byberry, Pa.	Universal Broadcasting Co.	1,000	1,150	260.7
WCAX	Burlington, Vt.	University of Vermont	100	1,180	254.1
WCAZ	Carthage, Ill.	Carthage College	50	1,200	249.9
WCBA	Allentown, Pa.	B. Bryan Musselman (WSAM)	100	1,350	222.1
WCBD	Zion, Ill.	Wilbur Glenn Voliva (WLS)	5,000	870	344.6
WCBE	New Orleans, La.	Uhalt Radio	5	1,320	227.1
WCBM	Baltimore, Md.	Hotel Chateau	100	1,330	225.4
WCBR	Portable	Charles H. Messter	100	1,490	201.2
WCBS	Springfield, Ill.	Harold L. Dewing and Charles Messter.	250	1,430	209.7
WCCO	Anoka, Minn.	Washburn-Crosby Co. (7,500 watts 6 to 6).	5,000	740	405.2
WCDA	Cliffside Park, N. J.	Italian Educational Broadcasting Co. (WINR-WCOH on 1420).	250	1,410	212.6
WCFL	Chicago, Ill.	Chicago Federation of Labor (WEMC-WLTS).	1,500	620	483.6
WCGU	Coney Island, N. Y.	United States Broadcasting Corporation (WKBO-WKBQ).	500	1,370	218.8
WCLB	Long Beach, N. Y.	Arthur Faske (WBMS-WGOP-WWRL).	100	1,500	199.9
WCLO	Kenosha, Wis.	C. E. Whitmore (WJBC-WWAE)	100	1,320	227.1
WCLS	Joliet, Ill.	WCLS (Inc.) (WKBB)	150	1,390	215.7
WCMA	Culver, Ind.	Culver Military Academy (WOOD).	500	1,150	260.7
WCOA	Pensacola, Fla.	City of Pensacola	500	1,200	249.9
WCOC	Columbus, Miss.	Crystal Oil Co.	500	1,300	230.6
WCOH	Greenville, N. Y.	Westchester Broadcasting Corporation (WINR-WCDA).	250	1,420	211.1
WCON	Danbury, Conn.	Danbury Broadcasting Station (WIOC).	100	1,130	265.3
WCOT	Providence, R. I.	Jacob Conn.	200	1,330	225.4
WCRW	Chicago, Ill.	Clinton R. White (WFKB-WPCC).	500	1,340	223.7
WCSH	Portland Me.	Congress Square Hotel Co.[1]	500	820	365.6
WCSO	Springfield, Ohio.	Wittenberg College	500	1,170	256.3
WCWK	Ft. Wayne, Ind.	Chester W. Keen	250	1,400	214.2
WCX-WJR	See WJR-WCX.				
WDAD-WLAC	See WLAC-WDAD.				
WDAE	Tampa, Fla.	Tampa Publishing Co.	500	1,120	267.7
WDAF	Kansas City, Mo.	Kansas City Star Co.	1,000	810	370.2
WDAG	Amarillo, Tex.	J. Laurance Martin	1,000	1,140	263.0
WDAH	El Paso, Tex.	Trinity Methodist Church	100	1,280	234.2
WDAY	Fargo, N. Dak.	WDAY (Inc.) (KFDY) (500 watts, 6 to 6)	250	550	545.1
WDBJ	Roanoke, Va.	Richardson-Wayland Electric Corporation.	250	1,300	230.6
WDBO	Orlando, Fla.	Rollins College (Inc.) (1,000 watts, 6 to 6.)	500	1,040	288.3
WDEL	Wilmington, Del.	WDEL (Inc.)	250	1,010	296.9
WDGY	Minneapolis, Minn.	Dr. Geo. W. Young (WCAL)	500	1,050	285.5
WDOD	Chattanooga, Tenn.	Chattanooga Radio Co. (Inc.)	500	1,230	243.8
WDRC	New Haven, Conn.	Doolittle Radio Corporation	500	1,060	282.8
WDSU	New Orleans, La.	Joseph H. Whalt	250	1,320	227.1
WDWF-WLSI	Cranston, R. I.	Dutee W. Flint and the Lincoln Studios (Inc.)	250	1,210	247.8

[1] Construction permit issued to move to Cumberland on 1,400 kilocycles 5,000 watts.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WDZ	Tuscola, Ill	James L. Bush (6 to 6 only)	100	1,080	277.6
WEAF	Bellmore, N. Y	National Broadcasting Co. (Inc.)	[1] 50	610	491.5
WEAN	Providence, R. I	The Shepard Co	500	1,090	275.1
WEAO	Columbus, Ohio	Ohio State University (WAIU)	750	1,060	282.8
WEAR	Cleveland, Ohio	WTAM & WEAR (Inc.) (WTAM-WSBT.)	1,000	750	399.8
WEBC	Superior, Wis	Head of the Lakes Broadcasting Co. (1,000 full time while President is in Wisconsin) (1,000 watts, 6 to 6).	250	1,240	241.8
WEBE	Cambridge, Ohio	Roy W. Waller	10	1,210	247.8
WEBH	Chicago, Ill	Edgewater Beach Hotel Co. (WJJD).	500	820	365.6
WEBQ	Harrisburg, Ill	Tate Radio Co	15	1,340	223.7
WEBR	Buffalo, N. Y	H. H. Howell	200	1,240	241.8
WEBW	Beloit, Wis	Beloit College	500	1,160	258.5
WEDC	Chicago, Ill	Emil Denemark (Inc.) (WGES)	500	1,240	241.8
WEDH	Erie, Pa	Erie Dispatch Herald	30	1,440	208.2
WEEI	Boston, Mass	Edison Electric Illuminating Co. of Boston.	500	590	508.2
WEHS	Evanston, Ill	Victor C. Carlson (WHFC-WKBI).	100	1,390	215.7
WEMC	Berrien Springs, Mich	Emmanuel Missionary College (WCFL-WLTS).	1,000	620	483.6
WENR-WBON	Chicago, Ill	Great Lakes Radio Broadcasting Co. (experimentally June and July).	5,000	1,040	288.3
WEPS	Gloucester, Mass	Matheson Radio Co. (Inc.)	100	1,010	296.0
WEVD	Woodhaven, N. Y	Debs Memorial Radio Fund (WATT-WGBB).	500	1,220	245.8
WEW	St. Louis, Mo	St. Louis University (6 to 6 only)	1,000	850	352.7
WFAA	Dallas, Tex	Dallas Morning News	500	550	545.1
WFAM	St. Cloud, Minn	Times Publishing Co. (Inc.)	10	1,190	252.0
WFAN	Philadelphia, Pa	Keystone Broadcasting Co. (Inc.) (WCAM).	500	1,340	223.7
WFBC	Knoxville, Tenn	First Baptist Church	50	1,280	243.2
WFBE	Cincinnati, Ohio	Park View Hotel (WKRC)	250	1,220	245.8
WFBG	Altoona, Pa	Wm. F. Gable Co	100	1,120	267.7
WFBJ	Collegeville, Minn	St. John's University	100	1,100	272.6
WFBL	Syracuse, N. Y	The Onondaga Co. (Inc.)	750	[1] 1,160	258.5
WFBM	Indianapolis, Ind	Indianapolis Power & Light Co. (WTAS).	1,000	1,090	275.1
WFBR	Baltimore, Md	Baltimore Radio Show (Inc.) (WCAO) (500 watts, 6 a. m. to 6 p. m.).	250	[1] 1,230	243.8
WFBZ	Galesburg, Ill	Knox College (WRAM)	50	1,210	247.8
WFCI	Pawtucket, R. I	Frank Crook (Inc.) (WNBX)	100	1,240	241.8
WFDF	Flint, Mich	Frank D. Fallain (WSKC)	100	1,100	272.7
WFI	Philadelphia, Pa	Strawbridge & Clothier (WLIT)	500	740	405.2
WFIW	Hopkinsville, Ky	The Acme Mills (Inc.)	1,000	1,150	260.7
WFJC	Akron, Ohio	W. F. Jones Broadcasting (Inc.) (WJAY).	500	1,320	227.1
WFKB	Chicago, Ill	Francis K. Bridgman (Inc.) (WCRW-PCC).	500	1,340	223.7
WFKD	Frankford, Pa	Foulkrod Radio Engineering Co. (WABY).	50	1,210	247.8
WFLA-WSUN	Clearwater, Fla	Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce.	750	580	516.9
WGAL	Lancaster, Pa	Lancaster Electric Supply & Construction Co. (WKJC).	15	1,190	252.0
WGBB	Freeport, N. Y	Harry H. Carman (WAAT-WEVD).	150	1,220	245.8
WGBC	Memphis, Tenn	First Baptist Church (WNBR)	15	1,310	228.9
WGBF	Evansville, Ind	Evansville on the Air (Inc.)	250	1,270	236.1
WGBI	Scranton, Pa	Scranton Broadcasters (Inc.) (WQAN).	250	1,300	230.6
WGBS	Astoria (Long Island), N. Y.	Gimbel Bros. (Inc.) (WIP-WOO)	500	860	348.6
WGCM	Gulfport, Miss	Gulf Coast Music Co. (Inc.)	100	1,350	222.1
WGCP	Newark, N. J	May Radio Broadcast Corporation (WAAM-WNJ).	250	1,120	267.7
WGES	Chicago, Ill	Oak Leaves Broadcasting Corporation (Inc.) (WEDC).	500	1,240	241.8
WGHP	Fraser, Mich	Geo. Harrison Phelps (Inc.) (WKAR).	750	1,080	277.6
WGL	Secaucus, N. J	International Broadcasting Corporation (WODA).	1,000	1,020	293.9

[1] Kilowatts.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WGM	Jeannette, Pa.	Verne Elton Spencer	50	1,440	208.2
WGMU	Portable	Atlantic Broadcasting Corporation (WRMU).	100	1,490	201.2
WGMS-WLB	See WLB-WGMS.				
WGN	Elgin, Ill.	Tribune Co.	[1] 15	720	416.4
WGOP	Flushing, N. Y.	Fred B. Zittell, jr. (WWRL-WCLB-WBMS).	100	1,500	199.9
WGR	Buffalo, N. Y.	Federal Radio Corporation	750	990	302.8
WGST	Atlanta, Ga.	Georgia School of Technology (WMAZ).	500	1,110	270.1
WGWB	Milwaukee, Wis.	Evening Wisconsin Co. (construction permit issued only) (WISN-WHAD).	250	1,110	270.1
WGY	South Schenectady, N. Y.	General Electric Co.	[1] 50	790	379.5
WHA	Madison, Wis.	University of Wisconsin (WLBL).	750	900	333.1
WHAD	Milwaukee, Wis.	Marquette University (WISN-WGWB).	500	1,110	270.1
WHAM	Victor Township, N. Y. (Rochester).	Stromberg-Carlson Telephone Manufacturing Co.	5,000	1,070	200.2
WHAP	Carlstadt, N. J.	Defenders of Truth Society (Inc.) (WBNY-WMSG).	1,000	1,270	236.1
WHAS	Louisville, Ky.	The Courier-Journal Co. and the Louisville Times Co.	5,000	930	322.4
WHAZ	Troy, N. Y.	Rensselaer Polytechnic Institute (8 p. m. to 12 p. m., Mondays, and 12 midnight to 1 a. m., Tuesdays).	500	900	305.9
WHB	Kansas City, Mo.	Sweeney Automobile School Co. (WOQ).	500	880	340.7
WHBC	Canton, Ohio.	St. John's Catholic Church	10	1,270	236.1
WHBD	Bellefontaine, Ohio.	First Presbyterian Church	100	1,350	222.1
WHBF	Rock Island, Ill.	Beardsley Specialty Co.	100	1,350	222.1
WHBL	Sheboygan, Wis.	Press Publishing Co. and C. L. Carrell (construction permit issued for 500 watts 6 a. m. to 6 p. m.	250	1,470	204.0
WHBM	Portable.	C. L. Carrell.	100	1,490	201.2
WHBP	Johnstown, Pa.	Johnstown Automobile Co. (6 a. m. to 6 p. m. 500 watts).	250	1310	228.
WHBQ	Memphis, Tenn.	Broadcasting Station WHBQ (Inc.).	100	1,290	232.4
WHBU	Anderson, Ind.	Citizens Bank	15	1,360	220.4
WHBW	Philadelphia, Pa.	D. R. Kienzle	100	1,360	220.4
WHBY	West De Pere, Wis.	St. Norbert's College	50	1,200	249.9
WHDI	Minneapolis, Minn.	Wm. Hood Dunwoody Industrial Institute (WLB).	500	1,220	245.0
WHEC-WABO	Rochester, N. Y.	Hickson Electric Co. (Inc.) (500 watts 6 a. m. to 6 p. m.).	250	1,180	254.1
WHFC	Chicago, Ill.	Goodson & Wilson (Inc.) (WKBI-WEHS).	200	1,390	215.7
WHK	Cleveland, Ohio.	Radio Air Service Corporation (1,000 watts 6 to 6).	500	1,130	265.3
WHN	New York, N. Y.	George Schubel (WQAO-WPAP).	500	760	394.5
WHO	Des Moines, Iowa.	Bankers Life Co.	5,000	560	535.4
WHPP	Englewood Cliffs, N. J.	Bronx Broadcasting Co. (WMRJ-WTRL).	10	1,450	206.0
WHT	Deerfield, Ill.	Radiophone Broadcasting Corporation (WIBO).	5,000	980	305.9
WIAD	Philadelphia, Pa.	Howard R. Miller (WNAT)	100	1,040	288.3
WIAS	Ottumwa, Iowa.	Poling Electric Co. (KICK) (6 to 6 only).	100	930	322.4
WIBA	Madison, Wis.	Capital Times-Strand Theater Station.	100	1,250	239.9
WIBG	Elkins Park, Pa.	St. Pauls P. E. Church (6 to 6 on Sunday only).	50	680	440.9
WIBJ	Portable.	C. L. Carrell.	100	1,490	201.2
WIBM	Portable (temporarily, Jackson, Mich.).	do.	100	1,490	201.2
WIBO	Desplaines, Ill.	WIBO Broadcasters (Inc.) (WHT).	5,000	980	305.9
WIBR	Steubenville, Ohio.	Thurman A. Owings.	50	1,200	249.9
WIBS	Elizabeth, N. J.	N. J. Broadcasting Corporation (WLBX-WMBQ).	250	1,470	204.0
WIBU	Poynette, Wis.	The Electric Farm	20	1,380	217.3
WIBW	Topeka, Kans.	C. L. Carrell.	250	1,470	204.0
WIBX	Utica, N. Y.	WIBX (Inc.) (300 watts 6 to 6).	150	1,260	238.0
WIBZ	Montgomery, Ala.	Alexander D. Trum.	15	1,300	230.6
WICC	Easton, Conn.	Bridgeport Broadcasting Station (Inc.) (WCON).	500	1,130	265.3

[1] Kilowatts.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WIL	St. Louis, Mo.	Missouri Broadcasting Corporation (WSBF).	250	1,160	258.5
WING	Bay Shore, N. Y.	Radiotel Manufacturing Co. (Inc.) (WCDA-WCOH).	150	1,420	211.1
WIOD	Miami Beach, Fla.	Carl G. Fischer Co.	1,000	1,210	247.8
WIP	Philadelphia, Pa.	Gimbel Bros. (Inc.) (WOO-WGBS).	500	860	346.6
WISN	Milwaukee, Wis.	Evening Wisconsin Co. (WGWB-WHAD).	250	1,110	270.1
WIVA	Norfolk, Va.	Radio Corporation of Virginia [8]	100	1,430	209.7
WJAD	Waco, Tex.	Frank P. Jackson (KFQB)	500	900	333.1
WJAG	Norfolk, Nebr.	Norfolk Daily News (KMMJ) (500 watts 7 to 7).	250	1,050	285.5
WJAK	Kokomo, Ind.	J. A. Kautz (Kokomo Tribune)	50	1,280	234.2
WJAM	Cedar Rapids, Iowa	D. M. Perham (KWCR)	250	1,250	239.9
WJAR	Providence, R. I.	The Outlet Co.	500	620	403.6
WJAS	Pittsburgh, Pa.	Pittsburgh Radio Supply House (KQV).	500	1,110	270.1
WJAX	Jacksonville, Fla.	City of Jacksonville (WAPI)	1,000	880	340.7
WJAY	Cleveland, Ohio	Cleveland Radio Broadcasting Corporation (WFJC).	500	1,320	227.1
WJAZ	Mount Prospect, Ill.	Zenith Radio Corporation (WMBI).	5,000	1,140	263.0
WJBA	Joliet, Ill.	D. H. Lentz, jr.	50	1,210	247.0
WJBB	Sarasota, Fla.	Financial Journal (Inc.)	250	1,260	238.0
WJBC	La Salle, Ill.	Hummer Furniture Co. (WCLO-WWAE).	100	1,320	227.1
WJBI	Red Bank, N. J.	Robt. S. Johnson	250	1,140	263.0
WJBK	Ypsilanti, Mich.	Ernest F. Goodwin	15	1,360	220.4
WJBL	Decatur, Ill.	Wm. Gushard Dry Goods Co.	250	1,410	212.6
WJBO	New Orleans, La.	Valdemar Jensen	100	1,140	263.0
WJBT	Chicago, Ill.	J. S. Boyd (Inc.) (WBBM-WAAF).	500	770	389.4
WJBU	Lewisburg, Pa.	Bucknell University	100	1,400	214.2
WJBW	New Orleans, La.	C. Carlson, jr. (WABZ)	30	1,260	238.0
WJBY	Gadsen, Ala.	Electric Construction Co.	50	1,280	234.2
WJBZ	Chicago Heights, Ill.	Roland G. Pamler and Anthony Coppotelli (WNBA).	100	1,440	208.2
WJJD	Mooseheart, Ill.	Supreme Lodge of the World Loyal Order of Moose (WEBH).	1,000	820	365.6
WJKS	Gary, Ind.	Johnson Kennedy Radio Corporation (WSBC).	500	1,290	232.4
WJR-WCX	Pontiac, Mich.	WJR (Inc.)	5,000	680	440.9
WJZ	Bound Brook, N. J.	Radio Corporation of America	30,000	660	454.3
WKAQ	San Juan, P. R.	Radio Corporation of Portio Rico.	500	930	322.4
WKAR	E. Lansing, Mich.	Michigan State College (WGHP) (1,000 watts 7 to 7).	500	1,080	277.6
WKAV	Laconia, H. N.	Laconia Radio Club	50	1,340	223.7
WKBB	Joliet, Ill.	Sanders Bros. (WCLS)	150	1,390	215.7
WKBC	Birmingham, Ala.	H. L. Ansley	10	1,370	218.8
WKBE	Webster, Mass.	K. & B. Electric Co.	100	1,310	228.9
WKBF	Indianapolis, Ind.	Noble Butler Watson	250	1,190	252.0
WKBG	Portable	C. L. Carrell	100	1,490	201.2
WKBH	LaCrosse, Wis.	Callaway Music Co.	500	1,300	230.6
WKBI	Chicago, Ill.	Fred L. Schoenwolf (WHFC-WEHS).	50	1,390	215.7
WKBN	Youngstown, Ohio	W. P. Williamson, jr. (WMBW)	50	1,400	214.2
WKBO	Jersey City, N. J.	Camith Corporation (WKBQ-W. C. G. U.)	500	1,370	218.8
WKBP	Battle Creek, Mich.	Enquirer-News Co.	50	1,410	212.6
WKBQ	New York, N. Y.	Standard Cahill Co. (Inc.) (WKBO-WCGU).	500	1,370	218.8
WKBS	Galesburg, Ill.	Permil N. Nelson (WLBO)	100	1,380	217.3
WKBT	New Orleans, La.	First Baptist Church	50	1,190	252.9
WKBV	Brookville, Ind.	Knox Battery & Electric Co.	100	1,380	217.3
WKBW	Amherst, N. Y.	Churchill Evangelistic Association (Inc.).	5,000	1,380	217.3
WKBZ	Ludington, Mich.	K. L. Ashbacker	15	1,500	199.9
WKEN	Grand Island, N. Y.	Radio Station WKEN (Inc.) (WSVS).	750	1,470	204.0
WKJC	Lancaster, Pa.	Kirk Johnson & Co. (WGAL)	50	1,190	252.0
WKRC	Cincinnati, Ohio	Kodel Radio Corporation (WFBE).	500	1,220	245.8
WKY	Oklahoma City, Okla.	WKY Radiophone Co.	150	1,040	288.3
WLAC	Nashville, Tenn.	Life & Casualty Insurance Co.	5,000	1,330	225.4
WLAP	Okalona, Ky.	American Broadcasters Corporation of Kentucky.	500	1,120	267.7

[8] Construction permit issued to move to Charlottesville, Va.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WLB	Minneapolis, Minn.	University of Minnesota (WHDI)[1]	500	1,220	245.8
WGMS					
WLBC	Muncie, Ind.	Donald A. Burton	50	1,430	209.7
WLBF	Kansas City, Kans.	Everett L. Dillard	50	1,430	209.7
WLBG	Petersburg, Va.	Robert Allen Gamble	500	1,400	214.2
WLBH	Farmingdale, N. Y.	Joseph J. Lombardi	30	1,290	232.4
WLBI	Wenona, Ill.	Wenona Legion Broadcasters	250	1,260	238.4
WLBL	Stevens Point, Wis.	Wisconsin Department of Markets (WHA) (6 a. m. to 6. p. m. 2,000 watts).	1,000	900	333.1
WLBO	Galesburg, Ill.	Fred A. Trebbe, jr. (WKBS)	100	1,380	217.3
WLBQ	Atwood, Ill.	E. Dale Trout	25	1,370	218.8
WLBT	Crown Point, Ind.	Harold Wendell	50	1,210	247.8
WLBV	Mansfield, Ohio	Mansfield Broadcasting Association.	50	1,450	206.8
WLBW	Oil City, Pa.	Petroleum Telephone Co.	500	1,020	293.9
WLBX	Long Island City, N. Y.	John N. Brahy (WIBS-WMBQ)	250	1,470	204.0
WLBY	Iron Mountain, Mich.	Aimone Electric	50	1,430	209.7
WLBZ	Dover-Foxcroft, Me.	Thompson L. Guernsey	250	1,440	208.2
WLCI	Ithaca, N. Y.	Lutheran Association of Ithaca	50	1,210	247.8
WLEX	Lexington, Mass.	Lexington Air Station	50	1,390	215.7
WLIB	Chicago, Ill.	Liberty Weekly (Inc.)	500	720	416.4
WLIT	Philadelphia, Pa.	Lit Brothers (WFI)	500	740	405.2
WLOE	Chelsea, Mass.	William S. Pote (WMES)	100	1,420	211.1
WLS	Crete, Ill.	Sears, Roebuck & Co. (WCBD)	5,000	870	344.6
WLSI-WDWF	See WDWF-WLSI.				
WLTH	Brooklyn, N. Y.	Voice of Brooklyn (Inc.) (WBBR-WEBJ).	250	1,170	256.3
WLTS	Chicago, Ill.	Lane Technical High School (WEMC-WCFL).	100	620	483.6
WLW	Harrison, Ohio	Crosley Radio Corporation	5,000	700	428.3
WLW	Cincinnati, Ohio	do	500	700	428.3
WLWL	Kearny, N. J.	Missionary Society (WMCA) of St. Paul the Apostle.	5,000	810	370.2
WMAC	Casenovia, N. Y.	Clive B. Meredith	500	1,330	225.4
WMAF	South Dartmouth, Mass. (summer months only).	Round Hills Radio Corporation	500	700	428.3
WMAK	Martinsville, N. Y.	WMAK Broadcasting System (Inc.).	750	550	545.1
WMAL	Washington, D. C.	M. A. Leese Co.	500	1,240	241.8
WMAN	Columbus, Ohio	W. E. Heskitt (WCAH)	50	1,280	234.2
WMAQ	Chicago, Ill.	Chicago Daily News (Inc.) (WQJ), experimental full time June-July.	5,000	670	447.5
WMAY	St. Louis, Mo.	Kingshighway Presbyteran Church (KWK-KFQA).	100	1,280	234.2
WMAZ	Macon, Ga.	Mercer University (WGST)	500	1,110	270.1
WMBA	Newport, R. I.	LeRoy Joseph Beebe	100	1,470	204.0
WMBB-WOK	Homewood, Ill.	American Bond & Mortgage Co.	5,000	1,190	252.0
WMBC	Detroit, Mich.	Michigan Broadcasting Co. (Inc.)	100	1,230	243.8
WMBD	Peoria Heights, Ill.	Peoria Heights Radio Laboratory	250	1,460	205.4
WMBE	White Bear Lake, Minn.	Dr. C. S. Stevens	10	1,440	208.2
WMBF	Miami Beach, Fla.	Fleetwood Hotel Corporation (WQAM).	500	780	384.4
WMBG	Richmond, Va.	Havens & Martin (Inc.) (WTAZ)	15	1,360	220.4
WMBH	Joplin, Mo.	Edwin Dudley Aber	100	1,470	204.0
WMBI	Addison, Ill.	Moody Bible Institute (WJAZ)	5,000	1,140	263.0
WMBJ	McKeesport, Pa.	Rev. John W. Sproul[2]	50	1,200	232.4
WMBL	Lakeland, Fla.	Benford's Radio Studios	100	1,310	228.9
WMBM	Memphis, Tenn.	Seventh Day Adventist Church	10	1,430	209.7
WMBO	Auburn, N. Y.	Radio Service Laboratories	100	1,360	220.4
WMBQ	Brooklyn, N. Y.	Paul J. Gollhofer (WIBS-WLBX)	100	1,470	204.0
WMBR	Tampa, Fla.	F. J. Reynolds	100	1,190	252.0
WMBS	Lemoyne, Pa.	Mack's Battery Co.	250	1,280	234.2
WMBW	Youngstown, Ohio.	Youngstown Broadcasting Co. (Inc.) (WKBN).	50	1,400	214.2
WMC	Memphis, Tenn.[2]	Memphis Commercial Appeal (Inc.).	5,000	580	516.9
WMCA	Hoboken, N. J.	Greeley Square Hotel Co. (WLWL).	500	810	370.2
WMES	Boston, Mass.	Massachusetts Education Society (WLOE).	50	1,420	211.1
WMPC	Lapeer, Mich.	First Methodist Protestant Church.	30	1,200	234.2

[1] Call WGMS used by WCCO when broadcasting over WLB.
[2] Construction permit issued only.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WMRJ	Jamaica, N. Y.	Peter J. Prinz (WHPP-WTRL)	10	1,450	206.8
WMSG	New York, N. Y.	Madison Square Garden Broadcast Corporation (WHAP-WBNY).	500	1,270	236.1
WNAC-WBIS	Boston, Mass.	The Shepard Stores	500	650	461.3
WNAD	Norman, Okla.	University of Oklahoma	500	1,250	239.9
WNAL	Omaha, Nebr.	R. J. Rockwell (KFOX)	250	1,160	258.5
WNAT	Philadelphia, Pa.	Lennig Bros. Co. (WIAD)	100	1,040	288.3
WNAX	Yankton, S. Dak.	Gurney Seed & Nursery Co. and Dakota Radio Appliance Co. (6 a. m. to 8 p. m. only).	1,000	990	302.8
WNBA	Forest Park, Ill.	Michael T. Rafferty (WJBZ)	200	1,440	208.2
WNBF	Endicott, N. Y.	Howitt-Wood Radio Co.	50	1,450	206.8
WNBH	New Bedford, Mass.	New Bedford Broadcasting Co.	250	1,150	260.7
WNBJ	Knoxville, Tenn.	Lonsdale, Baptist Church	50	1,450	206.8
WNBO	Washington, Pa.	John Brownlee Spriggs	15	1,420	211.1
WNBQ	Rochester, N. Y.	Gordon P. Brown	15	1,460	205.4
WNBR	Memphis, Tenn.	John Ulrich (WGBC)	100	1,310	228.9
WNBW	Carbondale, Pa.	Home Cut Glass & China Co.	5	1,500	199.9
WNBX	Springfield, Vt.	First Congregational Church Corporation (WFCI).	10	1,240	241.8
WNBZ	Saranac Lake, N. Y.	Smith & Mace (9 a. m. to 1 p. m. only).	10	1,290	232.4
WNJ	Newark, N. J.	Radio Investment Co. (WGCP-WAAM).	250	1,120	267.7
WNOX	Knoxville, Tenn.	Sterchi Bros.	100	1,130	265.3
WNRC	Greensboro, N. C.	Wayne M. Nelson	500	1,340	223.7
WNYC	New York, N. Y.	Department of Plant and Structures.	500	570	526.0
WOAI	San Antonio, Tex.	Southern Equipment Co.	5,000	1,070	280.2
WOAN	Lawrenceburg, Tenn.	Church of the Nazarene and Vaughan School of Music (WBAW).	500	1,250	239.9
WOAX	Trenton, N. J.	Franklyn J. Wolff (WCAP)	500	1,250	239.9
WOBR	Portable	Harl Smith	10	1,470	204.0
WOBT	Union City, Tenn.	Tittsworth's Radio and Music Shop.	15	1,460	205.4
WOBU	Charleston, W. Va.	Charleston Radio Broadcasting Co.	250	1,120	267.7
WOC	Davenport, Iowa	Palmer School of Chiropractic	5,000	800	374.8
WOCL	Jamestown, N. Y.	A. E. Newton	25	1,340	223.7
WODA	Paterson, N. J.	Richard E. O'Dea (WGL)	1,000	1,020	293.9
WOI	Ames, Iowa	Iowa State College (5,000 watts 6 a. m. to 6 p. m.).	2,500	1,130	265.3
WOK-WMBB	See WMBB-WOK.				
WOKO	Mount Beacon, N. Y.	Harold E. Smith	500	1,390	215.7
WOKT	Binghamton, N. Y.	Titus-Ets Corporation	500	1,430	209.7
WOMT	Manitowoc, Wis.	Mikadow Theater	100	1,350	222.1
WOO	Philadelphia, Pa.	John Wanamaker (WIP-WGBS)	500	860	348.6
WOOD	Furnwood, Mich.	Walter B. Stiles (Inc.) (WCMA)	500	1,150	260.7
WOQ	Kansas City, Mo.	Unity School of Christianity (WIIB).	500	880	340.7
WOR	Kearny, N. J.	L. Bamberger & Co.	5,000	710	422.3
WORD	Batavia, Ill.	People's Pulpit Association (uses one-fourth time on this channel).	5,000	1,190	252.0
WOS	Jefferson City, Mo.	State Marketing Bureau	500	710	422.3
WOW	Omaha, Nebr.	Woodmen of the World Life Insurance Association.	1,000	590	508.2
WOWO	Fort Wayne, Ind.	Main Auto Supply Co. (5,000 watts 6 a. m. to 6 p. m.).	2,500	1,310	228.9
WPAP-WQAO	See WQAO-WPAP.				
WPCC	Chicago, Ill.	North Shore Congregational Church (WCRW-WFKB).	500	1,340	223.7
WPCH	Hoboken, N. J.	Concourse Radio Corporation (WRNY).	500	920	325.9
WPEP	Waukegan, Ill.	Maurice Mayer	250	1,390	215.7
WPG	Atlantic City, N. J.	Municipality of Atlantic City	5,000	1,100	272.6
WPOR-WTAR	See WTAR-WPOP.				
WRBH	Manchester, N. H.	N. H. Broadcasting Corporation	500		C. P.
WRBI	Tifton, Ga.	Kents Furniture and Music Store (6 a. m. to 6 p. m.).	20	1,350	222.1
WRBJ	Hattiesburg, Miss.	Woodruff Furniture Co.	10	1,200	249.9
WRBL	Columbus, Ga.	Roy E. Martin	50	1,170	256.3
WRBQ	Greenville, Miss.	J. Pat Scully (6 a. m. to 6 p. m. only).	100	1,090	275.1
WRBT	Wilmington, N. C.	Wilmington Radio Association	50	1,320	232.4
WRBU	Gastonia, N. C.	A. J. Kirby Music Co.	50		C. P.
WRBW	Columbia, S. C.	Paul S. Pearle	15		C. P.
WRBX	Roanoke, Va.	Richmond Development Corporation.	250		C. P.
WPRC	Harrisburg, Pa.	Wilson Printing & Radio Co.	100	1,430	209.7

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WPSC	State College, Pa.	Pennsylvania State College (WBAK) (6 a. m. to 6 p. m. only).	500	1,000	299.8
WPSW	Philadelphia, Pa.	Philadelphia School of Wireless Telegraphy.	50	1,450	206.8
WPTF	Raleigh, N. C.	Durham Life Insurance Co.	1,000	550	545.1
WQAM	Miami, Fla.	Electric Equipment Co. (WMBF)	750	780	384.4
WQAN	Scranton, Pa.	Scranton Times (WGBI)	250	1,300	230.6
WQAO-WPAP	Cliffside, N. J.	Calvary Baptist Church (WHN)	500	760	394.5
WQBC	Utica, Miss.	Utica Chamber of Commerce (Inc.) (7 a. m. to 7 p. m., Monday to Saturday, inclusive).	225	1,390	215.7
WQBJ	Clarksburg, W. Va.	John Raikes [1]	65	1,250	239.9
WQBZ	Weirton, W. Va.	J. H. Thompson	60	1,200	249.9
WQJ	Chicago, Ill.	Calumet Broadcasting Co. (WMAQ).	500	670	447.5
WRAF	La Porte, Ind.	The Radio Club (Inc.)	100	1,440	208.2
WRAH	Providence, R. I.	Stanley N. Read	250	1,500	199.9
WRAK	Erie, Pa.	C. R. Cummins	30	1,370	218.8
WRAM	Galesburg, Ill.	Lombard College (WFBZ)	50	1,210	247.8
WRAW	Reading, Pa.	Avenue Radio & Electric Shop	100	1,260	238.0
WRAX	Philadelphia, Pa.	Berachah Church (Inc.)	250	1,410	212.6
WRBC	Valparaiso, Ind.	Immanuel Lutheran Church	250	1,260	238.0
WRBH	See opposite page.				
WRC	Washington, D. C.	Radio Corporation of America	500	640	468.5
WREC	Whitehaven, Tenn.	WREC (Inc.) (WSIX)	100	1,200	249.9
WREN	Lawrence, Kans.	Jenny Wren Co. (KFKU)	750	1,180	254.1
WRES	Quincy, Mass.	Harry Leonard Sawyer	50	1,380	217.3
WRHF	Washington, D. C.	American Broadcasting Co. (6 a. m. to 7 p. m. only).	150	930	322.4
WRHM	Fridley, Minn.	Rosedale Hospital Co. (Inc.)	1,000	1,150	260.7
WRJN	Racine, Wis.	Racine Broadcasting Corporation	50	1,210	247.8
WRK	Hamilton, Ohio.	S. W. Daron and John C. Slade	100	1,460	205.4
WRM	Urbana, Ill.	University of Illinois (WBAA) (1,000 watts 6 a. m. to 6 p. m.).	500	1,100	272.6
WRMU	Portable	Atlantic Broadcasting Corporation (WGMU).	100	1,490	201.2
WRNY	Coytesville, N. J.	Experimenter Publishing Co. (WPCH).	500	920	325.9
WRR	Dallas, Tex.	City of Dallas (KRLD)	500	650	461.3
WRUF	Gainesville, Fla.	University of Florida (WTFF) [1]	5,000	1,480	202.6
WRVA	Richmond, Va.	Larus & Bro. Co. (Inc.)	1,000	1,180	254.1
WSAI	Mason, Ohio.	Crosley Radio Corporation (issue)	5,000	830	361.2
WSAJ	Grove City, Pa.	Grove City College	250	1,340	223.7
WSAN	Allentown, Pa.	Allentown Call Publishing Co. (Inc.) (WCBA).	100	1,350	222.1
WSAR	Fall River, Mass.	Doughty & Welch Electric Co. (Inc.).	250	1,410	212.6
WSAX	Chicago, Ill.	Zenith Radio Corporation	100	1,470	204.0
WSAZ	Huntington, W. Va.	McKellar Electric Co	100	1,200	249.9
WSB	Atlanta, Ga.	Atlanta Journal Co	1,000	630	475.9
WSBC	Chicago, Ill.	World Battery Co. (Inc.) (WJKS)	500	1,290	232.4
WSBT	South Bend, Ind.	South Bend Tribune (WEAR-WTAM).	500	750	399.8
WSDA-WSGH	See WSGH-WSDA.				
WSEA	Portsmouth, Va.	Virginia Beach Broadcasting Co. (Inc.).	500	1,140	263.0
WSGH-WSDA	Brooklyn, N. Y.	Amateur Radio Specialty Co. (WBBC).	500	1,320	227.1
WSIX	Springfield, Tenn.	638 Tire & Vulcanizing Co. (WREC).	150	1,200	249.9
WSKC	Bay City, Mich.	World's Star Knitting Co. (WFDF).	250	1,100	272.6
WSM	Nashville, Tenn.	National Life & Accident Insurance Co. (Inc.).	5,000	890	336.9
WSMB	New Orleans, La.	Saenger Theaters (Inc.) & Maison Blanche Co.	750	1,010	296.9
WSMK	Dayton, Ohio.	Stanley M. Krohn, jr	200	1,010	296.9
WSPD	Toledo, Ohio.	Toledo Broadcasting Co	250	1,250	239.9
WSRO	Middletown, Ohio.	Harry W. Fahrlander	100	1,270	236.1
WSSH	Boston, Mass.	Tremont Temple Baptist Church (WBET).	100	1,040	288.3
WSUI	Iowa City, Iowa.	State University of Iowa (6 a. m. to 7.30 p. m. only).	500	630	475.9
WSUN-WFLA	See WFLA-WSUN.				
WSVS	Buffalo, N. Y.	Seneca Vocational School (WKEN)	50	1,470	204.0
WSYR	Syracuse, N. Y.	Clive B. Meredith	500	1,020	296.9

[1] Construction permit issued only.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
WTAD	Quincy, Ill	Illinois Stock Medicine Broadcasting Corporation (500 watts 6 to 7).	250	1,270	236.1
WTAG	Worcester, Mass	Worcester Telegram Publishing Co. (Inc.).	250	580	516.9
WTAM	Cleveland, Ohio	WTAM and WEAR (Inc.) (WEAR-WSBT) (5,000 watts 6 to 6).	3,500	750	399.8
WTAQ	Eau Claire, Wis	Clyde S. Van Gorden	500	1,180	254.1
WTAR-WPOR	Norfolk, Va	Reliance Electric Co. (Inc.) (WBBW).	500	1,270	236.1
WTAS	Elgin, Ill	Illinois Broadcasting Corporation (WFBM).	500	1,090	275.1
WTAW	College Station, Tex	Agricultural and Mechanical College of Texas (KFDM).	500	620	483.6
WTAX	Streator, Ill	Williams Hardware Co	50	1,210	247.8
WTAZ	Richmond, Va.[a]	W. Reynolds, jr., & T. J. McGuire (WMBG).	15	1,360	220.4
WTFF	Mount Vernon Hills, Va.	Independent Publishing Co. (WRUF).	[b]10	1,480	202.6
WTFI	Toccoa, Ga	Toccoa Falls Institute	500	1,430	209.7
WTHS	Atlanta, Ga	Atlanta Technological High School	200	1,320	227.1
WTIC	Hartford, Conn	Travelers Insurance Co. (WCAC)	500	560	535.4
WTMJ	Brookfield, Wis	Milwaukee Journal	1,000	1,020	293.9
WTRL	Midland Park, N. J	Technical Radio Laboratory (WMRJ-WHPP).	15	1,450	206.8
WWAE	Hammond, Ind	Dr. Geo. F. Courrier (WCLO-WJBC).	500	1,320	227.1
WWJ	Detroit, Mich	The Detroit News	1,000	850	352.7
WWL	New Orleans, La	Loyola University	500	1,220	245.8
WWNC	Asheville, N. C	Chamber of Commerce	1,000	1,010	296.9
WWRL	Woodside, N. Y	Wm. H. Reuman (WCLB-WBMS-WGOP).	100	1,500	199.9
WWVA	Wheeling, W. Va	West Virginia Broadcasting Corporation.	250	580	516.9
KDKA	East Pittsburgh, Pa	Westinghouse Electric & Manufacturing Co.	[b]50	950	315.6
KDYL	Salt Lake City, Utah	Intermountain Broadcasting Corporation.[c]	500	1,280	234.2
KEJK	Los Angeles, Calif	R. S. Macmillan (KFSG) (6 p. m. to 12 m. only; Monday, Tuesday, Thursday, and Friday 6 p. m. to 2 a. m.).	250	1,190	252.0
KELW	Burbank, Calif	Earl L. White	500	1,310	228.9
KEX	Portland, Oreg	Western Broadcasting Co	2,500	1,080	277.6
KFAB	Lincoln, Nebr	Nebraska Buick Auto Co. (KOIL)	5,000	940	319.0
KFAD	Phoenix, Ariz	Electrical Equipment Co	500	1,100	272.6
KFAU	Boise, Idaho	Independent School District of Boise City (4,000 watts 6 a. m. to 6 p. m.).	2,000	1,050	285.5
KFBB	Havre, Mont	F. A. Buttrey Co	50	1,090	275.1
KFBI	Airplane (portable) (Pacific coast).	Flying Broadcasters (Inc.)	50	1,470	204.0
KFBK	Sacramento, Calif	Kimball-Upson Co. (KTBI) 6 p. m. to 10 p. m. only Tuesday, Wednesday, Thursday, and Saturday.	100	1,090	275.1
KFBL	Everett, Wash	Leese Bros. (KXRO)	50	1,340	223.7
KFBU	Laramie, Wyo	Bishop N. S. Thomas (KFUM)	500	620	483.6
KFCB	Phoenix, Ariz	Nielson Radio Supply Co (250 Watts 6 to 6).	125	1,230	243.8
KFCR	Santa Barbara, Calif	Santa Barbara Broadcasting Co. limited to 10 p. m.	100	1,420	211.1
KFDM	Beaumont, Tex	Magnolia Petroleum Co. (WTAW)	500	620	483.6
KFDX	Shreveport, La	First Baptist Church	250	1,270	236.1
KFDY	Brookings, S. Dak	State College (WDAY)	500	550	545.1
KFDZ	Minneapolis, Minn	Harry O. Iverson	10	1,390	215.7
KFEC	Portland, Oreg	Meier & Frank Co. limited to 7 p. m.	50	1,400	214.2
KFEL	Denver, Colo	Eugene P. O'Fallon (Inc.) (KFUP).	250	1,320	227.1
KFEQ	St. Joseph, Mo	Scroggin & Co. Bank (2,000 Watts 6 to 6).	1,000	1,300	230.6
KFEY	Kellogg, Idaho	Union High School	10	1,290	232.4
KFGQ	Boone, Iowa	Boone Biblical College	10	1,430	209.7
KFH	Wichita, Kans	Hotel Lassen	500	1,220	245.8

[a] Construction permit issued to move to Chesterfield, Hills, Va.
[b] Kilowatts.
[c] Construction permit issued for 500 watts, 1,280 kilocycles.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
KFHA	Gunnison, Colo	Western State College of Colorado (KFKA).	50	1,200	249.0
KFHL	Oskaloosa, Iowa	Penn College	10	1,410	212.6
KFI	Los Angeles, Calif	Earle C. Anthony (Inc.)	50,000	640	468.5
KFIF	Portland, Ore	Benson Poly. School (KTBR)	50	1,310	228.9
KFIO	Spokane, Wash	North Central High School) (KFPY & KGY).	100	1,220	245.8
KFIU	Juneau, Alaska	Alaska Electrical Light & Power Co.	10	1,330	225.4
KFIZ	Fond du Lac, Wis	Fond du Lac Commonwealth Reporter.	100	1,120	267.7
KFJB	Marshalltown, Iowa	Marshall Electric Co. (250 Watts 6 to 6).	100	1,210	247.8
KFJF	Oklahoma City, Okla	National Radio Manufacturing Co.	5,000	1,100	272.6
KFJI	Astoria, Oreg	George Kincaid (KWJJ)	50	1,200	249.9
KFJM	Grand Forks, N. Dak	University of North Dakota	100	900	333.1
KFJR	Portland, Oreg	Ashley C. Dixon & Son	500	1,250	239.9
KFJY	Fort Dodge, Iowa	C. S. Tunwall (KFMR)	100	1,290	232.4
KFJZ	Fort Worth, Tex	Henry Clay Allison	50	1,200	249.9
KFKA	Greeley, Colo	Colo. State Teachers College (KFHA) (1000 Watts, 6 to 6).	500	1,200	249.9
KFKB	Milford, Kans	Dr. J. R. Brinkley (2,500 Watts, 7 to 7).	1,500	1,240	241.8
KFKU	Lawrence, Kans	Univ. of Kansas (WREN)	500	1,180	254.1
KFKX	Chicago, Ill	Westinghouse Electric & Manufacturing Co. (XYW).	2,500	570	526.0
KFKZ	Kirksville, Mo	Northeast Missouri State Teachers College.	15	1,330	225.4
KFLV	Rockford, Ill	Swedish Evangelical Mission Church.	100	1,120	267.7
KFLX	Galveston, Tex	George Roy Clough	100	1,110	270.1
KFMR	Sioux City, Iowa	Morningside College (KFJY)	100	1,290	232.4
KFMX	Northfield, Minn	Carleton College	500	1,270	236.1
KFNF	Shenandoah, Iowa	Henry Field Seed Co. (6 to 7 only)	2,000	650	461.3
KFOA	Seattle, Wash	Rhodes Department Store	1,000	670	447.5
KFON	Long Beach, Calif	Nichols & Warinner (Inc.) [7]	500	1,240	241.8
KFOR	Lincoln, Nebr	Howard A. Shuman	100	1,380	217.3
KFOX	Omaha, Nebr	Omaha Bureau of Education (WNAL).	100	1,160	258.5
KFPL	Dublin, Tex	C. C. Baxter	15	1,090	275.1
KFPM	Greenville, Tex	The New Furniture Co.	15	1,300	230.6
KFPR	Los Angeles, Calif	Los Angeles County forestry department (KFQZ).	250	1,290	232.4
KFPW	Sulphur Springs, Ark	Rev. Lannie W. Stewart	50	1,140	263.0
KFPY	Spokane, Wash	Symons Investment Co. (KGY) (KFIO).	250	1,220	245.8
KFQA	St. Louis, Mo	The Principia (WMAY-KWK)	50	1,280	234.2
KFQB	Fort Worth, Tex	W. B. Fishburn (Inc.) (WJAD)	1,000	900	333.1
KFQD	Anchorage, Alaska	Anchorage Radio Club	100	870	344.6
KFQU	Holy City, Calif	W. E. Riker (KGTT)	100	1,360	220.4
KFQW	Seattle, Wash	KFQW (Inc.)	100	1,380	217.3
KFQZ	Hollywood, Calif	Taft Radio & Broadcasting Co. (Inc.) (KFPR)	250	1,290	232.4
KFRC	San Francisco, Calif	Don Lee (Inc.)	1,000	660	454.3
KFRU	Columbia, Mo	Stephens College	500	1,200	249.9
KFSD	San Diego, Calif	Airfan Radio Corporation	500	680	440.9
KFSG	Los Angeles, Calif	Echo Park Evangalist Association (KEJK) (limited to 10 p. m.).	500	1,190	252.0
KFUL	Galveston, Tex	Will H. Ford	500	1,160	258.5
KFUM	Colorado Springs, Colo	W. D. Corley (KFBU)	1,000	620	483.6
KFUO	Clayton, Mo	Concordia Theological Seminary (KSD) (1,500 watts 6 a. m. to 6 p. m.).	1,000	550	545.1
KFUP	Denver, Colo	Fitzsimmons General Hospital (KFEL).	100	1,320	227.1
KFUR	Ogden, Utah	Peery Building Co	50	1,330	225.4
KFUS	Oakland, Calif	Dr. L. L. Sherman	50	1,440	208.2
KFUT	Salt Lake City, Utah	University of Utah	50	1,200	249.9
KFVD	Culver City, Calif	W. J. McWhinnie and C. I. McWhinnie (KGER).	250	1,390	215.7
KFVG	Independence, Kans	First Methodist Episcopal Church	50	1,330	225.4
KFVS	Cape Girardeau, Mo	Hirsch Battery & Radio Co	50	1,340	223.7
KFWB	Los Angeles, Calif	Warner Bros. Broadcasting	1,000	830	361.2
KFWC	Ontario, Calif	Lawrence E. Wall (KFBC)	100	1,210	247.8
KFWF	St. Louis, Mo	St. Louis Truth Center (Inc.)	250	1,400	214.2
KFWI	San Francisco, Calif	Radio Entertainments (Inc.)	500	1,120	267.7
KFWM	Oakland, Calif	Oakland Educational Society (1,000 watts 6 a. m. to 6 p. m.).	500	1,270	236.1

[7] Construction permit issued for 1,000 watts.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
KFWO	Avalon, Calif.	Lawrence Mott (limited to 10 p. m.).	250	1,000	299.8
KFXD	Jerome, Idaho	Service Radio Co. (50 watts 11 a. m. to 2 p. m.).	15	1,470	204.0
KFXF	Denver, Colo.	Pikes Peak Broadcasting Co.	250	1,060	282.8
KFXJ	Edgewater, Colo.	R. G. Howell (KGHF)	50	1,430	209.7
KFXR	Oklahoma City, Okla.	Exchange Avenue Baptist Church	50	1,340	223.7
KFXY	Flagstaff, Ariz.	Mary M. Costigan	100	1,460	205.4
KFYO	Breckenridge, Tex.	Kirksey Bros. Battery & Electric Co.	100	1,420	211.1
KFYR	Bismarck, N. Dak.	Hoskins-Meyer (500 watts 6 to 6).	250	1,200	249.9
KGA	Spokane, Wash.	Northwest Radio Service Co.	2,000	1,150	260.7
KGAR	Tucson, Ariz.	Citizen's Publishing Co.	100	1,280	234.2
KGB	San Diego, Calif.	Southwestern Broadcasting Corporation (KFWC).	100	1,210	247.8
KGBU	Ketchikan, Alaska	Alaska Radio & Service Co.	500	750	399.8
KGBX	St. Joseph, Mo.	Foster-Hall Tire Co.	100	1,040	288.3
KGBY	Columbus, Nebr.	Ervin Taddiken	50	1,350	222.1
KGBZ	York, Nebr.	Federal Live Stock Remedy Co.	100	1,410	212.6
KGCA	Decorah, Iowa	Chas. W. Greenley (KWLC)	10	1,210	247.8
KGCB	Enid, Okla.	Wallace Radio Institute (KGFG) [1]	50	1,390	215.7
KGCH	Wayne, Nebr.	Farmers & Merchants Cooperative Radio Corporation of America (KGDW).	250	1,020	293.9
KGCI	San Antonio, Tex.	Liberto Radio Sales (KGRC)	250 C. P. issued	1,360	220.4
KGCN	Concordia, Kans.	Concordia Broadcasting Co.	50	1,440	208.2
KGCR	Brookings, S. Dak.	Cutler's Radio Broadcasting Service (Inc.).	15	1,440	208.2
KGCU	Mandan, N. Dak.	Mandan, Radio Association	100	1,250	239.9
KGCX	Vida, Mont.	First State Bank of Vida	10	1,230	243.8
KGDA	Dell Rapids, S. Dak.	Home Auto Co. (6 to 6 only)	15	1,180	254.1
KGDE	Barrett, Minn.	Jaren Drug Co.	50	1,460	205.4
KGDM	Stockton, Calif.	E. F. Peffer (limited to 9 p. m.)	10	1,380	217.3
KGDP	Pueblo, Colo.	Pueblo Council, Boy Scouts of America.	10	1,340	223.7
KGDR	San Antonio, Tex.	Joe B. McShane (30 watts, 6 to 6)	15	1,450	206.8
KGDW	Humboldt, Nebr.	Frank J. Rist (KGCH)	100	1,020	293.9
KGDY	Oldham, S. Dak.	J. Albert Loesch	15	1,450	206.8
KGEF	Los Angeles, Calif.	Trinity Methodist Church (KGFH) (limited to 10 p. m.).	1,000	1,140	263.0
KGEK	Yuma, Colo.	Beehler Electric Equipment Co. (7 to 7 only).	50	1,140	263.0
KGEN	El Centro, Calif.	E. R. Irey and F. M. Bowles	100	1,330	225.4
KGEO	Grand Island, Nebr.	Hotel Yancey	100	1,460	205.4
KGEQ	Minneapolis, Minn.	Fred W. Herrmann	50	1,470	204.0
KGER	Long Beach, Calif.	C. Merwin Dobyns (KFVD)	100	1,390	215.7
KGES	Central City, Nebr.	Central Radio Electric Co.	10	1,470	204.0
KGEW	Fort Morgan, Colo.	City of Fort Morgan (KOW) (200 watts, 6 to 6).	100	1,370	218.8
KGEZ	Kalispell, Mont.	Flathead Broadcasting Association.	100	1,020	293.9
KGFB	Iowa City, Iowa.	Albert C. Dunkel	10	1,340	223.7
KGFF	Alva, Okla.	Earl E. Hampshire	25	1,460	205.4
KGFG	Oklahoma City, Okla.	Full Gospel Church (KGCB)	50	1,390	215.7
KGFH	Glendale, Calif.	Frederick Robinson (KGEF) (6 to 10 p. m. only, Monday, Wednesday, Friday, and Saturday).	250	1,140	263.0
KGFI	San Angelo, Tex.	San Angelo Broadcasting Co.	15	1,360	220.4
KGFJ	Los Angeles, Calif.	Ben S. McGlashan	100	1,410	212.6
KGFK	Hallock, Minn.	Kittson County Enterprise	50	1,340	223.7
KGFL	Raton, N. M.	N. L. Cotter	50	1,350	222.1
KGFN	Aneta, N. Dak.	Henry Heraldson and Carl Thingstad.	15	1,500	199.9
KGFO	Portable	Brant Radio Power Co.	100	1,470	204.0
KGFW	Ravenna, Nebr.	Otto F. Sothman	10	1,010	296.9
KGFX	Pierre, S. Dak.	Dana McNeil (6 a. m. to 6 p. m. only).	200	1,180	254.1
KGGF	Picher, Okla.	D. L. Connell, M. D.	100	1,450	206.8
KGGH	Cedar Grove, La.	Bates Radio & Electric Co. (KWEA).	50	1,410	212.6
KGGM	Albuquerque, N. Mex.	Jay Peters	100	1,470	204.0
KGHA	Pueblo, Colo.	Geo. H. Sweeney and N. S. Walpole.[1]	500	1,430	209.7
KGHB	Honolulu, Hawaii	Radio Sales Co.	250	1,320	227.1
KGHC	Slayton, Minn.	Hegstad Radio Co.	15	1,430	209.7
KGHD	Missoula, Mont.	Elmore-Nash Broadcasting (6 to 6 only).	5	1,290	232.4

[1] Construction permit issued only.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
KGHF	Pueblo, Colo.	Curtis B. Ritchs and Joe E. Finch (KFXJ).	250	1,430	209.7
KGHG	McGehee, Ark.	Chas. W. McCollum (6 to 6)	50	C. P.	
KGHI	Little Rock, Ark.	Berean Bible Class	15	1,150	260.7
KGHL	Billings, Mont.	Northwestern Auto Supply Co. (Inc.).	250	1,350	222.1
KGHX	Richmond, Tex.	Fort Bend County School Board	50	C. P.	
KGJF	Little Rock, Ark.	First Church of the Nazarene	250	1,080	277.6
KGKB	Goldthwaite, Tex.	Eagle Park Co.	50	1,070	280.2
KGKL	Georgetown, Tex.	M. L. Cates	100	1,290	232.4
KGKO	Wichita Falls, Tex.	Highland Heights Christian Church.	250	C. P.	
KGO	Oakland, Calif.	General Electric Co.	5,000	780	384.4
KGRC	San Antonio, Tex.	Eugene G. Roth (KGCI)[4]	250	1,360	220.4
KGRS	Amarillo, Tex.	Gish Radio Service (500 meters, 6 to 6).	250	1,230	243.8
KGTT	San Francisco, Calif.	Glad Tidings Temple and Bible Institute (KFQU).	50	1,360	220.4
KGU	Honolulu, Hawaii	Marion A. Mulrony	500	1,110	270.1
KGW	Portland, Oreg.	Oregonian Pub. Co.	1,000	610	491.5
KGY	Lacey, Wash.	St. Martins College (KFPY-KFIO).	50	1,220	245.8
KHJ	Los Angeles, Calif.	Don Lee (Inc.)	1,000	750	399.8
KHQ	Spokane, Wash.	Louis Wasmer (Inc.)	1,000	810	370.2
KICK	Red Oak, Iowa	Atlantic Automobile Co. (WIAS), Red Oak Radio Corporation, lessee (6 a. m. to 6 p. m. only).	100	930	322.4
KJBS	San Francisco, Calif.	Julius Brunton & Sons Co. (KLS)	100	1,220	245.8
KJR	Seattle, Wash.	Northwest Radio Service Co.	2,500	860	348.6
KKP	do	City of Seattle, Harbor Department (KRSC-KVL).	15	1,100	272.6
KLCN	Blytheville, Ark.	Daily Courier News (6 a. m. to 6 p. m. only).	50	1,050	285.5
KLDS-KMBC	See KMBC-KLDS.				
KLRA	Little Rock, Ark.	Arkansas Broadcasting Co.	50	1,470	204.0
KLS	Oakland, Calif.	Warner Bros. (KJBS)	250	1,220	245.8
KLX	do	Tribune Publishing Co.	500	590	508.2
KLZ	Dupont, Colo.	Reynolds Radio Co. (Inc.)	1,000	850	352.7
KMA	Shenandoah, Iowa	May Seed & Nursery (KWKH)	1,000	760	394.5
KMBC-KLDS	Independence, Mo.	Midland Broadcasting Co. and the Reorganized Church of Jesus Christ of Latter Day Saints.	1,500	1,110	270.1
KMED	Medford, Oreg.	W. J. Virgin (limited to 9 p. m.) (KDAC).	50	1,110	270.1
KMIC	Inglewood, Calif.	James R. Fouch	250	1,340	223.7
KMJ	Fresno, Calif.	The Fresno Bee (limited to 12 p. m.).	50	820	365.6
KMMJ	Clay Center, Nebr.	The M. M. Johnson Co. (WJAG) (500 watts 12 midnight to 7 p. m.)	250	1,050	285.5
KMO	Tacoma, Wash.	KMO (Inc.)	500	1,180	254.1
KMOX	Kirkwood, Mo.	Voice of St. Louis (Inc.)	5,000	1,000	299.8
KMTR	Hollywood, Calif.	KMTR Radio Corporation	500	580	516.9
KNRC	Santa Monica, Calif.	Clarence B. Juneau	500	800	374.8
KNX	Hollywood, Calif.	Western Broadcast Co.	5,000 C. P. issued	890	336.9
KOA	Denver, Colo.	General Electric Co.	5,000	920	325.9
KOAC	Corvallis, Oreg.	Oregon State Agricultural College (KMED) (limited to 8 p. m.).[7]	1,000	1,110	270.1
KOB	State College, N. Mex.	New Mexico College of Agricultural and Mechanical Arts (KWSC-KTW), 7,500 (6 a. m. to 6 p. m.).	5,000	760	394.5
KOCW	Chickasha, Okla.	Oklahoma College for Women	250	1,190	252.0
KOIL	Council Bluffs, Iowa	Mona Motor Oil Co. (KFAB)	5,000	940	319.0
KOIN	Portland, Oreg.	KOIN (Inc.)	1,000	940	319.0
KOMO	Seattle, Wash.	Fisher's Blend Station (Inc.)	1,000	970	309.1
KORE	Eugene, Oreg.	Eugene Broadcasting Station (KUJ-KWBS).	50	1,500	199.9
KOW	Denver, Colo.	Associated Industries (Inc.) (KGEW).	250	1,370	218.8
KPCB	Seattle, Wash.	Pacific Coast Biscuit Co.	100	1,300	230.6
KPJM	Prescott, Ariz.	Frank Wilburn	15	1,400	214.2
KPLA	Los Angeles, Calif.	Pacific Development Radio Co.	500	1,040	288.3
KPNP	Muscatine, Iowa	Central Radio Co.	100	1,420	211.1
KPO	San Francisco, Calif.	Hales Bros. the Chronicle	1,000	710	422.3
KPOF	Denver, Colo.	Pillar of Fire (Inc.)[5]	500	1,490	201.2
KPPC	Pasadena, Calif.	Pasadena Presbyterian Church (KPSN).	50	950	315.6

[4] Construction permit issued only.

[7] Construction permit issued for 1,000 watts.

List of licensed broadcasting stations arranged by call letters, effective June 30, 1928—Continued

Call	Station	Owner	Power	Kilocycles	Meters
			Watts		
KPQ	Seattle, Wash.	Archie Taft and Louis Wasmer (KPCB).	100	1,300	230.6
KPRC	Houston, Tex.	Houston Printing Co.[7]		1,020	293.9
KPSN	Pasadena, Calif.	Pasadena Star-News Publishing Co. (KPPC).	1,000	950	315.6
KQV	Pittsburgh, Pa.	Doubleday-Hill Electric Co. (WJAS).	500	1,110	270.1
KQW	San Jose, Calif.	First Baptist Church	500	1,010	296.9
KRE	Berkeley, Calif.	First Congregational Church (KLS).	100	1,220	245.8
KRGY	Harbingen, Tex.	Harbingen Music Co.	100	1,270	236.1
KRLD	Dallas, Tex.	KRLD (Inc.) (WRR)	500	650	461.3
KRMD	Shreveport, La.	Robert M. Dean (12 m to 1 p. m. Monday to Saturday, inclusive).	50	1,360	230.6
KRSC	Seattle, Wash.	Radio Sales Corporation (KVL-KKP).	50	1,100	272.6
KSAC	Manhattan, Kans.	Kansas State Agricultural College.	500	900	333.1
KSBA	Shreveport, La.	W. G. Patterson	1,000	1,120	267.7
KSCJ	Sioux City, Iowa.	Perkins Bros. Co. (KWUC) (1,000 watts 6 to 6).	500	1,230	243.8
KSD	St. Louis, Mo.	Pulitzer Publishing Co. (KFUO)	500	550	545.1
KSEI	Pocatello, Idaho.	KSEI Broadcasting Association	250	900	333.1
KSL	Salt Lake City, Utah.	Radio Service Corporation of Utah.[8]	5,000	990	302.8
KSMR	Santa Maria, Calif.	Santa Maria Valley R. R. Co. (KWTC).	100	1,100	272.6
KSO	Clarinda, Iowa.	Berry Seed Co.	500	1,320	227.1
KSOO	Sioux Falls, S. Dak.	Sioux Falls Broadcast Association (500 watts 6 to 6).	250	1,430	209.7
KSTP	Westcott, Minn.	National Battery Broadcasting Co.	[9] 5,000	1,360	220.4
KTAB	Oakland, Calif.	Associated Broadcasters	500	1,070	280.2
KTAP	San Antonio, Tex.	Robert B. Bridge [8]		1,310	228.9
KTBI	Los Angeles, Calif.	Bible Institute of Los Angeles (KFBK) (limited to 10 p. m.)[7]	1,000	1,090	275.1
KTBR	Portland, Oreg.	M. E. Brown (KFIF)	500	1,310	228.9
KTHS	Hot Springs National Park, Ark.	Arlington Hotel Co. (WBAP)	1,000	600	384.4
KTNT	Muscatine, Iowa.	Norman Baker	2,000	1,170	256.3
KTSA	San Antonio, Tex.	Alamo Broadcast Co.	2,000	1,130	265.3
KTUE	Houston, Tex.	Uhalt Electric	5	1,410	212.6
KTW	Seattle, Wash.	First Presbyterian Church (KWSC-KOB).	1,000	760	394.0
KUJ	Longview, Wash.	Fred W. Lovejoy and R. Kerfoot (KORE-KWBS).	10	1,500	199.9
KUOA	Fayetteville, Ark.	University of Arkansas	1,000	1,010	296.9
KUOM	Missoula, Mont.	State University of Montana	500	650	461.3
KUSD	Vermilion, S. Dak.	University of South Dakota	250	620	483.6
KUT	Austin, Tex.	University of Texas	500	1,290	232.4
KVI	Tacoma, Wash.	Puget Sound Radio Broadcasting Co. (limited to 9 p. m.).	250	1,060	282.8
KVL	Seattle, Wash.	Arthur C. Dailey (KKP-KRSC)	100	1,100	272.6
KVOO	Bristow, Okla.	Southwestern Sales Corporation	1,000	860	348.6
KVOS	Bellingham, Wash.	L. Kessler	250	1,430	209.7
KWBS	Portland, Oreg.	Schaeffer Radio Co. (KORE-KUJ).	15	1,500	199.9
KWCR	Cedar Rapids, Iowa.	Harry F. Paar (WJAM)	250	1,250	239.9
KWEA	Shreveport, La.	Wm. E. Antony (KGGH)	250	1,410	212.6
KWG	Stockton, Calif.	Portable Wireless Telegraph Co.	100	870	344.6
KWJJ	Portland, Oreg.	Wilbur Jerman (KFJI)	50	1,200	249.9
KWK	St. Louis, Mo.	Greater St. Louis Broadcasting Corporation (KFQA-WMAY) (2,000 watts 6 to 6).	1,000	1,280	234.2
KWKC	Kansas City, Mo.	Wilson Duncan Broadcasting Co.	100	1,350	222.1
KWKH	Kennonwood, La.	W. K. Henderson (KMA)	3,500	760	394.5
KWLC	Decorah, Iowa.	Luther College (KGCA)	50	1,210	247.8
KWSC	Pullman, Wash.	State College of Washington (KTW-KOB).	500	760	394.5
KWTC	Santa Ana, Calif.	Dr. John Wesley Hancock (KSMR).	100	1,100	272.6
KWUC	Le Mars, Iowa.	Western Union College (KSCJ)	1,500	1,230	243.8
KWWG	Brownsville, Tex.	Chamber of Commerce	500	1,080	277.6
KXA	Seattle, Wash.	American Radio Telegraph Co.	500	560	535.1
KXL	Portland, Oreg.	KXL Broadcasters (Inc.)	100	1,360	220.4
KXRO	Aberdeen, Wash.	KXRO (Inc.) (KFBL)	50	1,340	223.7
KYA	San Francisco, Calif.	Pacific Broadcasting Corporation	1,000	850	361.2
KYW	Chicago, Ill.	Westinghouse Electric & Manufacturing Co. (KFKX).	2,500	570	526.0
KZM	Hayward, Calif.	Leon P. Tenney (5,000 watts after 10 p. m.).	100	1,300	234.6

[6] Construction permit issued only.
[7] Coustruction permit issued for 1,000 watts.
[8] Construction permit issued for 5,000 watts.
[9] June and July.

APPENDIX D (4)

List of 683 licensed broadcasting stations arranged by frequencies as of June 30, 1928

Call letters	Location	Owner	Divides time with—	Power
	550 kilocycles; 545.1 meters			*Watts*
KSD	St. Louis, Mo	Pulitzer Publishing Co	KFUO	500
KFUO	Clayton, Mo	Concordia Theological Seminary (1,500 watts 6 a. m. to 6 p. m.).	KSD	1,000
WMAK	Martinsville, N. Y	WMAK Broadcasting System (Inc.).		750
WPTF	Raleigh, N. C	Durham Life Insurance Co		500
WFAA	Dallas, Tex	Dallas Morning News		500
KFDY	Brookings, S. Dak	State College	WDAY	500
WDAY	Fargo, N. Dak	Radio Equipment Corporation (500 watts 6 a. m. to 6 p. m.).	KFDY	250
	560 kilocycles; 535.4 meters			
WCAC	Storrs, Conn	Connecticut Agricultural College.	WTIC	500
WTIC	Hartford, Conn	Travelers Insurance Co	WCAC	500
WHO	Des Moines, Iowa	Bankers Life Co		5,000
	570 kilocycles; 526 meters			
WNYC	New York, N. Y	Department of Plant and Structures.		500
KMTR	Los Angeles, Calif	KMTR Radio Corporation		500
KFKX	Chicago, Ill	Westinghouse Electric & Manufacturing Co.	KYW	2,500
KYW	do	Westinghouse Electric & Manufacturing Co. (5,000 watts after 10 p. m.).	KFKX	2,500
	580 kilocycles; 516.9 meters (Canadian shared)			
WMC	Memphis, Tenn	Memphis Commercial Appeal (Inc.).		500
WWVA	Wheeling, W. Va	John C. Stroebel, jr		250
WTAG	Worcester, Mass	Worcester Telegram Publishing Co. (Inc.).		250
WFLA-WSUN	Clearwater, Fla	Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce.		750
	590 kilocycles; 508.2 meters			
WOW	Omaha, Nebr	Woodmen of the World Life Insurance Association.		1,00
KLX	Oakland, Calif	Tribune Publishing Co		500
WEEI	Boston, Mass	Edison Electric Illuminating Co. of Boston.		500
	600 kilocycles; 499.7 meters (Canadian shared)			
WBAP	Fort Worth, Tex	Carter Publications (Inc.)	WOAI	5,000
WOAI	San Antonio, Tex	Southern Equipment Co	WBAP	5,000
	610 kilocycles; 491.5 meters			
KGW	Portland, Oreg	Oregonian Publishing Co		1,000
WEAF	Bellmore, N. Y	National Broadcasting Co. (Inc.)		50,000
	620 kilocycles; 483.6 meters			
WJAR	Providence, R. I	The Outlet Co		500
WCFL	Chicago, Ill	Chicago Federation of Labor	WEMC-WLTS	1,500
WLTS	do	Lane Technical High School	WCFL-WEMC	100
WEMC	Berrien Springs, Mich	Emmanuel Missionary College	WLTS-WCFL	1,000
KUSD	Vermilion, S. Dak	University of South Dakota		250
WTAW	College Station, Tex	Agricultural and Mechanical College of Texas.	KFDM	500
KFDM	Beaumont, Tex	Magnolia Petroleum Co	WTAW	500
KFBU	Laramie, Wyo	Bishop N. S. Thomas	KFUM	500
KFUM	Colorado Springs, Colo	W. D. Corley	KFBU	1,000
	630 kilocycles; 475.9 meters (Canadian shared)			
WSB	Atlanta, Ga	Atlanta Journal Co		1,000
WSUI	Iowa City, Iowa	State University of Iowa (6 a. m. to 7.30 p. m.).		500

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	640 kilocycles; 468.5 meters			*Watts*
WRC	Washington, D. C.	Radio Corporation of America		500
KFI	Los Angeles, Calif.	Earl C. Anthony (Inc.)		5,000
	650 kilocycles; 461.3 meters			
WNAC-WBIS	Boston, Mass.	The Shepard Stores		500
KRLD	Dallas, Tex.	KRLD (Inc.)	WRR	500
WRR	do	City of Dallas	KRLD	500
KFNF	Shenandoah, Iowa	Henry Field Seed Co. (6 a. m. to 7 p. m. only).		2,000
WCAE	Pittsburgh, Pa.	Kaufman & Baer Co.		500
KUOM	Missoula, Mont.	State University of Montana		500
	660 kilocycles; 454.3 meters			
WJZ	Boundbrook, N. J.	Radio Corporation of America		30,000
KFRC	San Francisco, Calif.	Don Lee (Inc.)		1,000
	670 kilocycles; 447.5 meters			
WMAQ	Chicago, Ill.	Chicago Daily News (Inc.) [1]	WQJ	1,000
WQJ	do	Calumet Broadcasting Co.	WMAQ	500
KFOA	Seattle, Wash.	Rhodes Department Store		1,000
	680 kilocycles; 440.9 meters			
WJR-WCX	Pontiac, Mich.	WJR (Inc.) and Detroit Free Press.		5,000
WIBG	Elkins Park, Pa.	St. Paul's Protestant Episcopal Church (Sunday, 6 a. m. to 6 p. m.).		50
KFSD	San Diego, Calif.	Airfan Radio Corporation		500
WAAW	Omaha, Nebr.	Omaha Grain Exchange (6 a. m. to 6 p. m. only).		500
	690 kilocycles			
	700 kilocycles; 428.3 meters			
WLW	Harrison, Ohio	Crosley Radio Corporation		5,000
WLW	Cincinnati, Ohio	do		500
WMAF	South Dartmouth, Mass.	Round Hills Radio Corporation (summer months only).		500
	710 kilocycles; 422.3 meters			
WOR	Kearney, N. J.	L. Bamberger & Co.		5,000
KPO	San Francisco, Calif.	Hales Bros. and the Chronicle		1,000
WOS	Jefferson City, Mo.	State Marketing Bureau		500
	720 kilocycles; 416.4 meters			
WGN-WLIB	Chicago, Ill.	Tribune Co. and Liberty Weekly (Inc.).		500
WLIB-WGN	Near Elgin, Ill.	Liberty Weekly (Inc.) and Tribune Co.		15,000
	730 kilocycles [2]			
	740 kilocycles. 405.2 meters			
WLIT	Philadelphia, Pa.	Lit Bros.	WFI	500
WFI	do	Strawbridge & Clothier	WLIT	500
WCCO	Anoka, Minn.	Washburn-Crosby Co. (7,500 watts 6 a. m. to 6 p. m.).		5,000
	750 kilocycles; 399.8 meters			
WEAR	Cleveland, Ohio	Willard Storage Battery Co.	WTAM-WSBT	1,000
WTAM	do	Willard Storage Battery Co. (5,000 watts 6 a. m to 6 p. m.).	WEAR-WSBT	3,500
WSBT	South Bend, Ind.	South Bend Tribune	WEAR-WTAM	500
KHJ	Los Angeles, Calif.	Don Lee (Inc.) [3]		500
KGBU	Ketchikan, Alaska	Alaska Radio & Service Co.		500
	760 kilocycles; 394.5 meters			
KMA	Shenandoah, Iowa	May Seed & Nursery Co.	KWKH	1,000
KWKH	Shreveport, La.	W. K. Henderson	LMA	1,000
WHN	New York, N. Y.	George Schubel	WQAO-WPAP	500
WQAO-WPAP	Cliffside, N. J.	Cavalry Baptist Church	WHN	500
KTW	Seattle, Wash.	First Presbyterian Church	KWSC-KOB	1,000
KWSC	Pullman, Wash.	State College of Washington	KTW-KOB	500
KOB	State College, N. Mex.	New Mexico College of Agricultural and Mechanic Arts (7,500 watts 6 a. m. to 6 p. m.).	KWSC-KTW	5,000

[1] Construction permit issued for 2,500 after 6 p. m. and 5,000 6 a. m. to 6 p. m.
[2] Canadian wave.
[3] Construction permit issued for 1,000 watts.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	770 kilocycles; 389.4 meters			*Watts*
WBBM	Glenview, Ill	Atlass Investment Co	WAAF-WJBT	5,000
WAAF	Chicago, Ill	Drovers' Journal Publishing Co.	WBBM-WJBT	500
WJBT	do	J. S. Boyd (Inc.)	WBBM-WAAF	500
WABI	Bangor, Me	First Universalist Church (Sunday only).		100
	780 kilocycles; 384.4 meters (Canadian shared)			
WQAM	Miami, Fla	Electrical Equipment Co	WMBF	750
WMBF	Miami Beach, Fla	Fleetwood Hotel Corporation	WQAM	500
KGO	Oakland, Calif	General Electric Co		5,000
WBSO	Wellesley Hills, Mass	Babson's Statistical Organization (Inc.).[4]		100
KTHS	Hot Springs, Ark	Arlington Hotel Co		1,000
	790 kilocycles; 379.5 meters			
WCAJ	Lincoln, Nebr	Nebraska Wesleyan University (6 a. m. to 6 p. m. only).		500
WGY	South Schenectady, N. Y.	General Electric Co		50,000
	800 kilocycles; 374.8 meters			
KNRC	Santa Monica, Calif	Clarence B. Juneau		500
WOC	Davenport, Iowa	Palmer School of Chiropractic		5,000
	810 kilocycles; 370.2 meters			
WDAF	Kansas City, Mo	Kansas City Star Co		1,000
KHQ	Spokane, Wash	Louis Wasmer (Inc.)		1,000
WLWL	Kearny, N. J	Missionary Society of St. Paul the Apostle.	WMCA	5,000
WMCA	Hoboken, N. J	Greeley Square Hotel Co	WLWL	500
	820 kilocycles; 365.6 meters			
WEBH	Chicago, Ill	Edgewater Beach Hotel Co	WJJD	500
WJJD	Mooseheart, Ill	Supreme Lodge of the World, Loyal Order of Moose.	WEBH	1,000
KMJ	Fresno, Calif	Fresno Bee (daily to 10 p. m.)		50
	830 kilocycles; 361.2 meters			
WSAI	Mason, Ohio	U. S. Playing Card Co		5,000
KYA	San Francisco, Calif	Pacific Broadcasting Corporation.		1,000
	840 kilocycles[2]			
	850 kilocycles; 352.7 meters			
KLZ	Dupont, Colo	Reynolds Radio Co. (Inc.)		1,000
WWJ	Detroit, Mich	Detroit News		1,000
WEW	St. Louis, Mo	St. Louis University (6 a. m. to 6 p. m. only).		1,000
KFWB	Los Angeles, Calif	Warner Bros. Broadcasting[3]		500
	860 kilocycles; 348.6 meters			
WOO	Philadelphia, Pa	John Wanamaker	WIP-WGBS	500
WGBS	Astoria, Long Island, N. Y.	Gimbel Bros. (Inc.)	WIP-WOO	500
WIP	Philadelphia, Pa	do	WOO-WGBS	500
KVOO	Bristow, Okla	Southwestern Sales Corporation		1,000
KJR	Seattle, Wash	Northwest Radio Service Co	KXA	2,500
KXA	do	American Radio Telegraph Co	KJR	500
	870 kilocycles; 344.6 meters			
WLS	Crete, Ill	Sears, Roebuck & Co	WCBD	5,000
WCBD	Zion, Ill	Wilbur Glen Voliva	WLS	5,000
KWG	Stockton, Calif	Portable Wireless Telegraph Co. (daily to 10 p. m.).		50
KFQD	Anchorage, Alaska	Anchorage Radio Club		100

[2] Canadian wave.
[3] Construction permit issued for 1,000 watts.
[4] 6 a. m. to 6 p. m. and 12 midnight to 12.30 a. m.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	880 kilocycles; 340.7 meters (Canadian shared)			
				Watts
WAPI	Auburn, Ala	Alabama Polytechnic Institute	WJAX	1,000
WJAX	Jacksonville, Fla	City of Jacksonville	WAPI	1,000
WHB	Kansas City, Mo	Sweeney Automobile School Co.	WOQ	500
WOQ	do	Unity School of Christianity	WHB	500
	890 kilocycles; 336.9 meters (Canadian shared)			
WSM	Nashville, Tenn	National Life & Accident Insurance Co. (Inc.).		5,000
KNX	Hollywood, Calif	Western Broadcast Co		500
	900 kilocycles; 333.1 meters			
KFQB	Fort Worth, Tex	W. B. Fishburn (Inc.)	WJAD	1,000
WJAD	Waco, Tex	Frank P. Jackson	KFQB	500
WHA	Madison, Wis	University of Wisconsin	WLBL	750
WLBL	Stevens Point, Wis	Wisconsin Department of Markets (2,000 watts, 6 a. m. to 6 p. m.).	WHA	1,000
WBZ	East Springfield, Mass	Westinghouse Electric & Manufacturing Co.		15,000
WBZA	Boston, Mass	do		500
KSAC	Manhattan, Kans	Kansas State Agricutlural College.		500
KFJM	Grand Forks, N. Dak	University of North Dakota		100
KSEI	Pocatello, Idaho	KSEI Broadcasting Association		250
	910 kilocycles [1]			
	920 kilocycles; 325.9 meters			
KOA	Denver, Colo	General Electric Co		5,000
WRNY	Coteysville, N. J	Experimenter Publishing Co	WPCH	500
WPCH	Hoboken, N. J	Concourse Radio Corporation	WRNY	500
	930 kilocycles; 322.4 meters (Canadian shared)			
WRHF	Washington, D. C	American Broadcasting Co. (6 a. m. to 7 p. m. only).		150
WHAS	Louisville, Ky	Courier Journal Co. and Louisville Times Co.		500
KICK	Atlantic, Iowa [4]	Atlantic Automobile Co. (6 a. m. to 6 p. m. only).	WIAS	100
WIAS	Ottumwa, Iowa	Poling Electric Co. (6 a. m. to 6 p. m. only).	KICK	100
WKAQ	San Juan, P. R	Radio Corporation of Porto Rico		500
	940 kilocycles; 319 meters			
KOIL	Council Bluffs, Iowa	Mona Motor Oil Co	KFAB	5,000
KFAB	Lincoln, Nebr	Nebraska Buick Automobile Co.	KOIL	5,000
KOIN	Portland, Oreg	KOIN (Inc.)		1,000
	950 kilocycles; 315.6 meters			
KDKA	East Pittsburgh, Pa	Westinghouse Electric & Manufacturing Co.		50,000
KPSN	Pasadena, Calif	Pasadena Star News	KPPC	1,000
KPPC	do	Pasadena Presbyterian Church	KPSN	50
	960 kilocycles [1]			
	790 kilocycles; 309.1 meters			
WABC	Richmond Hill, N. Y	Atlantic Broadcasting Corporation (5,000 watts, 6 a. m. to 6 p. m.).	WBOQ	2,500
WBOQ	do	Atlantic Broadcasting Corporation.	WABC	500
KOMO	Seattle, Wash	Fisher's Blend Station (Inc.)		1,000

[1] Canadian wave.
[4] Construction permit issued to move to Red Oak, Iowa.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	980 kilocycles; 305.9 meters			
				Watts
WHT	Deerfield, Ill	Radiophone Broadcasting Corporation.	WIBO	5,000
WIBO	Chicago, Ill	WIBO Broadcasting (Inc.)	WHT	5,000
WHAZ	Troy, N. Y	Rensselaer Polytechnic Institute (8 p. m. to 12 p. m. Mondays and 12 midnight to 1 a. m. Tuesdays).		500
	990 kilocycles; 302.8 meters			
WGR	Buffalo, N. Y	Federal Radio Corporation		750
KSL	Salt Lake City, Utah	Radio Service Corporation [6]		1,000
WNAX	Yankton, S. Dak	Gurney Seed & Nursery Co. and Dakota Radio Apparatus Co. (6 a. m. to 6 p. m. only).		1,000
	1,000 kilocycles; 299.8 meters			
KFWO	Avalon, Calif	Lawrence Mott (daily to 10 p. m.)		250
KMOX	Kirkwood, Mo	Voice of St. Louis (Inc.)		5,000
WPSC	State College, Pa	Pennsylvania State College (6 a. m. to 8 p. m. only).	WBAK	500
WBAK	Harrisburg, Pa	Pennsylvania State Police (6 a. m. to 8 p. m. only).	WPSC	500
	1,010 kilocycles; 296.9 meters (Canadian shared).			
WWNC	Asheville, N. C	Chamber of Commerce		1,000
WEPS	Gloucester, Mass	Matheson Radio Co. (Inc.)		100
WSMK	Dayton, Ohio	Stanley M. Krohn, jr		200
WDEL	Wilmington, Del	Wilmington Electric Specialty Co. (Inc.).		100
WSMB	New Orleans, La	Saenger Theaters (Inc.) and Maison Blanche Co.		750
KUOA	Fayetteville, Ark	University of Arkansas		500
KQW	San Jose, Calif	First Baptist Church		500
KGFW	Ravenna, Nebr	Otto F. Sothman		10
	1,020 kilocycles; 293.9 meters			
WODA	Paterson, N. J	Richard E. O'Dea	WGL	1,000
WGL	Secaucus, N. J	International Broadcasting Corporation.	WODA	1,000
WTMJ	Milwaukee Journal	Brookfield, Wis		1,000
KPRC	Houston, Tex	Houston Printing Co		500
WLBW	Oil City, Pa	Petroleum Telephone Co		500
KGCH	Wayne, Nebr	S. A. Lutgen, M. D	KGDW	250
KGDW	Humboldt, Nebr	Frank J. Rist	KGCH	100
KGEZ	Kalispell, Mont	Flathead Broadcasting Association.		100
WSYR	Syracuse, N. Y	Clive B. Meredith		500
	1,030 kilocycles			
	1,040 kilocycles; 288.3 meters			
WDBO	Orlando, Fla	Rollins College (Inc.) (1,000 watts 6 a. m. to 6 p. m.).		500
WENR	Chicago, Ill	Great Lakes Radio Broadcasting Co.	WBCN	500
WBCN	do	do	WENR	250
WNAT	Philadelphia, Pa	Lennig Bros. Co	WIAD	100
WIAD	do	Howard R. Miller	WNAT	100
KGBX	St. Joseph, Mo	Foster-Hall Tire Co		100
WKY	Oklahoma City, Okla	WKY Radiophone Co		150
WSSH	Boston, Mass	Tremont Temple Baptist Church.	WBET	100
WBET	Medford, Mass	Boston Transcript Co	WSSH	500
KPLA	Los Angeles, Calif	Pacific Development Radio Co.		500

[6] Construction permit issued for 5,000 watts.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,050 kilocycles; 285.5 meters			*Watts*
WBAL	Glen Morris, Md	Consolidated Gas, Electric Light & Power Co.		5,000
KFAU	Boise, Idaho	Independent School district of Boise City (4,000 watts 6 a. m. to 6 p. m.)		2,000
KLCN	Blytheville, Ark	Daily Courier News (6 a. m. to to 6 p. m. only).		50
WJAG	Norfolk, Nebr	Norfolk Daily News (500 watts 7 a. m. to 7 p. m.)	KMMJ	250
KMMJ	Clay Center, Nebr	The M. M. Johnson Co. (500 watts 7 a. m. to 7 p. m.)	WJAG	250
WCAL	Northfield, Minn	St. Olaf College	WDGY	500
WDGY	Minneapolis, Minn	Dr. Geo. W. Young	WCAL	500
	1,060 kilocycles; 282.8 meters			
WAIU	Columbus, Ohio	American Insurance Union	WEAO	5,000
WEAO	do	Ohio State University	WAIU	750
KFXF	Denver, Colo	Pikes Peak Broadcasting Co		250
WRAK	Escanaba, Mich	Economy Light Co		50
WDRC	New Haven, Conn	Doolittle Radio Corporation		500
KVI	Tacoma, Wash	Puget Sound Radio Broadcasting Co. (limited to 9 p. m.)		250
	1,070 kilocycles; 280.2 meters			
WHAM	Victor Township, N. Y. (Rochester).	Stromberg-Carlson Telephone Manufacturing Co.		5,000
KTAB	Oakland, Calif	Associated Broadcasters		500
	1,080 kilocycles; 277.6 meters			
WGHP	Fraser, Mich	George Harrison Phelps (Inc.)	WKAR	750
WKAR	East Lansing, Mich	Michigan State College (1,000 watts, 7 a. m. to 7 p. m.).	WGHP	500
KWWG	Brownsville, Tex	Chamber of Commerce		500
WDZ	Tuscola, Ill	James L. Bush (6 a. m. to 6 p. m. only).		100
KEX	Portland, Oreg	Western Broadcasting Co		2,500
	1,090 kilocycles; 275.1 meters			
WEAN	Providence, R. I	The Shepard Co	WFBM	500
WTAS	Elgin, Ill	Illinois Broadcasting Corporation.		500
WFBM	Indianapolis, Ind	Indianapolis Power & Light Co.	WTAS	1,000
KFPI	Dublin, Tex	C. C. Baxter		15
KFBB	Havre, Mont	F. A. Buttrey Co		50
KFBK	Sacramento, Calif	Kimball-Upson Co. (limited to 10 p. m.).	KTBI	100
KTBI	Los Angeles, Calif	Bible Institute of Los Angeles (limited to 10 p. m.).	KFBK	1,000
	1,100 kilocycles; 272.6 meters			
WPG	Atlantic City, N. J	Municipality of Atlantic City		5,000
WRM	Urbana, Ill	University of Illinois (1,000 watts 6 a. m. to 6 p. m.).	WBAA	500
WBAA	Lafayette, Ind	Purdue University	WRM	500
KFJF	Oklahoma City, Okla	National Radio Manufacturing Co. (1,000 watts 6 a. m. to 6 p. m.).		750
KFAD	Phoenix, Ariz	Electric Equipment Co		500
WFBJ	Collegeville, Minn	St. Johns University		100
KSMR	Santa Maria, Calif	Santa Maria Valley R. R. Co	KWTC	100
KMTC	Santa Ana, Calif	Dr. John Wesley Hancock	KSMR	100
WFDF	Flint, Mich	Frank D. Fallain	WSKC	100
WSKC	Bay City, Mich	World's Star Knitting Co	WFDF	250

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,110 kilocycles; 270.1 meters			*Watts*
KMED	Medford, Oreg	W. J. Virgin	KOAC	50
KMBC-KLDS	Independence, Mo	Midland Broadcasting Co. and Reorganized Church of Jesus Christ and Latter Day Saints.		1,500
WJAS	Pittsburgh, Pa	Pittsburgh Radio Supply House	KQV	500
KQV	do	Doubleday-Hill Electric Co	WJAS	500
WGST	Atlanta, Ga	Georgia School of Techn ..gy	WMAZ	500
WMAZ	Macon, Ga	Mercer University	WGST	500
WISN	Milwaukee, Wis	Evening Wisconsin Co	WGWB-WHAD	250
WHAD	do	Marquette University	WISN-WGWB	500
WGWB	do	Evening Wisconsin Co	WISN-WHAD	250
KFLX	Galveston, Tex	Geo. Roy Clough		100
KGU	Honolulu, Hawaii	Marion Mulrony		500
KOKC	Corvallis, Oreg	Oregon State Agricultural College (daily to 8 p. m. only).[3]	KMED	500
	1,120 kilocycles; 267.7 (Canadian shared)			
WBAO	Decatur, Ill	James Milliken University		100
WDAE	Tampa, Fla	Tampa Publishing Co		500
KSBA	Shreveport, La	W. G. Patterson		1,000
KFLV	Rockford, Ill	Swedish Evangelical Mission Church.		100
WAAM	Newark, N. J	WAAM (Inc.)	WGCP-WNJ	250
WNJ	do	Herman Lubinsky	WGCP-WAAM	250
WGCP	do	May Radio Broadcast Corporation.	WAAM-WNJ	250
KFWI	San Francisco, Calif	Radio Entertainments (Inc.)		500
KFIZ	Fon du Lac, Wis	Fon du Lac (Wis.) Commonwealth Reporter.		100
WOBU	Charleston, W. Va	Charleston Radio Boradcasting Co.		50
WFBG	Altoona, Pa	William F. Gable Co		100
WLAP	Louisville, Ky	L. W. Benedict (100 watts, 6 a. m. to 6 p. m.).		30
	1,130 kilocycles; 265.3 meters			
WNOX	Knoxville, Tenn	People's Telegraph & Telephone Co.		1,000
WOI	Ames, Iowa	Iowa State College (2,500–3,000 watts, 6 a. m. to 6 p. m.).		
WHK	Cleveland, Ohio	Radio Air Service Corporation (500–1,000 watts, 6 a. m. to 6 p. m.).		
KTSA	San Antonio, Tex	Alamo Broadcast Co		2,000
WBES	Takoma Park, Md	Bliss Electrical School		100
WICC	Easton, Conn	Bridgeport Broadcasting Station (Inc.).	WCWS	500
WCWS	Danbury, Conn	Danbury Broadcasting Station	WICC	100
	1,140 kilocycles; 263 meters			
WSEA	Virginia Beach, Va	Virginia Beach Broadcasting Co. (Inc.).[7]		500
WJAZ	Mount Prospect, Ill	Zenith Radio Corporation	WMBI	5,000
WMBI	Addison, Ill	Moody Bible Institute	WJAZ	5,000
WDAG	Amarillo, Tex	J. Lawrence Martin		250
KGHP	Hardin, Mont	Hardin Post No. 8 American Legion. (6 a. m. to 6 p. m. only)[8]		50
KGFH	La Crescenta, Calif	Frederick Robinson	KGEF	250
KGEF	Los Angeles, Calif	Trinity Methodist Church	KGFH	1,000
WJBO	New Orleans, La	Valdemar Jensen		100
KFPW	Cartersville, Mo	Rev. Lannie W. Stewart		50
KGEK	Yuma, Colo	Bechler Electrical Equipment Co. (7 a. m. to 7 p. m. only).		10
WJBI	Red Bank, N. J	Robert S. Johnson	WEAM	250
WEAM	North Plainfield, N. J	Borough of North Plainfield	WJBI	250
	1,150 kilocycles; 260.7 meters			
WCMA	Culver, Ind	Culver Military Academy	WOOD	500
WOOD	Furnwood, Mich	Walter B. Stiles (Inc.)	WCMA	500
WRHM	Fridley, Minn	Rosedale Hospital Co.)Inc.)		1,000
KGA	Spokane, Wash	Northwest Radio Service Co		2,000
WHBA	Oil City, Pa	C. C. Shaffer		10
WCAU	Philadelphia, Pa	Universal Broadcasting Co		500
WNBH	New Bedford, Mass	New Bedford Broadcasting Co		250
WFIW	Hopkinsville, Ky	The Acme Mills (Inc.), (1,000 watts, 6 a. m. to 6 p. m.).		750

[3] Construction permit issued for 1,000 watts.
[7] Construction permit issued to move to Portsmouth, Va.
[8] Construction permit issued only.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,160 kilocycles; 258.5 meters			*Watts*
WFBL	Syracuse, N. Y	The Onondago Co. (Inc.)		750
WEB	Beloit, Wis	Beloit College		500
WNAL	Omaha, Nebr	R. J. Rockwell	KFOX-KOCH	250
KOCH	do	Central Radio School	WNAL-KFOX	250
KFOX	do	Omaha Board of Education	KOCH-WNAL	100
KFUL	Galveston, Tex	Thomas Goggin & Bros		500
WIL	St. Louis, Mo	Benson Radio Brodcasting Co	WSBF	250
WSBF	do	Mississippi Valley Broadcasting Co.	WIL	250
WBT	Charlotte, N. C	C. C. Coddington (1,000 watts, 7 a. m. to 7 p. m.).		750
	1,170 kilocycles; 256.3 meters			
KTNT	Muscatine, Iowa	Norman Baker		2,000
WCSO	Springfield, Ohio	Wittenberg College		500
WASH	Grand Rapids, Mich	Baxter Laundries (Inc.)		250
WBBR	Rossville, N. Y	People's Pulpit Association	WEBJ-WLTH	1,000
WEBJ	New York, N. Y	Third Avenue Railway Co	WBBR-WLTH	500
WLTH	Brooklyn, N. Y	Voice of Brooklyn (Inc.)	WBBR-WEBJ	250
	1,180 kilocycles; 254.1 meters			
KGFX	Pierre, S. Dak	Dana McNeil (6 a. m. to 6 p. m. only).		200
WRVA	Richmond, Va	Larus & Bros. Co. (Inc.)		1,000
WREN	Lawrence, Kans	Jenny Wren Co	KFKU	750
KFKU	do	University of Kansas	WREN	500
KMO	Tacoma, Wash	KMO (Inc.)		500
WTAQ	Eau Claire, Wis	Clyde S. Van Gordon		500
WCAX	Burlington, Vt	University of Vermont		100
KGDA	Dell Rapids, S. Dak	Home Auto Co. (6 a. m. to 6 p. m. only).		15
WHEC-WABO	Rochester, N. Y	Hickson Electric Co. (Inc.) (500 watts, 6 a. m. to 6 p. m.).		250
	1,190 kilocycles; 252 meters			
KEJK	Los Angeles, Calif	Freeman Lang	KFSG	250
WORD	Batavia, Ill	People's Pulpit Association (¼ time only).		5,000
WMBB-WOK	Homewood, Ill	American Bond & Mortgage Co		5,000
WKJC	Lancaster, Pa	Kirk Johnson & Co	WGAL	50
WGAL	do	Lancaster Electrical Supply & Construction Co.	WKJC	15
WKBF	Indianapolis, Ind	Noble Butler Watson		250
WMBR	Tampa, Fla	F. J. Reynolds		100
WKBT	New Orleans, La	First Baptist Church		50
WFAM	St. Cloud, Minn	Times Publishing Co. (Inc)		10
KOCW	Chickasha, Okla	Oklahoma College for Women		250
KFSG	Los Angeles, Calif	Echo Park Evangelical Association.	KEJK	500
	1,200 kilocycles; 249.9 meters			
KFKA	Greeley, Colo	Colorado State Teachers College (1,000 watts 6 a. m. to 6 p. m.).	KFHA	500
KFHA	Gunnison, Colo	Western State College of Colorado.	KFKA	50
WBAX	Wilkes-Barre, Pa	John H. Stenger, jr	WBRE	100
WBRE	do	Louis G. Baltimore	WBAX	100
KFRU	Columbia, Mo	Stephens College		500
WCOA	Pensacola, Fla	City of Pensacola		500
KFJI	Astoria, Oreg	E. E. Marsh	KWJJ	15
KWJJ	Portland, Oreg	Wilbur Jerman	KFJI	50
WIBR	Steubenville, Ohio	Thurman A. Owings		50
KFJZ	Fort Worth, Tex	W. E. Branch		50
WHBY	West de Pere, Wis	St. Norbert's College		50
KFYR	Bismarck, N. Dak	Hoskins-Meyer (500 watts 6 a. m. to 6 p. m.).		250
WCAZ	Carthage, Ill	Carthage College		50
WBBY	Charleston, S. C	Washington Light Infantry		75
KFUT	Salt Lake City, Utah	University of Utah		50
WSAZ	Huntington, W. Va	McKellar Electric Co		100
WREC	Whitehaven, Tenn	WREC (Inc.)	WSIX	100
WSIX	Springfield, Tenn	638 Tire & Vulcanizing Co	WREC	150
WQBZ	Weirton, W. Va	J. H. Thompson		60

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,210 kilocycles; 247.8 meters (Canadian shared)			*Watts*
WFKD	Frankford, Pa.	Foulkrod Radio Engineering Co.	WABY	50
WABY	Philadelphia, Pa.	John Magaldi, jr.	WFKD	50
WABW	Wooster, Ohio	College of Wooster		50
WEBE	Cambridge, Ohio	Roy W. Waller		10
WCAT	Rapid City, S. Dak.	South Dakota State School of Mines.		100
WIOD	Miami Beach, Fla.	Carl G. Fisher Co.		1,000
KFBC	San Diego, Calif.	Dr. Arthur W. Yale	KFWC	100
KFWC	Ontario, Calif.	Lawrence E. Wall	KFBC	100
KFJB	Marshalltown, Iowa	Marshall Electric Co. (250 watts 6 a. m. to 6 p. m.).		100
KGCA	Decorah, Iowa	Chas. W. Greenley	KWLC	10
KWLC	do	Luther College	KGCA	50
WLCI	Ithaca, N. Y.	Lutheran Association of Ithaca		50
WRAM	Galesburg, Ill.	Lombard College	WFBZ	50
WFBZ	do	Knox College	WRAM	50
WJBA	Joliet, Ill.	D. H. Lentz, jr.		50
WTAX	Streeter, Ill.	Williams Hardware Co.		50
WKDR	Kenosha, Wis.	Edward A. Dato		15
WLBT	Crown Point, Ind.	Harold Wendell		50
WRRS	Racine, Wis.	Racine Broadcasting Corporation.		50
WDWF-WLSI	Cranston, R. I.	Dutee W. Flint and the Lincoln Studio (Inc.).		250
	1,220 kilocycles; 245.8 meters			
WGBB	Freeport, N. Y.	Harry H. Carman	WAAT-WEVD	150
WAAT	Jersey City, N. J.	Bremer Broadcasting Corporation.	WGBB-WEVD	300
WEVD	Woodhaven, N. Y.	Debbs Memorial Radio Fund.	WAAT-WGBB	500
WHDI	Minneapolis, Minn.	Wm. Hood Dunwoody Industrial Institution.	WLB	500
WLB-WGMS[2]	do	University of Minnesota	WHDI	500
WFBE	Cincinnati, Ohio	Parkview Hotel	WKRC	250
WKRC	do	Kodel Radio Corporation	WFBE	500
KWL	New Orleans, La.	Loyola University		500
KFH	Wichita, Kans.	Hotel Lassen		500
KLS	Oakland, Calif.	Warner Bros.	KRE	250
KRE	Berkeley, Calif.	First Congregational Church	KLS	100
KFPY	Spokane, Wash.	Symons Investment Co.	KGY-KFIO	250
KFIO	do	North Central High School	KGY-KFPY	100
KGY	Lacey, Wash.	St. Martins College	KFPY-KFIO	50
	1,230 kilocycles; 243.8 meters			
KWUC	Le Mars, Iowa	Western Union College	KSCJ	1,500
KSCJ	Sioux City, Iowa	Perkins Bros. Co. (250 watts 6 a. m. to 6 p. m.).	KWUC	500
KGRS	Amarilla, Tex.	Gish Radio Service (500 watts 6 a. m. to 6 p. m.).		1,000
KFCB	Phoenix, Ariz.	Nielsen Radio Supply Co.		125
KGCX	Vida, Mont.	First State Bank of Vida		10
WMBC	Detroit, Mich.	Michigan Broadcasting Co. (Inc.).		100
WFBR	Baltimore, Md.	Baltimore Radio Show (Inc.) (500 watts 6 a. m. to 6 p. m.).	WCAO	250
WCAO	do	Monumental Radio (Inc.)	WFBR	250
WDOD	Chattanooga, Tenn.	Chattanooga Radio Co. (Inc.)		500
WCAD	Canton, N. Y.	St. Lawrence University (1,000 watts 6 a. m. to 6 p. m.).		500
	1,240 kilocycles; 241.8 meters			
WFCI	Pawtucket, R. I.	Frank Crook (Inc.)	WNBX	100
WNBX	Springfield, Vt.	First Congregational Church (Inc.).	WFCI	10
KFKB	Milford, Kans.	Dr. J. R. Brinkley (2,500 watts 7 a. m. to 7 p. m.).		1,500
WEDC	Chicago, Ill.	Emil Denemark (Inc.)	WGES	500
WGES	do	Oak Leaves Broadcasting Corporation.	WEDC	500
KFON	Long Beach, Calif.	Nichols & Warinner (Inc.)[1]		500

[1] Construction permit issued for 1,000 watts.
[2] Call WGMS used by WCCO when broadcasting over WLB.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,240 kilocycles; 241.8 meters—Continued			*Watts*
WEBR	Buffalo, N. Y.	H. H. Howell		200
WEBC	Superior, Wis.	Head of The Lakes Broadcasting Co.[10]		250
WMAL	Washington, D. C.	M. A. Leese Co.		500
WBRC	Birmingham, Ala.	Birmingham Broadcasting Co.		250
	1,250 kilocycles; 239.9 meters			
KFJR	Portland, Oreg.	Ashley C. Dixon & Son		500
WOAN	Lawrenceburg, Tenn.	Church of the Nazarene and Vaughan School of Music.	WBAW	500
WBAW	Nashville, Tenn.	Waldrun Drug Co.	WOAN	500
WJAM	Cedar Rapids, Iowa	D. M. Perham	KWCR	250
KWCR	do	Harry F. Paar	WJAM	250
WNAD	Norman, Okla.	University of Oklahoma		500
WIBA	Madison, Wis.	Capital Times-Strand Theater-Station.		100
KGCU	Mandan, N. Dak.	Mandan Radio Association		100
WBBP	Petoskey, Mich.	Petoskey High School		100
WOAX	Trenton, N. J.	Franklyn J. Wolff	WCAP	500
WCAP	Asbury Park, N. J.	Radio Industries Broadcast Co.	WOAX	500
WSPD	Toledo, Ohio	Toledo Broadcasting Co.		250
WQBJ	Clarksburg, W. Va.	John Raikes [9]		65
	1,260 kilocycles; 238 meters			
WRAW	Reading, Pa.	Avenue Radio & Electric Shop		100
WLBI	Wenona, Ill.	Wenona Legion Broadcasters		250
WRBC	Valparaiso, Ind.	Immanuel Lutheran Church		250
WJBW	New Orleans, La.	C. Carlson, jr.	WABZ	30
WABZ	do	Coliseum Place Baptist Church		50
KFVI	Houston, Tex.	Headquarters Troop, Fifty-sixth Cavalry.		50
WIBX	Utica, N. Y.	WIBX (Inc.) (300 watts 6 a. m. to 6 p. m.)		150
WJBB	Sarasota, Fla.	Financial Journal (Inc.)	WQBA	250
WQBA	Tampa, Fla.	Amorc College	WJBB	250
WADC	Akron, Ohio	Allen T. Simmons		1,000
	1,270 kilocycles; 236.1 meters			
KHMC	Harlingen, Tex.	Harlingen, Music Co.		100
KFDX	Shreveport, La.	First Baptist Church		250
WGBF	Evansville, Ind.	Finke Furniture Co.		250
KFMX	Northfield, Minn.	Carleton College		500
KFWM	Oakland, Calif.	Oakland Educational Society 1,000 watts 6 a. m. to 6 p. m.).		500
WHAP	Carlstadt, N. J.	Defenders of Truth Society (Inc.)	WBNY-WMSG	1,000
WMSG	New York, N. Y.	Madison Square Garden Broadcasting Co.	WBNY-WHAP	500
WBNY	do	Baruchrome Corporation	WMSG-WHAP	500
WTAR-WPOR	Norfolk, Va.	Reliance Electric Co. (Inc.)	WBBW	500
WBBW	do	Ruffner Junior High School	WTAR-WPOR	100
WTAD	Quincy, Ill.	Illinois Stock Medicine Broadcast Corporation (500 watts 6 a. m. to 6 p. m.).		250
WSRO	Middletown, Ohio	Harry W. Fahrlander		100
WHBC	Canton, Ohio	St. John's Catholic Church		10
	1,280 kilocycles; 234.2 meters			
WMAY	St. Louis, Mo.	Kingshighway Presbyterian Church.	KWK-KFQA	100
KWK	do	Greater St. Louis Broadcasting Corporation (2,000 watts 6 a.m. to 6 p. m.).	WMAY-KFQA	1,000
KFQA	do	The Principia	WMAY-KWK	50
WMBS	Lemoyne, Pa.	Mack's Battery Co.		250
WMPC	Lapeer, Mich.	First Methodist Protestant Church.		30
WMAN	Columbus, Ohio	W. E. Heskitt	WCAH	50
WJBY	Gadsden, Ala.	Electric Construction Co.		50
KGAR	Tucson, Ariz.	Citizen's Publishing Co.		100
WJAK	Kokomo, Ind.	J. A. Kautz (Kokomo Tribune)		50

[10] Construction permit issued for 1,000 watts 6 a. m. to 6 p. m. and 250 watts after 6 p. m.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,280 kilocycles; 234.2 meters—Continued			
				Watts
WFBC	Knoxville, Tenn	First Baptist Church		50
WDAH	El Paso, Tex	Trinity Methodist Church		100
WCAH	Columbus, Ohio	C. A. Entrekin	WMAN	250
WBBL	Richmond, Va	Grace Covenant Presbyterian Church.		100
KDYL	Salt Lake City, Utah	Intermountain Broadcasting Corporation.[11]		100
	1,290 kilocycles; 232.4 meters			
WNBZ	Saranac Lake, N. Y	Smith & Mace (9 a. m. to 1 p. m. only).		10
WJKS	Gary, Ind	Johnson-Kennedy Radio Corporation.	WSBC	500
WSBC	Chicago, Ill	World Battery Co. (Inc.)	WJKS	500
WBRL	Tilton, N. H	Booth Radio Laboratories		500
KUT	Austin, Tex	University of Texas		500
KFQZ	Hollywood, Calif	Taft Radio & Broadcasting Co. (Inc.).	KFPR	250
KFPR	Los Angeles, Calif	Los Angeles County Forestry Department.	KFQZ	250
WMBJ	McKeesport, Pa	Rev. John Sproul [8]		50
WHBQ	Memphis, Tenn	Broadcasting Station WHBQ (Inc.).		100
KFEY	Kellogg, Idaho	Union High School		10
WLBH	Farmingdale, N. Y	Joseph J. Lombardi		30
KFMR	Sioux City, Iowa	Morningside College	KFJY	100
KFJY	Fort Dodge, Iowa	C. S. Tunwall	KFMR	100
	1,300 kilocycles; 230.6 meters			
KFEQ	St. Joseph, Mo	Scroggin & Co. Bank (2,000 watts 6 a. m. to 6 p. m.).		1,000
KGCL	Seattle, Wash	Archie Taft and Louis Wasmer	KPCB	100
KPCB	do	Pacific Coast Biscuit Co	KGCL	100
WQAN	Scranton, Pa	Scranton Times	WGBI	250
WGBI	do	Scranton Broadcasters (Inc.)	WQAN	250
KFPM	Greenville, Tex	The New Furniture Co		15
WDBJ	Roanoke, Va	Richardson-Wayland Electric Corporation.		250
WCOC	Columbus, Miss	Crystal Oil Co		250
WIBZ	Montgomery, Ala	Alexander D. Trum		15
KDLR	Devils Lake, N. Dak	Radio Electric Co		15
WLBM	Boston, Mass	Browning-Drake Corporation [12]		50
WAFD	Detroit, Mich	Albert B. Parfet Co		100
WAAD	Cincinnati, Ohio	Ohio Mechanics Institute		25
	1,310 kilocycles; 228.9 meters			
WOWO	Fort Wayne, Ind	Main Auto Supply Co. (5,000 watts 6 a. m. to 6 p. m.).		2,500
WMBL	Lakeland, Fla	Benford's Radio Studios		100
WKBE	Webster, Mass	K. & B. Electric Co		100
KTAP	San Antonio, Tex	Robert B. Bridge		20
WHBP	Johnstown, Pa	Johnstown Automobile Co. (500 watts 6 a. m. to 6 p. m.).		250
KELW	Burbank, Calif	Earl L. White [11]		250
WGBC	Memphis, Tenn	First Baptist Church	WNBR	15
WNBR	do	John Ulrich	WGBC	100
KFIF	Portland, Oreg	Benson Polytechnic School	KTBR	50
KTBR	do	M. E. Brown	KFIF	50
	1,320 kilocycles; 227.1 meters			
WWAE	Chicago, Ill	Dr. Geo. F. Courrier	WCLO-WJBC	500
WJBC	La Salle, Ill	Hummer Furniture Co	WCLO-WWAE	100
WCLO	Kenosha, Wis	C. E. Whitmore	WJBC-WWAE	100
KSO	Clarinda, Iowa	Berry Seed Co		500
WSGH-WSDA	Brooklyn, N. Y	Amateur Radio Specialty Co	WBBC	500
WBBC	do	Brooklyn Broadcasting Corporation.	WSGH-WSDA	500

[8] Construction permit issued only.
[11] Construction permit issued for 500 watts.
[12] Construction permit issued to move to Cambridge, Mass.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,320 kilocycles; 227.1 meters—Continued			*Watts*
WJAY	Cleveland, Ohio	Cleveland Radio Broadcasting Corporation.	WFJC	500
WFJC	Akron, Ohio	W. F. Jones Broadcasting (Inc.).	WJAY	500
WCBE	New Orelans, La	Uhalt Radio		5
KFUP	Denver, Colo	Fitzsimons General Hospital	KFEL	100
KFEL	do	Eugene P. O'Fallon (Inc.)	KFUP	250
WAIZ	Appleton, Wis	Irving Zuelke (Inc.)		100
WTHS	Atlanta, Ga	Atlanta Technological High School.		200
KGHB	Honolulu, Hawaii	Radio Sales Co		250
	1,330 kilocycles; 225.4 meters			
WMAC	Casenovia, N. Y	Clive B. Meredith		500
WLAC-WDAD	Nashville, Tenn	Life & Casualty Insurance Co. and Dad's Auto Accessories.		1,000
KFIU	Juneau, Alaska	Alaska Electric Light & Power Co.		10
WCOT	Providence, R. I	Jacob Conn		100
WAGM	Royal Oak, Mich	Robert L. Miller		50
KFVG	Independence, Kans	First Methodist Episcopal Church.		50
KGEN	El Centro, Calif	E. R. Irey and F. M. Bowles [13]		15
KFKZ	Kirksville, Mo	Northeast Missouri State Teachers College.		15
KFUR	Ogden, Utah	Peery Building Co		50
WCBM	Baltimore, Md	Hotel Chateau		100
	1,340 kilocycles; 223.7 meters			
WFAN	Philadelphia, Pa	Keystone Broadcasting Co. (Inc.).	WCAM	500
KFXR	Oklahoma City, Okla	Exchange Avenue Baptist Church		50
WCAM	Camden, N. J	City of Camden	WFAN	500
WFKB	Chicago, Ill	Francis K. Bridgman (Inc.)	WPCC-WCRW	500
WCRW	do	Clinton R. White	WFKB-WPCC	500
WPCC	do	North Shore Congregational Church.	WCRW-WFKB	500
KMIC	Inglewood, Calif	James R. Fouch		250
KFBL	Everett, Wash	Leese Bros	KXRO	50
KXRO	Aberdeen, Wash	KXRO (Inc.)	KFBL	50
WKAV	Laconia, N. H	Laconia Radio Club		50
WSAJ	Grove City, Pa	Grove City College		250
KGFB	Iowa City, Iowa	Albert C. Dunkel		10
KGDP	Pueblo, Colo	Boy Scouts of America, Pueblo Council.		10
WNRC	Greensboro, N. C	Wayne M. Nelson		250
KGFK	Hallock, Minn	Kittson County Enterprise		50
WEBQ	Harrisburg, Ill	Tate Radio Co		15
KFVS	Cape Girardeau, Mo	Hirsch Battery & Radio Co		50
WOCL	Jamestown, N. Y	A. E. Newton		25
	1,350 kilocycles; 222.1 meters			
WSAN	Allentown, Pa	Allentown Call Publishing Co. (Inc.).	WCBA	100
WCBA	do	Charles W. Heimbach and B. Bryan Musselman.	WSAN	100
WHBD	Bellefontaine, Ohio	Chamber of Commerce		100
WHBF	Rock Island, Ill	Beardsley Specialty Co		100
KWKC	Kansas City, Mo	Wilson Duncan Broadcasting Co.		100
WOMT	Manitowoc, Wis	Mikadow Theater		100
KGFL	Raton, N. Mex	N. L. Cotter		50
KGBY	Columbus, Nebr	Ervin Taddiken		50
WGCM	Gulfport, Miss	Gulf Coast Music Co. (Inc.)		15
WAMD	St. Paul, Minn	National Battery Co		500

[13] Construction permit issued for 100 watts.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,360 kilocycles; 220.4 meters			
				Watts
KGTT	San Francisco, Calif.	Glad Tidings Temple & Bible Institute.	KJBS	50
KJBS	do	Julius Brunton & Sons Co.	KGTT	100
KGCI	San Antonio, Tex.	Liberto Radio Sales	KGRC	100
KGRC	do	Gene Roth & Co.	KGCI	100
WKBH	La Crosse, Wis.	Calloway Music Co.		500
KXL	Portland, Oreg.	KXL Broadcasters (Inc.)		100
WTAZ	Richmond, Va.	W. Reynolds, jr., and T. J. McGuire.	WMBG	15
WMBG	do	Havens & Martin (Inc.)	WTAZ	15
WHBW	Philadelphia, Pa.	D. R. Kienzle		100
WJBK	Ypsilanti, Mich.	Ernest F. Goodwin		15
WHBU	Anderson, Ind.	Citizens Bank		15
KRAC	Shreveport, La.	Caddo Radio Club		50
WMBO	Auburn, N. Y.	Radio Service Laboratories		100
KGFI	San Angelo, Tex.	M. L. Eaves		15
KSTP	Westcott, Minn.	National Battery Broadcasting Co.[9]		2,000
	1,370 kilocycles; 218.8 meters			
KOW	Denver, Colo.	Associated Industries (Inc.)	KGEW	250
KGEW	Fort Morgan, Colo.	City of Fort Morgan (200 watts, 6 a. m. to 6 p. m.).	KOW	100
WKBC	Birmingham, Ala.	H. L. Ansley		10
WLBQ	Atwood, Ill.	E. Dale Trout		25
WKBQ	New York, N. Y.	Standard Cahill Co. (Inc.)	WKBO-WCGU	500
WKBO	Jersey City, N. J.	Camith Corporation	WKBQ-WCGU	500
WCGU	Coney Island, N. Y.	Chas. G. Unger	WKBO-WKBQ	500
	1,380 kilocycles; 217.3 meters			
WKBW	Buffalo, N. Y.	Churchill Evangelistic Association (Inc.) (750 watts, 6 a. m. to 6 p. m.)[6]		500
KGDM	Stockton, Calif.	E. F. Peffer (limited to 9 p. m.)		10
KFQW	Seattle, Wash.	KFQW (Inc.)		100
WRES	Quincy, Mass.	Harry Leonard Sawyer		50
WKBV	Brookville, Ind.	Knox Battery & Electric Co.		100
WKBS	Galesburg, Ill.	Permit N. Nelson	WLBO	100
WLBO	do	Fred A. Trebbe, jr.	WKBS	100
KFOR	Lincoln, Nebr.	Howard A. Shuman		100
WIBU	Poynette, Wis.	The Electric Farm		20
	1,390 kilocycles; 215.7 meters			
WKBB	Joliet, Ill.	Sanders Bros.	WCLS	150
WCLS	do	WCLS (Inc.)	WKBB	150
WEHS	Evanston, Ill.	Victor C. Carlson	WHFC-WKBI	100
WHFC	Chicago, Ill.	Goodson & Wilson (Inc.)	WKBI-WEHS	200
WKBI	do	Fred L. Shoenwolf	WHFC-WEHS	50
WPEP	Waukegan, Ill.	Maurice Mayer		250
KGER	Long Beach, Calif.	C. Merwin Dobyns	KFVD	100
KFVD	Venice, Calif.	W. J. and C. I. McWhinnie	KGER	250
KFDZ	Minneapolis, Minn.	Harry O. Iverson		10
KGCB	Oklahoma City, Okla.	Wallace Radio Institute	KGFG	50
KGFG	do	Full Gospel Church	KGCG	50
WOKO	Peekskill, N. Y.	Harold C. Smith[10]		500
WLEX	Lexington, Mass.	Lexington Air Station		50
WQBC	Utica, Miss.	I. R. Jones (7 a. m. to 7 p. m. only).		225
	1,400 kilocycles; 214.2 meters			
KFEC	Portland, Oreg.	Meier & Frank Co. (daily to 7 p. m. only).		50
WAIT	Taunton, Mass.	A. H. Waite & Co. (Inc.)		10
WKBN	Youngstown, Ohio	W. P. Williamson, jr.	WMBW	50
WMBW	do	Youngstown Broadcasting Co. (Inc.).	WKBM	50
WLBG	Petersburg, Va.	Robert Allen Gamble		100
KFVF	St. Louis, Mo.	St. Louis Truth Center (Inc.)		250

[6] Construction permit issued for 5,000 watts.
[9] Construction permit issued only.
[10] Construction permit issued to move to Mount Beacon.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,400 kilocycles; 214.2 meters—Continued			*Watts*
WJBU	Lewisburg, Pa	Bucknell University		100
KPJM	Prescott, Ariz	Frank Wilburn		15
WCWK	Fort Wayne, Ind	Chester W. Keen		250
WCSH	Portland, Me	Congress Square Hotel Co.[15]		500
	1,410 kilocycles; 212.6 meters			
KGFJ	Los Angeles, Calif	Ben S. McGlashan		100
WRAX	Philadelphia, Pa	Berachah Church (Inc.)		250
KGBZ	York, Nebr	Federal Live Stock Remedy Co.		100
KTUE	Houston, Tex	Uhalt Electric		5
WJBL	Decatur, Ill	Wm. Gushard Dry Goods Co		250
WKBP	Battle Creek, Mich	Enquirer-News Co		50
KFHL	Oskaloosa, Iowa	Pennsylvania College		10
KWEA	Shreveport, La	William E. Antony	KGGH	250
KGGH	Cedar Grove, La	Bates Radio & Electric Co	KWEA	50
WSAR	Fall River, Mass	Doughty & Welch Electrical Co. (Inc.).		250
	1,420 kilocycles; 211.1 meters			
WCDA-WBRS	Cliffside Park, N. J	Italian Educational Broadcasting Co.	WRST	250
WRST	Bayshore, N. Y	Radiotel Manufacturing Co	WCDS-WBRS	150
WNBO	Washington, Pa	John Brownlee Spriggs		15
WMES	Boston, Mass	Massachusetts Educational Society.	WLOE	50
WLOE	Chelsea, Mass	William S. Pote	WMES	100
WBMH	Detroit, Mich	Braun's Music House		100
KPNP	Muscatine, Iowa	Central Radio Co		100
KFCR	Santa Barbara, Calif	Santa Barbara Broadcasting Co. (daily to 10 p. m.).		100
KFYO	Breckenridge, Tex	Kirksey Bros. Battery & Electric Co.		15
	1,430 kilocycles; 209.7 meters			
KGHC	Slayton, Minn	Hegstad Radio Co		15
WOKT	Rochester, N. Y	Titus-Ets Corporation		500
KVOS	Bellingham, Wash	L. Kessler		250
WPRC	Harrisburg, Pa	Wilson Printing & Radio Co		100
WIVA	Norfolk, Va	Radio Corporation of Virginia [16]		100
WLBC	Muncie, Ind	Donald A. Burton		50
WMBM	Memphis, Tenn	Seventh Day Adventist Church		10
WLBF	Kansas City, Mo	Everett L. Dillard		50
WCBS	Springfield, Ill	Harold L. Dewing and Charles Messter.		250
KSOO	Sioux Falls, S. Dak	Sioux Falls Broadcasting Association (500 watts 6 a. m. to 6 p. m.).[8]		250
KGHA	Pueblo, Colo	Geo. H. Sweeney and N. S. Walpole.		500
WLBY	Iron Mountain, Mich	Aimone Electric		50
KFGQ	Boone, Iowa	Boone Biblical College		10
WTFI	Toccoa, Ga	Toccoa Falls Institute		250
KGHF	Pueblo, Colo	Philip G. Lasky and J. H. Albert.	KFXJ	250
KFXJ	Edgewater, Colo	R. G. Howell	KGHF	50
	1,440 kilocycles; 208.2 meters			
KFQU	Holy City, Calif	W. E. Riker	KFUS-KZM	100
KZM	Oakland, Calif	Preston D. Allen	KFUS-KFQU	100
KFUS	do	Dr. L. L. Sherman	KFQU-KZM	50
WRAF	La Porte, Ind	The Radio Club (Inc.)		100
WJBZ	Chicago Heights, Ill	Roland G. Pamler and Anthony Coppotelli.	WNBA	100
WNBA	Forest Park, Ill	Michael T. Rafferty	WJBZ	200
WGM	Jeannette, Pa	Verne and Elton Spencer		50
WJPW	Ashtabula, Ohio	J. P. Wilson		30
WMBE	White Bear Lake, Minn.	Dr. C. S. Stevens		10
WLBZ	Dover-Foxcroft, Me	Thompson L. Guernsey		250
WRPI	Terre Haute, Ind	Rose Polytechnic Institute Broadcasting Association.		100
KGCN	Concordia, Kans	Concordia Broadcasting Co		50
KGCR	Brookings, S. Dak	Cutler's Radio Broadcasting Service (Inc.).		15

[8] Construction permit issued only.
[15] Construction permit issued to move to Cumberland, Me.; 5,000 watts.
[16] Construction permit issued to move to Charlottesville, Va.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,450 kilocycles; 206.8 meters			*Watts*
WPSW	Philadelphia, Pa.	Philadelphia School of Wireless Telegraphy.		50
WMRJ	Jamaica, N. Y.	Peter J. Prinz	WTRL-WHPP	10
WTRL	Midland Park, N. J.	Technical Radio Laboratory	WMRJ-WHPP	15
WHPP	Englewood Cliffs, N. J.	Bronx Broadcasting Co.	WMRJ-WTRL	10
WLBV	Mansfield, Ohio	Mansfield Broadcasting Association.		50
WNBJ	Knoxville, Tenn.	Lonsdale Baptist Church		50
KGDY	Oldham, S. Dak.	J. Albert Loesch		15
WNBF	Endicott, N. Y.	Howitt-Wood Radio Co.		50
KGGF	Picher, Okla.	D. L. Connell, M. D.		100
KGDR	San Antonio, Tex.	Joe B. McShane		15
KOOS	Marshfield, Oreg.	KOOS Radio Sales & Service (Inc.).[8]		50
	1,460 kilocycles; 205.4 meters			
WNBQ	Rochester, N. Y.	Gordon P. Brown		15
WKBL	Monroe, Mich.	Monrona Radio Manufacturing Co.		15
WMBD	Peoria Heights, Ill.	Peoria Heights Radio Laboratory.		250
WABF	Kingston, Pa.	Markle Broadcasting Corporation.		250
KGEO	Grand Island, Nebr.	Hotel Yancey		100
KFXY	Flagstaff, Ariz.	Mary M. Costigan		25
KGDE	Barrett, Minn.	Jaren Drug Co.		50
KGFF	Alva, Okla.	Earl E. Hampshire		25
WRK	Hamilton, Ohio.	S. W. Doron and John C. Slade		100
WOBT	Union City, Tenn.	Tittsworth's Radio and Music Shop.		15
	1,470 kilocycles; 204.0 meters			
KFXD	Jerome, Idaho	Service Radio Co. (50 watts, 11 a. m. to 2 p. m.).		15
WLBN	Portable	William E. Hiler		50
WSAX	Chicago, Ill.	Zenith Radio Corporation		100
WMBA	Newport, R. I.	LeRoy Joseph Beebe		100
WBBZ	Portable	C. L. Carrell		100
KGEQ	Minneapolis, Minn.	Fred W. Herrmann		50
WHBL	Sheboygan, Wis.	Press Publishing Co. and C. L. Carrell (500 watts, 6 a. m. to 6 p. m.).[9]		250
WIBW	Topeka, Kans.	C. L. Carrell		250
WMBH	Joplin, Mo.	Edwin Dudley Aber		100
WIBS	Elizabeth, N. J.	N. J. Broadcasting Corporation.	WLBX-WMBQ	250
WLBX	Long Island City, N. Y.	John N. Brahy	WIBS-WMBQ	250
WMBQ	Brooklyn, N. Y.	Paul J. Gollhofer	WIBS-WLBX	100
KGFO	Portable	Brant Radio Power Co.		100
KGES	Central City, Nebr.	Central Radio Electric Co.		10
WKEN	Kenmore, N. Y.	Radio Station WKEN (Inc.)[10]	WSVS	250
WSVS	Buffalo, N. Y.	Seneca Vocational School	WKEN	50
WOBR	Portable	Harl Smith		10
KGGM	do	Jay Peters		100
KFBI	Portable on airplane (Pacific coast).	Flying Broadcasters (Inc.)		50
	1,480 kilocycles; 202.6 meters			
KKP	Seattle, Wash.	City of Seattle, Harbor Department.	KRSC-KVI	15
KRSC	do	Radio Sales Corporation	KVL-KKP	50
KVL	do	Arthur C. Dailey	KRSC-KKP	100
WTFF	Mount Vernon Hills, Va.	Independent Publishing Co.	WRUF	10,000
WRUF	Gainesville, Fla.	University of Florida [8]	WTFF	5,000
	1,490 kilocycles; 201.6 meters			
WCBR	Portable	Charles H. Messter		100
WHBM	do	C. L. Carrell		100
WIBJ	do	do		100
WIBM	do	do		100
WKBG	do	do		100
WGMU	do	Atlantic Broadcasting Corporation.	WRMU	100
WRMU	do	do	WGMU	100
WATT	do	Edison Electric Illuminating Co.		100
WALK	Willow Grove, Pa.	Albert A. Walker		50
KPOF	Denver, Colo.	Pillar of Fire (Inc.)[8]		500

[8] Construction permit issued only. [10] Construction permit issued to move to Amherst; 750 watts.

List of 683 licensed broadcasting stations arranged by frequencies effective as of June 30, 1928—Continued

Call letters	Location	Owner	Divides time with—	Power
	1,500 kilocycles; 199.9 meters			*Watts*
KWBS	Portland, Oreg.	Schaeffer Radio Co.[18]	KLIT-KUJ	15
KUJ	Seattle, Wash.	Puget Sound Radio Broadcasting Co.	KLIT-KWBS	10
KLIT	Portland, Oreg.	Lewis Irvine Thompson	KUJ-KWBS	10
WKBZ	Ludington, Mich.	K. L. Ashbacker		15
KGFN	Aneta, N. Dak.	Henry Haraldson and Carl Thingsted.		15
WRAH	Providence, R. I.	Stanley N. Read		250
WBMS	Union City, N. J.	WBMS Broadcasting Corporation.	WWRL WBKN WGOP	100
WGOP	Flushing, N. Y.	Fred B. Zittell, jr.	WWRL WBKN WBMS	100
WWRL	Woodside, N. Y.	William H. Reuman	WBMS WBKN WGOP	100
WBKN	Brooklyn, N. Y.	Arthur Faske	WWRL WBMS WGOP	100
WNBW	Carbondale, Pa.	Home Cut Glass & China Co.		5

[18] Construction permit issued for 50 watts.

APPENDIX E (1)

Radio law of 1928 containing Davis amendment

[PUBLIC—No. 195—70TH CONGRESS]

[S. 2317]

An Act Continuing for one year the powers and authority of the Federal Radio Commission under the Radio Act of 1927, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all the powers and authority vested in the Federal Radio Commission by the Radio Act of 1927, approved February 23, 1927, shall continue to be vested in and exercised by the commission until March 16, 1929; and wherever any reference is made in such Act to the period of one year after the first meeting of the commission, such reference shall be held to mean the period of two years after the first meeting of the commission.

SEC. 2. The period during which the members of the commission shall receive compensation at the rate of $10,000 per annum is hereby extended until March 16, 1929.

SEC. 3. Prior to January 1, 1930, the licensing authority shall grant no license or renewal of license under the Radio Act of 1927 for a broadcasting station for a period to exceed three months and no license or renewal of license for any other class of station for a period to exceed one year.

SEC. 4. The term of office of each member of the commission shall expire on February 23, 1929, and thereafter commissioners shall be appointed for terms of two, three, four, five, and six years, respectively, as provided in the Radio Act of 1927.

SEC. 5. The second paragraph of section 9 of the Radio Act of 1927 is amended to read as follows:

"It is hereby declared that the people of all the zones established by section 2 of this Act are entitled to equality of radio broadcasting service, both of transmission and of reception, and in order to provide said equality the licensing author-

ity shall as nearly as possible make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave lengths, of periods of time for operation, and of station power, to each of said zones when and in so far as there are applications therefor; and shall make a fair and equitable allocation of licenses, wave lengths, time for operation, and station power to each of the States, the District of Columbia, the Territories and possessions of the United States within each zone, according to population. The licensing authority shall carry into effect the equality of broadcasting service hereinbefore directed, whenever necessary or proper, by granting or refusing licenses or renewals of licenses, by changing periods of time for operation, and by increasing or decreasing station power, when applications are made for licenses or renewals of licenses: *Provided*, That if and when there is a lack of applications from any zone for the proportionate share of licenses, wave lengths, time of operation, or station power to which such zone is entitled, the licensing authority may issue licenses for the balance of the proportion not applied for from any zone, to applicants from other zones for a temporary period of ninety days each, and shall specifically designate that said apportionment is only for said temporary period. Allocations shall be charged to the State, District, Territory, or possession wherein the studio of the station is located and not where the transmitter is located."

Approved, March 28, 1928.

APPENDIX E (2)

Allocation of radio facilities to the various States as of June 30, 1928

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Alabama:			
Auburn	WAPI	880	1,000
Birmingham	WBRC	990	250
Do	WKBC	1,370	10
Gadsden	WJBY	1,280	50
Montgomery	WIBZ	1,300	15
Total (5)			1,325
Alaska:			
Anchorage	KFQD	870	100
Juneau	KFIU	1,330	10
Ketchikan	KGBU	750	500
Total (3)			610
Arizona:			
Flagstaff	KFXY	1,400	100
Phoenix	KFAD	930	500
Do	KFCB	1,230	125
Prescott	KPJM	1,400	15
Tucson	KGAR	1,280	100
Total (5)			840
Arkansas:			
Blytheville	KLCN	1,050	50
Fayetteville	KUOA	1,010	1,000
Hot Springs	KTHS	600	1,000
Sulphur Springs	KFPW	1,140	50
McGehee	KGHG		50
Little Rock	KGJF	1,080	250
Do	KGHI	1,150	15
Do	KLRA	1,470	50
Total (8)			2,465
California:			
Alma (Holy City)	KFQU	1,360	100
Avalon	KFWO	1,000	250
Berkeley	KRE	1,300	100
Burbank	KELW	1,310	500
El Centro	KGEN	1,330	100
Fresno	KMJ	820	50
Hollywood	KFQZ	1,290	250
Los Angeles	KFWB	830	1,000
California—Continued.			
Inglewood	KMIC	1,340	250
Glendale	KGFH	1,140	250
Long Beach	KFON	1,240	1,000
Do	KGER	1,390	100
Los Angeles	KFI	640	50,000
Do	KEJK	1,190	250
Do	KFPR	1,200	250
Do	KFSG	1,190	500
Do	KGEF	1,140	1,000
Do	KGFJ	1,410	100
Do	KHJ	750	1,000
Hollywood	KMTR	580	500
Do	KNX	890	5,000
Los Angeles	KPLA	1,040	500
Do	KTBI	1,090	1,000
Oakland	KFUS	1,440	50
Do	KFWM	1,270	1,500
Do	KGO	780	10,000
Do	KLS	1,220	250
Do	KLX	590	500
Do	KTAB	1,070	500
Hayward	KZM	1,300	100
Ontario	KFWC	1,210	100
Pasadena	KPPC	950	50
Do	KPSN	950	1,000
Sacramento	KFBK	1,090	100
San Diego	KGB	1,210	100
Do	KFSD	680	500
San Francisco	KFRC	660	1,000
Do	KFWI	1,120	500
Do	KGTT	1,360	50
Do	KJBS	1,220	100
Do	KPO	710	1,000
Do	KYA	860	1,000
San Jose	KQW	1,010	500
Culver City	KFVD	1,390	250
Santa Ana	KWTC	1,100	100
Santa Barbara	KFCR	1,420	100
Santa Maria	KSMR	1,100	100
Santa Monica	KNRC	800	500
Stockton	KGDM	1,380	10
Do	KWG	870	100
Total (50)			83,110

Allocation of radio facilities to the various States as of June 30, 1928—Continued

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Colorado:			
Belleview College (Denver)	KPOF	1,490	500
Colorado Springs	KFUM	620	1,000
Denver	KFEL	1,320	250
Do	KFUP	1,320	100
Do	KFXF	1,060	250
Dupont	KLZ	850	1,000
Denver (near)	KOW	1,370	250
Denver	KOA	920	5,000
Edgewater (near)	KFXJ	1,430	50
Fort Morgan	KGEW	1,370	100
Greeley	KFKA	1,200	500
Gunnison	KFHA	1,200	50
Pueblo	KGDP	1,340	10
Do	KGHA	1,430	500
Do	KGHF	1,430	250
Yuma	KGEK	1,140	50
Total (16)			9,860
Connecticut:			
Danbury	WCON	1,130	100
Easton	WICC	1,130	500
Storrs	WCAC	560	500
Hartford	WTIC	560	500
New Haven	WDRC	1,060	500
Total (5)			2,100
Delaware: Wilmington	WDEL	1,010	250
District of Columbia:			
Washington	WMAL	1,240	500
Do	WRC	640	500
Do	WRHF	930	150
Total (3)			1,150
Florida:			
Clearwater	WSUN / WFLA	580	750
Gainesville	WRUF	1,480	5,000
Jacksonville	WJAX	880	1,000
Lakeland	WMBL	1,310	100
Miami	WQAM	780	750
Miami Beach	WIOD	1,210	1,000
Do	WMBF	780	500
Orlando	WDBO	1,040	500
Pensacola	WCOA	1,200	500
Sarasota	WJBB	1,260	250
Tampa	WDAE	1,120	500
Do	WMBR	1,190	100
Total (12)			10,950
Georgia:			
Atlanta	WGST	1,110	500
Do	WSB	630	1,000
Do	WTHS	1,320	200
Macon	WMAZ	1,110	500
Toccoa	WTFI	1,430	500
Tifton	WRBI	1,350	20
Columbus	WRBL	1,170	50
Total (7)			2,770
Hawaii:			
Honolulu	KGHB	1,320	250
Do	KGU	1,110	500
Total (2)			750
Idaho:			
Boise	KFAU	1,050	2,000
Jerome	KFXD	1,470	15 / 50
Kellogg	KFEY	1,290	10
Pocatello	KSEI	900	250
Total (4)			2,325

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Illinois:			
Addison	WMBI	1,140	5,000
Atwood	WLBQ	1,370	25
Batavia	WORD	1,190	5,000
Carthage	WCAZ	1,200	50
Chicago	KFKX	370	2,500
Do	KYW	570	2,500
Do	WAAF	770	500
Do	WCFL	620	1,500
Do	WCRW	1,340	500
Do	WEBH	320	500
Do	WEDC	1,240	500
Do	WENR / WBCN	1,040	5000
Do	WFKB	1,340	500
Do	WGES	1,240	500
Do	WHFC	1,390	200
Do	WJBT	770	500
Do	WKBI	1,390	50
Do	WLTS	620	100
Do	WMAQ	670	5,000
Do	WPCC	1,340	500
Do	WQJ	670	500
Do	WSAX	1,470	100
Do	WSBC	1,290	500
Chicago Heights	WJBZ	1,440	100
Crete	WLS	870	5000
Decatur	WBAO	1,120	100
Do	WJBL	1,410	250
Deerfield	WIIT	980	5,000
Desplaines (near)	WIBO	980	5,000
Chicago	WLIB	720	500
Elgin	WTAS	1,090	500
Elgin (Chicago)	WGN	720	15,000
Evanston	WEHS	1,390	100
Forest Park	WNBA	1,440	200
Galesburg	WFBZ	1,210	50
Do	WKBS	1,380	100
Do	WLBO	1,380	100
Do	WRAM	1,210	50
Glenview	WBBM	770	5,000
Harrisburg	WEBQ	1,340	15
Homewood (Chicago)	WMBB / WOK	1,190	5,000
Joliet	WCLS	1,390	150
Do	WJBA	1,210	50
Do	WKBB	1,390	150
La Salle	WJBC	1,320	100
Mooseheart	WJJD	820	1,000
Mount Prospect	WJAZ	1,140	5,000
Peoria Heights	WMBD	1,460	250
Quincy	WTAD	1,270	250
Rockford	KFLV	1,120	100
Rock Island	WHBF	1,350	100
Springfield	WCBS	1,430	250
Streator	WTAX	1,210	50
Tuscola	WDZ	1,080	100
Urbana	WRM	1,100	500
Waukegan	WPEP	1,390	250
Wenona	WLBI	1,260	250
Zion	WCBD	870	5,000
Total (58)			87,640
Indiana:			
Anderson	WHBU	1,360	15
Brookville	WKBV	1,370	100
Crown Point	WLBT	1,210	50
Culver	WCMA	1,150	500
Evansville	WGBF	1,270	250
Fort Wayne	WCWK	1,400	250
Do	WOWO	1,310	2,500
Gary	WJKS	1,290	500
Hammond	WWAE	1,320	500
Indianapolis (near)	WFBM	1,090	1,000
Indianapolis	WKBF	1,190	250
Kokomo	WJAK	1,280	50
Lafayette	WBAA	1,100	500
Laporte	WRAF	1,440	100
Muncie	WLBC	1,430	50

Allocation of radio facilities to the various States as of June 30, 1928—Continued

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Indiana—Continued.			
South Bend	WSBT	750	500
Terre Haute	WBOW	1,440	100
Valparaiso	WRBC	1,260	250
Total (18)			7,465
Iowa:			
Ames	WOI	1,130	2,500
Boone	KFGQ	1,430	10
Cedar Rapids	KWCR	1,250	250
Do	WJAM	1,250	250
Clarinda	KSO	1,320	500
Council Bluffs	KOIL	940	5,000
Davenport	WOC	800	5,000
Decorah	KGCA	1,210	10
Do	KWLC	1,210	50
Des Moines	WHO	560	5,000
Fort Dodge	KFJY	1,290	100
Iowa City	KGFB	1,340	10
Do	WSUI	630	500
Le Mars	KWUC	1,230	1,500
Marshalltown	KFJB	1,210	100
Muscatine	KPNP	1,420	100
Do	KTNT	1,170	2,000
Oskaloosa	KFHL	1,410	10
Ottumwa	WIAS	930	100
Red Oak	KICK	930	100
Shenandoah	KFNF	650	2,000
Do	KMA	760	1,000
Sioux City	KFMR	1,290	100
Do	KSCJ	1,230	500
Total (24)			26,690
Kansas:			
Concordia	KGCN	1,440	50
Inedpendence	KFVG	1,330	50
Kansas City	WLBF	1,430	50
Lawrence	KFKU	1,180	500
Do	WREN	1,180	750
Manhattan	KSAC	900	500
Milford	KFKB	1,240	1,500
Topeka	WIBW	1,470	250
Wichita	KFH	1,220	500
Total (9)			4,150
Kentucky:			
Hopkinsville	WFIW	1,150	1,000
Louisville	WHAS	930	5,000
Okalona	WLAP	1,330	500
Total (3)			6,500
Louisiana:			
Cedar Grove	KGGH	1,410	50
Kennonwood	KWKH	760	3,500
New Orleans	WABZ	1,260	50
Do	WDSU	1,320	250
Do	WJBO	1,140	100
Do	WJBW	1,260	30
Do	WKBT	1,190	50
Do	WSMB	1,010	750
Do	WWL	1,220	500
Shreveport	KFDX	1,270	250
Do	KRMD	1,360	50
Do	KWEA	1,410	250
Do	KSBA	1,120	1,000
Total (13)			6,830
Maine:			
Bangor	WABI	770	100
Dover-Foxcroft	WLBZ	1,440	250
Cumberland	WCSH	1,400	5,000
Total (3)			5,350

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Maryland:			
Baltimore	WCAO	1,230	250
Do	WCBM	1,330	100
Do	WFBR	1,230	250
Glen Morris (near)	WBAL	1,050	5,000
Salisbury	WBES	1,130	100
Total (5)			5,700
Massachusetts:			
Boston	WBIS / WNAC	650	500
Do	WBZA	900	500
Do	WEEI	590	500
Do	WMES	1,420	50
Do	WSSH	1,040	100
Chelsea	WLOE	1,420	100
South Dartmouth	WMAF	700	500
Fall River	WSAR	1,410	250
Gloucester	WEPS	1,010	100
Lexington	WLEX	1,390	50
Medford	WBET	1,040	500
New Bedford	WNBH	1,150	250
Quincy	WRES	1,380	50
East Springfield	WBZ	900	15,000
Taunton	WAIT	1,400	10
Webster	WKBE	1,310	100
Wellesley Hills	WBSO	780	100
Worcester	WTAG	580	250
Total (18)			18,910
Michigan:			
Battle Creek	WKBP	1,410	50
Bay City	WSKC	1,100	250
Berrien Springs	WEMC	620	1,000
Detroit	WAFD	1,300	100
Do	WBMH	1,420	100
Do	WMBC	1,230	100
Do	WWJ	850	1,000
East Lansing	WKAR	1,080	500
Flint	WFDF	1,100	100
Fraser	WGHP	1,080	750
Furnwood	WOOD	1,150	500
Grand Rapids	WASH	1,170	250
Iron Mountain	WLBY	1,430	50
Lapeer	WMPC	1,280	30
Ludington	WKBZ	1,500	15
Petoskey	WBBP	1,250	100
Pontiac	WCX / WJR	680	5,000
Royal Oak	WAGM	1,330	50
Ypsilanti	WJBK	1,360	15
Total (19)			9,960
Minnesota:			
Barrett	KGDE	1,460	50
Collegeville	WFBJ	1,100	100
Fridley (Minneapolis)	WRHM	1,150	1,000
Hallock	KGFK	1,340	50
Minneapolis	KFDZ	1,390	10
Do	KGEQ	1,470	50
Do	WDGY	1,050	500
Do	WHDI	1,220	500
Do	WLB	1,220	500
Northfield	KFMX	1,270	500
Do	WCAL	1,050	500
St. Cloud	WFAM	1,190	10
Anoka	WCCO	740	5,000
Slayton	KGHC	1,430	15
Westcott	KSTP	1,360	5,000
White Bear Lake	WMBE	1,440	10
Total (10)			13,795

Allocation of radio facilities to the various States as of June 30, 1928—Continued

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Mississippi:			
Columbus	WCOC	1,300	500
Gulfport	WGCM	1,350	100
Utica	WQBC	1,390	225
Hattiesburg	WRBJ	1,200	10
Greenville	WRBQ	1,090	100
Total (5)			935
Missouri:			
Cape Girardeau	KFVS	1,340	50
Clayton	KFUO	550	1,000
Columbia	KFRU	1,200	500
Independence	KMBC / KLDS	1,110	1,500
Jefferson	WOS	710	500
Joplin	WMBH	1,470	100
Kansas City	KWKC	1,350	100
Do	WDAF	810	1,000
Do	WHB	880	500
Do	WOQ	880	500
Kirksville	KFKZ	1,330	15
Kirkwood	KMOX	1,000	5,000
St. Joseph	KFEQ	1,300	1,000
Do	KGBX	1,040	100
St. Louis	KFQA	1,280	50
Do	KWK	1,280	1,000
Do	KFWF	1,400	250
Do	KSD	550	500
Do	WEW	850	1,000
Do	WIL	1,160	250
Do	WMAY	1,280	100
Do	WSBF	1,160	250
Total (22)			15,315
Montana:			
Havre	KFBB	1,090	50
Kalispell	KGEZ	1,020	100
	KGHD		
Missoula	KUOM	650	500
Vida	KGCX	1,230	10
Billings	KGHL	1,350	250
Total (5)			910
Nebraska:			
Central City	KGES	1,470	10
Clay Center	KMMJ	1,050	250
Columbus	KGBY	1,350	50
Grand Island	KGEO	1,460	100
Humboldt	KGDW	1,020	100
Lincoln	KFAB	940	5,000
Do	KFOR	1,380	100
Lincoln (University Place).	WCAJ	790	500
Norfolk	WJAG	1,050	250
Omaha	KFOX	1,160	100
Do	WAAW	680	500
Do	WNAL	1,160	250
Do	WOW	590	1,000
Ravenna	KGFW	1,010	10
Wayne	KGCH	1,020	250
York	KGBZ	1,410	100
Total (16)			8,570
w Hampshire:			
Laconia	WKAV	1,340	50
Tilton	WBRL	1,290	500
Manchester	WRBH		500
Total (3)			1,050
New Jersey:			
Asbury Park	WCAP	1,250	500
Atlantic City	WPG	1,100	5,000
Bound Brook	WJZ	660	30,000
Camden	WCAM	1,340	500
Carlstadt	WHAP	1,270	1,000
Now Jersey—Contd.			
Cliffside	WCDA	1,410	250
Do	WPAP / WQAO	760	500
Coytesville	WRNY	920	500
Elizabeth	WIBS	1,470	250
Englewood Cliffs	WHPP	1,450	10
Hoboken	WMCA	810	500
Do	WPCH	920	500
Jersey City	WAAT	1,220	300
Do	WKBO	1,370	500
Kearny	WLWL	810	5,000
Do	WOR	710	5,000
Midland Park	WTRL	1,450	15
Newark	WAAM	1,120	250
Do	WGCP	1,120	250
Do	WNJ	1,120	250
Paterson	WODA	1,020	1,000
Red Bank	WJBI	1,140	250
Secaucus	WGL	1,020	1,000
Trenton	WOAX	1,250	500
Union City	WBMS	1,500	100
Total (25)			53,925
New Mexico:			
Raton	KGFL	1,350	50
State College	KOB	760	5,000
Total (2)			5,050
New York:			
Amherst	WKBW	1,380	5,000
Do	WSVS	1,470	50
Astoria	WGBS	860	500
Auburn	WMBO	1,360	100
Bay Shore	WINR	1,420	150
Bellmore	WEAF	610	50,000
Binghamton	WOKT	1,430	250
Brooklyn	WBBC	1,320	500
Do	WLTH	1,170	250
Do	WMBQ	1,470	100
Do	WSGH / WSDA	1,320	500
Buffalo	WEBR	1,240	200
Do	WGR	990	750
Canton	WCAD	1,230	500
Cazenovia	WMAC	1,330	500
Coney Island (Sea Gate).	WCGU	1,370	500
Endicott	WNBF	1,450	50
Farmingdale	WLBH	1,290	30
Flushing	WGOP	1,500	100
Freeport	WGBB	1,220	400
Grand Island	WKEN	1,470	750
Greenville	WCOH	1,420	250
Ithaca	WLCI	1,210	50
Jamaica	WMRJ	1,450	10
Jamestown	WOCL	1,340	25
Long Beach	WCLB	1,500	100
Long Island City	WLBX	1,470	250
Martinsville	WMAK	550	750
Mount Beacon	WMSG	1,270	500
New York	WBNY	1,270	500
Do	WHN	760	500
Do	WKBQ	1,370	500
Do	WNYC	570	500
Peekskill	WOKO	1,390	500
Richmond Hill	WABC	970	2,500
Do	WBOQ	970	500
Rochester	WHEC / WABO	1,180	250
Do	WNBQ	1,460	15
Rossville	WBBR	1,170	1,000
Saranac Lake	WNBZ	1,290	10
South Schenectady	WGY	790	50,000
Syracuse	WFBL	1,160	750
Do	WSYR	1,020	500
Troy	WHAZ	980	500

Allocation of radio facilities to the various States as of June 30, 1928—Continued

State and city	Call signal	Frequency (kilocycles)	Power (watts)
New York—Contd.			
Utica	WIBX	1,260	150
Victor Township	WHAM	1,070	5,000
Woodhaven	WEVD	1,200	500
Woodside	WWRL	1,520	100
Total (48)			128,140
North Carolina:			
Asheville	WWNC	1,010	1,000
Charlotte	WBT	1,160	5,000
Gastonia	WRBU		50
Greensboro	WNRC	1,340	500
Raleigh	WPTF	500	1,000
Wilmington	WRBT	1,320	50
Total (6)			7,600
North Dakota:			
Aneta	KGFN	1,500	15
Bismarck	KFYR	1,200	250
Devils Lake	KDLR	1,300	15
Fargo	WDAY	550	250
Grand Forks	KFJM	900	100
Mandan	KGCU	1,250	100
Total (6)			730
Ohio:			
Akron	WADC	1,260	1,000
Do	WFJC	1,320	500
Bellefontaine	WHBD	1,350	100
Cambridge	WEBE	1,210	10
Canton	WHBC	1,270	10
Cincinnati	WAAD	1,300	25
Do	WFBE	1,220	250
Do	WKRC	1,220	500
Cleveland	WEAR	750	1,000
Do	WHK	1,130	500
Do	WJAY	1,320	500
Do	WTAM	750	3,500
Columbus	WAIU	1,060	5,000
Do	WCAH	1,280	250
Do	WEAO	1,060	750
Do	WMAN	1,280	50
Dayton	WSMK	1,010	200
Hamilton	WRK	1,460	100
Harrison	WLW	700	5,000
Mansfield	WLBV	1,450	50
Mason	WSAI	830	5,000
Middletown	WSRO	1,270	100
Springfield	WCSO	1,170	500
Steubenville	WIBR	1,200	50
Toledo	WSPD	1,250	250
Wooster	WABW	1,210	50
Youngstown	WKBN	1,400	50
Do	WMBW	1,400	50
Total (28)			25,345
Oklahoma:			
Alva	KGFF	1,460	25
Bristow	KVOO	860	5,000
Chickasha	KOCW	1,190	250
Enid	KGCB	1,390	50
Norman	WNAD	1,250	500
Oklahoma City	KFJF	1,100	5,000
Do	KFXR	1,340	50
Oklahoma City	KGFG	1,390	50
Do	WKY	1,040	150
Picher	KGGF	1,450	100
Total (10)			11,175
Oregon:			
Astora	KFJI	1,200	50
Corvallis	KOAC	1,110	1,000
Eugene	KORE	1,500	50
Medford	KMED	1,110	50
Oregon—Continued.			
Portland	KEX	1,080	2,500
Do	KFEC	1,400	50
Do	KFIF	1,310	50
Do	KFJR	1,250	500
Do	KGW	610	1,000
Do	KTBR	1,310	500
Do	KWBS	1,500	15
Do	KWJJ	1,200	50
Do	KXL	1,360	250
Sylvan	KOIN	940	1,000
Total (14)			7,065
Pennsylvania:			
Allentown	WCBA	1,350	100
Do	WSAN	1,350	100
Altoona	WFBG	1,120	100
Byberry	WCAU	1,150	1,000
Carbondale	WNBW	1,500	5
Elkins Park	WIBG	680	50
East Pittsburgh	KDKA	950	50,000
Erie	WRAK	1,370	30
Do	WEDH	1,440	30
Frankford	WFKD	1,210	50
Grove City	WSAJ	1,340	250
Harrisburg	WBAK	1,000	500
Do	WPRC	1,430	100
Jeannette	WGM	1,440	50
Johnstown	WHBP	1,310	250
Kingston (Pringleboro)	WABF	1,460	250
Lancaster	WGAL	1,190	15
Do	WKJC	1,190	50
Lemoyne	WMBS	1,280	250
Lewisburg	WJBU	1,400	100
McKeesport	WMBJ	1,290	50
Oil City	WLBW	1,020	500
Philadelphia	WFAN	1,340	500
Do	WABY	1,210	50
Do	WFI	740	500
Do	WHBW	1,360	100
Do	WIAD	1,040	100
Do	WIP	860	500
Do	WLIT	740	500
Do	WNAT	1,040	100
Do	WOO	860	500
Do	WPSW	1,450	50
Do	WRAX	1,410	250
Pittsburgh	KQV	1,110	500
Do	WCAE	650	500
Do	WJAS	1,110	500
Reading	WRAW	1,280	100
Scranton	WGBI	1,300	250
Do	WQAN	1,300	250
State College	WPSC	1,000	500
Washington	WNBO	1,420	15
Wilkes-Barre	WBAX	1,200	100
Do	WBRE	1,200	100
Willow Grove	WALK	1,490	50
Total (44)			59,845
Porto Rico: San Juan	WKAQ	930	500
Rhode Island:			
Cranston	WDWF / WLSI	1,210	250
Newport	WMBA	1,470	100
Pawtucket	WFCI	1,240	100
Providence	WCOT	1,330	100
Do	WEAN	1,090	500
Do	WJAR	620	500
Do	WRAH	1,500	250
Total (7)			1,800

Allocation of radio facilities to the various States as of June 30, 1928—Continued

State and city	Call signal	Frequency (kilocycles)	Power (watts)
South Carolina:			
Charleston	WBBY	1,200	75
Columbia	WRBW		15
Total (2)			90
South Dakota:			
Brookings	KFDY	550	500
Do	KGCR	1,440	15
Dell Rapids	KGDA	1,180	15
Oldham	KGDY	1,450	15
Pierre	KGFX	1,180	200
Rapid City	WCAT	1,210	100
Sioux Falls	KSOO	1,430	250
Vermillion	KUSD	620	250
Yankton	WNAX	990	1,000
Total (9)			2,345
Tennessee:			
Chattanooga	WDOD	1,230	500
Knoxville	WFBC	1,280	50
Do	WNBJ	1,450	50
Do	WNOX	1,130	1,000
Lawrenceburg	WOAN	1,250	500
Memphis	WGBC	1,310	15
Do	WHBQ	1,290	100
Do	WMBM	1,430	10
Do	WMC	580	5,000
Do	WNBR	1,310	100
Nashville	WBAW	1,250	5,000
Do	WLAC	1,330	5,000
Do	WSM	890	5,000
Springfield	WSIX	1,200	100
Union City	WOBT	1,400	15
Whitehaven (Memphis)	WREC	1,200	500
Total (16)			22,990
Texas:			
Amarillo	KGRS	1,230	250
Do	WDAG	1,140	1,000
Austin	KUT	1,260	500
Beaumont	KFDM	620	500
Breckenridge	KFYO	1,420	100
Brownsville	KWWG	1,080	500
College Station	WTAW	620	500
Dallas	KRLD	650	500
Do	WFAA	550	500
Do	WRR	650	500
Dublin	KFPL	1,090	15
El Paso	WDAH	1,280	100
Fort Worth	KFJZ	1,200	50
Do	WBAP	600	5,000
Do	KFQB	900	1,000
Galveston	KFLX	1,110	100
Do	KFUL	1,160	500
Georgetown	KGKL	1,290	100
Goldthwaite	KGKB	1,070	50
Greenville	KFPM	1,300	15
Harlingen	KHMC	1,270	100
Houston	KPRC	1,020	1,000
Do	KTUE	1,410	5
Richmond	KGHX		50
San Angelo	KGFI	1,360	15
San Antonio	KGCI	1,360	250
Do	KGDR	1,450	15
Do	KGRC	1,360	250
Do	KTAP	1,310	250
Do	KTSA	1,130	2,000
Do	WOAI	1,070	5,000
Waco	WJAD	900	500
Wichita Falls	KGKO		250
Total (33)			21,465
Utah:			
Ogden	KFUR	1,330	50
Salt Lake City	KDYL	1,280	500
Do	KFUT	1,200	50
Do	KSL	990	5,000
Total (4)			5,600
Vermont:			
Burlington	WCAX	1,180	100
Springfield	WNBX	1,240	10
Total (2)			110
Virginia:			
Chesterfield Hills	WTAZ	1,360	15
Mount Vernon Hills	WTFF	1,480	10,000
Norfolk	WBBW	1,270	100
Do	WTAR / WPOR	1,270	500
Do	WIVA	1,430	100
Petersburg	WLBG	1,400	500
Portsmouth	WSEA	1,140	500
Richmond	WBBL	1,280	100
Do	WMBG	1,360	15
Do	WRVA	1,180	1,000
Roanoke	WDBJ	1,300	250
Do	WRBX		250
Total (12)			13,330
Washington:			
Aberdeen	KXRO	1,340	50
Bellingham	KVOS	1,430	250
Everett	KFBL	1,340	50
Lacey	KGY	1,220	50
Pullman	KWSC	760	500
Seattle	KFOA	670	1,000
Do	KFQW	1,380	100
Do	KVL	1,100	100
Do	KJR	860	2,500
Do	KKP	1,100	15
Do	KOMO	970	1,000
Do	KPCB	1,300	100
Do	KRSC	1,100	50
Do	KXA	560	500
Do	KTW	760	1,000
Longview	KUJ	1,500	10
Spokane	KFIO	1,220	100
Do	KFPY	1,220	250
Do	KGA	1,150	2,000
Do	KHQ	810	1,000
Tacoma	KMO	1,180	500
Do	KVI	1,060	250
Seattle	KPQ	1,300	100
Total (23)			11,475
West Virginia:			
Charleston	WOBU	1,120	250
Clarksburg	WQBJ	1,250	50
Huntington	WSAZ	1,200	100
Wierton	WQBZ	1,200	60
Wheeling	WWVA	580	250
Total (5)			710
Wisconsin:			
Appleton	WAIZ	1,320	100
Beloit	WEBW	1,160	500
Brookfield	WTMJ	1,020	1,000
Eau Claire	WTAQ	1,180	500
Fond du Lac	KFIZ	1,120	100
Kenosha	WCLO	1,320	100
South Kenosha	WKDR	1,210	15
La Crosse	WKBH	1,300	500

Allocation of radio facilities to the various States as of June 30, 1928—Continued

State and city	Call signal	Frequency (kilocycles)	Power (watts)
Wisconsin—Contd.			
Madison	WHA	900	750
Do	WIBA	1,250	100
Manitowoc	WOMT	1,350	100
Milwaukee	WGWB	1,110	250
Do	WHAD	1,110	500
Do	WISN	1,110	250
Poynette	WIBU	1,380	20
Racine	WRJN	1,210	50
Sheboygan	WHBL	1,470	250
Stevens Point	WLBL	900	1,000
Superior	WEBC	1,240	250
West De Pere	WHBY	1,200	50
Total (20)			6,385
Wyoming: Laramie	KFBU	620	500
Total (1)			500
Portable:			
Airplane	KFBI	1,470	50
Inglewood, Calif	KGGM	1,470	100
Los Angeles, Calif	KGFO	1,470	100
Chicago, Ill	WBBZ	1,470	100
Do	WHBM	1,490	100
Do	WIBJ	1,490	100
Do	WIBM	1,490	100
Do	WKBG	1,490	100
Boston, Mass	WATT	1,490	100
MU-1 (yacht)	WRMU	1,490	100
Richmond Hill, N. Y.	WGMU	1,490	100
Providence, R. I	WCBR	1,490	100
Shelby, Ohio	WOBR	1,470	10
Total (13)			1,160

APPENDIX E (3)

Engineers' broadcast memorandum submitted to the commission on March 30, 1928

Experts employed by the commission submitted the following memorandum on March 30, 1928, which was used as a basis for discussion at the hearing of radio engineers April 6, 1928, and at the hearing of the broadcasters and manufacturers on April 23, 1928, to consider the most practical way to put into effect the equitable distribution clause of the radio act:

ALLOCATION OF BROADCASTING CHANNELS TO ZONES AND STATES

Attached are two sample allocations giving assignments of broadcasting channels to zones and States. These allocations are intended to comply with the provisions of the radio act of 1927 as recently amended. Both allocations are based upon a classification of broadcasting channels into three groups—national, regional, and local. The channels of each of these groups are apportioned equally to the five zones and in each zone are apportioned to the States, so far as possible in accordance with their population.

The power permitted for use by each assignment would on the average be as follows, subject to such modification as may be required or permitted by the terms of the radio act: National channels, 20,000 watts; regional channels, 500 watts; local channels, 100 watts.

CLASSIFICATION OF CHANNELS

The two allocations marked "Example A" and "Example B" differ primarily in the proportions by which the broadcasting spectrum is divided into the national and regional groups. The number of channels in each example assigned to each class is given in the following table:

	Example A	Example B
Cleared channels, one full-time assignment on each channel without duplication in any other part of the country	50	30
Regional channels, each zone to have assignments on half of these channels	36	56
Local channels, each zone to have five assignments on each of these channels	4	4
Total number of channels (omitting 6 used by Canada)	90	90

NUMBER OF FULL-TIME ASSIGNMENTS

The number of stations or groups of stations which, under each of these plans may be given full-time assignments is as follows:

Classification and number of station assignments

	Example A		Example B	
	Per zone	Total number	Per zone	Total number
Class C, for assignment to clear channels	10	50	6	30
Class B, for assignment to regional channels	18	90	28	140
Class A, for assignment to local channels	20	100	20	100
Total number of full-time assignments for night-time simultaneous operation	48	240	54	270

APPORTIONMENT OF CHANNELS TO ZONES AND TO STATES

The channels of each class are apportioned to the zones and States as follows: Each zone is given an equal number of channels of each class. The number of assignments in each zone is 20 per cent of the total number of assignments in the country.

In Example A, there are then allotted to each State the number of assignments of each class which corresponds to the proportion of its population to the population of the zone. The allotments of assignments to the several States are summarized in the following table. Certain States having fractional assignments are grouped, the group having an integral full-time assignment.

Example A

	Class C	Class B	Class A
Zone I			
Maine, New Hampshire	½	½	1
Vermont		½	1
Massachusetts	1½	3	3
Connecticut, Rhode Island	1	1	1
		½	1
New York	4	7½	7
New Jersey	1½	2½	2
Delaware, Maryland, District of Columbia	1½	½	1
		1	1
		½	1
Porto Rico			
Virgin Islands			
Total	10	18	20
Zone II			
Pennsylvania	3½	6½	7
Virginia	1	1½	2
Ohio	2½	4	5
Michigan	1½	3	3
Kentucky	1	2	2
West Virginia	½	1	1
Total	10	18	20
Zone III			
North Carolina	1	2	2
South Carolina	½	1	1
Georgia	1	2	2
Florida	½	½	1
Alabama	1	1½	2
Mississippi	½	1½	2
Tennessee	1	1½	2
Arkansas	½	1½	1
Louisiana	1	1½	1
Texas	2	3½	4
Oklahoma	1	1½	2
Total	10	18	20
Zone IV			
Indiana	1	2	2
Illinois	2½	4½	5
Wisconsin	1	2	2
North Dakota	½	½	1
South Dakota	½	½	1
Iowa	1	2	2
Nebraska	½	1	1
Kansas	½	1½	1
Missouri	1½	2½	3
Minnesota	1	1½	2
Total	10	18	20
Zone V			
Montana	½	1	1
Idaho	½	1	1
Wyoming	½	½	1
Colorado	1	2	2
New Mexico, Arizona	½	½	1
		½	2
Utah	½	1	1
Nevada	0	½	1
Washington	1½	2½	3
Oregon	1	1½	1
California	4	7	7
Hawaii			
Alaska			
Total	10	18	20

In Example B, the cleared channels, allocated to a zone as in Example A, are assigned to States according to population, fractional assignments being disregarded. This results in the assignment of six of each zone's allotment of class C channels. The remaining 4 of the 10 class C channels originally allotted for use in each zone may then be added to the regional group, until such time as there is a reallocation based on a new census. This gives a total of 56 class B channels, of which 28 may be used in each zone.

One of the class B channels allotted for use in a given zone is assigned to each State. The remaining regional assignments are apportioned to the States of that zone in proportion to their population. The 20 class A assignments are apportioned to the States as in Example A.

The allotments of assignments to States appearing in Example B are summarized in the following table:

Example B

	Class C	Class B	Class A	Total
Zone I				
Maine		1	1	2
New Hampshire		1	1	2
Vermont		1	1	2
Massachusetts	1	4	3	8
Connecticut		2	1	3
Rhode Island		1	1	2
New York	4	10	7	21
New Jersey	1	4	2	7
Delaware		1	1	2
Maryland		2	1	3
District of Columbia		1	1	2
Porto Rico				
Virgin Islands				
Total	6	28	20	54
Zone II				
Pennsylvania	3	9	7	19
Virginia	0	3	2	5
Ohio	2	6	5	13
Michigan	1	5	3	9
Kentucky	0	3	2	5
West Virginia	0	2	1	3
Total	6	28	20	54
Zone III				
North Carolina	1	3	2	6
South Carolina	0	2	1	3
Georgia	1	3	2	6
Florida	0	2	1	3
Alabama	1	3	2	6
Mississippi	0	2	2	4
Tennessee	1	2	2	5
Arkansas	0	2	1	3
Zone III—Cont.				
Louisiana	0	2	1	3
Texas	2	5	4	11
Oklahoma	0	2	2	4
Total	6	28	20	54
Zone IV				
Indiana	1	3	2	6
Illinois	2	7	5	14
Wisconsin	1	3	2	6
North Dakota	0	1	1	2
South Dakota	0	1	1	2
Iowa	0	3	2	5
Nebraska	0	2	1	3
Kansas	0	2	1	3
Missouri	1	3	3	7
Minnesota	1	3	2	6
Total	6	28	20	54
Zone V				
Montana	0	2	1	3
Idaho	0	2	1	3
Wyoming	0	1	1	2
Colorado	1	3	2	6
New Mexico	0	1	1	2
Arizona	0	1	1	2
Utah	0	2	1	3
Nevada	0	1	1	2
Washington	1	4	3	8
Oregon	0	2	1	3
California	4	9	7	20
Hawaii & Alaska				
Total	6	28	20	54

METHOD OF ALLOCATION

Class A.—In both examples the following four frequencies are designated as class A channels—1,350, 1,360, 1,410, and 1,500 kilocycles. By providing a separation of 50 kilocycles, or more, between three of the channels of this class, it is possible to make class A assignment to the required number of stations in each zone, even though several groups of three may be located in close proximity to one another geographically. The 1,500 kilocycle channel may be used also by portable broadcasting stations. This frequency is the border frequency between the broadcasting band and the adjacent band of higher frequency allocated by the International Radio Conference to mobile radio service.

Class B.—In both examples, the lower six channels, namely 550 to 600 kilocycles, inclusive, are designated as class B channels. This range includes two channels (580 and 600 kilocycles) which are shared with Canada. In addition, the remaining nine channels which are also shared with Canada are designated

as class B channels. These are the following: 630, 780, 880, 890, 930, 1,010, 1,120, 1,200, and 1,210 kilocycles.

In Example A, the remaining 21 class B channels are those from 1,260 to 1,490 kilocycles, inclusive, omitting the three channels in this range (1,350, 1,360, and 1,410 kilocycles) previously designated for class A.

Class C.—The frequency band from 610 to 1,250 kilocycles, inclusive, is designated as class C with the omission of the channels shared with Canada listed above and the following channels which are used by Canada exclusively: 690, 730, 840, 910, 960, and 1,030 kilocycles.

The class C channels are assigned to the five zones in the order of rotation—I, IV, II, V, III. This order of rotation makes it possible to secure an adequate geographical separation between stations assigned to channels separated by 10, 20, 30, or 40 kilocycles. This results also in the assignment of channels in a given zone having a separation of 50 kilocycles as a minimum; this separation being increased in a number of instances on account of the existence of Canadian channels. If the channels from 610 to 1,250 kilocycles are apportioned into the five groups in this way, it develops that one of these groups contains a large number of channels which are next to channels used by Canada. This group of channels should, therefore, be used by the United States in Zone III. This therefore determines in accordance with the order of rotation given above which group of channels should be used in each of the other zones. The following groups of channels are therefore assigned to class C stations in the several zones:

Zone I	Zone II	Zone III	Zone IV	Zone V
Kilocycles	*Kilocycles*	*Kilocycles*	*Kilocycles*	*Kilocycles*
640	660	620	650	610
700	720	680	710	670
760	790	750	770	740
820	850	810	830	800
900	940	870	920	860
980	1,000	970	990	950
1,050	1,070	1,040	1,060	1,020
1,100	1,130	1,090	1,110	1,080
1,160	1,180	1,150	1,170	1,140
1,230	1,250	1,220	1,240	1,190

In the assignment of class B channels to zones, attention is given to the fact that nine of the Canadian shared channels used in this way are adjacent to class C channels used by high-power stations. These Canadian shared channels should, therefore, be used in zones other than those in which the high-power stations on the adjoining channels are located. For example, the 630 kilocycle channel may be used in Zones II, IV, or V, but should not be used in Zones I and III. If proper assignments of the Canadian shared channels are made to Zones I and II, there results a definite assignment of the remaining class B channels to these two zones.

In order to secure the necessary distance separation between stations using a given class B channel, and in order to secure the necessary frequency separation between class B stations in a given zone, the class B channels are assigned alternately for use in Zones I and II. A class B channel assigned to Zone I may be assigned also to Zone V and to either Zone III or Zone IV. Similarly, a class B channel assigned to Zone II may be assigned to either Zone III or Zone IV. It might also be assigned to Zone V. The use of such a channel simultaneously in Zones III, IV, and V, while perhaps sometimes permissible from an interference standpoint, would result in twice as many assignments to each of these zones as to Zones I and II. A class B channel used in Zone I may, therefore, be used in either Zone III or Zone IV, but not both; and a class B channel used in Zone II may be used in either Zone III or Zone IV, but not both. In making assignments, one-half of the channels have been assigned to Zone I, and one-half to Zone II. Each channel assigned to Zone I is also assigned to a State in the eastern part of either Zone III or Zone IV and each channel assigned to Zone II is also assigned to a State in the western part of Zone III or Zone IV. This secures the maximum distance separation between assignments in these zones while maintaining an equality in the total number. Assignments to States in Zone V are made on the same channels assigned to Zone I.

POWER

By providing that each class of assignment carries with it a certain specification as to power, the proper distribution of channels to States carries with it a definite distribution of power to States. It is recognized that certain stations may not use the full power authorized for channels to which they are assigned. This may make possible the temporary use of additional power on other channels where permissible from a radio interference standpoint. Since each class C channel is used exclusively by a single full-time assignment, there is no technical reason why this should be fixed at any limit below that which will be determined by economic considerations. In order, however, to reach a definite value for the total power authorized for use on these channels, the power which may be used for each class C assignment may be fixed tentatively at 20,000 watts. This may be increased at a later time thus increasing the general power level of all class C assignments in all zones.

The power designated for each class B assignment is 500 watts. This will have to be reduced to 250 watts in the case of class B stations assigned to Canadian shared channels when these stations are located within 250 miles of the Canadian border. The power of certain class B stations may be increased to 1,000 watts, where these stations are located at points far removed geographically from other stations on the same channel.

The following table gives the power associated with each class of assignment:

Class	Power per assignment	Power per channel	Power per zone	Total power
C	20,000	20,000	200,000	1,000,000
B	500	1,000	9,000	45,000
A	100	250	2,000	10,000

It may be desirable to authorize increases in power for daytime and summer time operation.

NUMBER OF STATION ASSIGNMENTS

The number of station assignments depends entirely on the amount of time division which is required. Since the number of full-time channel assignments to zones has been made equal, the number of station assignments in the several zones will be equal, if equal time divisions are required. If licenses granted to stations which share time are counted as fractional assignments, the sum of these fractional assignments would equal the number of full-time assignments.

Assignments to such stations as operate only during the daytime are not included in these allocations.

REQUIREMENTS TO BE MET BY STATIONS OF EACH CLASS

In order to determine whether a station or an applicant is eligible for consideration for a given class of assignment, it seems essential that certain requirements be adopted with which the stations of the several classes must comply. These requirements should be most rigid in the case of the class B and class C stations and should, even in the case of class A stations, be such as to include only those stations whose operation is in the public interest.

These requirements may be primarily technical in their nature and thus subject to measurement by the field staff of the Radio Division of the Department of Commerce. To the technical requirements may, of course, be added other requirements based upon the public interest which the station is endeavoring to serve. The technical requirements which may be specified include such points as accuracy of maintenance of frequency, freedom from undesired emissions such as harmonics, amount of power used, and the percentage of undistorted modulation of the emitted wave. Consideration will need to be given to the numerical values which should be specified for each of these and similar characteristics in the case of stations of each of the several classes.

ALLOCATIONS—EXAMPLES A AND B

The examples of allocations attached hereto indicate the State to which each channel may be assigned, together with a designation of the class of the station. Assignments to the territorial possessions of the United States have not been included.

The particular number of assignments to each State is dependent upon the population figures which are used. These two examples differ slightly in this respect since Example A is based on the census of January 1, 1920, while Example B is based upon the official estimates made by the Bureau of the Census as of July 1, 1928. They may nevertheless serve satisfactorily as a basis for study.

The determination of which particular stations or group of stations shall have the assignments made to the several States, in either of the attached allocations, is a matter for decision by the commission. The relations between frequency separation, geographical separation, and power given in the basic allocation which is finally adopted should be studied with care to make sure that they provide such freedom from interference as is consistent with a maximum of broadcasting service.

Allocation of broadcasting channels to States

Channel	Example A		Example B	
	State	Class	State	Class
550	Pennsylvania	B	Pennsylvania	B
	Missouri	B	Missouri	B
560	Massachusetts	B	Massachusetts	B
	North Carolina	B	North Carolina	B
	California	B	California	B
570			Pennsylvania	B
			Texas	B
[1] 580	New York	B	New York	B
	Illinois	B	Illinois	B
	Utah	B	Utah	B
590	Ohio	B	Ohio	B
	Missouri	B	Missouri	B
	Kansas	B		
[1] 600	Connecticut	B	Connecticut	B
	Alabama	B	Alabama	B
	Florida	B	Colorado	B
	Colorado	B		
610	Washington	C	Washington	C
620	Texas	C	Texas	C
630	Pennsylvania	B	Pennsylvania	B
	Tennessee	B	Tennessee	B
	Mississippi	B		
640	New York	C	New York	C
650	Nebraska	C	Ohio	B
	Kansas	C	Nebraska	B
660	Michigan	C	Michigan	C
670	California	C	California	C
680	Tennessee	C	Tennessee	C
690	Canadian exclusive.		Canadian exclusive.	
700	Maryland	C	New York	B
	Delaware	C	North Carolina.	B
	District of Columbia.	C	Utah	B
710	Illinois	C	Illinois	C
720	Pennsylvania	C	Pennsylvania	C
730	Canadian exclusive.		Canadian exclusive.	
740	Colorado	C	Colorado	C
750	Georgia	C	Georgia	C
760	New Jersey	C	New Jersey	C
770	Iowa	C	Iowa	B
			Virginia	B
[1] 780	Kentucky	B	Kentucky	B
	Minnesota	B	Minnesota	B
790	Ohio	C	Ohio	C
800	California	C	California	C
810	Alabama	C	Alabama	C
820	Massachusetts	C	Massachusetts	C
830	Minnesota	C	Minnesota	C
840	Canadian exclusive.		Canadian exclusive.	
850	Michigan	C	Pennsylvania	B
	Pennsylvania	C	South Carolina	B
860	Montana	C	Maryland	B
	Wyoming	C	Indiana	B
			Montana	B
870	Florida	C	New Jersey	B
	South Carolina	C	Florida	B
			Colorado	B
[1] 880	Rhode Island		Rhode Island	B
	Wisconsin	B	Wisconsin	B
[1] 890	Pennsylvania	B	Pennsylvania	B
	Louisiana	B	Arkansas	B
	Arkansas	B	California	B
	California	B		
900	New York	C	New York	C
910	Canadian exclusive.		Canadian exclusive.	
920	Illinois	C	Illinois	C
[1] 930	New York State.	B	New York State.	B
	Georgia	B	Georgia	B
	Washington	B	Washington	B
940	Kentucky	C	Kentucky	B
			Minnesota	B
950	California	C	California	C
960	Canadian exclusive.		Canadian exclusive.	
970	Texas	C	Texas	C
980	New Jersey	C	Delaware	B
	Delaware	C	Wisconsin	B
	Maryland	C	Washington	C
	District of Columbia.	C		
990	Missouri	C	Missouri	C
1,000	Pennsylvania	C	Pennsylvania	C
[1] 1,100	New York	B	New York	B
	Illinois	B	Illinois	B
	California	B	California	B
1,020	New Mexico	C	Vermont	B
	Arizona	C	Georgia	B
	Utah	C	Arizona	B
1,030	Canadian exclusive.		Canadian exclusive.	
1,040	Louisiana	C	Pennsylvania	B
			Louisiana	B
1,050	Connecticut	C	Connecticut	B
	Rhode Island	C	Kansas	B
			Nevada	B
1,060	Wisconsin	C	Wisconsin	C
1,070	Ohio	C	Ohio	B
	West Virginia	C	Illinois	B
1,080	California	C	California	C
1,090	Oklahoma	C	West Virginia	B
			Oklahoma	B
1,100	New York State.	C	New York State.	C

[1] Canadian shared under Examples A and B.

Allocation of broadcasting channels to States—Continued

Channel	Example A		Example B	
	State	Class	State	Class
1,110	Indiana	C	Indiana	C
[1] 1,120	New York	B	New York	B
	New Jersey	B		
	Louisiana	B	Louisiana	B
	New Mexico	B	New Mexico	B
	Arizona	B		
1,130	Virginia	C	Virginia	B
			Minnesota	B
1,140	Idaho	C	New Jersey	B
	Washington	C	Alabama	B
			Idaho	B
1,150	North Carolina	C	North Carolina	C
1,160	Maine	C	Massachusetts	B
	New Hampshire	C	Texas	B
	Vermont	C	California	B
	Massachusetts	C		
1,170	North Dakota	C	Michigan	B
	South Dakota	C	South Dakota	B
1,180	Ohio	C	Ohio	C
1,190	Oregon	C	New York	B
			Florida	B
			Oregon	B
[1] 1,200	Virginia	B	Virginia	B
	Oklahoma	B	Oklahoma	B
[1] 1,210	Ohio	B	Ohio	B
	North Dakota	B	North Dakota	B
	South Dakota	B		
1,220	Mississippi	C	New Hampshire	B
	Arkansas	C	Mississippi	B
			California	B
1,230	New York	C	New York	C
1,240	Illinois	C	Michigan	B
	Missouri	C	Illinois	B
1,250	Pennsylvania	C	Pennsylvania	C
1,260	New York State	B	New York State	B
	Wisconsin	B	Wisconsin	B
	California	B	California	B
1,270	Michigan	B	Michigan	B
	Nebraska	B	Nebraska	B
1,280	Massachusetts	B	Massachusetts	B
	North Carolina	B	North Carolina	B
	Oregon	B	Oregon	B
1,290	Ohio	B	Ohio	B
	Texas	B	Texas	B
1,300	New Jersey	B	New Jersey	B
	Illinois	B	Illinois	B
	Wyoming	B	Wyoming	B
	Nevada	B		
1,310	Michigan	B	Michigan	B
1,310	Iowa	B	Iowa	B
1,320	District of Columbia	B	District of Columbia	B
	Mississippi	B	Mississippi	B
	California	B	California	B
1,330	West Virginia	B	West Virginia	B
	Arkansas	B	Arkansas	B
1,340	New York	B	New York	B
	Indiana	B	Indiana	B
	Montana	B	Montana	B
1,350	5 stations in each	A	5 stations in each.	A
1,360	do	A	do	A
1,370	Pennsylvania	B	Pennsylvania	B
	Missouri	B	Missouri	B
1,380	New York State	B	New York State	B
	South Carolina	B	South Carolina	B
	Washington	B	Washington	B
1,390	Ohio	B	Ohio	B
	Texas	B	Texas	B
	Oklahoma	B		
1,400	Maine	B	Maine	B
	New Hampshire	B		
	Illinois	B	Illinois	B
	California	B	California	B
1,410	5 stations in each.	A	5 stations in each.	A
1,420	Pennsylvania	B	Pennsylvania	B
	Virginia	B		
	Iowa	B	Iowa	B
1,430	New Jersey	B	New Jersey	B
	Georgia	B	Georgia	B
	Colorado	B	Colorado	B
1,440	Michigan	B	Michigan	B
	Tennessee	B	Tennessee	B
1,450	Indiana	B	Indiana	B
	Maryland	B	Maryland	B
	Idaho	B	Idaho	B
1,460	Pennsylvania	B	Pennsylvania	B
	Kansas	B	Kansas	B
1,470	New York	B	New York	B
	Alabama	B	Alabama	B
	California	B	California	B
1,480	Kentucky	B	Kentucky	B
	Texas	B	Texas	B
1,490	Massachusetts	B	Massachusetts	B
	Texas	B	Illinois	B
			Washington	B
1,500	5 stations in each.[3]	A	5 stations in each.[3]	A

[1] Canadian shared under Examples A and B.
[2] Canadian shared under Example A only.
[3] Including portable stations.

APPENDIX E (4)

Report of broadcasting committee of Institute of Radio Engineers submitted in part April 6, 1928

The broadcast committee of the Institute of Radio Engineers submitted the following report April 6, 1928:

"At a regular meeting of the board of direction of the Institute of Radio Engineers held on April 4, 1928, letters from the Federal Radio Commission requesting certain suggestions from the institute regarding the allocation of broadcast channels to zones and States were read.

"It was decided by the board of direction that the invitation of the commission to send representatives to an informal conference to be held in Washington on April 6 to discuss these matters should be accepted.

"A committee composed of the following members of the Institute of Radio Engineers was appointed: R. H. Marriott (chairman), Dr. J. H. Dellinger, C. W. Horn, and L. E. Whittemore.

"The board took up a technical discussion of the matters contained in the letters from the Federal Radio Commission, and there was more or less a consensus of opinion in regard to the following points.

"The following suggestions cover the present state of the art and are intended to apply to transmission during hours of darkness throughout the entire year. Daylight ranges are less and more duplication in daytime in frequency allocation may be permissible.

"It is suggested that the nomenclature as proposed by the commission regarding national, regional, and local classifications of channels and stations be changed to the former Department of Commerce nomenclature which referred to the channels and stations of these types as classes C, B, and A, respectively, since the names are substantially descriptive of the interfering effect of the stations and may therefore be misleading.

"In the matter of normal power for each class of station it is the board of direction's suggestion that it is to be noted that in order to cover large areas of the United States, with particular reference to rural districts, it is necessary to interconnect very large groups of powerful stations, including even class C stations.

"Normal power of class A stations should not exceed 250 watts. The normal power of class B stations should be from 300 to 1,000 watts, inclusive. The normal power of class C stations should be from 5,000 to 50,000 watts, with a provision that as soon as practicable these limits be raised (in the class C rating) with due regard to limitations imposed by local interference and interference with neighboring channels in then current receivers. The above figures are based upon reception with 5-tube radio receivers.

"It is suggested that in each class the following number of channels may be used and the following time divisions should be required.

	Number of channels	Number of assignments per channel	Number of full-time assignments	Extent of time division	Total number stations
Class A	4	50	200	None.	200
Class B	36	2½	90	None.	90
Class C	50	1	50	None.	50

"Time division is undesirable in that it increases the cost of operation. For this reason it is felt it should be minimized to the greatest extent compatible with other requirements.

"The board suggests that stations of each class should be required to meet the following technical requirements:

"*Maintenance of frequency.*—The present requirement of 500 cycles if adhered to is sufficient to prevent stations from wandering outside their channel assignments. The way in which further improvement in frequency control can be of benefit is in the elimination of beat-note interference between stations simultaneously occupying the same channel. To do this requires a frequency stability of the order of plus or minus 25 cycles. It may reasonably be anticipated that technical methods for obtaining such stability will be available in about two or three years, or perhaps less. It is suggested that when such equipment becomes readily and commercially available the requirement be made plus or minus 30 cycles. It is doubtful that any requirement between this value and the present value would be of sufficient beneficial effect to warrant its use as an interim measure.

"*Freedom from harmonics.*—Harmonics should be eliminated in so far as the state of the art permits.

"*Per cent undistorted modulation.*—It is of best interest to the broadcaster to use the highest degree of modulation consistent with good quality."

APPENDIX E (5)

Resolutions adopted by conference of engineers on April 6, 1928

RESOLUTION

It is the opinion of the engineers in attendance that from a radio engineering standpoint, under the provisions of the 1928 law requiring equality between zones, plan A, submitted for discussion by the commission, modified as follows, represents the maximum obtainable radio service from the available broadcasting channels in the present state of the art:

	Channels		Full-time assignments	
	Per zone	United States	Per zone	United States
Class C, 5,000 to 50,000 watts	10	50	10	50
Class B, 300 to 1,000 watts	18	36	18	90
Class A, 0 to 250 watts	4	4	40	200

APPENDIX E (6)

Summary of discussion at conference of engineers on April 6, 1928, by Dr. J. H. Dellinger

Division into classes.—The readjustment of station allocations required by the 1928 radio law gives the Radio Commission an opportunity to provide the radio listeners of the United States with a grade of radio broadcasting service far superior to that furnished under the present allocation of stations. A redistribution of broadcasting stations among the States will, if the proposed classification of services be established, result in the satisfactory reception of more programs at higher signal strengths by a greater number of listeners in a larger total area than at present and will do this with less interference than now exists.

The fundamental change required to bring about any material improvement is to provide a considerable number of channels upon which only one station operates. The reason for this is a purely physical fact. Since heterodyne interference extends to many times the distance to which actual program service from a broadcasting station extends, operation of two or more stations on a channel results in an area of destructive interference much greater than the area in which program service is provided. Program service, free from interference, can be furnished at great distances from a station only when the station has exclusive use of its channel.

Since there are only 90 channels available for broadcasting in the United States, 90 is the upper limit of the possible number of stations giving service at considerable distances.

When two or more stations operate simultaneously on a channel, program service can be furnished at short distances from each station without destructive heterodyne interference within that distance, provided the stations are located at proper distances apart corresponding to the power used. Under these conditions many stations can be operated for short-distance local service on a single channel. Outside the local service areas heterodyne interference will prevent satisfactory reception.

Sections of the country remote from centers of population can not be given service except by the stations first mentioned, which have exclusive use of their channels (class C).

It follows that the country as a whole can be given the service it demands only by having more than one class of stations—(1) long-distance stations, operating on exclusive channels; (2) shorter-distance stations, operating on shared channels. Considering the broadcasting needs and development in this country, it is apparent that the second class can advantageously be subdivided into stations of moderate distance range (class B) and small stations of very small distance range (class A).

Number of channels in each class.—The number of channels (50) indicated for class C stations is the minimum that should be provided, in view of the far greater service, both distant and local, that will be rendered by such channels, owing to the absence of heterodyne interference and the consequent possibility of the use of greater power. The distribution of the remaining 40 channels between classes B and A represents the best judgment of the engineers from present information. A further study should be made of this point on the basis of service requirements of various areas of the country. It is believed that the final answer on this point will not depart widely from the figures given.

Duplication of assignments per channel.—It is clear that the stations depended upon for service over large areas must operate on heterodyne-free channels and that therefore there must be only one assignment to each class C channel.

The moderate-distance (class B) and short-distance (class A) channels may each be used by a number of stations in simultaneous operation, since the only desideratum in good service within the local service range of each station. The power required for moderate-distance service (class B) will not permit as much duplication of stations on one channel as will the smaller power required for short-distance service (class A).

The amount of duplication recommended is: For each class B channel, on the average, two and a half assignments in the United States (i. e., the assignment of every other channel in each zone); and for each class C channel, 50 assignments in the United States (10 in each zone).

The limitation to two and a half assignments for each class B channel is determined by the geographical circumstances of the two smallest zones (1 and 2), together with the requirement of the law of equality between zones. Points in zones 1 and 2 average less than 500 miles apart, a distance too small to permit the assignment of any one channel in both zones with the recommended power.

Equality with respect to classes.—The provisions of the law requiring equal distribution among the zones and, according to population, among the States of station licenses, frequencies, time, and power must be applied separately to each of the three classes of stations mentioned. This results from the inclusion of the number of licenses as one of the elements of equal distribution.

Station power.—In order to merit the use of a class C channel a station must be competent to serve a large area. It follows that no class C station should be allowed to operate with less than 5,000-watts power. The only upper limit for this class need be that fixed by the production of interchannel interference, and, in consideration of the geographical distribution possible, may be 50,000 watts at the present time.

For the moderate-distance (class B) channels, powers of 300 to 1,000 watts will give satisfactory service, and for the short-distance (class A) channels power should not exceed 250 watts per station because of the extensive duplication permitted.

As an exception to these general recommendations for classes B and A, it is noted that where two or more stations operating on the same channel are all increased in power by the same factor their heterodyne-free service ranges will be substantially unaffected and a better signal (with respect to noise interference) will be delivered within each service area. This will be at the expense of producing a stronger heterodyne whistle outside the service areas of the two stations concerned.

Time division.—The expedient of time division does not in general lead to superior service to the listener. It is inherently uneconomic. Where several stations in an area are now dividing time the duplication of plant and overhead necessarily results in poorer service than would result were these stations to be consolidated into a single station using all the time.

For the class C stations particularly time division should not be allowed. An exclusive (class C) channel is capable of delivering such excellent service over large areas that care should be taken not to restrict the possible service from these channels by an uneconomic arrangement such as time division.

For the class B and class A channels there will doubtless be local conditions demanding, and perhaps justifying, time division in spite of its inherently uneconomic nature. However, the application of time division has been made difficult under the terms of the new law. Since the law requires equality of the number of hours and licenses among the zones, and, according to population, among the States within each zone, if time is divided on a given channel among several stations in any one State, this division must be duplicated on some channel in every other zone and proportionally in every State.

The same difficulty will exist in any attempt to divide time between stations located in different zones, as might be sought, e. g., to take advantage of the time difference between the east and west coasts. Time division between stations in widely separated localities is subject to the further objection of seriously complicating the maintenance of the proper frequency separation between stations in each of the localities to minimize interchannel interference.

APPENDIX E (7)

Copy of a communication from the Hon. Ewin L. Davis, Congressman from Tennessee

APRIL 6, 1928.

Hon. E. O. SYKES, Acting Chairman,
And Other Members, Federal Radio Commission,
Washington, D. C.

DEAR GENTLEMEN: This acknowledges receipt of yours of the 31st ultimo inclosing copy of letter to Mr. White, and copy of tentative plans under consideration for making an allocation of broadcasting stations in conformity with the newly enacted radio law, for which I thank you.

I had intended to accept your invitation to attend your meeting to-day, at which time you invite a discussion and criticism of these plans, but a matter has arisen which prevents my attendance at your meeting.

However, I wish to avail myself of the opportunity which you have kindly accorded to give any suggestions which may occur to me.

I have not had opportunity to thoroughly consider all features of your tentative plan, nor have I the time to now do more than make a few general suggestions for your consideration.

I wish to first refer to the language on page 10 of your tentative plan, as follows:

"It is recognized that certain stations may not use the full power authorized for channels to which they are assigned. This may make possible the temporary use of additional power on other channels where permissible from a radio interference standpoint. Since each class C channel is used exclusively by a single full-time assignment, there is no technical reason why this should be fixed at any limit below that which will be determined by economic considerations. In order, however, to reach a definite value for the total power authorized for use on these channels, the power which may be used for each class C assignment may be fixed tentatively at 20,000 watts. This may be increased at a later time, thus increasing the general power level of all class C assignments in all zones."

I respectfully, but most emphatically, dissent from the view that "there is no technical reason why this should be fixed at any limit below that which will be determined by economic considerations." While there would probably be no interference between class C stations operating exclusively on a single full-time wave length assignment with at least 50 kilocycles separation from similar stations, yet they would undoubtedly interfere with stations operating on assignments on each side of them.

I respectfully insist that the maximum station power should be 10.000 watts. The harmful effects of any power in excess of that far outweigh the benefits accruing to the station employing the high power. In this connection, I beg to call attention to the testimony of Commissioner Caldwell appearing on page 111 of the House committee hearings.

I also suggest that a 500-watt station can not consistently project anything like a satisfactory regional program; it is insufficient in many instances for even a State station. In this connection, I beg to refer to the testimony of Commissioner Pickard on page 230 of the House committee hearings, as well as the testimony of Commissioners Pickard and Caldwell with respect to the radius of different powered stations.

Wherefore I suggest that there is a proper place for both 5,000 and 1,000 watt stations, and that a drop from class C stations to 500 watts is wholly inadvisable and unjustified.

Furthermore, I suggest that the tentative plan is overloaded with so-called national stations, to which it is proposed to assign not only the most of the

wave lengths, but of the aggregate power as well. It occurs to me that it would be much more preferable and prove more satisfactory as a whole to provide for 25 stations authorized to employ not exceeding 10,000-watt power, and each assigned exclusively a single full-time wave length; and have 25 stations authorized to use not exceeding 5,000-watt power; 100 stations authorized to use 1,000-watt power, and whatever number and division that might be deemed advisable of stations authorized to employ 500 watts, 100 watts or 50 watts or less; this number of course being made to conform to the number of stations and the aggregate station power which the commission may determine to be proper for the broadcast structure.

Of course, I favor an equal allocation to each zone and a fair and equitable allocation among the States within each zone, according to population.

I think it would be entirely proper and in keeping with the act, in the event that any zone should not desire its full quota of maximum power stations, to divide such power among smaller powered stations within such zone, if there was a demand therefor.

On page 8 of your tentative plan, it is suggested that the Canadian shared channels should be used by the United States in Zone III, and a set-up accordingly is proposed. I respectfully dissent from this suggestion. If Canadian stations should employ high power on these channels, it would impair, if not destroy, their usefulness in the United States. While it would be proper to allocate a fair portion of these Canadian shared channels to Zone III, yet they should not be onerated with anything like all of them. Most of the western section of this country and all of the southern part of Zone V would be further removed from Canadian stations than would Zone III. Some sections of Zone III are nearer Canada than some of the States in Zone IV, and are substantially as near as the southern portions of Zones I and II.

Furthermore, in considering assignments to Zone III and the southern part of Zone V, consideration should be given to the channels being used in Mexico and Cuba. In fact, unless there is some definite agreement made between the United States and Mexico and Cuba along the line of the agreement with Canada, this is liable to become a disturbing factor.

No generally satisfactory result can be obtained without recognizing and dealing in a fair and scientific manner with the chain broadcasters. According to expressions of you gentlemen at the hearings, you recognize the importance and necessity of solving that problem in some manner. Chain programs should undoubtedly be made available in so far as practicable to those who desire to hear them, and yet they should not be given such assignments of wave lengths and power as will prevent the satisfactory broadcasting and reception of independent programs. High power is not needed for broadcasting chain programs except perhaps in the case of isolated stations. Furthermore, in spite of the statements of interested engineers to the contrary, chain programs can be successfully broadcast on the same wave length. It is certainly practical and feasible for the chain programs to be broadcast upon a very few wave lengths. Certainly their stations should not be permitted to broadcast chain programs on high power and each on a separate wave length; it would probably be proper to permit the broadcasting of chain programs on the maximum power in cases where such station is so far removed from other stations broadcasting the chain program that such power is required to send its program out to the listeners dependent upon such station for reception; where such high power is necessary, it should be granted to the stations nearest to the audience to be served. Stations broadcasting their chain programs should not be permitted to use more power than is necessary to serve the listeners within the area of such station who can not be satisfactorily served by other stations broadcasting the same chain program. In other words, even from the standpoint of getting the National Broadcasting Company chain program to the various sections of the country, there is no occasion for granting to such stations a monopoly of power or desirable and cleared channels, not to speak of the fact that such an allocation would deprive stations broadcasting independent programs of the share to which they are entitled, and which the public are entitled to hear. A proper limitation on power to be used by chain stations can be imposed either in the first instance, or at least when they are broadcasting chain programs.

In conclusion, I wish to repeat that the equalization amendment embraced in the recent radio act is constructive and not destructive. If such provision is carried into effect in accordance with its terms, purpose, and spirit, as I assume you gentlement are endeavoring to do, we will have a very much improved broadcast situation throughout the country. The equalization provision is workable

from a scientific standpoint, as well as from the standpoint of fairness and justice. As was well stated in last Sunday's issue of the New York Herald Tribune "there is general agreement here that the new law can eventually be worked out to the satisfaction of the entire country."

I wish to again express my appreciation of the invitation to submit any suggestions to your commission which might occur to me. The foregonig suggestions are given for your consideration, and I trust that they may be received in the spirit in which given.

Yours sincerely,

(Signed) EWIN L. DAVIS.

APPENDIX E (8)

Memorandum submitteed by broadcasters, manufacturers, and dealers at hearing on April 23, 1928

The Federal Radio Commission held an informal meeting Monday, April 23, 1928, in order to give broadcasters, radio manufacturers, and dealers an opportunity to present their views regarding changes in the broadcasting structure in keeping with the amendment to the radio act of 1927.

For its guidance the commission desired to get opinions on the subject from all thoughtful persons familiar with the radio problem. Several unable to attend the meeting submitted their views in writing.

The discussion was confined to basic principles as laid down by the amendment of the radio act of 1927, requiring equal distribution of radio facilities throughout the country, and had no bearing whatever on which stations should be selected for the new broadcasting structure. Merits of individual stations were not considered.

At that hearing representatives of the National Association of Broadcasters, the Radio Manufacturers' Association, and the Federated Radio Trades Association submitted the following memorandum:

"Through the courtesy of the Federal Radio Commission, we, the National Association of Broadcasters, the Federated Radio Trades Association, and the Radio Manufacturers' Association, hereby express our views regarding the difficult problems before the commission in an effort to assist in the solution of those problems. Committees representing the three associations met in Chicago on April 16, 17, and 18, first separately and later jointly, and unanimously agreed to the submission of the following memorandum:

"These three associations believe that the purpose of any reallocation of broadcasting licenses under the amended law is the ultimate establishment of conditions of interference free radio reception in which the maximum number of listeners throughout the Nation will have the maximum possible choice of broadcast program service with the maximum possible signal strength. Any steps which may be taken to comply with the requirements of the radio law as amended should look toward the establishment of such improved conditions with the minimum of delay.

"It appears in the present state of the art that the readjustment necessary to improve radio service and to comply with the radio law as amended should include as its ultimate goal a reduction in the number of stations.

"Although we realize that in making such a readjustment it is necessary to consider the problem as a whole because of the effect of stations on each other, nevertheless, the new allocations should be made so as to bring about at the outset as small a change in existing allocations as is consistent with the ultimate attainment for the listening public of such advantages as are possible within the limits of the existing law.

"We recognize that engineering advice is essential in the establishment of a comprehensive broadcasting plan. It is not our purpose, however, to discuss the plan which has been submitted by a committee of engineers, but realizing that there are other considerations which should be taken into account, we have prepared our observations to this end.

"Being in immediate contact with the economic and commercial aspects of the situation, we offer this memorandum from that viewpoint, not as a completely evolved plan but as a suggested method of procedure. This method contemplates the early establishment of a broadcasting system in conformity with the engineering basis which has been explained to the Federal Radio Commission.

"In order to comply with the radio law as amended in so far as it requires an equal distribution of broadcasting stations among the five zones there are, generally speaking, three typical methods of procedure:

"1. To take as the basis (or, to adopt a convenient term, 'common denominator') for such compliance a number of stations which would permit the maximum of heterodyne-free channels consistent with the varied requirements of service to the radio-receiving public; for example, 110 per zone, or a total of 550. This method would require the elimination of a large number of stations.

"2. To take as the common denominator one-fifth of the total number of station licenses, which, according to our information, is approximately 700 stations, or 140 stations per zone. This would permit the application of the 'borrowing clause' of the amendment to the detriment of the fourth zone only and to the advantage of the other four zones.

"3. To take as the common denominator the number of stations now licensed in the zone having the greatest number of stations, which, according to our information, is the fourth zone, with 208 stations. This would give the hypothetical total of 1,040 stations. This or any other plan contemplating an increase in the number of stations should not be considered for many reasons.

"We favor the second of the above methods of procedure, with an approach to the first, as best calculated to achieve the ideal ultimately to be realized, as soon as time and practical considerations permit. The outline of the first two methods of procedure is set forth in Exhibit A.

"In order to comply with the radio law as amended in so far as it requires an equal distribution of power among the five zones, the common denominator as to power for each zone should be not less than one fifth of the total power now authorized under existing licenses and construction permits. Any increase over this amount should be cautiously applied to stations on relatively cleared channels and in such manner as not to increase heterodyne interference.

"The application of the three common denominators to the existing situation is outlined in Exhibit B, the three common denominators being:

"1. Two hundred and fifty kilowatts for each zone.

"2. One-fifth of the total power now authorized under existing licenses for each zone.

"3. The maximum power now licensed in the zone having the largest allotment of power under existing licenses, which is approximately 218 kilowatts in the first zone.

"In order to comply with the radio law as amended in so far as it requires an equal distribution of frequencies the basis for equalization should be taken as the average of the present zone frequency assignments which, according to our information, is 66.

"Inasmuch as the existing frequency assignments naturally classify themselves into five groups, namely—

"Frequencies assigned to one zone only,
"Frequencies shared by two zones,
"Frequencies shared by three zones,
"Frequencies shared by four zones.
"Frequencies shared by five zones,

assignments of frequencies to zones should be based upon this classification.

"In making zone frequency assignments those existing assignments which are recognized as being outstanding in the public interest, convenience, and necessity should not be materially changed in the initial approach to the establishment of an ideal zone frequency equalization.

"Illustrative of the thought above expressed, a chart (Exhibit C) is submitted which shows an equal allocation of a number of existing assignments to each zone.

"As for the equalization of periods of operation between the five zones, it is our opinion that a maximum quota of hours of operation for each zone should be fixed at a point sufficiently high to take into consideration the maximum requirements of any one zone in the establishment of a character of service that is compatible with public interest, convenience, and necessity.

"It is our belief that the licenses of stations which persistently violate regulations covering the operation of stations should be revoked in accordance with the provisions of the Federal radio law.

"Respectfully submitted.

"THE NATIONAL ASSOCIATION OF BROADCASTERS.
"FEDERATED RADIO TRADES ASSOCIATION.
"RADIO MANUFACTURERS ASSOCIATION."

EXHIBIT A

Allocation of station licenses in accordance with the use of two typical "common denominators"

	Present	Using 140 as common denominator	Using 110 as common denominator
ZONE I			
Maine	3	4	3
New Hampshire	2	2	2
Vermont	2	2	1
Massachusetts	21	22	17
Connecticut	5	8	7
Rhode Island	9	4	3
New York	55	60	47
New Jersey	25	19	17
Delaware	1	1	1
Maryland	5	8	6
District of Columbia	3	3	2
Porto Rico	1	7	6
Virgin Islands	0	1	1
Total	132	141	113
ZONE II			
Pennsylvania	45	48	38
Virginia	12	13	10
West Virginia	4	8	7
Ohio	29	33	26
Michigan	21	25	20
Kentucky	3	13	10
Total	114	140	111
ZONE III			
North Carolina	4	15	11
South Carolina	1	9	6
Georgia	5	16	13
Florida	13	7	5
Alabama	5	13	10
Tennessee	17	12	10
Mississippi	3	9	7
Arkansas	4	10	8
Louisiana	13	27	21
Oklahoma	10	12	9
Total	75	130	100
ZONE IV			
Indiana	18	17	13
Illinois	67	39	31
Wisconsin	19	16	12
Minnesota	18	14	11
North Dakota	6	3	2
South Dakota	9	4	3
Iowa	24	13	10
Nebraska	17	8	6
Kansas	7	7	6
Missouri	25	19	15
Total	210	140	109
ZONE V			
Montana	6	9	7
Idaho	4	7	5
Wyoming	1	3	2
Colorado	16	13	10
New Mexico	2	5	4
Arizona	5	5	4
Utah	4	6	5
Nevada	0	1	1
Washington	23	20	15
Oregon	15	10	7
California	52	56	43
Hawaii	2	4	3
Alaska	3	1	1
Total	133	140	107

EXHIBIT B

Allocation of power in accordance with the use of three "common denominators"

	Present	250,000	138,000	218,000
FIRST ZONE				
Maine	5,350	7,000	3,860	6,100
New Hampshire	1,050	4,000	2,210	3,490
Vermont	110	3,250	1,795	2,830
Massachusetts	20,010	39,000	21,550	34,000
Connecticut	2,100	15,000	8,270	13,100
Rhode Island	2,150	6,250	3,450	5,450
New York	163,250	106,250	57,950	92,600
New Jersey	16,165	34,250	18,900	29,900
Delaware	100	2,000	1,105	1,745
Maryland	8,050	14,500	8,000	12,650
District of Columbia	1,150	5,000	2,760	4,360
Porto Rico	500	12,750	7,030	11,100
Virgin Islands	0	250	138	218
Total	217,985	249,500	137,018	217,543

Allocation of power in accordance with the use of three "common denominators"—Continued

	Present	250,000	138,000	218,000
SECOND ZONE				
Pennsylvania	59,575	86,000	47,500	75,900
Virginia	13,330	22,500	12,400	19,600
West Virginia	660	15,000	8,290	13,100
Ohio	27,595	59,250	32,700	51,600
Michigan	10,475	44,250	24,400	38,600
Kentucky	1,600	22,500	12,400	19,600
Total	113,235	249,500	137,690	218,400
THIRD ZONE				
North Carolina	12,350	26,000	14,350	23,650
South Carolina	90	16,500	9,100	14,400
Georgia	2,520	238,500	15,700	24,900
Florida	7,200	12,250	6,750	10,700
Alabama	1,325	23,000	12,700	20,500
Tennessee	22,990	22,250	12,290	19,400
Mississippi	825	16,000	8,730	13,950
Arkansas	1,865	17,250	9,520	15,050
Louisiana	6,330	17,500	9,650	15,250
Texas	19,815	48,500	22,600	42,300
Oklahoma	11,175	21,250	11,700	18,500
Total	86,485	249,000	133,090	218,600
FOURTH ZONE				
Indiana	9,565	30,250	16,700	27,600
Illinois	91,940	70,000	37,100	63,900
Wisconsin	7,985	28,000	15,450	25,500
Minnesota	12,295	25,750	14,200	23,500
North Dakota	1,230	6,000	3,310	5,470
South Dakota	2,595	6,500	3,590	5,930
Iowa	29,740	23,250	12,850	20,250
Nebraska	8,470	13,250	7,300	11,550
Kansas	5,000	12,750	7,050	11,100
Missouri	17,865	33,500	18,500	30,600
Total	186,830	249,250	136,040	225,400
FIFTH ZONE				
Montana	965	15,750	8,370	13,700
Idaho	5,310	11,750	6,750	10,250
Wyoming	500	5,250	2,790	4,580
Colorado	9,810	23,750	13,100	20,700
New Mexico	7,550	8,500	4,520	7,400
Arizona	965	10,000	5,320	8,720
Utah	5,600	11,500	6,120	10,000
Nevada	0	1,750	930	1,525
Washington	11,175	34,750	18,500	30,300
Oregon	6,950	19,750	9,450	15,450
California	33,760	98,500	52,400	86,000
Hawaii	750	6,500	3,460	5,660
Alaska	610	1,250	665	1,090
Total	83,960	249,000	132,375	215,375

EXHIBIT C

The following chart accompanied the proposal of the radio industry submitted Monday, April 23, to the Federal Radio Commission by the National Association of Broadcasters, Radio Manufacturers Association, and Federated Radio Trades Association:

Kilocycles	I	II	III	IV	V	Kilocycles	I	II	III	IV	V
550	2	0	X2	4	0	1,030	C0	0	0	0	0
560	X2	0	0	X1	1	1,040	2	2	X2	X2	1
570	X1	0	0	X2	X1	1,050	X1	0	1	4	X1
580	1	1	X3	0	1	1,060	1	X2	0	0	2
590	X1	0	0	X1	X1	1,070	X1	0	1	0	1
600	0	0	X2	0	0	1,080	0	X2	X1	1	X1
610	X1	0	0	0	X1	1,090	1	0	1	X2	X3
620	X1	1	2	X3	X2	1,100	X1	2	X1	3	5
630	0	0	X1	1	0	1,110	0	X2	3	X5	3
640	X1	0	0	0	X1	1,120	3	3	X2	3	1
650	X2	1	X2	X1	1	1,130	3	X1	X2	X1	0
660	X1	0	0	0	X1	1,140	2	X1	2	X3	4
670	0	0	0	X2	1	1,150	1	X4	0	2	X1
680	0	X3	0	1	X1	1,160	1	0	X2	6	0
690	C0	0	0	0	0	1,170	3	X2	0	X1	0
700	1	X1	0	0	0	1,180	3	X1	1	X5	1
710	X1	0	0	1	X1	1,190	0	1	X4	3	1
720	0	0	0	X2	0	1,200	0	X5	X5	4	X5
730	C0	0	0	0	0	1,210	4	4	X1	10	2
740	0	X2	0	X1	0	1,220	3	X2	1	4	5
750	0	X2	0	1	X2	1,230	3	1	X2	2	2
760	X3	0	X1	1	3	1,240	4	0	0	4	1
770	X1	0	0	X3	0	1,250	2	2	X3	4	1
780	1	2	X2	0	X1	1,260	1	X2	5	2	0
790	X1	0	0	1	0	1,270	3	X5	2	3	1
800	0	0	0	X1	X1	1,280	0	5	3	4	2
810	X2	0	0	1	X1	1,290	3	1	2	4	4
820	0	0	0	X2	X1	1,300	1	X5	3	2	4
930	0	X1	0	0	X2	1,310	1	1	5	X1	2
840	C0	0	0	0	0	1,320	3	X2	2	4	3
850	0	X1	0	1	X1	1,330	3	1	X2	2	2
860	1	X2	X1	0	X1	1,340	3	2	2	7	4
870	0	0	0	X2	2	1,350	0	3	1	5	1
880	0	0	X2	2	0	1,360	1	4	4	X3	3
890	0	0	X1	0	1	1,370	3	1	0	1	2
900	X2	0	X2	4	1	1,380	X2	0	0	5	2
910	C0	0	0	0	0	1,390	2	0	3	7	1
920	X2	0	0	0	X1	1,400	X2	4	0	2	2
930	2	X1	0	2	1	1,410	1	2	0	3	1
940	0	0	0	X3	0	1,420	5	2	1	1	1
950	0	X1	0	0	2	1,430	1	3	2	6	4
960	C0	0	0	0	0	1,440	1	2	0	8	1
970	X2	0	0	0	X1	1,450	5	2	3	1	1
980	1	0	0	X2	0	1,460	1	3	2	3	1
990	X1	0	1	1	1	1,470	5	1	1	8	0
1,000	0	X2	0	X1	1	1,480	0	X1	0	0	0
1,010	2	1	X3	1	1	1,490	4	1	0	4	1
1,020	X3	1	1	3	1	1,500	5	2	0	1	3

EXHIBIT CX

[Submitted by National Association of Broadcasters, Radio Manufacturers Association, and Federated Radio Trades Association, showing typical distribution of frequencies]

Kilocycles	Zone					Kilocycles	Zone				
	1	2	3	4	5		1	2	3	4	5
550	X		X		X	660	X				X
560	X			X	X	670				X	X
570	X			X		680		X	X		X
580 [1]	X	X	X		X	690 [2]					
590	X		X		X	700	X	X			
600 [1]		X	X			710	X			X	X
610	X				X	720				X	
620	X		X	X		730 [2]					
630 [1]			X	X		740		X		X	
640	X				X	750		X		X	X
650		X	X			760	X		X	X	X

[1] Canadian shared.

[2] Canada.

Kilocycles	Zone					Kilocycles	Zone				
	1	2	3	4	5		1	2	3	4	5
770	X			X		1,150	X	X		X	X
780 [1]	X	X			X	1,160		X	X	X	
790	X		X			1,170	X	X	X	X	
800				X	X	1,180	X		X	X	X
810	X		X	X		1,190		X	X	X	X
820				X	X	1,200		X	X	X	X
830		X			X	1,210 [1]	X	X	X	X	X
840 [2]						1,220	X	X	X	X	X
850		X		X	X	1,230	X	X	X	X	X
860	X	X	X		X	1,240	X	X	X		X
870				X	X	1,250	X	X	X	X	X
880 [1]			X	X		1,260	X	X	X	X	
890 [1]		X	X			1,270	X	X	X	X	X
900	X		X	X	X	1,280		X	X	X	X
910 [2]						1,290	X	X	X	X	X
920	X				X	1,300	X	X	X	X	X
930 [1]	X	X		X	X	1,310	X	X	X	X	X
940				X	X	1,320	X	X	X	X	X
950		X			X	1,330	X	X	X	X	X
960 [2]						1,340	X	X	X	X	X
970	X				X	1,350		X	X	X	X
980	X			X		1,360	X	X	X	X	X
990	X		X	X	X	1,370	X	X		X	X
1,000	X	X		X		1,380	X	X	X		X
1,010 [1]	X	X	X	X	X	1,390	X		X	X	X
1,020	X	X	X	X	X	1,400	X	X		X	X
1,030 [2]						1,410	X	X	X	X	X
1,040	X	X	X	X	X	1,420	X	X	X	X	X
1,050	X		X	X	X	1,430	X	X	X	X	X
1,060			X	X	X	1,440	X	X		X	X
1,070	X	X	X			1,450	X	X	X	X	X
1,080		X	X	X	X	1,460	X	X	X	X	X
1,090	X	X	X	X		1,470	X	X	X	X	
1,100	X	X	X	X	X	1,480		X	X		
1,110		X	X	X	X	1,490	X	X	X	X	X
1,120 [1]	X	X	X	X	X	1,500	X	X	X	X	X
1,130	X	X	X	X							
1,140	X	X	X	X	X	Total	64	60	63	70	69

[1] Canadian shared. [2] Canada.

APPENDIX E (9)

Suggestions of Louis B. F. Raycroft, vice president of the National Electrical Manufacturers Association, made to the commission on April 23, 1928

Two weeks ago, at the invitation of this commission, I came to Washington, on behalf of the radio manufacturers in the National Electrical Manufacturers Association, to be present at the presentation and discussion of a plan for the reallocation of broadcasting stations, which had been submitted by a group of engineers. At that time I was impressed with the necessity of giving the proposed plan careful study from the commercial standpoint, and so suggested to the commission. Since then I have been able to obtain the views of many of the executives of radio companies, particularly those engaged in the manufacture of receiving sets. I have also had the opportunity to personally review the engineers' plan in detail, and I now offer the following comments.

In the first place, I want to say that the commercial interests recognize very fully the great difficulties, technical, practical, and legal, with which the commission is confronted in discharging its obligations to the public and the industry under the amended Federal radio act. The commission may be assured of the earnest support of every responsible interest in the radio industry in successfully resolving these difficulties.

The engineers' plan as submitted to the commission involves certain fundamental ideas which appeal to every one of us as being entirely reasonable and not subject to any vital disagreement. It sets up, for example, a definite objective of interference-free radio transmission and reception, equitably distributed throughout the country, under the specific restrictions of the amended act. It recognizes the desirability of providing exclusive channels for a number of sta-

tions, able and willing to accept and discharge the large responsibilities which such privileges would incur. Again, it accepts the principle that other stations must be content with an allocation under which their signals will not be interference free, except within restricted areas.

It is in the process of working toward the agreed objective that room is found for helpful suggestions to the commission. I am sure, for example, that a decision to attempt to immediately reach the stated objective would defeat its own purpose. The present broadcasting situation is so widely different that a wisely planned progressive program is the only means through which success may be made certain. An examination of the existing situation will provide the foundation on which to build a program. Of the 693 broadcasting stations in the country to-daly, we find 127 occupying 66 channels in zone 1, 119 on 34 channels in zone 2, 103 on 51 channels in zone 3, 210 on 74 channels in zone 4, and 134 on 71 channels in zone 5. While these figures are by no means equal, yet they permit of equalization without too great difficulty, provided the earlier adjustments of number be reasonably balanced with the other factors involved.

In the equalization there are four distinct problems stated in the amendment—equality in the number of licenses, equality in the number of channels, equality in the allotment of time, and equality in station power, between the five zones, and in proportion to the population of the States within the zones. Obviously, the most difficult of these problems is the equality in the number of channels, and it is equally apparent that your program should first provide equality between the zones, before any attempt is made to establish proportionality to State populations within the zones. I can not pass this point without noting with great regret the unfortunate inequality made compulsory by the amendment, under which, for example, Texas, with a population of 5,400,000 and an area of over 225,000 square miles, is granted only 3.9 per cent of the national total of channels, licenses, power, and time, while California, with only 4,433,000 population and less than 159,000 square miles, is granted the surprising total of 8.2 per cent of the entire national radio facilities. And it is not as though this was the only unjust discrepancy under an act which pretends to establish equality of broadcasting service. The State of Washington, with less than 1,600,000 population, is granted over 2.8 per cent, while Tennessee, with its much larger population of over 2,480.000, is granted less than 1.8 per cent. And so on.

Not only is the problem of equality in the number of channels the most difficult but from the viewpoint of improving broadcasting service it is the most important. From a practical angle the reallocation of channels is the principal and immediate method by which conditions can be improved. I beg to submit, therefore, the following specific suggestions:

1. An examination of the existing allocations indicates quite clearly that 28 of the 39 stations now authorized to use 5 kilowatts or more are of a character to justify their being considered for exclusive channels. These 28 stations are on channels which could be cleared without great difficulty. There appears to be no present basis for clearing more than this number of channels. Let us say, then, that the first step is to clear these channels, leaving these 28 stations on their present assignments.

2. These 28 stations should be permitted, perhaps even urged, to immediately increase their power to the maximum now employed by any of them in order that they may serve the greatest possible number of listeners.

3. If there are other existing stations not now considered suitable for exclusive channels but which demand such channels, as they can probably be accommodated on the channels to which they are now assigned, perhaps with slightly greater difficulty. In any event if they are found capable of delivering the required service construction permits should be issued and arrangements made to provide a cleared channel when they are ready.

4. In clearing the original 28 channels it will be necessary to reallocate approximately 58 stations. (It is to be noted that since these stations can not be moved geographically, moving them to new channels will not change zone or State quotas of channels, powers, or number of stations.) The commission should invite any station which must be moved in order to clear a channel and which is in a State now having too many stations or too many channels to discontinue operation voluntarily. Some will comply with this request, and thus reduce the number of channels and licenses in excess of legal quotas.

5. Some stations will refuse to comply with such a request. If their demand to be permitted to continue seems to be justified, then they should be accom-

modated on some other channel. This should be done by assigning them to a channel now used in the same State but occupied by a more recent licensee, or one giving the poorest service, deviating from frequency, or otherwise obviously the weakest station. If no such station can be found, then the station to be moved must be inserted in a channel with others on divided time.

6. The 28 stations above referred to occur as follows: I, 5; II, 5; III, 4; IV, 10; V, 3. Zones I, II, III, and V will be entitled to additional cleared channels if it is considered necessary to equalize the cleared channels by zones. The commission should let it be known that these zones can have these additional cleared channels when they can justify them.

7. Of the 90 American channels, after the twenty-eight-odd cleared channels have been deducted, there remain approximately 60, subject to further reduction as time goes on. These 60 channels are for the lower-powered nonexclusive services, which in the present state of the art can not be strictly heterodyne free, except in their local service areas. These should be so adjusted as to equalize the heterodyne interference in all parts of the country, or, in other words, so as to give each station the maximum possible local service area. This is to be done (*a*) by requiring that stations occupying the same channel shall have equal power; (*b*) establishing a minimum distance between stations of each class of power; and (*c*) determining from the stations now assigned to each such channel what the power (and spacing) for that channel is to be in order to require the minimum change in existing assignments. In some cases it will be desirable to allow or require a station to increase its power in order to avoid changing its channel. The 60 nonexclusive channels should be classified on the above basis and the stations reassigned accordingly.

8. The next and final step will be to refuse to relicense stations which still represent too much power to a State, too many licenses to a State, or too many channels to a State. The stations to be thus discontinued should be those obviously least desirable or those in areas otherwise well served under the limitations of the law. The only alternative is to establish a single channel in the higher frequencies to which such stations may be transferred.

It will be apparent that I have given here only a brief outline of the program which I suggest for your consideration, and yet I believe that the essential features of a program that will meet with support from every interested group have been clearly pointed out. In closing let me state again the absolute necessity for building the new structure out of the present structure. No drastic step to sweep the board clean and start anew can be expected to succeed.

APPENDIX E (10)

Discussion of proposals by Dr. J. H. Dellinger

AT THE FEDERAL RADIO COMMISSION HEARING OF APRIL 23, 1928

A number of the discussions offered at the hearing indicated that there has not been adequate understanding of the recommendations submitted to the Federal Radio Commission by the April 6 conference of engineers. This is particularly true of the proposals on broadcast allocations presented by the National Association of Broadcasters, the Radio Manufacturers' Association, etc. The recommendations made by these organizations did not constitute a definite plan. They set forth certain considerations but did not give a procedure for making the necessary allocations of broadcast stations under the radio act of 1928. These proposals will be referred to herein as the "broadcasters' plan."

The broadcasters' plan took definite and detailed account of only two of the four elements which must be equalized under the law, and (what is much more serious) took no account of the relations between these elements. These elements are frequencies, number of licenses, power, and time. It is only as you come to the relations between the four elements that you reach either the difficulties of the situation or its possibilities. For example, the interrelation between frequency and power is the heart of the problem. It is only by proper adjustment of these two factors with due regard to geographical separations that there can be any hope of reducing interference and making any material improvement in the present chaotic situation. The broadcasters' plan was

devoted largely to illustrative divisions of number of licenses and power. In neglecting the first element, frequency, they sidestepped the real problem. In neglecting time division they overlooked the one possible means of retaining the present number of stations in an allocation which would be relatively free from destructive interference.

With their emphasis upon the possibilities of borrowing licenses and power between States and zones, it was apparent that the broadcasters' plan seeks mainly the retention of the status quo. It is only natural that broadcasters should have their thoughts primarily filled with questions of licenses and of power. Their plan presented little beyond obvious calculations as to rearrangements among States on the basis of various illustrative numbers of licenses and amounts of power. The only definite recommendations were a declaration (1) that approximately 700 stations should be provided for, (2) that the average power should be maintained at some figure at least equal to the present amount, and (3) that the number of changes made in the initial establishment of the new allocation should be kept a minimum. This plea for the status quo was doubtless conceived in a spirit of helpfulness based on a fear of litigations and of changes whose value might not be demonstrable in advance. It nevertheless reveals a serious, and almost total, lack of understanding of the import of the April 6 recommendations of the engineers.

Fortunately the broadcasters' plan contains a proviso that the engineers' recommendations should be followed as far as practicable. They can be followed in full and still bring about the aims covered by the three definite recommendations of the broadcasters' plan just mentioned. Thus they can meet all the aims of the broadcasters and give them much more in addition. To clear up the present situation, eliminating the station assignments which introduce serious conflicts with the engineers' recommendations, would require a much less radical disruption of the present broadcast situation than is commonly thought. While the three definite aims included in the broadcasters' plan can thus be met, there are some features of their presentation which must be discarded, unless the idea of improvement in the broadcasting situation is abandoned. One of these is the idea of extensive borrowing, where the number of licenses, amount of power, etc., in various States or zones are materially different from the present situation. Such borrowing would increase interference and, furthermore, would be contrary to the law, except on a mere temporary basis. The division into five classes of power included in the broadcasters' plan is furthermore without justification and can not lead to an allocation as free from interference as the three classes of power included in the engineers' recommendations.

The engineers did not present essentially a "plan." They presented considerations or principles which underlie the broadcast allocation and certain recommendations that offer the best application of them that it is possible to work out.

The fatal weakness of the broadcasters' plan in so far as it differs from the engineers' recommendations was revealed by the answer to a question put to one of its proponents during the hearing. The question was asked as to what service could be expected outside of the so-called service area of each station under the plan. The reply was that no service could be expected at a distance and that the plan considered only the local service area around each station. This admits that the plan is no improvement, and claims to be none, over the present situation. Those persons living at points remote from radio stations could expect no service under this plan, just as at present. It is just here that the engineers' recommendations are distinct from any other plans which have been recommended in that the maximum possibility of avoiding heterodyne interference, and thus giving some service at considerable distances beyond the local-service area of each station is provided.

The broadcasters' plan sidesteps entirely the question as to the degree of simultaneous operation of the various stations. This again prevents this plan from being given any serious consideration, for simultaneous operation of several stations on a channel is the crux of the whole problem. Assuming that the plan contemplates all 700 stations operating simultaneously, reference to the data presented by the engineers on April 6 and to the report of the American Engineering Council of March 30, 1927, shows that destructive interference would result. This is particularly true because of the large number of stations crowded into the two smallest zones, Nos. 1 and 2.

Perhaps the chief point of the engineers' recommendations which has been overlooked is the outstanding importance of providing not less than 50 exclu-

sive channels, together with the fact that very much more power can be used on exclusive channels than on shared channels. It is only on exclusive channels that listeners at a distance can receive service. The rural population of the country will be heavily discriminated against unless a large number of exclusive channels are provided. Furthermore, when channels are exclusive there is no necessity of holding their power down to any particular limit. While the engineers' recommendations stated that the limit for the exclusive channels might be 50 kilowatts at the present time, the only power limit need be that fixed by the production of interchannel interference. In other words, it is contemplated that with improvements in the radio art the power used on the exclusive channels may be increased without limit, thus increasing service to the rural population. On this account the recommendation in the broadcasters' plan that power be limited to 10 kilowatts would unnecessarily reduce the service which might be secured under the best broadcast allocation.

In reference to time division, while the engineers' recommendations pointed out its inherently uneconomic character and the difficulties of employing it under the law, they recognized that there will be conditions demanding and even justifying time division. Assuming time divisions aggregating the use of half time by every class B and class A station, and no time divisions for class C stations, there could be a total of 50 class C, 180 class B, and 400 class A stations under the engineers' recommendations, a total of 630 stations. There would, of course, be some class B stations operating on full time, but there are many cases where local conditions make a station operate on very much less than half time, so an average arrangement of half-time operation could in fact be worked out.

Several speakers at the hearing emphasized that engineering considerations are not the only ones involved, and that other matters, financial problems, local conditions, etc., make some of the engineering recommendations impracticable. While it is true that the problem of broadcast allocation is too complex to be solved by straight engineering calculation, nevertheless its solution can not be right if it disregards any valid engineering principle. An engineering principle is nothing but an organized body of facts affecting a practical situation. An engineering program is a program in which the results of a future practical situation are predetermined from an organized body of facts. The engineers' recommendations regarding broadcast allocations represent the best available organized body of pertinent facts. Any allocation which proceeds counter to the sound principles included in these recommendations will reduce the advantage which the people of the United States could secure in the new allocation.

The fact is, the few objections which have been made to the engineers' recommendations and the occasional accusation of impracticability reveal merely a lack of comprehension of them and a fear that they will lead to a complete upheaval of all the present broadcasting structure. Some study indicates that a relatively minor disturbance of the present structure can produce a considerable degree of conformity to the engineers' recommendations and an astonishing improvement in the broadcast service available to the listeners. It is not to be supposed that the commission will neglect the opportunity, the duty, to make the necessary changes to bring about a tangible betterment of the situation.

Another objection to the engineers' recommendations from the practical viewpoint has been the accusation that it is difficult to convert it from a mere set of statements into a specific allocation. This is far from the truth. The commission has only to determine which of the available 90 channels are to be assigned to each of the three classes of stations, and a little calculation gives a table of the frequencies, power, etc., available to each State. This having been done, the task of the commission becomes a judicial one. Through a hearing held in each State, or some other procedure, decisions will have to be reached as to which stations are entitled to utilize the broadcasting channels available.

It is believed that broadcasters and others will be more ready to advocate the engineers' recommendations when they understand that they can be put into effect without the feared complete destruction of the present broadcasting set-up. The broadcasters, in fact, are likely to be the principle advocates of the recommendations when they become aware of the superior service their stations can render under a sound engineering allocation.

APPENDIX E (11)

Tabulation of percentages of radio facilities assignable to each State, based on 1928 population estimate of the United States Census Bureau

Experts employed by the commission made the following tabulation showing the percentages of radio facilities assignable to each State, under the 1928 "Equitable allocation" clause of the radio act, based upon estimates of 1928 population prepared by United States Census Bureau, which gives the total population of the United States as 121,649,342:

First zone

Commissioner, O. H. Caldwell

State	Population	Per cent	State	Population	Per cent
Maine	795,000	0.581	Delaware	244,000	0.178
New Hampshire	456,000	.333	Maryland	1,616,000	1.180
Vermont	352,428	.258	District of Columbia	552,000	.403
Massachusetts	4,290,000	3.135	Porto Rico	1,299,809	.947
Connecticut	1,667,000	1.218	Virgin Islands	26,051	.019
Rhode Island	716,000	.524			
New Jersey	3,821,000	2.795	Total	27,385,288	20.000
New York	11,550,000	8.441			

Second zone

Commissioner, Ira E. Robinson

State	Population	Per cent	State	Population	Per cent
Pennsylvania	9,854,000	7.010	Michigan	4,591,000	3.263
Virginia	2,575,000	1.830	Kentucky	2,553,000	1.830
West Virginia	1,724,000	1.227			
Ohio	6,826,000	4.855	Total	28,123,000	20.000

Third zone

Commissioner, E. O. Sykes

State	Population	Per cent	State	Population	Per cent
North Carolina	2,938,000	2.091	Arkansas	1,944,000	1.385
South Carolina	1,864,000	1.328	Louisiana	1,950,000	1.389
Georgia	3,203,000	2.283	Texas	5,487,000	3.900
Florida	1,411,000	1.012	Oklahoma	2,426,000	1.720
Alabama	2,573,000	1.835			
Tennessee	2,502,000	1.782	Total	28,088,618	20.000
Mississippi	1,790,618	1.275			

Fourth zone

Commissioner, Sam Pickard

State	Population	Per cent	State	Population	Per cent
Indiana	3,176,000	2.372	Iowa	2,428,000	1.814
Illinois	7,396,000	5.530	Nebraska	1,408,000	1.053
Wisconsin	2,953,000	2.208	Kansas	1,835,000	1.372
North Dakota	641,192	.479	Missouri	3,523,000	2.638
Minnesota	2,722,000	2.039			
South Dakota	704,000	.526	Total	26,786,192	20.000

Fifth zone

Commissioner, H. A. Lafount

State	Population	Per cent	State	Population	Per cent
Montana	548,889	0.975	Washington	1,587,000	2.818
Idaho	546,000	.970	Oregon	902,000	1.602
Wyoming	247,000	.438	California	4,556,000	8.200
Colorado	1,090,000	1.935	Territory of Hawaii (1920)	255,912	.453
New Mexico	396,000	.703	Alaska (1920)	55,036	.0983
Arizona	474,000	.842			
Utah	531,000	.933	Total	11,266,244	20.000
Nevada	77,407	.137			

APPENDIX F (1)

List of portable stations deleted by General Orders No. 30, dated May 10, 1928, and No. 34, dated May 25, 1928

Zone No. 1

The Edison Electric Illuminating Co. of Boston, radio station WATT.
Atlantic Broadcasting Corporation, radio stations WRMU and WGMU.
Charles H. Messter, radio station WCBR.

Zone No. 2

Harl Smith, radio station WOBR.

Zone No. 3

None.

Zone No. 4

C. L. Carrell, radio stations WKBG, WIBM, WIBJ, WHBM, and WBBZ.
Brant Radio Power Co., radio station KGFO.

Zone No. 5

Jay Peters, radio station KGGM.
Flying Broadcasters (Inc.), radio station KFBI.

APPENDIX F (2)

Letter to and list of stations included in General Order No. 32, issued May 25, 1928

Accompanying the General Order 32, Chairman Robinson sent to each broadcaster on the list the following letter:

"MAY 25, 1928.

"DEAR SIR: Please note copy of attached Order No. 32 in which the commission has extended your present license for a period of 60 days. From an examination of your application for future license it does not find that public interest, convenience, or necessity would be served by granting it. The commission has fixed the date for hearing on this application on July 9, at 10 o'clock a. m., in its offices at Washington, D. C.

"At this hearing, unless you can make an affirmative showing that public interest, convenience, or necessity will be served by the granting of your application, it will be finally denied."

List of stations to receive a copy of General Order No. 32 and the accompanying letter, arranged by zones:

Zone No. 1

New Jersey Broadcasting Corporation, radio station WIBS, Elizabeth, N. J.
WBMS Broadcasting Corporation, radio station WBMS, Union City, N. J.
Standard Cahill Co. (Inc.), radio station WKBQ, New York, N. Y.
Camith Corporation, radio station WKBO, Jersey City, N. J.
Amateur Radio Specialty Co., radio station WSGH–WSDA, Brooklyn, N. Y.
William H. Reuman, radio station WWRL, Woodside, N. Y.
May Radio Broadcast Corporation, radio station WGCP, Newark, N. J.
John H. Brahy, radio station WLBX, Long Island City, N. Y.
Joseph J. Lombardi, radio station WLBH, Farmingdale, N. Y.
Radiotel Manufacturing Co., radio station WINR (formerly WRST), Bay Shore, N. Y.
Bronx Broadcasting Co., radio station WHPP, Englewood Cliffs, N. J.
Browning Drake Corporation, radio station WLBM, Cambride, Mass.
Stanley N. Read, radio station WRAH, Providence, R. I.
Technical Radio Laboratory, radio station WTRL, Midland Park, N. J.
Bliss Electrical School, radio station WBES, Takoma Park, Md.
Harry Leonard Sawyer, radio station WRES, Quincy, Mass.
A. H. Waite & Co. (Inc.), radio station WAIT, Taunton, Mass.
Fred B. Zittell, jr., radio station WIBI, Flushing, N. Y.
William S. Pote, radio station WRSE, Chelsea, Mass.
Danbury Broadcasting Station, radio station WCON, Danbury, Conn.
Concourse Radio Corporation, radio station WPCH, Hoboken, N. J.
Robert S. Johnson, radio station WJBI, Red Bank, N. J.
Titus-ets Corporation, radio station WOKT, Binghamton, N. Y.
Peter J. Prinz, radio station WMRJ, Jamaica, N. Y.
Bremer Broadcasting Corporation, radio station WAAT, Jersey City, N. J.
Westchester Broadcasting Corporation, radio station WCOH, Greenville, N. Y.
Brooklyn Broadcasting Corporation, radio station WBBC, Brooklyn, N. Y.
United States Broadcast Corporation, radio station WCGU, Coney Island, N. Y.
Arthur Faske, radio station WCLB, Long Beach, N. Y.
Debs Memorial Radio Fund, radio station WEVD, Woodhaven, N. Y.
International Broadcasting Corporation, radio station WGL, Secaucus, N. J.
Paul J. Gallhofer, radio station WMBQ, Brooklyn, N. Y.
Italian Educational Broadcasting, radio station WCDA, Cliffside Park, N. J.
Jacob Conn, radio station WCOT, Providence, R. I.
Hotel Chateau, radio station WCBM, Baltimore, Md.
Massachusetts Educational Society, radio station WMES, Boston, Mass.

Zone 2

W. F. Jones Broadcasting (Inc.), radio station WFJC, Akron, Ohio.
Louis G. Baltimore, radio station WBRE, Wilkes-Barre, Pa.
W. P. Williamson, jr., radio station WKBN, Youngstown, Ohio.
Aimone Electric, radio station WLBY, Iron Mountain, Mich.
Rev. John W. Sproul, radio station WMBJ, McKeesport, Pa.
Cleveland Radio Broadcasting Corporation, radio station WJAY, Cleveland, Ohio.
Ernest F. Goodwin, radio station WJBK, Ypsilanti, Mich.
Howard R. Miller, radio station WIAD, Philadelphia, Pa.
College of Wooster, radio station WABW, Wooster, Ohio.
Macks' Battery Co., radio station WMBS, Lemoyne, Pa.
C. R. Cummins, radio station WRAK, Erie, Pa.
Verne & Elton Spencer, radio station WGM, Jeannette, Pa.
Youngstown Broadcasting Co. (Inc.), radio station WMBW, Youngstown, Ohio.
Stanley M. Krohn, radio station WSMK, Dayton, Ohio.
J. H. Thompson, radio station WQBZ, Weirton, W. Va.
Petoskey High School, radio station WBBP, Petoskey, Mich.
Berachah Church (Inc.), radio station WRAX, Philadelphia, Pa.
William F. Gable Co., radio station WFBG, Altoona, Pa.

Ruffner Junior High School, radio station WBBW, Norfolk, Va.
Grace Covenant Presbyterian Church, radio station WBBL, Richmond, Va.
W. Reynolds & T. J. McGuire, radio station WTAZ, Chesterfield Hills, Va.
Markle Broadcasting Corporation, radio station WABF, Kingston, Pa.
Keystone Broadcasting Co. (Inc.), radio station WFAN, Philadelphia, Pa.
Ray W. Waller, radio station, WEBE, Cambridge, Ohio.
Foulkrod Radio Engineering Co., radio station WFKD, Frankford, Pa.
Braun's Music House, radio station WBMH, Detroit, Mich.
Havens and Martin (Inc.), radio station WMBG, Richmond, Va.
K. L. Ashbacker, radio station WKBZ, Ludington, Mich.
St. John's Catholic Church, radio station WHBC, Canton, Ohio.
J. Magaldi, jr., radio station WABY, Philadelphia, Pa.
Park View Hotel, radio station WFBE, Cincinnati, Ohio.

Zone 3

None.

Zone 4

Frederick A. Trebbe, jr., radio station WLBO, Galesburg, Ill.
Wm. Gushard Dry Goods Co., radio station WJBL, Decatur, Ill.
American Bond & Mortgage Co., radio station WMBB-WOK, Homewood, Ill.
James L. Bush, radio station WDZ, Tuscola, Ill.
Carthage College, radio station WCAZ, Carthage, Ill.
The Liberty Weekly (Inc.), radio station WLIB, Chicago, Ill.
J. A. Kautz, (Kokomo Tribune) radio station WJAK, Kokomo, Ind.
Donald A. Burton, radio station WLBC, Muncie, Ind.
Harold L. Dewing and Charles Messter, radio station WCBS, Springfield, Ill.
Wenona Legion Broadcasters, radio station WLBI, Wenona, Ill.
Knox College, radio station WFBZ, Galesburg, Ill.
James Milliken University, radio station WBAO, Decatur, Ill.
Illinois Stock Medicine Broadcasting Corporation, radio station WTAD, Quincy, Ill.
Great Lakes Radio Broadcasting Corporation, radio station WBCN, Chicago, Ill.
Knox Battery & Electric Co., radio station WKBV, Brookville, Ind.
Harold Wendell, radio station WLBT, Crown Point, Ind.
Michael T. Rafferty, radio station WNBA, Forest Park, Ill.
Beardsley Specialty Co., radio station WHBF, Rock Island, Ill.
Victor C. Carlson, radio station WEHS, Evanston, Ill.
Illinois Broadcasting Corporation, radio station WTAS, Elgin, Ill.
Tate Radio Co., radio station WEBQ, Harrisburg, Ill.
D. H. Lentz, jr., radio station WJBA, Joliet, Ill.
E. Dale Trout, radio station WLBQ, Atwood, Ill.
Williams Hardware Co., radio station WTAX, Streator, Ill.
Westinghouse Electric & Manufacturing Co., radio station KFKX, Chicago, Ill.
Emil Denemark (Inc.), radio station WEDC, Chicago, Ill.
World Battery Co. (Inc.), radio station WSBC, Chicago, Ill.
Maurice Mayer, radio station WPEP, Waukegan, Ill.
Goodson & Wilson (Inc.), radio station WIIFC, Chicago, Ill.
Lombard College, radio station WRAM, Galesburg, Ill.
Sanders Bros., radio station WKBB, Joliet, Ill.
Peoria Heights Radio Laboratory, radio station WMBD, Peoria Heights, Ill.
Permil N. Nelson, radio station WKBS, Galesburg, Ill.
Hummer Furniture Co., radio station WJBC, La Salle, Ill.
Fred L. Schoenwolf, radio station WKBI, Chicago, Ill.
W. C. L. S. (Inc.), radio station WCLS, Joliet, Ill.
Francis K. Bridgman (Inc.), radio station WFKB, Chicago, Ill.
Lane Technical High School, radio station WLTS, Chicago, Ill.
Calumet Broadcasting Co., radio station WQJ, Chicago, Ill.
Zenith Radio Corporation, radio station WSAX, Chicago, Ill.
Roland G. Pamler & Anthony Coppotelli, radio station WJBZ, Chicago Heights, Ill.
Clinton R. White, radio station WCRW, Chicago, Ill.

The Radio Club (Inc.), radio station WRAF, La Porte, Ind.
Dr. George F. Courrier, radio station WWAE, Hammond, Ind.
Albert C. Dunkel, radio station KGFB, Iowa City, Iowa.
Penn College, radio station KFHL, Oskaloosa, Iowa.
Central Radio Co., radio station KPNP, Muscatine, Iowa.
Atlantic Automobile Co., Red Oak Radio Corporation, lessee, radio station KICK, Red Oak, Iowa.
First Methodist Episcopal Church, radio station KFVG, Independence, Kans.
Dr. C. S. Stevens, radio station WMBE, White Bear Lake, Minn.
Harry O. Iverson, radio station KFDZ, Minneapolis, Minn.
Hegstad Radio Co., radio station KGHC, Slayton, Minn.
Kingshighway Presbyterian Church, radio station WMAY, St. Louis, Mo.
Wilson Duncan Broadcasting Co., radio station KWKC, Kansas City, Mo.
Chester W. Keen, radio station WCWK, Fort Wayne, Ind.
Morningside College, radio station KFMR, Sioux City, Iowa.
Charles W. Greenley, radio station KGCA, Decorah, Iowa.
Harry F. Paar, radio station KWCR, Cedar Rapids, Iowa.
Poling Electric Co., radio station WIAS, Ottumwa, Iowa.
Western Union College, radio station KWUC, Le Mars, Iowa.
Concordia Broadcasting Co., radio station KGCN, Concordia, Kans.
Fred W. Herrmann, radio station KGEQ, Minneapolis, Minn.
Times Publishing Co. (Inc.), radio station WFAM, St. Cloud, Minn.
The Principia, radio station KFQA, St. Louis, Mo.
St. Louis Truth Center (Inc.), radio station KFWF, St. Louis, Mo.
Foster-Hall Tire Co., radio station KGBX, St. Joseph, Mo.
Omaha Board of Education, radio station KFOX, Omaha, Nebr.
Ervin Taddiken, radio station KGBY, Columbus, Nebr.
The Farmers & Merchants Cooperative Radio Corporation of America, radio station KGCH, Wayne, Nebr.
Frank J. Rist, radio station KGDW, Humboldt, Nebr.
Federal Live Stock Remedy Co., radio station KGBZ, York, Nebr.
Cutler's Radio Broadcasting Service (Inc.), radio station KGCR, Brookings, S. Dak.
Home Auto Co., radio station KGDA, Dell Rapids, S. Dak.
Callaway Music Co., radio station WKBH, LaCrosse, Wis.
The Electric Farm, radio station WIBU, Poynette, Wis.
Capital Times-Strand Theater Station, radio station WIBA, Madison, Wis.
C. E. Whitmeer, radio station WCLO, Kenosha, Wis.
Irving Zuelke (Inc.), radio station WAIZ, Appleton, Wis.
Central Radio Electric Co., radio station KGES, Central City, Nebr.
Otto F. Sothman, radio station KGFW, Ravenna, Nebr.
Hotel Yacey, radio station KGEO, Grand Island, Nebr.
R. J. Rockwell, radio station WNAL, Omaha, Nebr.
Radio Electric Co., radio station KDLR, Devils Lake, N. Dak.
J. Albert Loesch, radio station KGDY, Oldham, S. Dak.
Edward A. Dato, radio station WKDR, South Kenosha, Wis.
Beloit College, radio station WEBW, Beloit, Wis.
Fond du Lac Commonwealth Reporter, radio station KFIZ, Fond du Lac, Wis.
St. Norbert's College, radio station WHBY, West de Pere, Wis.
Mikadow Theater (Francis M. Kadow), radio station WOMT, Manitowoc, Wis.
Evening Wisconsin Co., radio station WGWB, Milwaukee, Wis.
Henry Haraldson & Carl Thingstad, radio station KGFN, Aneta, N. Dak.

Zone No. 5

Los Angeles County Forestry Department, radio station KFPR, Los Angeles, Calif.
Dr. L. L. Sherman, radio station KFUS, Oakland, Calif.
E. F. Peffer, radio station KGDM, Stockton, Calif.
Koos Radio Sales & Service (Inc.), radio station KOOS, Marshfield, Oreg.
University of Utah, radio station KFUT, Salt Lake City, Utah.

APPENDIX F (3)

Analysis of stations by zones and States showing number that were included in General Order No. 32, issued May 25, 1928

Zone and State	Number of stations	Stations sent General Order No. 32
FIRST ZONE		
Maine	3	0
New Hampshire	3	0
Vermont	2	0
Rhode Island	7	2
Massachusetts	19	5
Connecticut	6	1
New York	49	15
New Jersey	26	12
Delaware	1	0
Maryland	5	[1] 2
District of Columbia	3	0
Porto Rico	1	0
Total	124	37
Portable	4	0
Grand total	128	37
SECOND ZONE		
Pennsylvania	44	12
Virginia	12	4
Ohio	28	9
West Virginia	5	1
Michigan	19	5
Kentucky	3	0
Total	111	31
Portable	1	0
Grand total	112	31
THIRD ZONE		
Alabama	5	0
Florida	12	0
Georgia	5	0
South Carolina	2	0
North Carolina	6	0
Tennessee	16	0
Texas	33	0
Louisiana	13	0
Mississippi	5	0
THIRD ZONE—continued		
Arkansas	8	0
Oklahoma	10	0
Total	115	0
FOURTH ZONE		
Illinois	59	38
Indiana	18	7
South Dakota	9	3
North Dakota	6	2
Nebraska	17	9
Wisconsin	20	11
Iowa	24	9
Kansas	9	2
Minnesota	16	5
Missouri	22	5
Total	200	91
Portable	6	0
Grand total	206	91
FIFTH ZONE		
California	50	3
Colorado	16	0
Oregon	15	1
Washington	23	0
Idaho	4	0
Arizona	5	0
New Mexico	2	0
Nevada	0	0
Utah	4	1
Alaska	3	0
Hawaii	2	0
Montana	7	0
Wyoming	1	0
Total	132	5
Portable	2	0
Grand total	134	5

[1] WBES transferred to Salisbury.

SUMMARY

	Portables	Number of stations	Stations sent General Order No. 32
First zone	4	124	37
Second zone	1	111	31
Third zone	0	115	0
Fourth zone	6	200	91
Fifth zone	2	132	5
Grand total	13	682	164

APPENDIX F (4)

List of decisions of commission adverse to stations under General Order No. 32, together with summary of commission's orders, dated September 5, 1928

SUMMARY OF COMMISSION'S ORDERS IN CASES ARISING OUT OF GENERAL ORDER NO. 32

FEDERAL RADIO COMMISSION,
Washington, D. C., September 5, 1928.

Altogether there were 164 broadcasting stations involved in the hearings held in July, in the course of which they were called upon to demonstrate to the commission that their continued operation would serve public interest, convenience, or necessity. Of the 164 stations only 81 escaped adverse action of the commission, and even as to those there may be changes in frequency or reduction in hours of operation shown by the new reallocation.

Of the remaining stations, 12 were reduced in power, 4 were placed on probation, and 5 were left on as the result of consolidation (2 of these consolidations being also reduced in power). The remainder of the stations, a total of 62, were all deleted, either as the result of orders of the commission refusing to grant the applications for renewal of licenses, of default, or of voluntary surrenders of licenses. Consequently, a very considerable reduction has been made in the number of broadcasting stations licensed to operate, and among the stations left on the air reductions have been such as to assist the commission in eliminating interference.

The orders of the commission follow:

FEDERAL RADIO COMMISSION,
Washington, D. C., July 27, 1928.

The Federal Radio Commission to-day notified 36 radio broadcasting stations that their applications for renewal of licenses after August 1, 1928, have been denied. These stations were on the list of 162 which were notified on May 25, 1928, that after an examination of the applications for renewal of their licenses the commission was not satisfied that public interest, convenience, or necessity would be served by granting their applications. Four other stations also voluntarily surrendered their licenses.

The commission fixed July 9, 1928, as the date for hearings on these applications, and the station owners were notified that unless, at that hearing, they made an affirmative showing that public interest, convenience, or necessity would be served by granting the application they would be finally denied.

These station owners failed to appear at the hearing July 9, 1928, either in person or by representative, and failed to make any showing whatever that public interest, convenience, or necessity would be served by granting the renewals.

The commission having made a full investigation of the matters and things involved in said applications and having determined that public interest, convenience, or necessity would not be served by the granting of said applications, issued an order of denial.

The commission also made public a general order extending all existing licenses until September 1, 1928, except the 162 stations cited on May 25, 1928, those which voluntarily retired from the broadcasting field and those who failed to apply for a renewal.

The commission is now engaged in the consideration of the voluminous documentary evidence submitted in the cases recently heard for the renewal of licenses, and its decisions will be duly made.

The following is the list of stations whose licenses expire August 1, 1928, because of failure to appear at the hearing July 9, 1928:

Zone No. 1

Stanley N. Read, radio station WRAH, Providence, R. I.
Harry Leonard Sawyer, radio station WRES, Quincy, Mass.
A. H. Waite & Co. (Inc.), radio station WAIT, Taunton, Mass.
Fred B. Zittell, jr., radio station WGOP, Flushing, N. Y.
Danbury Broadcasting Station, radio station WCON, Danbury, Conn.
Titus-ets Corporation, radio station WOKT, Binghamton, N. Y.

Zone No. 2

College of Wooster, radio station WABW, Wooster, Ohio.
Verne and Elton Spencer, radio station WGM, Jeannette, Pa.
Petoskey High School, radio station WBBP, Petoskey, Mich.

Zone No. 3

None.

Zone No. 4

Frederick A. Trebbe, jr., radio station WLBO, Galesburg, Ill.
Wenona Legion Broadcasters, radio station WLBI, Wenona, Ill.
Knox College, radio station WFBZ, Galesburg, Ill.
Harold Wendell, radio station WLBT, Crown Point, Ind.
Roland G. Palmer and Anthony Coppotelli, radio station WJBZ, Chicago Heights, Ill.
E. Dale Trout, radio station WLBQ, Atwood, Ill.
Maurice Mayer, radio station WPEP, Waukegan, Ill.
Lombard College, radio station WRAM, Galesburg, Ill.
Francis K. Bridgman (Inc.), radio station WFKB, Chicago, Ill.
Lane Technical High School, radio station WLTS, Chicago, Ill.
Albert C. Dunkel, radio station KGFB, Iowa City, Iowa.
Central Radio Co., radio station KPNP, Muscatine, Iowa.
Harry O. Iverson, radio station KFDZ, Minneapolis, Minn.
Morningside College, radio station KFMR, Sioux City, Iowa.
Times Publishing Co., radio station WFAM, St. Cloud, Minn.
J. Albert Loesch, radio station KGDY, Oldham, S. Dak.
Fond du Lac Commonwealth Reporter, radio station KFIZ, Fond du Lac, Wis.
Penn College, radio station KFHL, Oskaloosa, Iowa.
Dr. C. S. Stevens, radio station WMBE, White Bear Lake, Minn.
Hegstad Radio Co., radio station KGHC, Slayton, Minn.
Fred W. Herrmann, radio station KGEQ, Minneapolis, Minn.
Omaha Board of Education, radio station KFOX, Omaha, Nebr.
Edward A. Dato, radio station WKDR, South Kenosha, Wis.
Henry Haraldson and Carl Thingstad, radio station KGFN, Aneta, N. Dak.

Zone No. 5

Los Angeles County forestry department, radio station KFPR, Los Angeles, Calif.
Dr. L. L. Sherman, radio station KFUS, Oakland, Calif.
University of Utah, radio station KFUT, Salt Lake City, Utah.
The stations that surrendered their licenses were:
Browning-Drake Corporation, radio station WLBM, Cambridge, Mass.
Zenith Radio Corporation, radio station WSAX, Chicago, Ill.
Third Avenue Railway Co., radio station WEBJ, New York City.
KOOS Radio Sales Service (Inc.), radio station KOOS, Marshfield, Oreg.

FEDERAL RADIO COMMISSION,
Washington, D. C., August 21, 1928.

The Federal Radio Commission announced to-day its decision in two cases recently heard of broadcasters whose public service was questioned. Other decisions will likely be reached during this week.

In the case of station WCOT, operated by Jacob Conn at Providence, R. I., the commission decided its license will not be renewed after September 1, 1928.

In the case of KGDM, operated by E. F. Peffer at Stockton, Calif., the commission decided to renew its license subject to the reallocation now in progress.

In handing down its decision the commission rendered a long opinion, explaining in detail the principles and policies pursued in citing stations to show cause why they are operating in the public interest and how it reached its conclusions.

In the case of WCOT, the opinion states that the evidence discloses this station is used by its owner: (1) As a means of direct advertising, (2) for the promotion of its candidacy for mayor of Providence, (3) for expressing his views on

all private matters, (4) as a medium for his attacks on his personal enemies. Of the 12 hours stated in the application to be devoted to entertainment, it appears from the evidence that most of them have been used largely in personal remarks of Mr. Conn, the musical numbers forming but a setting for the expression of his own views upon matters in which he is personally interested.

"There is convincing evidence that false statements and defamatory language have been broadcast over this station by the applicant.

"There is also evidence that programs have been received by this applicant over the air from other stations and rebroadcast from station WCOT without the consent of the originating station. Although under the circumstances existing in this case there is a question as to whether there was a technical rebroadcasting in violation of section 28 of the radio act of 1927, the taking of another station's program and presenting it over the air without the permission of the originating station is a reprehensible practice.

"There is no convincing evidence as to any educational or æsthetic value of the programs rendered, but, on the contrary, it is manifest that the station is one which is operated without regard to the rendering of any real public service in the field of radio broadcasting and in such a manner as must be objectionable to the large mass of the listening public and exists chiefly for the purpose of serving the private interests of the applicant and as a conveyance for his own personal views."

The commission denied emphatically, in the opinion, charges made in the course of the hearings that it was actuated by a prejudice against the small station serving local communities, declaring:

"This charge is totally unfounded. It is true that a large number of the smaller stations were included in General Order No. 32, although a considerable number of medium and of higher-powered stations were also included. The reason, however, was not that the stations were small; as a matter of fact, the commission has for a long time past been convinced that from an engineering point of view the accommodation of these stations is not a serious problem on the basis of their present number and, with a few exceptions in areas already overcrowded, can continue to operate without causing undue interference if properly managed by their operators. The commission was moved to its action largely by the deluge of complaints of poor service and interference from people living in the vicinity of such stations; it was also moved by the negligent manner in which many such stations were operated mechanically and the unexplained failure of the owners to provide themselves with comparatively inexpensive apparatus which would have protected the public from a large portion of the interference. In many cases the commission was influenced by the character of the licensee, who seemed not to be worthy of the trust implied in his license; or by the uncertain service rendered, which deprived his service area of its right to a regular schedule fulfilling its local needs. In a word, the action of the commission did not proceed on the theory that the community was not entitled to local broadcasting service but rather that the particular licensee was unworthy of the privilege of rendering that service to the community.

"In the many hearings that have resulted from General Order No. 32 the commission has been gratified in no respect as much as in the showing that has been made by the great majority of these small local stations. Not only have they amply justified their continued existence but they have rendered a valuable public service in their cooperation with the commission by their earnest and dignified presentation of their claims to recognition. In many cases the hearings have entailed considerable expense and effort on their part, yet the commission feels certain that the owners of the stations themselves will agree that the information which has thus been imparted to the commission and the information in turn which the owners have received as to the problems of the commission have made the expense and the effort more than worth while. Many of them have given expression to a new or increased sense of responsibility to the public as a result of their participation in the hearings. It has also been gratifying to note the interest which the listening public has shown in most of these stations and to have the importance of the small community to the welfare of the country so clearly demonstrated in the field of radio broadcasting. In all those cases where the commission has found it necessary to refuse renewal applications of small local stations it has done so because it is convinced that the community is entitled to better service than it is now receiving, to be rendered by a licensee more worthy of the trust."

In explaining the principles which guided the commission in determining which stations should be forced to make an affirmative showing that their operation is in the public interest, convenience, or necessity, the opinion stated:

"The commission has felt that many broadcasting stations in the United States have not been showing themselves worthy of the great privileges which had been conferred upon them by the Federal Government and have not fulfilled the trust which the standard of public interest, convenience, or necessity imposes upon them. If this be correct, the commission would fail in its duty if it permitted such stations to continue to enjoy valuable franchises of which the total number is all too limited, and thus to prevent the public from receiving the maximum benefit to which it is entitled from the use of the channels assigned to broadcasting. A station which has not been measuring up to its trust should be replaced with a better one; a community which is being overserved and saturated with broadcasting by a multiplicity of stations, many of which are duplicating each others' programs, must suffer curtailment for the benefit of a community which is not receiving adequate service; all stations must bow to the paramount interest of the public in receiving good programs, as free as possible from interference, and proceeding from all parts of the country so as to cover in a fair proportion the needs of local community, State, zone, and Nation.

"Of necessity, in making up the list the commission was guided in its action by the information in its possession. In addition to the information disclosed by the applications themselves, the commission had before it reports from the Federal radio supervisors in the various districts as to the mechanical efficiency and operation of the station, showing in many cases that a particular station, either by reason of antiquated apparatus or carelessness in operation, was causing unnecessary interference with the broadcasting of stations and was thus depriving the public of the benefit of the use of channels other than the one to which it had been assigned. Special investigators sent out by the commission reported, as did also the supervisors, on the type of service (or lack thereof) being rendered by the stations. In addition, the commission has in its files hundreds of thousands of letters from radio listeners commending or criticizing the various stations, both on the subject of interference and on the subject of the sort of service being rendered; these letters were supplemented by impressions conveyed verbally to members of the commission and obtained by them personally by visits to the stations and conferences with their representatives. The records of the commission disclosed which communities, States, and zones were being excessively 'served,' even to the point of fatal interference between the stations themselves and at the expense of other parts of the country; they also disclosed the existence of unnecessary licenses to stations not actually in operation.

"On the basis of information thus obtained, the commission had what seemed to it full justification in each case for requiring the station to make a further showing that public interest, convenience, or necessity would be served by granting its application for a renewal."

FEDERAL RADIO COMMISSION,
Washington, D. C., August 22, 1928.

Decisions were rendered to-day by the Federal Radio Commission in three more cases of radio broadcasting stations whose public service was challenged in General Order No. 32, issued by the commission on May 25, 1928. The decisions are the outcome of extensive public hearings held last July, when the applicants were given an opportunity to present evidence outlining in detail the kind of public service rendered.

In th case of WNBA, operated by Michael T. Rafferty, at Forest Park, Ill., on a frequency at 1,440 kilocycles with 200 watts power, the decision was adverse to the applicant and that station will be deleted September 1, 1928.

The license of this station was suspended 30 days last spring because of alleged violations of the rules and regulations of the commission.

In the two other cases decided—WEHS, operated by Victor C. Carlson on 1,390 kilocycles with 100 watts (Evanston, Ill.), and station WEVD, operated by Debs Memorial Fund at Woodhaven, N. Y., on 1,220 kilocycles with 500 watts—the decisions favored the applicants and their licenses will be renewed September 1, 1928, subject to the reallocation now in progress.

The case of station WEVD was one of the first heard by the commission. After hearing the evidence which was presented to it, the commission has

decided that the granting of the application for a renewal of a license will meet the standard of public interest, convenience, or necessity prescribed by the law.

Undoubtedly, some of the doctrines broadcast over the station would not meet the approval of individual members of the commission. This consideration, however, had nothing to do with the commissioners' original action in placing the station on General Order No. 32 and requiring it to make a showing as to the service being given the public. As was the case with all other stations subjected to the order, the commission was led to its action by complaints in its files on the score of interference and the character of its programs, and by information which otherwise came to the commission. In this particular case the complaints are found to be unjustified.

The commission will not draw the line on any station doing an altruistic work, or which is the mouthpiece of a substantial political or religious minority. Such a station must, of course, comply with the requirements of the law and must be conducted with due regard for the opinions of others. There is no evidence that station WEVD has failed to meet these tests; on the contrary, the evidence shows that the station has pursued a very satisfactory policy.

The renewal of the application is, of course, subject to such changes in the frequency, power, and hours of operation as may be necessary under the reallocation which the commission is planning to announce in the near future.

FEDERAL RADIO COMMISSION,
Washington, D. C., August 23, 1928.

Four more decisions were handed down to-day by the Federal Radio Commission in cases of radio broadcasting stations which were called upon to prove that their operation was in the public interest, convenience, or necessity.

The license of one of the stations, WJBA, operated by Michael T. Rafferty at Joliet, Ill., will be revoked September 1, 1928; the power of another station, WCRW, operated by Clinton R. White at Chicago, Ill., will be reduced from 500 watts to 100 watts, effective September 1, 1928; and the licenses of the other two stations, WLBC, operated by Donald A. Burton at Muncie, Ind., and WJBL, operated by William Gushard Dry Goods Co. at Decatur, Ill., will be renewed.

In announcing its decision the commission made public certain basic principles adopted for its guidance in reaching decisions. It stated:

"The commission is convinced that within the band of frequencies devoted to broadcasting, public interest, convenience, or necessity will be best served by a fair distribution of different types of service. Without attempting to determine how many channels should be devoted to the various types of service, the commission feels that a certain number should be devoted to stations so equipped and financed as to permit the giving of a high order of service over as large a territory as possible. This is the only manner in which the distant listener in the rural and sparsely settled portions of the country will be reached. A certain number of other channels should be given over to stations which desire only to reach a more limited locality. Finally, there should be a provision for a number of stations which are distinctly local in character and which aim to serve only the smaller towns in the United States without any attempt to reach listeners beyond the immediate vicinity of such towns.

"The commission also believes that public interest, convenience, or necessity will be best served by avoiding too much duplication of programs and types of programs. Where one community is overserved and another community is receiving duplication of the same programs, the second community should be restricted in order to benefit the first. Where one type of service is being rendered by several stations in the same region, consideration should be given to a station which renders a type of service which is not such a duplication.

"In view of the paucity of channels, the commission is of the opinion that the limited facilities for broadcasting should not be shared with stations which give the sort of service which is readily available to the public in another form. For example, the public in large cities can easily purchase and use phonograph records of the ordinary commercial type. A station which devotes the main portion of its hours of operation to broadcasting such phonograph records is not giving the public anything which it can not readily have without such a station. If, in addition to this, the station is located in a city where there are large resources in program material, the continued operation of the station

means that some other station is being kept out of existence which might put to use such original program material. The commission realizes that the situation is not the same in some of the smaller towns and farming communities, where such program resources are not available. Without placing the stamp of approval on the use of phonograph records under such circumstances, the commission will not go so far at present as to state that the practice is at all times and under all conditions a violation of the test provided by the statute."

Explaining its reasons for reducing the power of station WCRW, the commission said:

"This station was first licensed on or about August 15, 1926, and was one of the many stations which came into being during the chaotic period which preceded the enactment of the radio act of 1927. This station first appropriated to itself a frequency then being used by a Minneapolis station and two or three weeks later it 'jumped' to a frequency which, under an informal understanding between the Department of Commerce and Canadian authorities, had been reserved for exclusive use by Canadian stations.

"At the hearing Mr. White, the applicant, was the only witness. In addition to his testimony, a number of affidavits were submitted and considered by the commission.

"The evidence discloses that station WCRW's transmitter is located in the midst of a very thickly inhabited community on the near north side in Chicago. Of the total hours of operation, 75 per cent is devoted to the broadcasting of phonograph records, a type of entertainment which the witness referred to as 'electrical reproduction.' It is clear that a large part of the program is distinctly commercial in character, consisting of advertisers' announcements and of direct advertising, including the quoting of prices. An attempt was made to show a very limited amount of educational and community civic service, but the amount of time thus employed is negligible and the evidence of its value to the community is not convincing. Manifestly this station is one which exists chiefly for the purpose of deriving an income from the sale of advertising of a character which must be objectionable to the listening public and without making much, if any, endeavor to render any real service to that public."

FEDERAL RADIO COMMISSION.
Washington, D. C., August 24, 1928.

The Federal Radio Commission announced to-day decision in 16 cases of radio broadcasting stations whose applications for renewal of licenses were challenged pending a careful examination of the kind of public service which they were rendering.

Two decisions were adverse to the applicants, WPEP, operated by Maurice Mayer, at Waukegan, Ill., and WTRL, operated by the Technical Radio Laboratory at Midland Park, N. J., and the licenses of these stations will be revoked September 1, 1928.

The power of two other stations, WEDC, operated by Emil Densmark (Inc.), at Chicago, Ill., and WKBQ, operated by the Standard Cahill Co. (Inc.), New York, was reduced. The power of WEDC was reduced from 500 to 100 watts and WKBQ was reduced from 500 to 250 watts.

Applications for the renewal of licenses for the following stations were approved:

Fred L. Schoenwolf, radio station WKBI, Chicago, Ill.

WBMS Broadcasting Corporation, radio station WBMS, Union City, N. J.

W. H. Reuman, radio station WWRL, Woodside, N. Y.

W. F. Jones Broadcasting (Inc.), radio station WFJC, Akron, Ohio.

Ernest F. Goodwin, radio station WJBK, Ypsilanti, Mich.

J. H. Thompson, radio station WQBZ, Weirton, W. Va.

New Jersey Broadcasting Corporation, radio station WIBS, Elizabeth, N. J.

Brooklyn Amateur Radio Specialty Co., radio station WSGH–WSDA, Brooklyn, N. Y.

May Radio Broadcasting Corporation, radio station WGCP, Newark, N. J.

Cleveland Radio Broadcasting Corporation, radio station WJAY, Cleveland, Ohio.

Howard R. Miller, radio station WIAD, Philadelphia, Pa.

James L. Bush, radio station WDZ, Tuscola, Ill.

In the case of station WPEP the records of the commission show that this station actually went off the air last May following a judgment for unpaid salaries.

In the opinion explaining its adverse decision in the case of WTRL the commission said:

"The application, which is dated January 14, 1928, discloses that the station's transmitter is located at 28 Sicomac Avenue, Midland Park, N. J., and that it has a maximum power of 15 watts. In the application, answers to the questions referring to hours of operation and types of programs are evaded, thus indicating that this station at the time of the filing of the application was not in operation.

"This station was first licensed on or about December 18, 1926, and was one of the many stations which came into being during the chaotic period just prior to the enactment of the radio act of 1927.

"D. W. May, representing the applicant, was the main witness on behalf of this station. In addition to his testimony, affidavits of Harold C. Hogencamp, president of the Technical Radio Laboratory and operator of the station, and others were submitted and considered by the commission.

"The evidence disclosed that station WTRL, if it is on the air at all, occupies but very little time, at very irregular intervals, and uses mostly phonograph records. There is little evidence that station WTRL has ever been heard on the air, but, on the contrary, the radio inspector in his testimony on behalf of the commission stated that he had on a number of occasions tried to tune in on this station, but was unable to do so. There is evidence that the equipment is not in use and that it is housed in a room for the raising of dogs and charging of storage batteries. Manifestly this station is one which has not justified its existence and the applicant is holding a license without regard to the rendering to the public of any real service in the field of radio broadcasting.

"After a careful consideration of the evidence and the arguments presented to it the commission has come to the conclusion that a renewal of the applicant's license would not serve the public interest, convenience, or necessity, and an order is being entered refusing the application."

Referring to its decision renewing the licenses of 12 stations, the commission said it was much impressed by the record of public service being rendered by them, according to the documentary evidence submitted, which more than offsets the adverse reports of interference and poor programs on file, on which the citation under General Order No. 32 was based.

The commission said it is convinced these stations can continue to operate without causing undue interference if properly managed by their operator.

As a result of the public hearings the commission now has on hand much valuable information regarding the valuable local service rendered by these stations. These stations have given expression of a new or increased sense of responsibility to the public as a result of the hearings.

FEDERAL RADIO COMMISSION,
Washington, D. C. August 25, 1928.

The Federal Radio Commission to-day revoked the licenses of three more radio broadcasting stations and reduced the power of two others, effective September 1, 1928.

This action was the outcome of hearings held last July, when certain stations were called upon to prove to the satisfaction of the commission that they were rendering a real public service.

The commission also announced that favorable action had been taken on the applications of 13 other cases of radio stations whose public service had been challenged by listeners.

The stations to be deleted are:

Western Union College, radio station KWUC, Le Mars, Iowa.

Irving Zuelke (Inc.), radio station WAIZ, Appleton, Wis.

R. J. Rockwell, radio station WNAL, Omaha, Nebr.

The stations whose power is to be reduced are:

Goodsan & Wilson (Inc.), radio station WHFC, Chicago, Ill. Reduced from 200 to 100 watts.

John N. Brahy, radio station WLBX, Long Island City, N. Y. Reduced from 250 to 100 watts.

The stations whose licenses will be renewed September 1, 1928, are:
Radiotel Manufacturing Co., radio station WINR, Bay Shore, N. Y.
J. A. Kautz (Kokomo Tribune), radio station WJAK, Kokomo, Ind.
Illinois Stock Medicine Broadcasting Corporation, radio station WTAD, Quincy, Ill.
Knox Battery & Electric Co., radio station WKBV, Brookville, Ind.
Williams Hardware Co., radio station WTAX, Streator, Ill.
Hummer Furniture Co., radio station WJBC, La Salle, Ill.
Dr. George F. Courrier, radio station WWAE, Hammond, Ind.
Beardsley Specialty Co., radio station WHBF, Rock Island, Ill.
Tate Radio Co., radio station WEBQ, Harrisburg, Ill.
Peoria Heights Radio Laboratory, radio station WMBD, Peoria Heights, Ill.
The Radio Club (Inc.), radio station WRAF, Laporte, Ind.
Carthage College, radio station WCAZ, Carthage, Ill.
Joseph J. Lombardi, radio station WLBH, Farmingdale, N. Y.

The adverse decision in the case of WNAL was due largely, the commission announced, to the fact that this station for some time has not maintained a regular schedule.

Station KWUC, according to evidence submitted to the commission, jumped its power from 50 to 1,500 watts when Government control broke down and station WAIZ, which was destroyed by fire some months ago, has not been rebuilt.

The main reasons for reducing the power of WHFC, the commission said, were the facts that it made a very weak showing of public service in the past and its transmitter is located in the heart of the residential section of Chicago and many listeners complained of its interference.

The commission again expressed gratification over the fact that it was able to render favorable decisions in the cases of many small stations whose public service was questioned. In the judgment of the commission, the demand for the special local community service rendered by these stations was much more pronounced and convincing than the opposition.

FEDERAL RADIO COMMISSION,
Washington, D. C., August 27, 1928.

The Federal Radio Commission to-day deleted another radio broadcasting station and announced that the applications of 10 other stations for renewal of licenses had been approved.

This action was the outcome of public hearings held last July, when the stations were called upon to prove that they are operating in the public interest.

The station whose license will be revoked September 1, 1928, is KFQA, operated by the Principia, at St. Louis, Mo.

The stations whose applications for the renewal of their licenses were approved:
International Broadcasting Corporation, radio station WOV–WGL, Secaucus, N. J.
Bronx Broadcasting Co., radio station WHPP, Englewood Cliffs, N. J.
Berachah Church (Inc.), radio station WRAX, Philadelphia, Pa.
Ruffner Junior High School, radio station WBBW, Norfolk, Va.
Wilson Duncan Broadcasting Co., radio station KWKC, Kansas City, Mo.
William S. Pote, radio station WLOE, Chelsea, Mass.
Concourse Radio Corporation, radio station WPCH, Hoboken, N. J.
William F. Gable Co., radio station WFBG, Altoona, Pa.
Atlantic Automobile Co., radio station KICK, Red Oak, Iowa.
Radio Electric Co., radio station KDLR, Devils Lake, N. Dak.

FEDERAL RADIO COMMISSION,
August 27, 1928.

In the case of station KFQA, at St. Louis, Mo., the commission entered an order refusing to renew the license, the effect of which will be to force the station to discontinue broadcasting on September 1. The case is a good illustration for a direct application of the principle previously announced by the commission that it is not in the public interest, convenience, nor necessity to continue to license a station which is not putting its transmitter to any use.

In this particular case the station is owned and operated by the trustees of an institution known as the Principia, which has not used the transmitter, but instead has broadcast its programs through station KWK, at St. Louis. During the hearing, held on July 9, the representative of the station urged that all the applicant wanted was to maintain a license from the commission but did not care about the transmitter. Manifestly, if the commission were to do this it would have to assign a wave length to the station and take it away from some one else who would put it to use. The public would not receive any benefit, because the wave length would not be in use to its capacity. The commission takes the position that it can not assign the valuable privileges of an assignment of a wave length and power under circumstances such as this. The only interest urged was a distinctly private one.

Among the cases in which favorable action was taken was that of station WGL, located at Secausus, N. J. This station made a showing before the commission which demonstrated a rather fairly extensive field of public service. Among other things, the station has devoted itself very liberally to the national preparedness movement, and has at all times extended its facilities to the American Legion, the Veterans of Foreign Wars, the National Surety League, and similar organizations. During the year it also made a showing of support from various civic organizations. Whether or not one agrees with the views of a particular organization, the question of preparedness is certainly an important one, and a station which devotes its facilities to a fair presentation of such questions to the public is entitled to consideration as performing a public service.

In the case of station WBBW, of Norfolk, Va., the station made a satisfactory showing of an altruistic purpose in serving its community. It has devoted itself to furnishing wholesome amusement and information to the patrons of the three high schools in the city; it is distinctly a community proposition, with programs furnished by the various clubs and organizations of the three high schools. Naturally a station such as this could not expect to enjoy a large assignment of power, but should be allowed to continue in serving the community as it has been doing in the past.

FEDERAL RADIO COMMISSION,
Washington, D. C., August 29, 1928.

With regard to four broadcasting stations located in Pennsylvania, the Federal Radio Commission entered to-day an unusual order which virtually placed these stations under probation for the next 30 days. The stations are WRAK, owned by C. A. Cummins, Erie, Pa.; WABF, owned by the Markle Broadcasting Corporation, at Kingston, Pa.; WBRE, owned by Louis G. Baltimore, Wilkes-Barre, Pa.; and WMBS, owned by Mack's Battery Co., Lamoyne, Pa. These cases all presented the same problem to the commission. The problem was how to relieve the public served by these stations from the disagreeable burden of having to listen to the broadcasting of personal disputes over the stations.

Station WRAK, for example, is located in a city which, by virtue of its population and location, is entitled to local broadcasting service. Erie has a population of approximately 125,000; the nearest station is about 70 miles away. It is not uniformly well served by any outside station because of peculiar fading phenomena. During the five months including the summer period static conditions are very bad.

There are two small stations located in the town, one of which is WRAK. The owners of the two stations have apparently indulged in a continuous personal controversy, in the course of which they have used their stations for purposes of abuse against each other. The controversy has been aired in the newspapers, the owner of the other station having control of a newspaper. Charges of perjury, libel, and slander have been constantly exchanged. As a result of one of the controversies, Mr. Cummins spent a night in jail and extensive litigation is in process or threatened. Needless to say, such an exhibition is distasteful in itself and is only aggravated when the facilities of radio stations are put at the disposition of the two combatants to carry it on. The commission is not attempting to pass on the responsibility for a dispute; it may rest with one station or the other, and if the commission had before it all the facts it now has, the other station would have been included in General Order No. 32. The commission, however, is certain that whoever may be to blame, it is not in the public interest, convenience, or necessity to permit these two

broadcasters further to regale the inhabitants of Erie with their personal differences. On the other hand, since Erie is unquestionably entitled to broadcasting service, and since the applicant station has been performing a fair service to the community, so far as the programs are concerned, the commission believes that an equitable solution of the matter is to permit the station to continue on the air temporarily, so that it may have an opporunity to demonstrate that it is capable of a better showing.

A similar situation has existed with regard to three stations located in or near Wilkes-Barre, Pa.—WABF and WBRE, both of which were included in General Order 32, and WBAX, which was not. These stations serve a large population in the coal regions, which, by reason of their distinctive character and their geographical location, are entitled to local broadcasting service. The controversy seems to be largely between station WBAX on the one hand and WABF and WBRE on the other, and without pausing to summarize the details the commission will confine itself to saying that it is of a fairly similar nature to the controversy in Erie, is disagreeable to radio listeners, and serves no public interest. The situation at Harrisburg, where station WMBS is located, is of the same character.

The commission in arriving at its decisions on cases heard in General Order 32 has been very careful not to overstep the limits of its authority by any act which might be construed as an exercise of the power of censorship or as a great invasion of the right of free speech guaranteed by the Federal Constitution. Wherever the evidence is shown that a particular station is serving as a mouthpiece for a substantial religious or political minority, no matter how much the individual members of the commission may disagree with the views of that minority, the commission has taken action favorable to the station. An example of this is the commission's decision in the case of station WEVD, in New York, the mouthpiece of the Socialist Party. This has been true even in cases where the evidence as to program service rendered by the station was far from convincing. It is also true of station WIBA, in Madison, Wis., a station which is partly owned by a newspaper which has been spokesman for the La Follette progressive movement. The station is on the air only a limited amount of time, and there has been a great deal of complaint as to the quality of its programs, yet the commission has decided to renew the license of this station.

Through the course of the hearings a great deal has been said on the subject of freedom of speech, and it is consequently intimated that in making its decisions the commission has been usurping the power of a censor. It will not be out of place at this time to give expression to a few general observations on the subject of freedom of speech as applied to broadcasting.

It is self-evident that the constitutional guaranty of freedom of speech applies to the expression of political and religious opinions, to discussions, fair comments, and criticisms on matters of general public interest, of candidates, of men holding public office, and of political, social, and economical issues. At no time has the commission considered that it had any right to chastise a station for its conduct in handling such matters if the station has observed the requirement of the law that it give rival candidates equal opportunities to use its microphone.

Does this same constitutional guaranty apply to the airing of personal disputes and private matters? It seems to the commission that it does not. The history of the guaranty shows that it was the outgrowth of a long struggle for the right of free expression on matters of public interest. Two neighbors may indulge in any verbal dispute they please in their own back yards where no one is within hearing distance. Let them try to conduct the same dispute in a public place, such as on a busy street or in a theater, and they soon find that they are not protected by the Constitution. Even if they conduct the controversy on premises owned by them, if it is so noisy as to disturb people in the vicinity it will soon be terminated as a nuisance. The rights of the public to be free from disturbances of this sort are superior to those of the individual. Even on a subject of public importance a man is not permitted to get up in a public place such as on a street or in a public park in many cities and speak to the public without a permit.

With these limitations already imposed by the law on unrestrained utterance, is the commission powerless to protect the great public of radio listeners from disturbances and nuisances of this kind? Should a man who is forbidden to perpetrate such a nuisance in a public street or in such a manner as to disturb people living in the vicinity be allowed to invade the homes of radio

listeners over a vast area in something so disagreeable and annoying? Listeners have no protection unless it is given to them by this commission, for they are powerless to prevent the ether waves carrying the unwelcome messages from entering the walls of their houses. Their only alternative, which is not to tune in on the station, is not satisfactory, particularly when in a city such as Erie only the local stations can be received during a large part of the year. When a station is misused for such a private purpose the entire listening public is deprived of the use of a station for a service in the public interest.

The commission is unable to see that the guaranty of freedom of speech has anything to do with entertainment programs as such. Since there are only a limited number of channels and since an excessive number of stations desire to broadcast over these channels, the commission believes it is entitled to consider the program service rendered by the various applicants, to compare them, and to favor those which render the best service. If one station is broadcasting commercial phonograph records in a large city where original programs are available and another station is broadcasting original programs, for which it is making a great financial outlay, the commission believes that the second station should be favored and that the question of freedom of speech is not involved. This is only one example of money that might be cited. Entertainment such as music is not "speech" in the sense in which it is used in the first amendment to the Federal Constitution.

Nevertheless, on all matters that seem near the border line the commission will proceed very cautiously, and where it feels that it may reasonably be contended that freedom of speech is involved, although the commission may not entirely agree with the contention, it will give the station the benefit of the doubt, as has been done in the cases which have come before it.

FEDERAL RADIO COMMISSION,
Washington, D. C., August 31, 1928.

The Federal Radio Commission to-day rendered decisions in a number of cases of radio broadcasting stations, reducing the power of some, because it would better serve the public interest, and continued the license of others.

The power of station KWCR, Cedar Rapids, Iowa, has been reduced from 250 to 100 watts, it being found that this power is sufficient to properly serve the community in which the station is located. This station is distinctly a local one and its programs have a limited appeal. Because of the present situation with which the commission has had to deal regarding crowded air channels, the large number of stations operating in Iowa, and resultant interference, it was found necessary to reduce the power of some of the stations in that territory.

WKBO, Jersey City, N. J., has been reduced from 500 to 250 watts for similar reasons. The service now rendered by that station will not be materially impaired by reason of this reduction.

Station WJBI, Red Bank, N. J., has been reduced from 250 to 100 watts, that power being sufficient to effectively reach the local community served by that station. The continued operation of distinctly local stations with greater power than is absolutely necessary in carrying out the actual service of the station is felt to be one of the causes for unnecessary interference, especially where such stations are located in districts where a large number of stations are located and there is unnecessary duplication of the same type of program.

The licenses of the following stations have been continued, it having been found that the service they render is in the public interest:

WBMH, Detroit, Mich.; WBBL, Richmond, Va.; WCGU, New York City; WCLB, Long Beach, N. Y.; WFAN, Philadelphia, Pa.; WKBE, Webster, Mass.; WTAZ, Richmond, Va.; WIAS, Ottumwa, Iowa; WMBQ, Brooklyn, N. Y.; KGCA, Decorah, Iowa; KGCN, Concordia, Kans.

These decisions are effective September 1, 1928.

FEDERAL RADIO COMMISSION,
Washington, D. C., September 1, 1928.

The Federal Radio Commission made public to-day a number of decisions in cases of radio broadcasting stations whose public service was challenged by listeners. The final list of decisions follows:

Among other stations which the commission has ordered to discontinue operations, by refusing to grant its application for renewal of license, is station WMBB–WOK, located at Homewood, Ill., near Chicago, and owned by the American Bond & Mortgage Co. This station has been licensed to operate on 5,000 watts and has a transmitter capable of an even larger amount of power, its capacity being 20,000 watts, according to its application. It is, therefore, by all odds, the largest station deleted by the commission.

The controlling reason for the deletion of this station is the congested situation in Chicago, where approximately 15 stations of 5 kilowatts power or greater have been in licensed operation, in addition to a large number of others having power assignments ranging from 1,000, 500, and down to 50 watts. Chicago is being overserved at the expense of the rest of the country, and, in fact, at the expense of its own radio-listening public. The multiplicity of stations not only makes it impossible for the average receiving set in that city to tune in on outside stations but causes a great deal of interference by cross-talk as between the Chicago stations themselves. If there is to be equality of broadcasting service both as to transmission and reception throughout the five zones of the United States, or even as between the States of the fourth zone, Chicago's quota must be radically cut down.

The commission took adverse action on all the applications for renewal of licenses in cases involving duplicate sets of call letters for the performance of what was really one continuous service. The stations affected are all in the fourth zone, four of them being at Chicago and one at Milwaukee. In the case of station WQJ, the licensee has been the Calumet Broadcasting Co., which is owned and controlled by the Calumet Baking Powder Co. For a long period of time, however, the Calumet Broadcasting Co. has neither used nor operated this station; it entered into a lease with the Chicago Daily News whereby the Chicago Daily News has complete control of the operation of the station in conjunction with its own station WMAQ. There is no reason or justification, therefore, for maintaining a separate license for a concern which is not engaged in the use or operation of the station. To give it a separate license means that the fourth zone, and the State of Illinois within that zone, is being charged with a station license under the quotas of the State and zone permitted under the Davis amendment, and it is not equitable that there should be two licenses when only one service is being rendered.

The same reason applies to the case of station WBCN, owned by the Great Lakes Broadcasting Co., which in turn is controlled by certain public utilities in Chicago. This station is used for one continuous service in conjunction with station WENR, owned by the same company. While at present the two transmitters are located in different parts of the city, there is no very convincing reason for continuing the operation of both of them as distinguished from continuous service of one of them.

In the case of WLIB the facts are that both that station and WGN use a transmitter located near Elgin, Ill., and maintain an auxiliary transmitter located on the Drake Hotel in Chicago, the latter transmitter being used for emergency purposes only in case of a temporary breakdown of the Elgin apparatus. The two stations represent one continuous service. The same interests also own WTAS, which has been operating on a frequency of 1,090 kilocycles and also located near Elgin. While this station has a separate transmitter, it seems best to the commission that it should be combined with WGN and WLIB on the same channel into one station. This represents virtually a deletion of WLIB and WTAS, but a period of 30 days is being accorded to these stations to arrange a station consolidation into one station with WGN.

In the case of KFKX, owned and operated by the Westinghouse Co., a consolidation has been proposed to the commission whereby this station will, together with station WEBH, be merged with station KYW. This also constitutes a virtual deletion of KFKX and WEBH, but in order to allow them to complete the consolidation the commission is giving them a 30-day extension.

The same reasons apply to WGWB, at Milwaukee, which is operated as one continuous service with WISN, operated by the Wisconsin News. WCWB is therefore being deleted.

Another station to be deleted is WMBW, at Youngstown, Ohio. This is really the result of a consolidation with WKBN in the same city, the consolidation having already been effected.

Other consolidations which have been approved by the commission, or imposed on the stations by the commission, are the following:

Stations WJBL and WBAO, at Decatur, Ill. In this case WJBL has been reduced from its present assignment of 250 to 100 watts during the hours of 6

o'clock p. m. to 6 o'clock a. m., in order to eliminate interference by that station in regions beyond the service area which it is reasonably entitled to serve.

Stations WKBB and WCLS, at Joliet, Ill. In both of these cases the assigned power of the station has been reduced from 150 to 100 watts for the same reason.

Stations WKBS and WLBO, at Galesburg, Ill.

Stations KGBY, KGCH, KGDW, KGBZ, KGES, and KGEO at various small towns in Nebraska. In this case the consolidation has already been effected, with the result that the key station which will continue to operate them all is station KGBZ at York, Nebr.

The result of these consolidations has been to effect a very material reduction in the number of station licenses in the overcongested fourth zone, and the commission expresses its appreciation to the stations concerned for their cooperation.

List of stations whose applications for renewal of licenses were approved:

CWWR Fort Wayne, Ind. power reduced from 250 to 100 watts).
WMAY St. Louis, Mo.
WEBE Cambridge, Ohio.
WFKD Frankford, Pa.
WCDA Cliffside Park, N. J.
WMBG Richmond, Va.
WKBZ Ludington, Mich.
WHBC Canton, Ohio.
KGCR Brookings, S. Dak.
KGDA Dell Rapids, S. Dak.
WKBH La Crosse, Wis.
WIBU Poynette, Wis.
WCLO Kenosha, Wis.
KGBX St. Joseph, Mo.
KGDY Oldham, S. C.
KFIZ Fond du Lac, Wis.
WCBM Baltimore, Md.
WMES Boston, Mass.
WABY Philadelphia, Pa.
WFBE Cincinnati, Ohio.
KGFW Ravenna, Nebr.
WSMK Dayton, Ohio.
WCBS Springfield, Ill.
KGBX Goldthwaite, Tex.

APPENDIX F (5)

Statement by commission of principles involved in its decisions under General Order No. 32

The Federal Radio Commission made public on September 1, 1928, its views on certain points of law raised in the recent hearings of radio broadcasting stations which were called upon to prove that they are operating in the public interest. The statement follows:

"DECISIONS ON CERTAIN POINTS OF LAW

"The commission realizes that a detailed discussion of the various points of law which have been raised in these hearings would be out of place in this document. On the other hand, the commission feels that a brief statement of its attitude on the more important questions will be helpful both to the parties and to any court of review which may be called upon to pass upon the commission's decisions in these cases.

"In many of the cases it has been urged that the radio act of 1927 and the amendment in 1928 are invalid and unconstitutional for various reasons. Among these reasons it has been said that the statutes do not come within the power of Congress over interstate commerce. In the opinion of the commission broadcasting does constitute commerce; this is particularly evident where it is made a vehicle for advertising. The advertising may be paid for by outsiders whose names and products are placed before the public in connection with programs, or it may take the form of advertising the business of the broadcaster himself. Most of the broadcasting stations are now supported in whole or in part by advertising. There are no stations covered by General Order No. 32 whose programs are not heard at least part of the time in States other than the State in which the stations are respectively located.

"Whether broadcasting be interstate commerce or not, it is clear that even the smallest broadcasting station does or may interfere with interstate commerce and is therefore subject to regulation. It prevents anyone in the vicinity of the station from receiving programs or messages on that channel, and its interference or nuisance range extends far beyond the State of its location. In a greater or less degree, depending upon its power, it prevents anyone in

the vicinity of the station from receiving programs or messages on other channels, particularly the closely adjacent frequencies. The harmonics which are emitted by a substantial number of transmitters interfere or may interfere with frequencies two, three, or four times the assigned frequency and may thus cause trouble in the bands of high frequencies where so much of the point-to-point radio communication takes place, carried on by wireless-telegraphy stations, ship-to-shore stations, and the like. Interference may also be caused with radio stations operated by the United States Army and Navy.

"It is contended that to refuse to grant these applications for renewals of licenses constitutes a taking of property without due process of law. Without pausing to enter into a discussion of the authorities, the commission will confine itself to pointing out its reasons for believing that the contention is not well founded. If an applicant is deprived of anything by the decision of the commission, it is not of his tangible property, his transmitter, or his studio, but of the privilege of using and operating this property either in interstate commerce or in such a way as may interfere with interstate commerce. Not a single applicant involved in these hearings—in fact, not a single licensed broadcaster—has ever acquired or enjoyed this privilege other than under a license from the United States Government and under a law requiring such a license as a prerequisite condition. The first broadcasting station was established in 1921. Nine years before Congress had enacted the radio act of 1912, which required a license of everyone engaging in radio communication, and all broadcasters sought and received licenses under this act until the enactment of the radio act of 1927. Each license was for a period of three months, and each broadcaster who continued to broadcast renewed his license from time to time. With very few exceptions (which are disclosed by the applications in those cases) all the applicants involved in these hearings received such licenses and renewed them from time to time; the exceptions obtained their first licenses from this commission under the radio act of 1927.

"The radio act of 1912 was never passed upon or construed by the Supreme Court of the United States. It was the subject of not altogether consistent opinions by the Court of Appeals of the District of Columbia, by a district court of the United States, and by the Attorney General of the United States. (Hoover *v.* Intercity Radio Co. (Inc.), 286 Fed. 1003; United States *v.* Zenith Radio Corporation et al., 12 Fed. (2d) 614; Opinions of Attorney General of November 22, 1921, and July 8, 1926.) While there is room for disagreement as to the construction put upon certain provisions of the act in each of these opinions, it is clear that none of them denied the right of the United States to require a license as a condition prerequisite to entering upon radio communication.

"Each of the applicants, therefore, has recognized the superior and exclusive right of the United States to control who shall and who shall not operate a radio transmitter, not once but several times. Each of the applicants has accepted and enjoyed the privileges of short-term licenses and recognized the right of the United States to require further applications and to determine whose licenses should be renewed. Can any of them now be heard to say that by applying for and obtaining a license to operate for three months he has acquired a permanent right to one of the limited channels in the ether against the United States, as well as against all others who may be able to give far better and more important service to the public? Furthermore, the commission is of the opinion that even if the act of 1912 had not been enacted, or if it had only the restricted scope given it by the above-cited authorities, no broadcaster could acquire such a right in the ether as is now claimed. The ether with respect to radio communication is very much like the Great Lakes with respect to navigation; the necessity for exclusive Federal control in the ether, however, is vastly greater because of the limited number of channels and the importance of their being used to the best advantage of the people of the United States. The subject is not only national but international in character and has already been the subject of great international conventions to which the United States has been and is a party.

"Even were the possibility of acquiring a property right in the use of the ether conceded, still each applicant would be faced with an insuperable objection to the establishment of any such right in his case. All licensees under the radio act of 1927, have in each of the several applications made by each of them, subscribed to a waiver of any claim to the use of any particular frequency

or wave length or of the ether as against the regulatory power of the United States because of the previous use of the same whether by license or otherwise.

"This condition has become part of the terms of each license. In addition, each of the applicants who was licensed prior to the enactment of the law subscribed to a much broader waiver, required by a joint resolution of Congress adopted on December 8, 1926, of any right or of any claim to any right as against the United States to any wave length or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof. It would seem, therefore, that each applicant has effectively waived any right he may have in the permanent use of the ether, and Congress intended that he should so waive any such right.

"The validity and meaning of the standard of 'public interest, convenience, and necessity,' have been discussed in an opinion previously published.

"Another point urged upon the commission is that before proceeding to such hearings as have been held the commission is obliged by the law to classify radio stations and to do other acts enumerated in section 4 of the radio act of 1927. It is difficult to understand the significance of this contention. There has been a classification of radio stations; among other things, broadcasting stations have been grouped together and have been assigned to a particular band of frequencies; experimental stations, amateur stations, point-to-point wireless stations, ship stations, etc., all have been classified to a greater or less degree. There has been no subclassification of broadcasting stations, but, except for the requirements of the Davis amendment, there has been no occasion for such a classification.

"Another contention has been that the commission, before refusing to renew a license, or holding a hearing in connection therewith. is bound to make specific charges and notify the applicant of such charges so that he may prepare his defense. This contention, in the opinion of the commission, misconceives the purpose and effect of section 11 of the act. The burden is on the applicant to show that granting his application would serve public interest, convenience, or necessity; he is given a hearing so that he may have an opportunity to make such a showing. The burden is not on the commission to establish that granting his application would not meet the test.

"Complaint has been made that no 'rules and regulations' governing the conduct of the hearings were promulgated by the commission. That there were rules and regulations, though somewhat informal in character, is apparent from the record. The absence of more formal rules, however, redounded entirely to the advantage of the applicants, who, in the interest of fairness, were allowed the utmost latitude in the manner and method of presenting their cases.

"The only restriction of importance that was imposed by the commission was the exclusion of unsworn evidence consisting of letters and petitions which were offered by the thousands and usually in commendation of the applicant's station. While the commission sought to exclude such evidence, it gave the applicant practically the full benefit by permitting him to state into the record the number and character of the letters or petitions, and, to a large extent, the names of any prominent persons or organizations who had signed them. To have received such evidence would have unduly encumbered the record in each case and would have subjected the applicant to unnecessary expense on appeal. By such a ruling a great advantage was given to the applicant, for, by the same token. the commission did not put into the record in any case the thousands of letters which have come to it from radio listeners.

"There was a general tendency among the applicants and their attorneys to confuse the proceedings with hearings on revocations of licenses. It seems hardly necessary to point out that not a single case under General Order No. 32 involved a revocation of license; each was a case of an application to renew a license. The contention was made that this procedure could not be followed if the aim were, in whole or in part, to give effect to the Davis amendment. A careful reading of that amendment, however, discloses that refusing to renew a license is one of the means specifically provided for giving it effect.

"In some of the cases the commission, during the course of the hearings, reserved its rulings on the introduction of evidence or on points of law. In each case all evidence on which a ruling was reserved has been considered by the commission in reaching the decision, and may, therefore, be considered as having been received. All objections to the jurisdiction of the commission, the validity of its action, the validity of the law or of any of its provisions, or the like, have been overruled."

APPENDIX F (6)

Statement made by the commission on August 23, 1928, relative to public interest, convenience, or necessity

FEDERAL RADIO COMMISSION,
Washington, D. C.

The Federal Radio Commission announced on August 23, 1928, the basis principles and its interpretation of the public interest, convenience, or necessity clause of the radio act, which were invoked in reaching decisions in cases recently heard of radio broadcasting stations whose public service was challenged. The commission's statement follows:

PUBLIC INTEREST, CONVENIENCE, OR NECESSITY

The only standard (other than the Davis amendment) which Congress furnished to the commission for its guidance in the determination of the complicated questions which arise in connection with the granting of licenses and the renewal or modification of existing licenses is the rather broad one of "public interest, convenience, or necessity." The first paragraph of section 9 of the radio act of 1927, for example, provides as follows:

"The licensing authority, if public convenience, interest, or necessity will be served thereby, subject to the limitations of this act, shall grant to any applicant therefor a station license provided for by this act."

The first paragraph of section 2 of the same act provides as follows:

"If upon examination of any application for a station license or for the renewal or modification of a station license the licensing authority shall determine that public interest, convenience, or necessity would be served by the granting thereof, it shall authorize the issuance, renewal, or modification thereof in accordance with said findings. In the event the licensing authority upon examination of any such application does not reach such decision with respect thereto, it shall notify the applicant thereof, shall fix and give notice of a time and place for hearing thereon, and shall afford such applicant an opportunity to be heard under such rules and regulations as it may prescribe."

Section 21 provides in part:

"No license shall be issued under the authority of this act for the operation of any station the construction of which is begun or is continued after this act takes effect, unless a permit for its construction has been granted by the licensing authority upon written application therefor. The licensing authority may grant such permit if public convenience, interest, or necessity will be served by the construction of the station. * * * Upon the completion of any station for the construction or continued construction for which a permit has been granted, and upon it being made to appear to the licensing authority that all the terms, conditions, and obligations set forth in the application and permit have been fully met, and that no cause or circumstance arising or first coming to the knowledge of the licensing authority since the granting of the permit would, in the judgment of the licensing authority, make the operation of such station against the public interest, the licensing authority shall issue a license to the lawful holder of said permit for the operation of said station. Said license shall conform generally to the terms of said permit."

Other instances of the use of the phrase are to be found in the opening paragraph and in subparagraph (f) of section 4. No attempt is made anywhere in the act to define the term "public interest, convenience, or necessity," nor is any illustration given of its proper application.

The commission is of the opinion that Congress, in enacting the Davis amendment, did not intend to repeal or do away with this standard. While the primary purpose of the Davis amendment is to bring about equality as between the zones, it does not require the commission to grant any application which does not serve public interest, convenience, or necessity simply because the application happens to proceed from a zone or State that is under its quota. The equality is not to be brought about by sacrificing the standard. On the other hand, where a particular zone or State is over its quota, it is true that the commission may on occasions be forced to deny an application the granting of which might, in its opinion, serve public interest, convenience, or necessity. The Davis amendment may, therefore, be viewed as a partial limitation upon the power of the commission in applying the standard.

The cases which the commission has considered as a result of General Order No. 32 are all cases in which it has had before it applications for renewals of station licenses. Under section 2 of the act the commission is given full power and authority to follow the procedure adhered to in these cases, when it has been unable to reach a decision that granting a particular application would serve public interest, convenience, or necessity. In fact, the entire radio act of 1927 makes it clear that no renewal of a license is to be granted, unless the commission shall find that public interest, convenience, or necessity will be served. The fact that all of these stations have been licensed by the commission from time to time in the past, and the further fact that most of them were licensed prior to the enactment of the radio act of 1927 by the Secretary of Commerce, do not, in the opinion of the commission, demonstrate that the continued existence of such stations will serve public interest, convenience, or necessity. The issuance of a previous license by the commission is not in any event to be regarded as a finding further than for the duration of the limited period covered by the license (usually 90 days). There have been a variety of considerations to which the commission was entitled to give weight. For example, when the commission first entered upon its duties it found in existence a large number of stations, much larger than could satisfactorily operate simultaneously and permit good radio reception. Nevertheless, in order to avoid injustice and in order to give the commission an opportunity to determine which stations were best serving the public, it was perfectly consistent for the commission to relicense all of these stations for limited periods. It was in the public interest that a fair test should be conducted to determine which stations were rendering the best service. Furthermore, even if the relicensing of a station in the past would be some indication that it met the test, there is no reason why the United States Government, the commission, or the radio-listening public should be bound by a mistake which has been made in the past. There were no hearings preliminary to granting these licenses in the past, and it can hardly be said that the issue has been adjudicated in any of the cases.

The commission has been urged to give a precise definition of the phrase "public interest, convenience, or necessity," and in the course of the hearings has been frequently criticized for not having done so. It has also been urged that the statute itself is unconstitutional because of the alleged uncertainty and indefiniteness of the phrase. So far as the generality of the phrase is concerned, it is no less certain or definite than other phrases which have found their way into Federal statutes and which have been upheld by the Supreme Court of the United States. An example is "unfair methods of competition." To be able to arrive at a precise definition of such a phrase which will foresee all eventualities is manifestly impossible. The phrase will have to be defined by the United States Supreme Court, and this will probably be done by a gradual process of decisions on particular combinations of fact.

It must be remembered that the standard provided by the act applies not only to broadcasting stations but to each type of radio station which must be licensed, including point-to-point communication, experimental, amateur, ship, airplane, and other kinds of stations. Any definition must be broad enough to include all of these and yet must be elastic enough to permit of definite application to each.

It is, however, possible to state a few general principles which have demonstrated themselves in the course of the experience of the commission and which are applicable to the broadcasting band.

In the first place, the commission has no hesitation in stating that it is in the public interest, convenience, and necessity that a substantial band of frequencies be set aside for the exclusive use of broadcasting stations and the radio listening public, and under the present circumstances believes that the band of 550 to 1,500 kilocycles meets that test.

In the second place, the commission is convinced that public interest, convenience, or necessity will be served by such action on the part of the commission as will bring about the best possible broadcasting reception conditions throughout the United States. By good conditions the commission means freedom from interference of various types as well as good quality in the operation of the broadcasting station. So far as possible, the various types of interference, such as heterodyning, cross talk, and blanketing must be avoided. The commission is convinced that the interest of the broadcast listener is of superior importance to that of the broadcaster and that it is better that there

should be a few less broadcasters than that the listening public should suffer from undue interference. It is unfortunate that in the past the most vociferous public expression has been made by broadcasters or by persons speaking in their behalf and the real voice of the listening public has not sufficiently been heard.

The commission is furthermore convinced that within the band of frequencies devoted to broadcasting, public interest, convenience, or necessity will be best served by a fair distribution of different types of service. Without attempting to determine how many channels should be devoted to the various types of service, the commission feels that a certain number should be devoted to stations so equipped and financed as to permit the giving of a high order of service over as large a territory as possible. This is the only manner in which the distant listener in the rural and sparsely settled portions of the country will be reached. A certain number of other channels should be given over to stations which desire to reach a more limited region and as to which there will be large intermediate areas in which there will be objectionable interference. Finally, there should be a provision for stations which are distinctly local in character and which aim to serve only the smaller towns in the United States without any attempt to reach listeners beyond the immediate vicinity of such towns.

The commission also believes that public interest, convenience, or necessity will be best served by avoiding too much duplication of programs and types of programs. Where one community is underserved and another community is receiving duplication of the same order of programs, the second community should be restricted in order to benefit the first. Where one type of service is being rendered by several stations in the same region, consideration should be given to a station which renders a type of service which is not such a duplication.

In view of the paucity of channels, the commission is of the opinion that the limited facilities for broadcasting should not be shared with stations which give the sort of service which is readily available to the public in another form. For example, the public in large cities can easily purchase and use phonograph records of the ordinary commercial type. A station which devotes the main portion of its hours of operation to broadcasting such phonograph records is not giving the public anything which it can not readily have without such a station. If, in addition to this, the station is located in a city where there are large resources in program material, the continued operation of the station means that some other station is being kept out of existence which might put to use such original program material. The commission realizes that the situation is not the same in some of the smaller towns and farming communities, where such program resources are not available. Without placing the stamp of approval on the use of phonograph records under such circumstances, the commission will not go so far at present as to state that the practice is at all times and under all conditions a violation of the test provided by the statute. It may be also that the development of special phonograph records will take such a form that the result can be made available by broadcasting only and not available to the public commercially, and if such proves to be the case the commission will take the fact into consideration. The commission can not close its eyes to the fact that the real purpose of the use of phonograph records in most communities is to provide a cheaper method of advertising for advertisers who are thereby saved the expense of providing an original program.

While it is true that broadcasting stations in this country are for the most part supported or partially supported by advertisers, broadcasting stations are not given these great privileges by the United States Government for the primary benefit of advertisers. Such benefit as is derived by advertisers must be incidental and entirely secondary to the interest of the public.

The same question arises in another connection. Where the station is used for the broadcasting of a considerable amount of what is called "direct advertising," including the quoting of merchandise prices, the advertising is usually offensive to the listening public. Advertising should be only incidental to some real service rendered to the public, and not the main object of a program. The commission realizes that in some communities, particularly in the State of Iowa, there seems to exist a strong sentiment in favor of such advertising on the part of the listening public. At least the broadcasters in that community have succeeded in making an impressive demonstration before the commission on each occasion when the matter has come up for discussion. The commission is not fully convinced that it has heard both sides of the matter, but is willing to con-

cede that in some localities the quoting of direct merchandise prices may serve as a sort of local market, and in that community a service may thus be rendered. That such is not the case generally, however, the commission knows from thousands and thousands of letters which it has had from all over the country complaining of such practices.

Another question which must be taken seriously is the location of the transmitter of the station. This is properly a question of interference. Generally speaking, it is not in the public interest, convenience, or necessity for a station of substantial power (500 watts or more) to be located in the midst of a thickly inhabited community. The question of the proper location of a station with respect to its power is a complicated one and can not here be discussed in detail. Obviously it is desirable that a station serving a particular community or region should cover that community or region with a signal strong enough to constitute adequate service.

It is also desirable that the signal be not so strong as to blanket reception from other stations operating on other frequencies. There is a certain amount of blanketing in the vicinity of every transmitter, even one of 5, 10, or 50 watts. The frequencies used by stations in the same geographical region can be widely enough separated, however, so that the blanketing will not be serious from a transmitter of less than 500 watts, even when located in a thickly inhabited community. With stations of that amount of power, or greater, the problem becomes a serious one. In order to serve the whole of a large metropolitan area a 500-watt station has barely sufficient power even when it is located in the center of the area. If its transmitter is located away from the thickly inhabited portions and out in the country it will not give satisfactory service. Such an area can only be adequately served, without blanketing by stations of greater power located in sparsely settled portions of the near-by country.

Theoretically, therefore, it may be said that it will not serve public interest, convenience, or necessity to permit the location of a low-powered station in a large city. It can not hope to serve the entire city, and yet it renders the frequency useless for the listeners of the city outside of the small area immediately surrounding the station. On the other hand, such a station might give very good service to a small town or city.

The commission is furthermore convinced that in applying the test of public interest, convenience, or necessity, it may consider the character of the licensee or applicant, his financial responsibility, and his past record, in order to determine whether he is more or less likely to fulfill the trust imposed by the license than others who are seeking the same privilege from the same community, State, or zone.

A word of warning must be given to those broadcasting (of which there have been all too many) who consume much of the valuable time allotted to them under their licenses in matters of a distinctly private nature, which are not only uninteresting but also distasteful to the listening public. Such is the case where two rival broadcasters in the same community spend their time in abusing each other over the air.

A station which does not operate on a regular schedule made known to the public through announcements in the press or otherwise is not rendering a service which meets the test of the law. If the radio listener does not know whether or not a particular station is broadcasting, or what its program will be, but must rely on the whim of the broadcaster and on chance in tuning his dial at the proper time, the service is not such as justify the commission in licensing such a broadcaster as against one who will give a regular service of which the public is properly advised. A fortiori, where a licensee does not use his transmitter at all and broadcasts his programs, if at all, over some other transmitter separately licensed, he is not rendering any service. It is also improper that the zone and State in which his station is located should be charged with a license under such conditions in connection with the quota of that zone and that State under the Davis amendment.

A broadcaster who is not sufficiently concerned with the public's interest in good radio reception to provide his transmitter with an adequate control or check on its frequency is not entitled to a license. The commission in allowing a latitude of 500 cycles has been very lenient and will necessarily have to reduce this margin in the future. Instability in frequency means that the radio-listening public is subjected to increased interference by heterodyne (and, in some cases, cross-talk) on adjacent channels as well as on the assigned channels.

In conclusion, the commission desires to point out that the test—"public interest, convenience, or necessity"—becomes a matter of a comparative and

not an absolute standard when applied to broadcasting stations. Since the number of channels is limited and the number of persons desiring to broadcast is far greater than can be accommodated, the commission must determine from among the applicants before it which of them will, if licensed, best serve the public. In a measure, perhaps, all of them give more or less service. Those who give the least, however, must be sacrificed for those who give the most. The emphasis must be first and foremost on the interest, the convenience, and the necessity of the listening public, and not on the interest, convenience, or necessity of the individual broadcaster or the advertiser.

APPENDIX G (1)

List of radio broadcasting stations, arranged by States, showing assignment made September 10, 1928, and under new allocation effective November 11, 1928. (Revised by appended statements marked G–1a and G–1b)

FEDERAL RADIO COMMISSION.
Washington, D. C., September 10, 1928.

List of radio broadcasting stations, arranged according to States, showing their power and frequencies as of September 1, 1928, and the new allocation so that comparisons can be made easily. This new allocation is to be effective at 3 a. m., eastern standard time, on November 11, 1928.

List of radio broadcasting stations, arranged by States, etc.

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	ALABAMA			*Watts*			*Watts*	
WAPI	Auburn	Alabama Polytechnic Institute	WJAX	1,000	880	WJAX	[1] 1,000	1,140
WBRC	Birmingham	Birmingham Broadcasting Co		250	990		500	930
WKBC	do	H. L. Ansley		10	1,370		10	1,310
WJBY	Gadsden	Electric Construction Co		50	1,280		50	1,210
WIBZ	Montgomery	Alexander D. Trum		15	1,300		15	1,500
	ALASKA							
KFQD	Anchorage	Anchorage Radio Club		100	870		100	900
KFIU	Juneau	Alaska Electric Light & Power Co		10	1,330		10	1,310
KGBU	Ketchikan	Alaska Radio Service Co. (Inc.)		500	750		500	610
	ARIZONA							
KFXY	Flagstaff	Mary M. Costigan		100	1,460		100	1,420
KFAD	Phoenix	Electrical Equipment Co		500	930		500	620
KFCB	do	Nielsen Radio Supply Co		[2] 125	1,230		100	1,310
KGAR	Tucson	Citizen Publishing Co		100	1,280		100	1,370
KPJM	Prescott	Frank Wilburn		[3] 15	1,400		15	1,500
	ARKANSAS							
KLCN	Blytheville	Daily Courier News		[3] 50	1,050		[3] 50	1,290
KUOA	Fayetteville	University of Arkansas		1,000	1,010	KLRA	1,000	1,250
KTHS	Hot Springs	Arlington Hotel Co	WBAP	1,000	800	WBAP	[1] 1,000	800
KLRA	Little Rock	Arkansas Broadcasting Co		50	1,470	KUOA	1,000	1,250
KGHI	do	Berean Bible Class		15	1,150		15	1,500
KGJF	do	First Church of the Nazarene		250	1,080		100	1,370
KGHG	McGehee	Charles W. McCollum		50	1,350		50	1,370
KFPW	Sulphur Springs	Rev. Lannie W. Stewart		50	1,140		[3] 50	1,340

[1] Construction permit for 5,000 watts issued.
[2] Construction permit for 250 watts, daytime only, issued.
[3] Daytime.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	CALIFORNIA			Watts			Watts	
KFWO	Avalon	Lawrence Mott		[4] 250	1,000	KWTC	100	1,500
KRE	Berkeley	First Congregational Church of Berkeley	KZM	100	1,300	KFQU-KGTT	100	1,500
KEJK	Beverly Hills	R. S. MacMillan (Ltd.)	KFSG	250	1,190	KFON	500	1,250
KELW	Burbank	Earl L. White		500	1,310	KNRC	500	780
KFVD	Culver City	W. J. & C. I. McWhinnie	KGER	250	1,390		[4] 250	700
KGEN	El Centro	Irey & Bowles		100	1,330		100	1,200
KMJ	Fresno	The Fresno Bee		[5] 50	820		100	1,200
KGFH	Glendale	Fred Robinson	KGEF	[4] 250	1,140		[4] 250	1,000
KZM	Hayward	Leon P. Tenney	KRE	100	1,300	KJBS	100	1,370
KFQZ	Hollywood	Taft Radio & Broadcasting Co		250	1,290		[4] 250	850
KFWB	do	Warner Bros. Broadcasting Corporation		1,000	830	KPSN	1,000	950
KNX	do	Western Broadcasting Co		[1] 500	890		5,000	1,050
KMTR	do	KMTR Radio Corporation		500	580	KPLA	1,000	570
KFQU	Holy City	W. E. Riker	KGTT	100	1,360	KRE-KGTT	100	1,500
KMIC	Inglewood	James R. Fouch		250	1,340	KFSG	500	1,120
KGER	Long Beach	C. Merwin Dobyn	KFVD	100	1,390		100	1,370
KFON	do	Nichols & Warinner (Inc.)		1,000	1,240	KEJK	1,000	1,250
KFI	Los Angeles	Earle C. Anthony (Inc.)		[6] 500	640		[6] 5,000	640
KFSG	Los Angeles	Echo Park Evangelical Association	KEJK	[4] 500	1,190	KMIC	500	1,120
KGEF	do	Trinity Methodist Church	KGFH	[4] 1,000	1,140	KTBI	1,000	1,300
KGFJ	do	Ben S. McGlashan		100	1,410		100	1,420
KHJ	do	Don Lee (Inc.)		1,000	750		1,000	900
KTBI	do	Bible Institute of Los Angeles	KFBK	[4] 1,000	1,090	KGEF	1,000	1,300
KPLA	do	Pacific Development Radio Co		500	1,040	KMTR	1,000	570
KLX	Oakland	Tribune Publishing Co		500	590	KTAB	500	1,270
KGO	do	General Electric Co		[7] 5,000	780		10,000	790
KTAB	do	Associated Broadcasters		500	1,070	KLX	500	1,270
KFWM	do	Oakland Educational Society		[8] 500	1,270	KFWI	500	930
KLS	do	Warner Brothers	KJBS	250	1,220	KWG	100	1,420
KFWC	Ontario	James R. Fouch	KGB	100	1,210	KPPC	100	1,200
KPPC	Pasadena	Pasadena Presbyterian Church	KPSN	50	950	KFWC	50	1,200
KPSN	do	Pasadena Star-News Publishing Co	KPPC	1,000	950	KFWB	1,000	950
KFSD	San Diego	Airfan Radio Corporation		500	680		500	600

KGB	do	Southwestern Broadcasting Corporation	KFWC	[3] 100	1,210		250	1,340
KFRC	San Francisco	Don Lee (Inc.)		1,000	660		1,000	610
KGTT	do	Glad Tidings Temple and Bible Institute.	KFQU	50	1,360	KFQU-KRE	50	1,500
KFWI	do	Radio Entertainments (Inc.)		500	1,120	KFWM	500	930
KJBS	do	J. Brunton & Sons Co	KLS	100	1,220	KZM	100	1,370
KPO	do	Hale Bros. & Chronicle		1,000	710		5,000	680
KYA	do	Pacific Broadcasting Corporation		1,000	850		1,000	1,220
KFBK	Sacramento	Kimball-Upson Co	KTBI	[4] 100	1,090		100	1,310
KQW	San Jose	First Baptist Church		500	1,010		500	1,010
KWTC	Santa Ana	Pacific Broadcasting Federation	KSMR	100	1,100	KFWO	100	1,500
KFCR	Santa Barbara	Santa Barbara Broadcasting Co		100	1,420		100	1,500
KSMR	Santa Maria	Santa Maria Valley R. R. Co	KWTC	100	1,100		100	1,200
KNRC	Santa Monica	Pickwick Broadcasting Corporation		500	800	KELW	500	780
KWG	Stockton	Portable Wireless Tel. Co		100	870	KLS	100	1,420
KGDM	do	E. F. Peffer		10	1,380		[5] 50	1,150
	COLORADO							
KFUM	Colorado Springs	W. D. Corley	KFBU	1,000	620	KOW	1,000	1,390
KPOF	Denver	Pillar of Fire (Inc.)		500	1,490	KFKA	500	1,010
KOW	do	Associated Industries (Inc.) Broadcasting.	KGEW	250	1,370	KFUM	500	1,390
KFUP	do	Fitzsimmons General Hospital	KFEL	100	1,320	KFXJ	100	1,500
KFEL	do	E. P. O'Fallon (Inc.)	KFUP	250	1,320	KFXF	250	1,120
KFXJ	Edgewater	R. G. Howell	KGHF	50	1,430	KFUP	50	1,500
KGEW	Fort Morgan	City of Fort Morgan	KOW	[3] 100	1,370	KGEK	100	1,200
KFKA	Greeley	Colorado State Teachers' College	KFHA	[3] 500	1,200	KPOF	500	1,010
KFHA	Gunnison	Western State College of Colorado	KFKA	50	1,200		50	1,200
KFXF	Denver	Pikes Peak Broadcasting Co		250	1,060	KFEL	250	1,120
KOA	do	General Electric Co		5,000	920		12,500	830
KLZ	Dupont	Reynolds Radio Co		1,000	850		1,000	560
KGDP	Pueblo	Boy Scouts of America (Pueblo Council)		10	1,340		10	1,210
KGHF	do	Ritchie & Finch	KFXJ	250	[7] 1,430		250	1,320
KGEK	Yuma	Beehler Electrical Equipment Co		[3] 50	1,140	KGEW	50	1,200
	CONNECTICUT							
WICC	Easton	Bridgeport Broadcasting Station (Inc.)		500	1,130	WBRL	500	1,430
WTIC	Hartford	Travelers Insurance Co	WCAC	500	560	WBAL	[6] 500	1,060
WDRC	New Haven	Doolittle Radio Corporation		500	1,060	WCAC	500	1,330
WCAC	Mansfield	Connecticut Agricultural College	WTIC	500	560	WDRC	500	1,330
	DELAWARE							
WDEL	Wilmington	WDEL (Inc.)		250	1,010	WMAL	250	630

[1] Construction permit for 5,000 watts issued.
[2] Daytime.
[3] Limited time.
[4] Limited to 12 p. m.
[5] Construction permit for 50,000 watts issued.
[6] Construction permit for 10,000 watts issued.
[7] 1,000 watts in daytime only.
[8] 200 watts in daytime only.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	DISTRICT OF COLUMBIA							
				Watts			*Watts*	
WRHF	Washington	American Broadcasting Co		[3] 150	930		[3] 150	1,270
WMAL	do	M. A. Leese Co		500	1,240	WDEL	250	630
WRC	do	Radio Corporation of America		500	640		500	950
	FLORIDA							
WFLA-WSUN	Clearwater	Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce.		750	580		1,000	900
WRUF	Gainesville	University of Florida (construction permit only).	WTFF	5,000	1,480	KFJF	5,000	1,470
WJAX	Jacksonville	City of Jacksonville	WAPI	1,000	880	WAPI	1,000	1,140
WMBL	Lakeland	Benford's Radio Studios		100	1,310		100	1,310
WQAM	Miami	Electrical Equipment Co	WMBF	750	780	WIOD	750	1,240
WMBF	Miami Beach	Fleetwood Hotel Corporation	WQAM	500	780		500	560
WIOD	do	Isle of Dreams Broadcasting Co		1,000	1,210	WQAM	1,000	1,240
WDBO	Orlando	Rollins College (Inc.)		[3] 500	1,040	WDAE	1,000	620
WCOA	Pensacola	City of Pensacola		500	1,200		500	1,120
WJBB	Sarasota	Financial Journal (Inc.)		250	1,260		100	1,370
WDAE	Tampa	Tampa Publishing Co		500	1,120	WDBO	1,000	620
WMBR	do	F. J. Reynolds		100	1,190		100	1,210
	GEORGIA							
WGST	Atlanta	Georgia School of Technology	WMAZ	500	1,110	WMAZ	500	890
WSB	do	Atlanta Journal Co		1,000	630		[1] 1,000	740
WTHS	do	Atlanta Technical High School		200	1,320	WRBI	100	1,310
WMAZ	Macon	Mercer University	WGST	500	1,110	WGST	500	890
WRBL	Columbus	Roy E. Martin		50	1,170		50	1,200
WRBI	Tifton	Kents furniture and music store		[3] 20	1,350	WTHS	20	1,310
WTFI	Toccoa	Toccoa Falls Institute		500	1,430		500	1,450
	HAWAII							
KGU	Honolulu	Marion A. Mulrony		500	1,110		500	940
KGHB	do	Radio Sales Co		250	1,320		250	1,320

	IDAHO							
KFAU	Boise City	Independent school district of Boise City.		[10] 2,000	1,050	KDYL	1,000	1,230
KFXD	Jerome	Service Radio Co		[11] 15	1,470		50	1,420
KFEY	Kellogg	Union High School		10	1,290		10	1,370
KSEI	Pocatello	KSEI Broadcasting Association		250	900		250	1,320
	ILLINOIS							
WMAQ	Chicago	Chicago Daily News (Inc.)	WQJ	5,000	670		5,000	670
WMBI	do	Moody Bible Institute	WJAZ	5,000	1,140	WOWO-KTNT-WCBD	5,000	1,160
WORD	Batavaia	Peoples Pulpit Association		[12] 5,000	1,190	WJAZ-WHT-WIBO	[6] 5,000	1,480
WCAZ	Carthage	Carthage College		50	1,200	WDZ	[3] 100	1,070
KFKX-KYW	Chicago	Westinghouse Electric & Manufacturing Co.		2,500	570		5,000	1,000
WAAF	do	Drovers Journal Publishing Co	WBBM-WJBT	500	770		[3] 500	940
WCFL	do	Chicago Federation of Labor	WEMC	1,500	620	WJJD-WRM	1,000	620
WEDC	do	Emil Denemark (Inc.)	WGES	100	1,240	WCRW-WSBC	100	1,210
WENR-WBCN	do	Great Lakes Radio Broadcasting Co		5,000	1,040	WLS	5,000	870
WGES	do	Oak Leaves Broadcasting Corporation	WEDC	500	1,240	WJKS-WPCC	500	1,360
WHFC	do	Goodson & Wilson (Inc.)	WKBI-WEHS	100	1,390	WEHS-WCLS-WKBB-WKBI.	100	1,310
WJBT	See WBBM-WJBT.							
WKBI	Chicago	Fred Schoenwolf	WHFC-WEHS	50	1,390	WEHS-WCLS-WKBB-WHFC.	50	1,310
WPCC	do	North Shore Congregational Church	WCRW	500	1,340	WJKS-WGES	500	1,360
WSBC	do	World Battery Co	WJKS	100	1,290	WEDC-WCRW	100	1,210
WLS	Crete	Sears, Roebuck & Co	WCBD	5,000	870	WENR-WBCN	5,000	870
WBAO	Decatur	Jas. Millikin University		100	1,120		[3] 100	1,120
WJBL	do	Gushard Dry Goods Co		250	1,410	WJBC	100	1,200
WIBO	Desplaines	WIBO Broadcasting (Inc.)	WHT	5,000	980	WJAZ-WHT-WORD	5,000	1,480
WGN-WTAS-WLIB	Chicago	Tribune Co		15,000	720		15,000	720
WCRW	do	Clinton R. White	WPCC	100	1,340	WEDC-WSBC	100	1,210
WEHS	Evanston	Victor C. Carlson	WHFC-WKBI	100	1,390	WHFC-WCLS-WKBB-WKBI.	100	1,310
WKBS	Galesburg	Permil N. Nelson	WLBO	100	1,380	WLBO	100	1,310
WLBO	do	Fred. A. Trebbe, jr	WKBS	100	1,380	WKBS	100	1,310
WBBM-WJBT	Chicago	Atlas Investment Co	WJBT-WAAF	5,000	770	KFAB	10,000	770
WEBQ	Harrisburg	Tate Radio Co		15	1,340	KFVS	50	1,210
WCLS	Joliet	WCLS (Inc.)	WKBB	150	1,390	WEHS-WKBB-WKBI-WHFC.	100	1,310
WKBB	do	Sanders Bros. (Inc.)	WCLS	150	1,390	WEHS-WCLS-WKBI-WHFC.	100	1,310
WJBC	La Salle	Hummer Furniture Co	WCLO-WWAE	100	1,320	WJBL	100	1,200
WJJD	Mooseheart	Supreme Lodge of World, Loyal Order of Moose.	WEBH	{1,000 / [5] 25,000}	820	WCFL-WRM	1,000	620

[1] Construction permit for 5,000 watts issued.
[3] Daytime.
[6] Construction permit for 50,000 watts issued.
[8] 1,000 watts in daytime only.
[10] 4,000 watts in daytime only.
[11] 50 watts in daytime only.
[12] One-fourth time only.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	ILLINOIS—continued			*Watts*			*Watts*	
WJAZ	Mount Prospect	Zenith Radio Corporation	WMBI	5,000	1,140	WORD-WIBO-WHT	5,000	1,480
WMBD	Peoria Heights	Peoria Heights Radio Laboratory		250	1,460	WTAD	500	1,440
WTAD	Quincy	Illinois Stock Medicine Broadcasting Corporation.		250 / [3] 500	1,270	WMBD	500	1,440
KFLV	Rockford	Swedish Evangelical Mission Church		100	1,120	WHDI=WDGY-KFEQ	500	1,410
WHBF	Rock Island	Beardsley Specialty Co		100	1,350		100	1,210
WCBS	Springfield	Dewing & Messter		100 / [3] 250	1,430	WTAX	100	1,210
WTAX	Streator	Williams Hardware Co		50	1,210	WCBS	50	1,210
WHT	Deerfield	Radiophone Broadcasting Corporation	WIBO	5,000	980	WJAZ-WORD-WIBO	5,000	1,480
WDZ	Tuscola	James L. Bush		[3] 100	[3] 1,080	WCAZ	[3] 100	[3] 1,070
WRM	Urbana	University of Illinois	WBAA	500 / [3] 1,000	1,100	WJJD-WCFL	500	620
WCBD	Zion	Wilbur Glenn Voliva	WLS	5,000	870	WOWO-KTNT-WMBI	5,000	1,160
	INDIANA							
WHBU	Anderson	Citizens Bank		15	1,360		100	1,210
WCMA	Culver	Culver Military Academy	WOOD	500	1,150	WBAA-WKBF	500	1,400
WGBF	Evansville	Evansville on the Air (Inc.)		250	1,270	WOS-KFRU	500	630
WCWK	Fort Wayne	Chester W. Keen		100	1,400		[3] 500	[3] 1,320
WOWO	do	Main Auto Supply Co		2,500 / [15] 5,000	1,310	KTNT-WCBD-WMBI	5,000	1,160
WJKS	Gary	Johnson Kennedy Radio Corporation	WSBC	500	1,290	WGES-WPCC	500	1,360
WWAE	Hammond	Dr. George F. Courrier	WCLO-WJBC	500	1,320	WRAF	100	1,200
				CP				
WFBM	Indianapolis	Indianapolis Power & Light Co	WTAS	1,000	1,090	WSBT	1,000	920
WKBF	do	Noble Butler Watson		250	1,190	WBAA-WCMA	500	1,400
WJAK	Kokomo	J. A. Kautz (Kokomo Tribune)		50	1,280	WLBC	50	1,310
WBAA	Lafayette	Purdue University	WRM	500	1,100	WCMA-WKBF	500	1,400
WRAF	La Porte	Radio Club (Inc.)		100	1,440	WWAE	100	1,200
WLBC	Muncie	Donald A. Burton		50	1,430	WJAK	50	1,310
WSBT	South Bend	South Bend Tribune	WEAR-WTAM	500	750	WFBM	500	920

WBOW	Terre Haute	Banks of Wabash Broadcasting Association.		100	1,440		100	1,310
WRBC	Valparaiso	Immanuel Lutheran Church		250	1,260		[3] 500	[3] 1,240
WKBV	Brookville	Knox Battery & Electric Co		100	1,370		100	1,500
	IOWA							
WOI	Ames	Iowa State College		{2,500 / [3] 5,000}	1,130	WHO [4]	5,000	1,050
KFGQ	Boone	Boone Biblical College		10	1,430		10	1,310
KWCR	Cedar Rapids	Harry F. Paar	WJAM	100	1,250	KFJY	100	1,310
KSO	Clarinda	Berry Seed Co		500	1,320	WKBH-WHBL	1,000	1,380
KOIL	Council Bluffs	Mona Motor Oil Co	KFAB	5,000	940		1,000	1,260
WOC	Davenport	Palmer School of Chiropractic		5,000	800	WSUI [4]	5,000	970
KGCA	Decorah	Charles W. Greenley	KWLC	10	1,210	KWLC [3]	50	1,270
KWLC	do	Luther College	KGCA	50	1,210	KGCA [3]	50	1,270
WHO	Des Moines	Bankers Life Co		5,000	560	WOI [4]	5,000	1,050
KFJY	Fort Dodge	C. S. Tunwall		100	1,290	KWCR	100	1,310
WSUI	Iowa City	State University of Iowa		[3] 500	[3] 630	WOC [4]	500	970
KFJB	Marshalltown	Marshall Electric Co		{100 / [3] 250}	1,210	WJAM	100	1,200
KTNT	Muscatine	Norman Baker		2,000	1,170	WOWO-WCBD-WMBI	5,000	1,160
WIAS	Ottumwa	Poling Electric Co	KICK	[3] 100	[3] 930	KICK [5]	100	560
KICK	Red Oak	Atlantic Automobile Co., Red Oak Radio Corporation (lessee).	WIAS	[3] 100	[3] 930	WIAS	[3] 100	[3] 560
KFNF	Shenandoah	Henry Field Seed Co		[3] 2,000	[3] 650	WNAX-KUSD	500	890
KMA	do	May Seed & Nursery Co	KWKH	1,000	760	KGBZ	500	930
KSCJ	Sioux City	Perkins Bros. Co		{[1] 500 / [3] 1,000}	1,230	WTAQ	1,000	1,330
WJAM	Waterloo	Waterloo Broadcasting Co	KWCR	250	1,250	KFJB	100	1,200
	KANSAS							
KGCN	Concordia	Concordia Broadcasting Co		50	1,440		50	1,420
WLBF	Kansas City	Everett L. Dillard		50	1,430		100	1,200
KFKU	Lawrence	University of Kansas	WREN	500	1,180	KSAC-WREN	500	1,010
WREN	do	Jenny Wren Co	KFKU	750	1,180	KFKU-KSAC	500	1,010
KSAC	Manhattan	Kansas State Agriculture College		500	900	KFKU-WREN	500	1,010
KFKB	Milford	John R. Brinkley, M. D		{1,500 / [12] 2,500}	1,240		[6] 5,000	[6] 1,130
WIBW	Topeka	C. L. Carrell		250	1,470	KFH	1,000	1,300
KFH	Wichita	Hotel Lassen		500	1,220	WIBW	500	1,300
	KENTUCKY							
WFIW	Hopkinsville	Acme Mills (Inc.)		1,000	1,150		1,000	940
WHAS	Louisville	Courier-Journal and the Louisville Times Co.		[1] 500	930	WWVA	[7] 5,000	1,020
WLAP	Okalona	American Broadcasting Corporation of Kentucky.		[13] 30	1,120		30	1,200

[1] Construction permit for 5,000 watts issued.
[3] Daytime.
[4] Limited time.
[5] 1,000 watts daytime only.
[6] Construction permit for 10,000 watts issued.
[12] Construction permit for 500 watts issued; 100 watts daytime only.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	LOUISIANA			*Watts*			*Watts*	
KGGH	Cedar Grove	Bates Radio & Electric Co	KWEA	50	1,410	KWEA	50	1,370
KWKH	Kennonwood	W. K. Henderson	KMA	3,500	760	WWL	5,000	850
WDSU	New Orleans	Jos. H. Uhalt		250	1,320		1,000	1,270
WABZ	do	Coliseum Place Baptist Church	WJBW	50	1,260	WJBW	50	1,200
WJBO	do	Valdemar Jensen		100	1,140		100	1,370
WJBW	do	Chas. C. Carlson, jr	WABZ	30	1,260	WABZ	30	1,200
WKBT	do	First Baptist Church		50	1,190		50	1,420
WSMB	do	Saenger Theatres (Inc.), Maison Blanche Co.		750	1,010		750	1,320
WWL	do	Loyola University		500	1,220	KWKH	[1] 500	850
KFDX	Shreveport	First Baptist Church		250	1,270	KRMD	100	1,200
KRMD	do	Robt. M. Dean		[4] 50	[4] 1,360	KFDX	50	1,200
KWEA	do	William B. Antony	KGGH	250	1,410	KGGH	100	1,370
KSBA	do	W. G. Patterson		1,000	1,120		1,000	1,450
	MAINE							
WABI	Bangor	First Universalist Church (Sunday)		100	770		100	1,200
WLBZ	Dover-Foxcroft	Thompson L. Guernsey		250	1,440		250	570
WCSH	Portland	Congress Square Hotel Co		[1] 500	1,400		500	940
	MARYLAND							
WCAO	Baltimore	Monumental Radio (Inc.)	WFBR	250	1,230		250	600
WCBM	do	Hotel Chateau		100	1,330		100	1,370
WFBR	do	Baltimore Radio Show (Inc.)	WCAO	[14] 250	1,230		250	1,120
WBAL	do	Consolidated Gas Electric Light & Power Co.		5,000	1,050	WTIC	5,000	1,060
WSMD	Salisbury	Tom F. Little		100	1,130		100	1,310
	MASSACHUSETTS							
WBZA	Boston	Westinghouse Electric & Manufacturing Co.		500	900	WBZ	500	990

WBIS-WNAC	do	The Shepard Stores		500	650		500	1,230
WEEI	do	Edison Electric Illuminating Co		500	590		500	590
WMES	do	Massachusetts Educational Society	WLOE	50	1,420	WLOE	50	1,500
WSSH	do	Tremont Temple Baptist Church	WBET	100	1,040	WLEX	100	1,420
WLOE	Chelsea	William S. Pote	WMES	100	1,420	WMES	100	1,500
WMAF	South Dartmouth	Round Hills Radio Corporation		[15] 500	[15] 700	WBET	500	1,320
WSAR	Fall River	Doughty & Welch Electric Co. (Inc.)		250	1,410	WNBH	250	1,450
WEPS	Gloucester	Matheson Radio Co. (Inc.)		100	1,010	WKBE	100	1,200
WLEX	Lexington	Lexington Air Station		15	1,390	WSSH	50	1,420
WBET	Boston	Boston Transcript Co	WSSH	500	1,040	WMAF	500	1,320
WNBH	New Bedford	New Bedford Broadcasting Co		250	1,150	WSAR	250	1,450
WBZ	East Springfield	Westinghouse Electric & Manufacturing Co.		15,000	900	WBZA	15,000	990
WKBE	Webster	K. & B. Electric Co		100	1,310	WEPS	100	1,200
WBSO	Wellesley Hills	Babson's Statistical Organization (Inc.)		100	780		[3] 100	[3] 780
WTAG	Worcester	Worcester Telegram Publishing Co. (Inc.).		250	580		250	580
	MICHIGAN							
WKBP	Battle Creek	Enquirer-News Co		50	1,410		50	1,420
WSKC	Bay City	World's Star Knitting Co	WFDF	250	1,100		500	1,410
WEMC	Berrien Springs	Emmanuel Missionary Colony	WCFL	1,000	620		[3] 1,000	[3] 680
WWJ	Detroit	Detroit News		1,000	850		1,000	820
WMBC	do	Michigan Broadcasting Co. (Inc.)		100	1,230	WAFD	100	1,420
WBMH	do	Braun's Music House		100	1,420	WAGM	100	1,310
WAFD	do	Albert B. Parfet Co		100	1,300	WMBC	100	1,420
WKAR	East Lansing	Michigan State College	WGHP	[3] 500	1,080		[3] 500	[3] 1,040
WFDF	Flint	Frank D. Fallain	WSKC	100	1,100	WMPC	100	1,310
WGHP	Fraser	George Harrison Phelps (Inc.)	WKAR	750	1,080		750	1,220
WOOD	Grand Rapids	Walter B. Stiles (Inc.)	WCMA	500	1,150	WASH	500	1,270
WASH	do	Baxter Laundries (Inc.)		250	1,170	WOOD	250	1,270
WIBM	Jackson	C. L. Carrell		100	1,490		100	1,370
WMPC	Lapeer	First Methodist Episcopal Church		30	1,280	WFDF	30	1,310
WKDZ	Ludington	K. L. Ashbacker		15	1,500		50	1,500
WJR-WCX	Pontiac	WJR (Inc.)		5,000	680		5,000	750
WAGM	Royal Oak	Robert L. Miller		50	1,330	WBMH	50	1,310
WJBK	Ypsilanti	Ernest F. Goodwin		15	1,360		50	1,370
	MINNESOTA							
KGDE	Barrett	Jaren Drug Co		50	1,460		50	1,200
WFBJ	Collegeville	St. John's University		100	1,100		100	1,370
WRHM	Fridley	Rosedale Hospital Co. (Inc.)		1,000	1,150	WCAL-KFMX-WLB	1,000	1,230
KGFK	Hallock	Kittson County Enterprise		50	1,340		50	1,200
WDGY	Minneapolis	Dr. George W. Young	WCAL	500	1,050	WHDI-KFLV-KFEQ	500	1,410
WHDI	do	W. Dunwoody Industrial Institute	WLB	500	1,220	WDGY-KFEQ-KFLV	500	1,410
WLB-WGMS	do	University of Minnesota	WHDI	500	1,220	WCAL-KFMX-WRHM	1,000	1,230
WCCO	do	Washburn-Crosby Co		[16] 5,000	740		10,000	810

[1] Construction permit for 5,000 watts issued.
[3] Daytime.
[4] Limited time.
[5] 1,000 watts in daytime only.
[14] 500 watts in daytime only.
[15] Summer.
[16] 7,500 watts in daytime only.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	MINNESOTA—contd.							
				Watts			*Watts*	
KFMX	Northfield	Carleton College		500	1,270	WCAL-WRHM-WLB	1,000	1,230
WCAL	do	St. Olaf College	WDGY	500	1,050	KFMX-WRHM-WLB	1,000	1,230
KSTP	Westcott	National Battery Broadcasting Co		5,000	1,360		10,000	1,460
	MISSISSIPPI							
WCOC	Columbus	Crystal Oil Co		500	1,300		500	880
WRBQ	Greenville	J. Pat Scully		[3] 100	[3] 1,090		100	1,200
WGCM	Gulfport	Gulf Coast Music Co		[23] 15	1,350		15	1,370
WRBJ	Hattiesburg	Woodruff Furniture Co		10	1,200		10	1,500
WQBC	Utica	Utica Chamber of Commerce (Inc.)		[17] 225	[17] 1,390		100	1,210
	MISSOURI							
KFVS	Cape Girardeau	Hirsch Battery & Radio Co		50	1,340	WEBQ	50	1,210
KFRU	Columbia	Stephens College		500	1,200	WOS-WGBF	500	630
KMBC-KLDS	Independence	Midland Broadcasting Co		1,500	1,110	WHB	[4] 1,000	[4] 950
WOS	Jefferson City	State Marketing Bureau		500	710	KFRU-WGBF	500	630
WMBH	Joplin	Edwin D. Aber		100	1,470		100	1,210
KWKC	Kansas City	Wilson Duncan Broadcasting Co		100	1,350		100	1,370
WDAF	do	Kansas City Star Co		1,000	810	WOQ	1,000	610
WHB	do	Sweeney Automobile School Co	WOQ	500	880	KMBC-KLDS	1,000	950
WOQ	do	Unity School of Christianity	WHB	500	880	WDAF	1,000	610
KFKZ	Kirksville	Northeast Missouri State Teachers College.		15	1,330		50	1,210
KFEQ	St. Joseph	Scroggin & Co. Bank		[18] 1,000	1,300	WHDI-WDGY-KFLV	500	1,410
KFUO	St. Louis	Concordia Theological Seminary	KSD	[19] 1,000	550	KSD	500	550
KGBX	St. Joseph	Foster-Hall Tire Co		100	1,040		100	1,210
KMOX	St. Louis	Voice of St. Louis (Inc.)		5,000	1,000		5,000	1,090
KWK	do	Greater St. Louis Broadcasting Corporation.	WMAY	[18] 1,000	1,280	WIL	1,000	1,350
KFWF	do	St. Louis Truth Center (Inc.)		100	1,400	WMAY	100	1,20(
KSD	do	Pulitzer Publishing Co	KFUO	500	550	KFUO	500	55(
WEW	do	St. Louis University		[3] 1,000	[3] 850		[3] 1,000	[3] 76(

WIL	do	Missouri Broadcasting Co		250	1,160	KWK	1,000	1,350
WMAY	do	Kingshighway Presbyterian Church	KWK	100	1,280	KFWF	100	1,200
	MONTANA							
KGHL	Billings	Northwestern Auto Supply Co. (Inc.)		250	1,350		500	950
KFBB	Havre	F. A. Buttrey Co		50	1,090		100	1,200
KGEZ	Kalispell	Flathead Broadcasting Association		100	1,020		100	1,310
KUOM	Missoula	State University of Montana		500	650	KHQ	500	920
KGHD	do	Elmore-Nash Broadcasting Corporation		[3] 5	[3] 1,290		5	1,420
KGCX	Vida	First State Bank of Vida		10	1,230		10	1,370
	NEBRASKA							
KMMJ	Clay Center	M. M. Johnson Co	WJAG	250	1,050		[3] 1,000	[3] 740
KFOR	Lincoln	Howard A. Shuman		100	1,380		100	1,210
KFAB	do	Nebraska Buick Auto Co	KOIL	5,000	940	WBBM-WJBT	5,000	770
WCAJ	do	Nebraska Wesleyan University		[3] 500	[3] 790	WOW-WJAG	500	590
WJAG	Norfolk	Norfolk Daily News	KMMJ	[14] 250	1,050	WCAJ-WOW	[3] 500	[3] 590
WAAW	Omaha	Omaha Grain Exchange		[3] 500	[3] 680		[3] 500	[3] 660
WOW	do	WOW Life Insurance Association		1,000	590	WJAG-WCAJ	1,000	590
KGFW	Ravenna	Otto F. Sothman		10	1,010		50	1,420
KGBZ[20]	York	Federal Live Stock Remedy Co		100	1,410	KMA	500	930
	NEW HAMPSHIRE							
WKAV	Laconia	Laconia Radio Club		50	1,340		50	1,310
WBRL	Tilton	Booth Radio Laboratories		500	1,290	WICC	500	1,430
	NEW JERSEY							
WCAP	Ashury Park	Radio Industries Broadcasting Co	WOAX	[3] 500	1,250	WCAM-WOAX	500	1,280
WPG	Atlantic City	Municipality of Atlantic City		5,000	1,100	WLWL	5,000	1,100
WCAM	Camden	City of Camden	WFAM	500	1,340	WCAP-WOAX	500	1,280
WHAP	Carlstadt	See New York.						
WCDA	Cliffside Park	See New York.						
WPAP-WQAO	do	See New York.						
WRNY	Coytesville	See New York.						
WIBS	Elizabeth	New Jersey Broadcasting Corporation	WLBX-WMBQ	250	1,470	WNJ-WBMS-WAAT-WKBO.	250	1,450
WHPP	Englewood Cliffs	See New York.						
WMCA	Hoboken	See New York.						
WPCH	do	See New York.						
WAAT	Jersey City	Bremer Broadcasting Corporation	WGBB-WEVD	300	1,220	WBMS-WIBS-WKBO-WNJ.	250	1,450
WKBO	do	Camith Corporation	WKBQ-WCGU	250	1,370	WBMS-WAAT-WIBS-WNJ.	250	1,450

[3] Daytime.
[4] Limited time.
[5] 1,000 watts in daytime only.
[14] 500 watts in daytime only.
[17] Week days.
[18] 2,000 watts in daytime only.
[19] 1,500 watts in daytime only.
[20] Stations KGES, KGBY, KGCH, KGEO, KGDW to combine as KGBZ.
[22] Construction permit for 100 watts issued.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	NEW JERSEY—contd.							
				Watts			*Watts*	
WLWL	Kearny	See New York.						
WOR	Newark	L. Bamberger & Co		5,000	710		5,000	710
WAAM	do	WAAM (Inc.)	WGCP-WNJ	250	1,120	WGCP-WODA	500	1,250
WGCP	do	May Radio Broadcasting Corporation	WAAM-WNJ	250	1,120	WODA-WAAM	250	1,250
WNJ	do	Herman Lubinsky	WGCP-WAAM	250	1,120	WAAT-WIBS-WKBO-WBMS.	250	1,450
WODA	Paterson	Richard E. O'Dea	WOV	1,000	1,020	WGCP-WAAM	1,000	1,250
WJBI	Red Bank	Robert S. Johnson	WEAM	100	1,140	WGBB-WINR-WCOH	100	1,210
WOV	Secaucus	See New York.						
WOAX	Trenton	Franklyn J. Wolff	WCAP	500	1,250	WCAM-WCAP	500	1,280
WBMS	Union City	WMBS Broadcasting Corporation	WWRL-WCLB	100	1,500	WAAT-WIBS-WKBO-WNJ.	100	1,450
	NEW MEXICO							
KOB	State College	New Mexico College of Agriculture	KWSC-KTW	[21] 5,000	760	KEX	5,000	1,180
KGFL	Raton	N. L. Cotter		50	1,350		50	1,210
KGGM	Albuquerque	Jay Peters		100	1,470		100	1,420
	NEW YORK							
WKBW	Buffalo	Churchill Evangelic Association		5,000	1,380	WKEN	5,000	1,470
WGBS	Astoria	Gimbel Bros. (Inc.)	WIP-WOO	500	860		[4] 500	[4] 1,180
WMBO	Auburn	Radio Service Laboratories		100	1,360		100	1,370
WINR	Bay Shore	Radiotel Manufacturing Co. (Inc.)	WCDA-WCOH	150	1,420	WJBI-WGBB-WCOH	100	1,210
WEAF	Bellmore	National Broadcasting Co. (Inc.)		50,000	610		[23] 50,000	660
WBBC	Brooklyn	Brooklyn Broadcasting Corporation	WSGH-WSDA	500 CP-250	1,320	WCGU-WLTH-WSGH-WSDA.	500	1,400
WLTH	do	Voice of Brooklyn (Inc.)	WBBR-WEBJ	250	1,170	WCGU-WBBC-WSGH-WSDA.	250	1,400
WMBQ	do	Paul J. Gollhofer	WIBS-WLBX	100	1,470	WLBX-WCLB-WWRL	100	1,500
WSGH-WSDA	do	Amateur Radio Specialty Co	WBBC	500	1,320	WCGU-WLTH-WBBC	500	1,400
WEBR	Buffalo	H. H. Howell		200	1,240		100	1,310
WGR	do	Federal Radio Corporation		750	990	WSYR	750	550

WKEN	do	WKEN (Inc.)	WSVS	750	1,470	WKBW	750	1,470
WSVS	do	Seneca Vocational School	WKEN	50	1,470		50	1,370
WCAD	Canton	St. Lawrence University		[8] 500	1,230		[8] 300	1,220
WMAC	Cazenovia	Clive B. Meredith		500	1,330	WHEC-WABO-WOKO	500	1,440
WCGU	Coney Island	United States Broadcast Corporation	WKBO-WKBQ	500	1,370	WSGH-WSDA-WLTH-WBBC.	500	1,400
WNBF	Endicott	Howitt-Wood Radio Co		50	1,450		50	1,500
WLBH	Farmingdale	Joseph J. Lombardi		30	1,290	WHPP-WMRJ	30	1,420
WGBB	Freeport	Harry H. Carman	WAAT-WEVD	150	1,220	WJBI-WINR-WCOH	100	1,210
WCOH	Greenville	Westchester Broadcasting Corporation	WINR-WCDA	250	1,420	WJBI-WGBB-WINR	100	1,210
WLCI	Ithaca	Lutheran Association of Ithaca		50	1,210		50	1,210
WMRJ	Jamaica	Peter J. Prinz	WHPP	10	1,450	WLBH-WHPP	10	1,420
WOCL	Jamestown	A. E. Newton		25	1,340		25	1,210
WCLB	Long Beach	Arthur Faske	WBMS-WWRL	100	1,500	WMBQ-WLBX-WWRL	100	1,500
WLBX	Long Island City	John N. Brahy	WIBS-WMBQ	250	1,470	WMBQ-WCLB-WWRL	100	1,500
WMAK	Martinsville	WMAK Broadcasting System (Inc.)		750	550	WFBL	750	900
WOKO	Peekskill	Harold E. Smith		500	1,390	WHEC-WABO-WMAC	500	1,440
WBNY	New York	Baruchrome Corporation	WMSG-WHAP	500	1,270	WMSG-WCDA-WKBQ	250	1,350
WHN	do	George Schubel	WQAO-WPAP	500	760	WQAO-WPAP-WRNY	250	1,010
WKBQ	do	Standard Cahill Co. (Inc.)	WKBO-WCGU	250	1,370	WBNY-WMSG-WCDA	250	1,350
WNYC	do	Department of Plant and Structures		500	570	WMCA	500	570
WMSG	do	Madison Square Garden Broadcasting Corporation.	WHAP-WBNY	500	1,270	WBNY-WCDA-WKBQ	250	1,350
WABC-WBOQ	do	Atlantic Broadcasting Corporation (old assignment for WBOQ, 500 watts and 970 kilocycles shared with WABC).	WBOQ	[21] 2,500	970		5,000	860
WHEC-WABO	Rochester	Hickson Electric Co		[14] 250	1,180	WMAC-WOKO	250	1,440
WNBQ	do	Gordon P. Brown		15	1,460		15	1,500
WBBR	Rossville	Peoples Pulpit Association	WEBJ-WLTH	1,000	1,170	WHAP-WEVD-WHAZ	1,000	1,300
WNBZ	Saranac Lake	Smith & Mace		[3] 10	1,290		[3] 10	1,290
WGY	Schenectady	General Electric Co		50,000	790		[22]50,000	790
WFBL	Syracuse	Onondaga Co. (Inc.)		750	1,160	WMAK	750	900
WSYR	do	Clive B. Meredith		500	1,020	WGR	500	550
WHAZ	Troy	Rensselaer Polytechnic Institute		[24] 500	980	WBBR-WHAP-WEVD	500	1,300
WIBX	Utica	WIBX (Inc.)		[23] 150	1,260		100	1,310
WHAM	Rochester	Stromberg-Carlson Telephone manufacturing Co.		5,000	1,070		5,000	1,150
WEVD	Woodhaven	Debs Memorial Radio Fund	WATT-WGBB	500	1,220	WBBR-WHAP-WHAZ	500	1,300
WWRL	Woodside	William H. Reuman	WCLB-WBMS	100	1,500	WMBQ-WLBX-WCLB	100	1,500

[3] Daytime.
[4] Limited time.
[5] 1,000 watts daily.
[8] 1,000 watts in daytime only.
[14] 500 watts in daytime only.
[21] 10,000 watts in daytime only.
[22] See General Order No. 42.
[23] Construction permit for 5,000 watts issued; 5,000 watts daytime only.
[24] Mondays and Tuesdays.
[25] 300 watts in daytime only.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	NEW YORK—contd.			Watts			Watts	
WCDA*	New York	Italian Educational Broadcasting Co	WINR-WCOH	250	1,410	WBNY-WMSG-WKBQ	250	1,350
WHAP*	do	Defenders of Truth Society (Inc.)	WBNY-WMSG	1,000	1,270	WBBR-WEVD-WHAZ	1,000	1,300
WPAP-WQAO*	do	Calvary Baptist Church	WHN	500	760	WRNY-WHN	250	1,010
WRNY*	do	Experimenter Publishing Co	WPCH	500	920	WQAO-WPAP-WHN	250	1,010
WHPP*	do	Bronx Broadcasting Co	WMRJ-WTRL	10	1,450	WLBH-WMRJ	10	1,420
WPCH*	do	Concourse Radio Corporation	WRNY	500	920		[3] 500	810
WLWL*	do	Missionary Society of St. Paul, the Apostle.	WMCA	5,000	810	WPG	[3] 5,000	1,100
WOV*	do	International Broadcasting Corporation	WODA	1,000	1,020		[3] 1,000	1,130
WJZ*	do	Radio Corporation of America		30,000	660		[22] 30,000	760
WMCA*	do	Greeley Square Hotel Co	WLWL	500	810	WNYC	500	570
	NORTH CAROLINA							
WWNC	Asheville	Chamber of Commerce		1,000	1,010		1,000	570
WBT	Charlotte	C. C. Coddington		[1] 1,000	1,160	WPTF	[7] 5,000	1,080
WRBU	Gastonia	A. J. Kirby Music Co		50			50	1,210
WNRC	Greensboro	Wayne M. Nelson		500	1,340		500	1,440
WPTF	Raleigh	Durham Life Insurance Co		1,000	550	WBT	[7] 5,000	1,080
WRBT	Wilmington	Wilmington Radio Association		50	1,320		50	1,370
	NORTH DAKOTA							
KFYR	Bismarck	Hoskins-Meyer		[14] 250	1,200	KFDY-KFJM	500	550
KDLR	Devils Lake	Radio-Electric Co		15	1,300		100	1,210
WDAY	Fargo	WDAY (Inc.)	KFDY	250	550	WEBC	1,000	1,280
KFJM	Grand Forks	University of North Dakota		100	900	KFDY-KFYR	500	550
KGCU	Mandan	Mandan Radio Association		100	1,250		100	1,200
	OHIO							
WADC	Akron	Allen T. Simmons		1,000	1,260	WFJC	1,000	1,340
WFJC	do	W. F. Jones Broadcasting Co. (Inc.)	WJAY	500	1,320	WADC	500	1,340

WHBD	Bellefontaine	First Presbyterian Church		10	1,210		10	1,210
WEBE	Cambridge	Roy W. Waller		10	1,210		10	1,210
WHBC	Canton	St. John's Catholic Church		10	1,270		10	1,200
WAAD	Cincinnati	Ohio Mechanics Institute		25	1,300		25	1,370
WKRC	do	Kodel Radio Corporation	WFBE	500	1,220		500	550
WFBE	do	Park View Hotel	WKRC	250	1,220		100	1,200
WJAY	Cleveland	Cleveland Radio Broadcasting Corporation.	WFJC	500	1,320	WHK	500	1,390
WHK	do	Radio Air Service Corporation		[8] 500	1,130	WJAY	500	1,390
WTAM	do	WTAM & WEAR (Inc.)	WEAR-WSBT	3,500	750	WEAR	3,500	1,070
WEAR	do	do	WTAM-WSBT	1,000	750	WTAM	1,000	1,070
WAIU	Columbus	American Insurance Union	WEAO	5,000	1,060	WEAO	[4] 5,000	640
WCAH	do	Commercial Radio Service Co	WMAN	250	1,280	WSPD	250	1,450
WEAO	do	Ohio State University	WAIU	750	1,060	WAIU	[4] 750	640
WMAN	do	W. E. Hoskitt	WCAH	50	1,280		50	1,210
WSMK	Dayton	Stanley M. Krohn, jr		200	1,010		200	570
WRK	Hamilton	Doron & Slade		100	1,460		100	1,420
WLW	Harrison	Crosley Radio Corporation		5,000	700	WSAI	5,000	700
WLBV	Mansfield	Mansfield Broadcasing Association		50	1,450		100	1,210
WSAI	Mason	Crosley Radio Corporation (lessee)		5,000	830	WLW	5,000	700
WSRO	Middletown	Harry W. Fahrlander		100	1,270		100	1,420
WCSO	Springfield	Wittenberg College		500	1,170	KQV	500	1,380
WIBR	Steubenville	Thurman A. Owings		50	1,200		50	1,200
WSPD	Toledo	Toledo Broadcasting Co		250	1,250	WCAH	250	1,450
WKBN	Youngstown	W. P. Williamson, jr	WMBW	50	1,400	WMBS	500	1,430
	OKLAHOMA							
KGFF	Alva	Earl L. Hampshire		25	1,460		100	1,420
KOCW	Chickasha	Oklahoma College for Women		250	1,190		100	1,420
KGCB	Enid	Wallace Radio Institute	KGFG	50	1,390		50	1,210
WNAD	Norman	University of Oklahoma		500	1,250	KGGF	500	580
KFJF	Oklahoma City	National Radio Manufacturing Co		[1] 1,000	1,100	WRUF	5,000	1,470
KFXR	do	Exchange Avenue Baptist Church		50	1,340		50	1,310
KGFG	do	Full Gospel Church	KGCB	50	1,390		50	1,370
WKY	do	WKY Radiophone Co		150	1,040		1,000	900
KGGF	Picher	D. L. Connell, M. D		100	1,450	WNAD	500	580
WBBZ	Ponca City	C. L. Carrell		100	1,470		100	1,200
KVOO	Tulsa	Southwestern Sales Corporation		[1] 1,000	860	WNOX	1,000	560
	OREGON							
KFJI	Astoria	George Kincaid	KWJJ	50	1,200	KFEC	50	1,370
KOAC	Corvallis	Oregon State Agricultural College	KMED	[4] [26] 500	1,110	KXL	1,000	1,250
KORE	Eugene	Eugene Broadcast Station	KUJ-KWBS	50	1,500		100	1,420
KMED	Medford	W. J. Virgin	KOAC	[4] 50	1,110		50	1,420
KEX	Portland	Western Broadcasting Co		2,500	1,080	KOB	5,000	1,180

[8] Station transferred from New Jersey to conform to the amendment to the radio act. [1] Construction permit for 5,000 watts issued. [3] Daytime. [4] Limited time.
[7] Construction permit for 10,000 watts issued. [5] 1,000 watts in daytime only. [14] 500 watts in daytime only. [22] See General Order No. 42. [26] Construction permit for 1,000 watts issued.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	OREGON—contd.			*Watts*			*Watts*	
KFEC	Portland	Meier & Frank Co		[4] 50	1,400	KFJI	100	1,370
KFIF	do	Benson Polytechnic School	KTBR	50	1,310		50	1,420
KFJR	do	Ashley C. Dixon & Son		500	1,250	KTBR	500	1,300
KTBR	do	M. E. Brown	KFIF	500	1,310	KFJR	500	1,300
KGW	do	Oregonian Publishing Co		1,000	610		1,000	590
KWBS	do	Schaeffer Radio Co	KORE-KUJ	15	1,500		15	1,500
KWJJ	do	Wilbur Jerman	KFJI	50	1,200		50	1,500
KXL	do	KXL Broadcasters (Inc.)		250	1,360	KOAC	500	1,250
KOIN	do	KOIN (Inc.)		1,000	940		1,000	940
	PENNSYLVANIA							
WCBA	Allentown	B. Bryan Musselman	WSAN	100	1,350	WSAN	100	1,500
WSAN	do	Allentown Call Publishing Co. (Inc.)	WCBA	100	1,350	WCBA	100	1,500
WFBG	Altoona	Wm. F. Gable Co		100	1,120	WHBP	100	1,310
WNBW	Carbondale	Home Cut Glass & China Co		5	1,500		5	1,200
WIBG	Elkins Park	St. Pauls Protestant Episcopal Church		[17] 50	680		[3] 50	930
WEDH	Erie	Erie Dispatch Cummins Herald Broadcasting Corp		30	1,440		30	1,420
WRAK	do	C. R. Cummins		30	1,370		50	1,370
WFKD	Frankford	Foulkrod Radio Engineering Co	WABY	50	1,210		50	1,310
WSAJ	Grove City	Grove City College		250	1,340		100	1,310
WBAK	Harrisburg	Pennsylvania State Police (Ltd.)	WPSC	500	1,000		[3] 500	1,120
WPRC	do	Wilson Printing & Radio Co		100	1,430		100	1,200
WHBP	Johnstown	Johnstown Automobile Co		[14] 250	1,310	WFBG	100	1,310
WABF	Kingston	Markle Broadcasting Corporation		250	1,460	WRAX	250	1,440
WGAL	Lancaster	Lancaster Electrical Supply & Construction Co.	WKJC	15	1,190	WRAW-WKJC	15	1,310
WKJC	do	Kirk-Johnson Co	WGAL	50	1,190	WRAW-WGAL	50	1,310
WMBS	Lamoyne	Mack's Battery Co		250	1,280	WKBN	250	1,430
WJBU	Lewisburg	Buchnell University		100	1,400		100	1,210
WLBW	Oil City	Petroleum Telephone Co		500	1,020		500	1,260
WFAN	Philadelphia	Keystone Broadcasting Co. (Inc.)	WCAM	500	1,340	WIP	500	610

WABY	do	John Magaldi, jr	WFKD	50	1,210	WIAD-WNAT	50	1,310
WFI	do	Strawbridge & Clothier	WLIT	500	740	WLIT	500	560
WCAU	do	University Broadcasting Co		1,000	1,150		[28] 5,000	1,170
WHBW	do	Dr. R. Kienzle		100	1,360	WALK-WOO-WPSW	100	1,500
WIAD	do	Howard R. Miller	WNAT	100	1,040	WABY-WNAT	100	1,310
WIP	do	Gimbel Bros. (Inc.)	WOO-WGBS	500	860	WFAN	500	610
WLIT	do	Lit Brothers	WFI	500	740	WFI	500	560
WNAT	do	Lennig Bros. Co	WIAD	100	1,040	WIAD-WABY	100	1,310
WOO	do	John Wanamaker	WIP-WGBS	500	860	WPSW-WHBW-WALK	100	1,500
WRAX	do	Beracha Church (Inc.)		250	1,410	WABF	250	1,420
KQV	Pittsburgh	Doubleday Hill Electric	WJAS	500	1,110	WCSO	500	1,380
WCAE	do	Kaufmann & Baer Co		500	650		500	1,240
WJAS	do	Pittsburgh Radio Supply	KQV	500	1,110		500	1,290
KDKA	do	Westinghouse Electric & Manufacturing Co.		50,000	950		[22] 50,000	980
WRAW	Reading	Avenue Radio and Electric Shop		100	1,260	WGAL-WKJC	100	1,310
WGBI	Scranton	Scranton Broadcasters (Inc.)	WQAN	250	1,300	WQAN	250	880
WQAN	do	The Scranton Times	WGBI	250	1,300	WGBI	[3] 250	880
WPSW	Philadelphia	Philadelphia School Wireless Telegraphy.		50	1,450	WALK-WHBW-WOO	50	1,500
WPSC	State College	Pennsylvania State College	WBAK	[4] 500	1,000		[3] 500	1,230
WNBO	Washington	John Brownlee Spriggs		15	1,420		15	1,200
WBAX	Wilkes-Barre	John H. Stenger, jr	WBRE	100	1,200		100	1,210
WALK	Willow Grove	Albert A. Walker		50	1,490	WHBW-WOO-WPSW	50	1,500
WBRE	Wilkes-Barre	Louis G. Baltimore	WBAX	100	1,200		100	1,310
	PORTO RICO							
WKAQ	San Juan	Radio Corporation of Porto Rico		500	930		500	580
	RHODE ISLAND							
WDWF-WLSI	Cranston	D. W. Flint and Lincoln Studios		250	1,210	WFCI	100	1,370
WMBA	Newport	Leroy J. Beebe		100	1,470		100	1,500
WFCI	Pawtucket	Frank Brook (Inc.)	WNBX	100	1,240	WDWF-WLSI	100	1,370
WEAN	Providence	Shepard Co		500	1,090		[3] 500	1,160
WJAR	do	The Outlet Co		500	620		250	890
	SOUTH CAROLINA							
WBBY	Charleston	Washington Light Infantry		75	1,200		75	1,200
WRBW	Columbia	Paul S. Pearce		[28] 15			15	1,310
	SOUTH DAKOTA							
KFDY	Brookings	South Dakota State College	WDAY	500	550	KFYR-KFJM	500	550
KGCR	do	Cutler's Radio Broadcasting Service		15	1,440		100	1,210
KGDA	Dell Rapids	Home Auto Co		[3] 15	1,180		15	1,210
KGDY	Oldham	J. Albert Loesch		15	1,450		15	1,200

[3] Daytime.
[4] Limited time.
[14] 500 watts in daytime only.
[22] See General Order No. 42.
[27] Daytime (Sunday only).
[28] Construction permit only.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	SOUTH DAKOTA—con.							
				Watts			*Watts*	
KGFX	Pierre	Dana McNeil		[3] 200	1,180		[3] 200	580
KSOO	Sioux Falls	Sioux Falls Broadcasting Association		[14] 250	1,430		[3] 1,000	990
KUSD	Vermilion	University of South Dakota		250	620	WNAX-KFNF	500	890
WCAT	Rapid City	South Dakota State School of Mines		100	1,210		100	1,200
WNAX	Yankton	Gurney Seed & Nursery Co. and Dakota Radio Apparatus Co.		[4] 1,000	990	KUSD-KFNF	500	890
	TENNESSEE							
WFBC	Knoxville	First Baptist Church		50	1,280		50	1,200
WNBJ	do	Lonsdale Baptist Church		50	1,450		50	1,310
WNOX	do	Sterchi Bros		1,000	1,130	KVOO	1,000	560
WOAN	Lawrenceburg	Church of Nazarene and Vaughan School of Music.	WBAW	500	1,250	WREC	500	600
WGBC	Memphis	First Baptist Church	WNBR	15	1,310	WNBR	[39] 500	1,430
WHBQ	do	Broadcasting Station WHBQ (Inc.)		100	1,290		100	1,370
WMBM	do	Seventh Day Adventist Church		10	1,430		10	1,500
WMC	do	Memphis Commercial Appeal (Inc.)		[1] 500	580		500	780
WNBR	do	John Ulrich	WGBC	100	1,310	WGBC	500	1,430
WBAW	Nashville	Waldrum Drug Co	WOAN	5,000	1,250	WLAC	5,000	1,490
WLAC	do	Life & Casualty Insurance Co		[1] 1,000	1,330	WBAW	5,000	1,490
WSM	do	National Life & Accident Insurance		5,000	890		[6] 5,000	650
WSIX	Springfield	Six-thirty-eight Tire & Vulcanizing Co	WREC	150	1,200	WREC	100	1,210
WOBT	Union City	Titsworth's Radio and Music Shop		15	1,460		15	1,310
WREC	Whitehaven	WREC (Inc.)	WSIX	500	1,200	WOAN	500	600
WDOD	Chattanooga	Chattanooga Radio Co. (Inc.)		500	1,230		1,000	1,280
	TEXAS							
KGRS	Amarillo	Gish Radio Service		[14] 250 [3] 500	1,230	WDAG	1,000	1,410
WDAG	do	J. Laurence Martin		[36] 250	1,140	KGRS	1,000	1,410
KUT	Austin	University of Texas		500	1,290	WTAW	500	1,120
KFDM	Beaumont	Magnolia Petroleum Co	WTAW	500	620	KPRC	500	550

KFYO	Breckenridge	Kirksey Bros. Battery & Electric Co		100	1,420		100	1,420
KWWG	Brownsville	Chamber of Commerce		500	1,080	KRGV	500	1,010
WTAW	College Station	Agricultural and Mechanical College of Texas.	KFDM	500	620	KUT	500	1,120
KRLD	Dallas	KRLD (Inc.)	WRR	500	650	WFAA	[7] 5,000	1,040
WFAA	do	Dallas Morning News		500	550	KRLD	[22] 5,000	1,040
WRR	do	City of Dallas	KRLD	500	650	WOAI	(1)	1,190
KFPL	Dublin	C. C. Baxter		15	1,090		15	1,370
WDAH	El Paso	Trinity Methodist Church		100	1,280		100	1,310
KFJZ	Fort Worth	Henry C. Allison		50	1,200		100	1,370
WBAP	do	Carter Publications (Inc.)	KTHS	5,000	970	KTHS	[6] 5,000	800
KFQB	do	W. B. Fishburn (Inc.)	WJAD	1,000	900	WJAD	1,000	1,240
KFLX	Galveston	George Roy Clough		100	1,110		100	1,210
KFUL	do	Will H. Ford		500	1,160	KTSA	500	1,290
KGKL	Georgetown	M. L. Cates		100	1,290		100	1,370
KGKB	Goldthwaite	Eagle Publishing Co		50	1,070		100	1,500
KFPM	Greenville	New Furniture Co		15	1,300		15	1,310
KRGV	Harlingen	Harlingen Music Co		100	1,270	KWWG	500	1,010
KPRC	Houston	Houston Printing Co		[26] 500	1,020	KFDM	1,000	550
KTUE	do	Uhalt Electric		5	1,410		5	1,370
KGHX	Richmond	Fort Bend County School Board		[29] 50			50	1,500
KGFI	San Angelo	San Angelo Broadcasting Co		15	1,360		15	1,310
KGCI	San Antonio	Liberto Radio Sales	KGRC	250	1,360		100	1,370
KGDR	do	Joe B. McShane		[30] 15	1,450		100	1,500
KGRC	do	Eugene J. Roth	KGCI	[31] 100	1,360		100	1,310
KTSA	do	Alamo Broadcast Co		2,000	1,130	KFUL	1,000	1,290
KTAP	do	Robert B. Bridge		[31] 20	1,310		100	1,210
WOAI	do	Southern Equipment Co		5,000	1,070	WRR	5,000	1,190
WJAD	Waco	Frank P. Jackson	KFQB	500	900	KFQB	1,000	1,240
KGKO	Wichita Falls	Highland Heights Christian Church		250	1,350		100	1,370
	UTAH							
KFUR	Ogden	Peery Building Co		50	1,330		50	1,310
KDYL	Salt Lake City	Intermountain Broadcasting Corporation.		[33] 100	1,280	KFAU	1,000	1,230
KSL	do	Radio Service Corporation of Utah		[1] 1,000	990		[1 28] 1,130	1,130
	VERMONT							
WCAX	Burlington	University of Vermont		100	1,180	WNBX	100	1,200
WNBX	Springfield	First Congregational Church Corporation.	WFCI	10	1,240	WCAX	10	1,200

[1] Construction permit for 5,000 watts issued.
[2] Daytime.
[4] Limited time.
[6] Construction permit for 50,000 watts issued.
[7] Construction permit for 10,000 watts issued.
[14] 500 watts in daytime only.
[22] See General Order No. 42.
[26] Construction permit for 1,000 watts issued.
[28] Construction permit only.
[29] Sunday only.
[30] 30 watts in daytime only.
[31] Construction permit for 250 watts issued.
[33] Construction permit for 500 watts issued.

List of radio broadcasting stations, arranged by States, etc.—Continued

Station	Location	Owner	Assignments					
			Former			New		
			Shared with—	Power	Kilocycles	Shared with—	Power	Kilocycles
	VIRGINIA			Watts			Watts	
WTAZ	Richmond	W. Reynolds, jr., and Thomas J. McQuire.	WMBG	[28] 15	1,360	WMBG	[28] 15	1,210
WNEW	Newport News	Virginia Broadcasting Co. (Inc.)		[28] 100	1,430		100	1,310
WTFF	Mount Vernon Hills	Independent Publishing Co	WRUF	10,000	1,480		10,000	1,460
WTAR-WPOR	Norfolk	Reliance Electric Co. (Inc.)	WBBW	500	1,270	WSEA	500	780
WBBW	do	Ruffner Junior High School	WTAR-WPOR	100	1,270		100	1,200
WLBG	Petersburg	Robert Allen Gamble		[33] 100	1,400		100	1,200
WRVA	Richmond	Larus & Bro. Co. (Inc.)		1,000	1,180		[1] 1,000	1,110
WMBG	do	Havens & Martin (Inc.)	WTAZ	15	1,360	WTAZ	100	1,210
WBBL	do	Grace Covenant Presbyterian Church		100	1,260		100	1,370
WRBX	Roanoke	Richmond Development Corporation		[28] 250		WDBJ	250	930
WDBJ	do	Richardson-Wayland Electric Co		250	1,300	WRBX	250	930
WSEA	Portsmouth	Virginia Broadcasting Co. (Inc.)		500	1,140	WTAR-WPOR	500	780
	WASHINGTON							
KXRO	Aberdeen	KXRO (Inc.)	KFBL	50	1,340		50	1,210
KVOS	Bellingham	L. Kessler		250	1,430	KWSC-KXA	250	670
KFBL	Everett	Leese Bros	KXRO	50	1,340	KUJ-KVL	50	1,500
KGY	Lacey	St. Martin's College	KFPY-KFRO	50	1,220	KKP-KFQW	50	1,420
KUJ	Longview	Fred. W. Lovejoy and R. W. Kerfoot	KORE-KWBS	10	1,500	KFBL-KVL	10	1,500
KWSC	Pullman	State College of Washington	KTW-KOB	500	760	KXA-KVOS	500	570
KFOA	Seattle	Rhodes Department Store		1,000	670	KTW	1,000	1,280
KFQW	do	KFQW (Inc.)		100	1,380	KGY-KKP	100	1,420
KPQ	do	Archie Taft and Louis Wasmer	KPCB	100	1,300	KPCB	100	1,210
KVL	do	Arthur C. Dailey	KKP-KRSC	100	1,100	KFBL-KUJ	100	1,500
KJR	do	Northwestern Radio Service Co		2,500	860		5,000	970
KKP	do	City of Seattle (harbor department)	KRSC-KVL	15	1,100	KGY-KFQW	15	1,420
KOMO	do	Fisher's Blend Station (Inc.)		1,000	970		1,000	620
KPCB	do	Pacific Coast Biscuit Co	KPQ	100	1,300	KPQ	100	1,210
KRSC	do	Radio Sales Corporation	KVL-KKP	50	1,100		[3] 50	1,120
KTW	do	First Presbyterian Church	KWSC-KOB	1,000	760	KFOA	1,000	1,280

KXA	do	American Radio Telephone Co.		500	560	KWSC-KVOS	500	570
KFIO	Spokane	North Central High School	KFPY-KGY	100	1,220		[9] 100	1,220
KFPY	do	Symons Investment Co.	KGY-KFIO	250	1,220		100	1,210
KGA	do	Northwestern Radio Service Co.		2,000	1,150		5,000	1,470
KMO	Tacoma	KMO (Inc.)		500	1,180	KVI	500	1,340
KVI	do	Puget Sound Radio Broadcasting Co. (Ltd.).		250	1,060	KMO	1,000	1,340
KHQ	Spokane	Louis Wasmer (Inc.)		1,000	810	KUOM	1,000	920
	WEST VIRGINIA							
WOBU	Charleston	Charleston Radio Broadcasting Co.		250	1,120	WSAZ	250	580
WQBJ	Clarksburg	John Raikes		[20] 65	1,250		[20] 65	1,200
WQBZ	Weirton	J. H. Thompson		60	1,200		60	1,200
WSAZ	Huntington	McKellar Electric Co.		100	1,200	WOBU	250	580
WWVA	Wheeling	West Virginia Broadcasting Corporation.		250	580	WHAS	[1] 250	1,020
	WISCONSIN							
WEBW	Beloit	Beloit College		500	1,160		[3] 250	600
WTMJ	Brookfield	Milwaukee Journal		1,000	1,020	WHA	1,000	570
WTAQ	Eau Claire	Clyde S. Van Gorden		500	1,180	KSCJ	1,000	1,330
KFIZ	Fond du Lac	Fond du Lac Commonwealth Reporter		100	1,120		100	1,420
WCLO	Kenosha	C. E. Whitemore	WJBC-WWAE	100	1,320	WRJN	100	1,200
WKBH	La Crosse	Callaway Music Co.		500	1,300	KSO-WHBL	1,000	1,380
WIBA	Madison	Capital Times Strand Theater Station		100	1,250		100	1,210
WHA	do	University of Wisconsin	WLBL	750	900	WTMJ	750	570
WOMT	Manitowoc	Mikadow Theater		100	1,350		100	1,210
WHAD	Milwaukee	Marquette University	WISM-WGWB	500	1,110	WISN	250	1,120
WISN	do	Evening Wisconsin Co.	WGWB-WHAD	250	1,110	WHAD	250	1,120
WIBU	Poynette	The Electric Farm		20	1,380		100	1,310
WRJN	Racine	Racine Broadcasting Corporation		50	1,210	WCLO	100	1,200
WHBL	Sheboygan	Press Publishing Co. and C. L. Carrell		[14] 250	1,470	WKBH-KSO	1,000	1,380
WEBC	Superior	Head of Lakes Broadcasting Co.		[8] 250	1,240	WDAY	1,000	1,280
WLBL	Stevens Point	Wisconsin Department of Markets	WHA	[10] 1,000	900		[3] 1,000	900
WHBY	West De Pere	St. Norbert's College		50	1,200		50	1,200
	WYOMING							
KFBU	Laramie	Bishop N. S. Thomas	KFUM	500	620		500	600

[1] Construction permit for 5,000 watts issued.
[3] Daytime.
[8] 1,000 watts in daytime only.
[9] 500 watts in daytime only.
[10] 2,000 watts in daytime only.
[20] Construction permit only.
[22] Construction permit for 500 watts issued.

APPENDIX G–1A

FEDERAL RADIO COMMISSION,
Washington, D. C., October 16, 1928.

The commission has found it necessary to make certain changes in the allocation announced September 10, 1928, effective November 11, 1928. These changes are due in part to the fact that extensive checking has revealed possibilities for deriving greater service to the public on certain channels and for more economical use of daytime hours; in part to the desire to remedy certain injustices to particular stations and certain sections of the country without the expense of a hearing; and in part to the necessity of correcting a few sources of interference.

Licenses are being issued and mailed to the stations in accordance with the assignments indicated on the list. These licenses will be effective on November 11, 1928, at 3 o'clock a. m., eastern standard time, and will expire on February 1, 1929, at the same hour.

All stations dissatisfied with their assignments under the revised allocation should follow the procedure set forth in the commission's statement of September 11, 1928. Applications must be on forms provided by the commission; these may be obtained from the radio supervisors or from the secretary of the commission. All such applications must specify what frequency, power, and/or hours of operation are desired by the applicant. No one application may specify more than one frequency. If one applicant files two or more applications for different frequencies only one of the applications will be set for hearing, and consideration of the others will be postponed until the one heard is disposed of; if such an applicant fails to designate which application he desires to be heard first, the commission will select such application.

CHANGES FOR STATIONS ON CLEAR AND REGIONAL CHANNELS FROM THE LIST OF SEPTEMBER 8, 1928, EFFECTIVE NOVEMBER 11, 1928

WAAF, Chicago, Ill., Drovers Journal Publishing Co. Formerly 500 watts, 940 kilocycles, daylight; changed to 500 watts, 920 kilocycles, daylight.

WAAM, Newark, N. J., WAAM (Inc.) (WGCP, WODA). Formerly 500 watts, 1,250 kilocycles; changed to 250 watts, 1,250 kilocycles.

WAAT, Jersey City, N. J., Bremer Broadcasting Corporation (WBMS and WNJ and WIBS and WKBO). Formerly 250 watts, 1,450 kilocycles; changed to 300 watts, 1,070 kilocycles, operating until 6 p. m., but not after sunset at Cleveland.

WADC, Akron, Ohio, Allen T. Simmons (WFJC). Formerly 1,000 watts, 1,340 kilocycles; changed to unlimited time, 1,320 kilocycles.

WAIU, Columbus, Ohio, American Insurance Union (WEAO). Formerly 500 watts, 640 kilocycles; changed to not sharing, but limited time.

WAPI, Auburn, Ala., Alabama Polytechnic Institute (WJAX). Formerly 1,000 watts, 1,140 kilocycles; changed to sharing with KVOO (construction permit for 5,000 watts).

WBAL, Baltimore, Md., temporarily assigned full time on 1,060 kilocycles, pending completion of WTIC's 50,000-watt transmitter (estimated date, June, 1929).

WBBM-WJBT, Glenview, Ill., Atlas Investment Co. (KFAB). Formerly 10,000 watts, 770 kilocycles; given construction permit for 25,000 watts.

WBET, Medford, Mass., Boston Transcript Co. (WMAF). Formerly 500 watts, 1,320 kilocycles; changed to 500 watts, 1,360 kilocycles.

WBMS, Union City, N. J., WBMS Broadcasting Corporation (sharing with WNJ, WAAT, WIBS, and WKBO). Formerly 100 watts, 1,450 kilocycles; changed to 250 watts, 1,450 kilocycles, sharing with WNJ, WIBS, and WKBO.

WBT, Charlotte, N. C., C. C. Coddington (WPTF). Formerly 5,000 watts, 1,080 kilocycles; changed to full time (formerly construction permit for 10,000 watts).

WCAE, Pittsburgh, Pa., Kauffman & Baer Co. Formerly 500 watts, 1,240 kilocycles; changed to 500 watts, 1,220 kilocycles.

WCAH, Columbus, Ohio, Commercial Radio Service Co. (WSPD). Formerly 250 watts, 1,450 kilocycles; changed to sharing with WMBS, 250 watts, 1,430 kilocycles.

WCAJ, Lincoln, Nebr., Nebraska Wesleyan University (WJAG and WOW). Formerly 500 watts, 590 kilocycles; changed to sharing with WOW only.

WCAL, Northfield, Minn., St. Olaf College (sharing with KFMX and WRHM and WLB). Formerly 1,000 watts, 1,230 kilocycles; changed to (dividing as before) 100 watts, 1,250 kilocycles.

WCAZ, Carthage, Ill., Carthage College (WDZ). Formerly 100 watts, 1,070 kilocycles, daylight; changed to not sharing, daylight time.

WCBD, Zion, Ill., Wilbur Glenn Voliva (WOWO and KTNT). Formerly 500 watts, 1,160 kilocycles; changed to sharing WMBI (daylight) 5,000 watts, 1,080 kilocycles.

WCFL, Chicago, Ill., Chicago Federation of Labor (sharing WJJD and WRM). Formerly 1,000 watts 620 kilocycles; changed to (construction permit issued), 50,000 watts, 970 kilocycles, limited time.

WCWK, Fort Wayne, Ind., Chester W. Keen. Formerly 500 watts, 1,320 kilocycles, daylight; changed to sharing WSBT–WFBM, 500 watts, 1,230 kilocycles.

WDBJ, Roanoke, Va., Richardson-Wayland Electric Corporation (WRBX). Formerly 250 watts, 930 kilocycles; changed to full time, 500 watts, daylight.

WDEL, Wilmington, Del., WDEL (Inc.) (WMAL). Formerly 250 watts, 630 kilocycles; changed to full time, 250 watts, 1,410 kilocycles.

WDGY, Minneapolis, Minn., Dr. George W. Young (sharing KFLV, WHDI, and KFEQ). Formerly 500 watts, 1,410 kilocycles; changed to sharing with KFLV, WHDI, and WHBL, same power and kilocycles.

WDZ, Tuscola, Ill., James L. Bush (WCAZ). Formerly 100 watts, 1,070 kilocycles, daylight; changed to full time.

WEAI, Ithaca, N. Y., Cornell University (this station is an addition to September 8, 1928, list), 1,000 watts, 740 kilocycles, daylight.

WEAO, Columbus, Ohio, Ohio State University (WAIU). Formerly 750 watts, 640 kilocycles, limited time; changed to sharing with WKRC, 750 watts, 550 kilocycles.

WFBM, Indianapolis, Ind., Indianapolis Power & Light Co. Construction permit, 25,000 watts, 1,050 kilocycles, limited time.

WFBM, Indianapolis, Ind., Indianapolis Power & Light Co. (Sharing WSBT). Formerly 1,000 watts, 920 kilocycles; changed to sharing (WSBT, WCWK), 500 watts, 1,230 kilocycles.

WFJC, Akron, Ohio, W. F. Jones Broadcasting (Inc.) (WADC). Formerly 500 watts, 1,340 kilocycles; changed to share with WJAY, 500 watts, 1,450 kilocycles.

WFLA-WSUN, Clearwater, Fla., Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce (sharing with WMBE). Formerly 1,000 watts, 560 kilocycles; changed to not sharing, 1,000 watts, 900 kilocycles.

WGCP, Newark, N. J., May Radio Broadcast Corporation (sharing with WODA-WAAM). Formerly 250 watts, 1,250 kilocycles; changed to 500 watts, 1,250 kilocycles.

WGHP, Fraser, Mich., Geo. Harrison Phelps (Inc.). Formerly 750 watts, 1,220 kilocycles; changed to 750 watts, 1,240 kilocycles.

WGR, Buffalo, N. Y., Federal Radio Corporation (WYSR). Formerly 750 watts, 550 kilocycles; changed to not sharing.

WHAD, Milwaukee, Wis., Marquette University (WISN). Formerly 250 watts, 1,120 kilocycles; changed to sharing with WLBL, 500 watts, 900 kilocycles, daylight.

WHAS, Louisville, Ky., the Courier Journal Co. and the Louisville Times Co. (WWVA), formerly 5,000 watts, 1,020 kilocycles (construction permit for 10,000); changed to not sharing, 5,000 watts, 820 kilocycles. (construction permit for 10,000).

WHBL, Sheboygan, Wis., Press Publishing Co. and C. L. Carrell (sharing with KSO, WKBH). Formerly 1,000 watts, 1,380 kilocycles; changed to sharing with WDGY, KFLV, WHDI, 500 watts, 1,410 kilocycles.

WHDI, Minneapolis, Minn., William Hood Dunwoody Industrial Institute (WDGY, KFEQ, KFLV). Formely 500 watts, 1,410 kilocycles; changed to sharing with WDGY, WHBL, KFLV, same power and kilocycles.

WHEC–WABO, Rochester, N. Y., Hickson Electric Co. (Inc.) (WMAC, WOKO). Formerly 250 watts, 1,440 kilocycles; changed to 500 watts, 1,440 kilocycles.

WHK, Cleveland, Ohio, Radio Air Service Corporation (WJAY). Formerly 500 watts, 1,390 kilocycles; changed to 1,000 watts, 1,390 kilocycles.

WHO, Des Moines, Iowa, Bankers Life Co. (WOI). Formerly 5,000 watts, 1,050 kilocycles; changed to sharing with WOC, 5,000 watts, 1,000 kilocycles.

WIBS, Elizabeth, N. J., N. J. Broadcasting Corporation (WBMS, WNJ, WAAT, WKBO). Formerly 250 watts, 1,450 kilocycles; changed to share with WBMS, WNJ, WKBO, 250 watts, 1,450 kilocycles.

WISN, Milwaukee, Wis., Evening Wisconsin Co. (WHAD). Formerly 250 watts, 1,120 kilocycles; changed to full time.

WJAG, Norfolk, Nebr., Norfolk Daily News (WCAJ, WOW). Formerly 500 watts, 590 kilocycles, daylight; changed to limited time, 500 watts, 1,060 kilocycles.

WJAS, Pittsburgh Radio Supply House. Formerly 500 watts, 1,290 kilocycles; changed to 1,000 watts, 1,290 kilocycles.

WJAX, Jacksonville, Fla., City of Jacksonville (WAPI). Formerly 1,000 watts, 1,140 kilocycles; changed to 1,000 watts, 1,260 kilocycles.

WJAY, Cleveland, Ohio, Cleveland Radio Broadcasting Corporation (WHK), 500 watts, 1,390 kilocycles; changed to sharing with WFJC, 500 watts, 1,450 kilocycles.

WJBB, Sarasota, Fla., Financial Journal (Inc.). Formerly 100 watts, 1,370 kilocycles; changed to 250 watts, 1,010 kilocycles.

WJJD, Loyal Order of Moose, Moosehart, Ill. (WCFL, WRM). Formerly 1,000 watts, 620 kilocycles; changed to (construction permit) 20,000 watts, 830 kilocycles, limited time.

WJKS, Gary, Ind., Johnson-Kennedy Radio Corporation, formerly sharing WGES, WPCC, 500 watts, 1,360 kilocycles; changed to sharing WGES, 500 watts, 1,360 kilocycles.

WKBH, La Crosse, Wis., Callaway Music Co. (KSO, WHBL). Formerly 1,000 watts, 1,380 kilocycles; changed to sharing with KSO only, same power and kilocycles.

WKBN, Youngstown, Ohio, W. P. Williamson, jr. (WMBS). Formerly 500 watts, 1,430 kilocycles; changed to share with WSMK, 500 watts, 570 kilocycles.

WKBO, Jersey City, N. J., Camith Corporation (WBMS, WNJ, WAAT, WIBS), 250 watts, 1,450 kilocycles; changed to share with WBMS, WNJ, WIBS.

WKBW, Amherst, N. Y., Churchill Evangelistic Association (WKEN), 5,000 watts, 1,470 kilocycles; changed to not sharing.

WKEN, Grand Island, N. Y., WKEN (Inc.) (WKBW), 750 watts, 1,470 kilocycles; changed to limited time, 750 watts, 1,040 kilocycles.

WKRC, Cincinnati, Ohio, Kodel Radio Corporation, 500 watts, 550 kilocycles; changed to share with WEAO, 500 watts, 550 kilocycles.

WLB, WGMS, Minneapolis, Minn., University of Minnesota. Formerly 1,000 watts, 1,230 kilocycles; call WGMS, used by WCCO, when broadcasting over WLB (WCAL, KFMX, WRHM), dividing as before, 1,000 watts, 1,250 kilocycles.

WLBL, Stevens Port, Wis., Wisconsin Department of Markets. Formerly 1,000 watts, 900 kilocycles; changed to share with WHAD, same power and kilocycles.

WLBZ, Dover-Foxcroft, Me., Thompson L. Guernsey. Formerly 250 watts, 570 kilocycles; changed to construction permit for 500 watts, 620 kilocycles.

WLTH, Brooklyn, N. Y., Voice of Brooklyn (Inc.), formerly (WCGU, WSGH, WSDA, WBBC); 250 watts, 1,400 kilocycles; no change in time division, 500 watts, 1,400 kilocycles.

WLW, Mason, Ohio, Crosley Radio Corporation (WSAI); 5,000 watts, 700 kilocycles; changed to full time, construction permit for 5,000 watts, 700 kilocycles.

WLWL, Kearney, N. J., Missionary Society of St. Paul the Apostle (WPG); 5,000 watts, 1,100 kilocycles; changed to daylight, sharing WPG, 5,000 watts, 1,100 kilocycles.

WMAF, S. Dartmouth, Mass., Round Hills Radio Corporation (WBET); 500 watts, 1,320 kilocycles; changed to 500 watts, 1,360 kilocycles.

WMAL, Washington, D. C., M. A. Leese Co. (WDEL); 250 watts, 630 kilocycles; changed to full time.

WMBF, Miami Beach, Fla., Fleetwood Hotel Corporation (WFLA, WSUN); 500 watts, 560 kilocycles; changed to not sharing.

WMBI, Addison, Ill., Moody Bible Institute, formerly sharing WOWO, KTNT, and WCBD; 5,000 watts, 1,160 kilocycles; changed sharing WCBD, day, 5,000 watts, 1,080 kilocycles, day.

WMBS, Lemoyne, Pa., Mack's Battery Co. (WKBN); 250 watts, 1,430 kilocycles; changed to sharing WCAH, 500 watts, 1,430 kilocycles.

WMMN, Fairmont, W. Va., Holt Rowe Novelty Co. (new station); night, 250 watts, 890 kilocycles; daytime, 500 watts.

WNAD, Norman, Okla., University of Oklahoma (KGGF); 500 watts, 580 kilocycles; changed to sharing KGGF, 500 watts, 1,010 kilocycles.

WNJ, Newark, N. J., Radio Investment Co. (WBMS, WAAT, WIBS, WKBO); 250 watts, 1,450 kilocycles; changed to share WBMS, WIBS, WKBO, same power and kilocycles.

WNOX, Knoxville, Tenn., Sterchi Bros. (KVOO); 1,000 watts, 560 kilocycles; changed to not sharing KVOO.

WOC, Davenport, Iowa, Palmer School of Chiropractic (WSUI); former limited time, 5,000 watts, 970 kilocycles; changed to share with WHO, 5,000 watts, 1,000 kilocycles.

WOI, Ames, Iowa, Iowa State College (WHO); formerly limited time, 5,000 watts, 1,050 kilocycles; changed, dividing KFEQ, daylight, 3,500 watts, 560 kilocycles.

WOW, Omaha, Nebr., Woodmen of the World (WJAG, WCAJ); 1,000 watts, 590 kilocycles; changed to sharing WCAJ, same power and kilocycles.

WOWO, Fort Wayne, Ind., Main Auto Supply Co. (KTNT, WCBD, WMBI); 5,000 watts, 1,160 kilocycles; changed to sharing WWVA.

WPCC, Chicago, Ill., North Shore Congregational Church (WJKS, WGES); 500 watts, 1,360 kilocycles; changed to share WRM, WHA, 500 watts, 570 kilocycles.

WPTF, Raleigh, N. C., Durham Life Insurance Co. (WBT); 5,000 watts, 1,080 kilocycles; changed to not sharing. construction permit for 10,000 watts, 680 kilocycles, limited time.

WQBC, Utica, Miss., Chamber of Commerce (Inc.); 100 watts, 1,210 kilocycles; changed to 300 watts, 1,360 kilocycles.

WRBX, Roanoke, Va., Richmond Development Co. (WDBJ); 250 watts, 930 kilocycles; changed to construction permit canceled.

WREN, Lawrence, Kans., Jenny Wren Co. (KSAC, KFKU); 500 watts, 1,010 kilocycles; changed to share KFKU, 1,000 watts, 1,220 kilocycles.

WRHM, Fridley, Minn., Rosedale Hospital Co. (Inc.) (WCAL, KFMX, WLB); 1,000 watts, 1,230 kilocycles; changed to sharing as before, 1,000 watts, 1,250 kilocycles.

WRM, Urbana, Ill., University of Illinois (WJJD, WCFL); 500 watts, 620 kilocycles; changed to sharing WPCC, WHA, 500 watts, 570 kilocycles.

WRUF, Gainesville, Fla., University of Florida (KFJF); 5,000 watts, 1,470 kilocycles; changed to unlimited time.

WSAI, Mason, Ohio, Crosley Radio Corporation (lessee) sharing WLW. Formerly 5,000 watts, 700 kilocycles; changed to full time not sharing with WLW, 5,000 watts, 800 kilocycles.

WSB, Atlanta, Ga., Atlanta Journal Co. Formerly 1,000 watts, 740 kilocycles; construction permit for 5,000 watts; changed to construction permit for 10,000 watts.

WSBT, South Bend, Ind., South Bend Tribune (WFBM). Formerly 500 watts, 920 kilocycles; changed to sharing WFBM and WCWK, 500 watts, 1,230 kilocycles.

WSMK, Dayton, Ohio, Stanley M. Krohn, jr. Formerly 200 watts, 570 kilocycles; changed to sharing WKBN, same power and kilocycles.

WSPD, Toledo, Ohio, Toledo Broadcasting, Co. (WCAH). Formerly 250 watts, 1,450 kilocycles; changed to full time, 500 watts 1,340 kilocycles.

WSUI, Iowa City, Iowa, State University of Iowa (WOC). Formerly 500 watts, 970 kilocycles; limited time; changed to sharing KSAC, 500 watts, 580 kilocycles.

WSYR, Syracuse, N. Y., Clive B. Meredith (WGR). Formerly 500 watts, 550 kilocycles; changed to full time, 250 watts, 570 kilocycles.

WTIC, Hartford, Conn., temporary operation on 600 kilocycles, 250 watts, full time, pending completion of 50,000-watt transmitter which will be assigned half time on 1,060 kilocycles.

WWJ, Detroit, Mich., the Detroit News. Formerly 1,000 watts, 820 kilocycles; changed to 1,000 watts, 920 kilocycles.

WWVA, Wheeling, W. Va., West Virginia Broadcasting Corporation (WTAS). Formerly 250 watts, 1,020 kilocycles, construction permit for 5,000 watts; changed to sharing with WOWO, 250 watts, 1,160 kilocycles, construction permit for 5,000 watts.

KDYL, Salt Lake, Utah, Intermountain Broadcasting Corporation (KFAU). Formerly construction permit 1,000 watts, 1,230 kilocycles; changed to full time, construction permit for 1,000 watts, 1,290 kilocycles.

KFAU, Boise, Idaho, Independent School District of Boise City (KDYL). Formerly 1,000 watts, 1,230 kilocycles; changed to sharing with KXL, 1,000 watts, 1,250 kilocycles.

KFBB, Havre, Mont., F. A. Buttrey Co. Formerly 100 watts, 1,200 kilocycles; changed to Buttrey Broadcast (Inc.), sharing with KGIR, construction permit 250 watts, 1,360 kilocycles, 500 watts, daylight.

KFDM, Beaumont, Tex., Magnolia Petroleum Co. (KPRC). Formerly 500 watts, 550 kilocycles; changed to full time, 500 watts, 560 kilocycles.

KFEL, Denver, Colo., Eugene P. O'Fallon (Inc.) (KFXF). Formerly 250 watts, 1,120 kilocycles; changed to 250 watts, 940 kilocycles.

KFEQ, St. Joseph, Mo., Scroggin & Co. Bank (WHDI, WDGY, and KFLV). Formerly 2,500 watts, 1,410 kilocycles; changed to sharing WOI, 2,500 watts, 560 kilocycles, daylight.

KFH, Wichita, Kans., Hotel Lassen (WIBW). Formerly 500 watts, 1,300 kilocycles; changed to (dividing as before) 1,000 watts, 1,300 kilocycles.

KFFIO, Spokane, Wash., North Central High School. Formerly 100 watts, 1,220 kilocycles, daylight; changed to 100 watts, 1,230 kilocycles, daylight.

KFJF, Oklahoma City, Okla., National Radio Manufacturing Co. (WRUF); 5,000 watts, 1,470 kilocycles; changed to full time.

KFKA, Greeley, Colo., Colorado State Teachers College (KPOF); 500 watts, 1,010 kilocycles; changed to 500 watts, 880 kilocycles.

KFKU, Lawrence, Kans., University of Kansas (KSAC, WREN); 500 watts, 1,010 kilocycles; changed to sharing with WREN, 1,000 watts, 1,220 kilocycles.

KFLV, Rockford, Ill., A. T. Frykman (WHDI, WDGY, KFEQ); 500 watts, 1,410 kilocycles; changed to sharing with WHDI, WDGY, WHBL.

KFMX, Northfield, Minn., Carleton College (WCAL, WRHM, WLB); 1,000 watts, 1,230 kilocycles; changed to (dividing as before) 1,000 watts, 1,250 kilocycles.

KFOA, Seattle, Wash., Rhodes Department Store (KTW). Formerly 1,000 watts, 1,280 kilocycles; changed to 1,000 watts, 1,270 kilocycles.

KFPY, Spokane, Wash., Symons Investment Co. Formerly 100 watts, 1,210 kilocycles; changed to sharing KWSC, 500 watts, 1,390 kilocycles.

KFQD, Anchorage, Alaska, Anchorage Radio Club. Formerly 100 watts, 900 kilocycles; changed to 100 watts, 1,230 kilocycles.

KFSD, San Diego, Calif., Airfan Radio Corporation. Formerly 500 watts, 600 kilocycles; changed to 1,000 watts (day), 500 watts (night), 600 kilocycles.

KFUM, Colorado Springs, Colo., W. D. Corley (KOW). Formerly 1,000 watts, 1,390 kilocycles; changed to full time, 1,000 wats, 1,270 kilocycles.

KFXF, Denver, Colo., Pikes Peak Broadcasting Co. (KFEL). Formerly 250 watts, 1,120 kilocycles; changed to 250 watts, 940 kilocycles.

KGB, San Diego, Calif., Southwestern Broadcasting Corporation. Formerly 250 watts, 1,340 kilocycles; changed to 250 watts, 1,360 kilocycles.

KGBU, Ketchikan, Alaska, Alaska Radio & Service Co. Formerly 500 watts, 610 kilocycles; changed to 500 watts, 900 kilocycles.

KGGF, Picher, Okla., D. L. Conneli, M. D. (WNAD). Formerly 500 watts, 580 kilocycles; changed to 500 watts 1,010 kilocycles.

KGIO, Idaho Falls, Idaho, Jack W. Duckworth, jr (KGIQ). This station is an addition to the list of September 8, 1928; 25 watts, 1,320 kilocycles.

KGIQ, Twin Falls, Idaho, Stanley M. Soule (KGIO). This station is an addition to the list of September 8, 1928; 250 watts, 1,320 kilocycles.

KGIR, Butte, Mont., Symons Broadcasting Co. (KFBB). This station is an addition to the list of September 8, 1928; 250 watts, 1,360 kilocycles.

KGJF, Little Rock, Ark., First Church of the Nazarene. Formerly 100 watts, 1,370 kilocycles; changed to 250 watts, 890 kilocycles.

KGKO, Wichita Falls, Tex., Highland Heights Christian Church; 100 watts, 1,370 kilocycles; changed to 250 watts, 570 kilocycles.

KGW, Portland, Oreg., Oregonian Publishing Co. Formerly 1,000 watts, 590 kilocycles; changed to 1,000 watts, 620 kilocycles.

KHQ, Spokane, Wash., Louis Wasmer (Inc.) (KUOM). Formerly 1,000 watts, 920 kilocycles; changed to full time, 1,000 watts, 590 kilocycles.

KJBS, San Francisco, Calif., Julius Brunton & Sons Co. (KZM); 100 watts, 1,370 kilocycles; changed to daylight time not sharing with KZM, 100 watts, 1,100 kilocycles.

KLRA, Little Rock, Ark., Arkansas Broadcasting Co. (KUOA); 1,000 watts, 1,250 kilocycles; changed to 1,000 watts, 1,390 kilocycles.

KLX, Oakland, Calif., Tribune Publishing Co. (KTAB). Formerly 500 watts, 1,270 kilocycles; changed to full time, 500 watts, 880 kilocycles.

KOAC, Corvallis, Oreg., Oregon State Agricultural College (KXL); 1,000 watts, 1,250 kilocycles; changed to full time, 1,000 watts, 560 kilocycles.

KOB, State College, N. Mex., New Mexico College of Agriculture and formerly Mechanical Arts (KEX); 5,000 watts, 1,180 kilocycles; changed to 10,000 watts, 1,180 kilocycles.

KOMO, Seattle, Wash., Fisher's Blend Station (Inc.); 1,000 watts, 620 kilocycles; changed to 1,000 watts, 920 kilocycles.

KOW, Denver, Colo., Associated Industries (Inc.) Broadcasting (KFUM); 500 watts, 1,390 kilocycles; changed to full time.

KPOF, Denver, Colo., Pillar of Fire (Inc.) (KFKA); 500 watts, 1,010 kilocycles; changed to (KFKA) 500 watts, 880 kilocycles.

KPRC, Houston, Tex., Houston Printing Co. (KFDM); 1,000 watts, 550 kilocycles; changed to full time, 1,000 watts, 920 kilocycles.

KRGV, Harlingen, Tex., Harlingen Music Co. (KWWG); 500 watts, 1,010 kilocycles; changed to 500 watts, 1,260 kilocycles.

KSAC, Manhattan, Kans., Kansas State Agricultural College (WREN-KFKU); 500 watts, 1,010 kilocycles; changed to sharing with WSUI, 500 watts, 580 kilocycles.

KSEI, Pocatello, Idaho. KSEI Broadcasting Association; 250 watts, 1,320 kilocycles; changed to 250 watts, 900 kilocycles.

KSOO, Sioux Falls, S. Dak., Sioux Falls Broadcast Association; 1,000 watts, 990 kilocycles daylight; changed to 1,000 watts, 1,110 kilocycles limited time.

KSO, Clarinda, Iowa, Berry Seed Co. (WKBH, WHBL); 1,000 watts, 1,380 kilocycles; changed to sharing with WKBH.

KTAB, Oakland, Calif., Associated Broadcasters (KLX); 500 watts, 1,270 kilocycles; changed to full time, 500 watts, 1,280 kilocycles.

KTNT, Muscatine, Iowa, Norman Baker (WOWO, WGBD, WMBI); 5,000 watts, 1,160 kilocycles; changed to full time daylight hours, 5,000 watts, 1,170 kilocycles daylight.

KTW, Seattle, Wash., First Presbyterian Church (KFOA); 1,000 watts, 1,280 kilocycles; changed to sharing (KFOA), 1,000 watts, 1,270 kilocycles.

KUOA, Fayetteville, Ark., University of Arkansas (KLRA); 1,000 watts, 1,250 kilocycles; changed to sharing (KLRA), 1,000 watts, 1,390 kilocycles.

KUOM, Missoula, Mont., State University of Montana (KHQ); 500 watts, 920 kilocycles; changed to sharing with KXA, 500 watts, 570 kilocycles.

KVOO, Tulsa, Okla., Southwestern Sales Corporation (WNOX); 1,000 watts, 560 kilocycles; changed to sharing with WAPI, construction permit 5,000 watts, 1,140 kilocycles.

KWJJ, Portland, Oreg., Wilbur Jerman; 50 watts, 1,500 kilocycles; changed to 500 watts, 1,060 kilocycles (limited time).

KWKH, Kennonwood, La., W. K. Henderson (WWL); construction permit for 20,000 watts, 850 kilocycles.

KWSC, Pullman, Wash., State College of Washington (KXA, KVOS); 500 watts, 570 kilocycles; changed to sharing with KFPY, 500 watts, 1,390 kilocycles.

KWWG, Brownsville, Tex., Chamber of Commerce (KRGV); 500 watts, 1,010 kilocycles; changed to 500 watts, 1,260 kilocycles.

KXA, Seattle, Wash., American Radio Telegraph Co. (KWSC, KVOS); 500 watts, 570 kilocycles; changed to sharing with KUOM, 500 watts, 570 kilocycles.

KXL, Portland, Oreg., KXL Broadcasters (Inc.) (KOAC); 500 watts, 1,250 kilocycles; changed to sharing with KFAU.

KYA, San Francisco, Calif., Pacific Broadcasting Corporation; 1,000 watts, 1,220 kilocycles; changed to 1,000 watts, 1,230 kilocycles.

KYW-KFKX, Chicago, Ill., Westinghouse Electric & Manufacturing Co.; 5,000 watts, 1,000 kilocycles; changed to 5,000 watts, 1,020 kilocycles.

APPENDIX G-1B

FEDERAL RADIO COMMISSION,
Washington, D. C., October 19, 1928.

Changes in assignments for local stations from the list of September 8, 1928, effective November 11, 1928:

FIRST ZONE

Station WIBX, Utica, N. Y., WIBX (Inc.), changed from 1,310 kilocycles with 100 watts to 1,200 kilocycles with 100 watts.

Station WFCI, Pawtucket, R. I., Frank Crook (Inc.), changed from sharing with WDWF on 1,370 kilocycles with 100 watts to sharing with WDWF on 1,210 kilocycles with 100 watts.

Station WDWF, Cranston, R. I., Dutee W. Flint and the Lincoln Studios (Inc.), changed from 1,370 kilocycles with 100 watts to sharing with WFCI on 1,210 kilocycles with 100 watts.

SECOND ZONE

Station WKJC, Lancaster, Pa., Kirk Johnson & Co., changed from sharing with WRAW and WGAL on 1,310 kilocycles with 50 watts to sharing with WPRC on 1,200 kilocycles with 50 watts.

Station WRK, Hamilton, Ohio, S. W. Doron and John C. Slade, changed from 1,420 kilocycles with 100 watts to 1,310 kilocycles with 100 watts.

Station WQBZ, Weirton, W. Va., J. H. Thompson, changed from 1,200 kilocycles with 60 watts to sharing with WIBR on 1,420 kilocycles with 60 watts.

Station WIBR, Steubenville, Ohio, Thurman A. Owings, changed from 1,200 kilocycles with 50 watts to sharing with WQBZ on 1,420 kilocycles with 50 watts.

Station WAAD, Cincinnati, Ohio, Ohio Mechanics Institution, changed from 1,370 kilocycles with 25 watts to sharing with WSRO on 1,420 kilocycles with 25 watts.

Station WAFD, Detroit, Mich., Albert B. Parfet Co., changed from sharing with WMBC on 1,420 kilocycles with 100 watts to 1,500 kilocycles with 100 watts.

THIRD ZONE

Station KFDX, Shreveport, La., First Baptist Church, changed from sharing with KRMD on 1,200 kilocycles with 100 watts to sharing with KWEA on 1,210 kilocycles with 100 watts.

Station KWEA, Shreveport, La., William E. Anthony, changed from sharing with KGGH on 1,370 kilocycles with 100 watts to sharing with KFDX on 1,210 kilocycles with 100 watts.

Station WRBQ, Greenville, Miss., J. Pat Scully, changed from 1,200 kilocycles with 100 watts to 1,210 kilocycles with 100 watts.

Station WGCM, Gulfport, Miss., Gulf Coast Music Co. (Inc.), changed from 1,370 kilocycles with 15 watts to 1,210 kilocycles with 100 watts.

Station KRMD, Shreveport, La., Robert M. Dean, changed from sharing with KFDX on 1,200 kilocycles with 50 watts to sharing with KGGH on 1,310 kilocycles with 50 watts.

Station KGGH, Cedar Grove, La., Bates Radio & Electric Co., changed from sharing with KWEA on 1,370 kilocycles with 50 watts to sharing with KRMD on 1,310 kilocycles with 50 watts.

Station KFPL, Dublin, Tex., C. C. Baxter, changed from 1,370 kilocycles with 15 watts to 1,310 kilocycles with 15 watts.

Station KGHG, McGeehee, Ark., Chas. W. McCollum, changed from 1,370 kilocycles with 50 watts to 1,310 kilocycles with 50 watts.

FOURTH ZONE

Station KFKZ, Kirksville, Mo., Northeast Missouri State Teachers College, changed from 1,210 kilocycles with 50 watts to 1,200 kilocycles with 50 watts.

Station KGDA, Dell Rapids, S. Dak., Home Auto Co., changed from 1,210 kilocycles with 15 watts to 1,370 kilocycles with 15 watts.

Station KGBX, St. Joseph, Mo., Foster-Hall Tire Co., changed from 1,210 kilocycles with 100 watts to sharing with KWKC on 1,370 kilocycles with 100 watts.

Station KICK, Red Oak, Iowa, Atlantic Automobile Co., Red Oak Radio Corporation, lessee, changed from daytime on 560 kilocycles with 100 watts to sharing with WIAS on 1,420 kilocycles with 100 watts.

Station WLBF, Kansas City, Kans., Everett L. Dillard, changed from 1,200 kilocycles with 100 watts to 1,420 kilocycles with 100 watts.

Station WMBH, Joplin, Mo., Edwin Dudley Aber, changed from 1,210 kilocycles with 100 watts to 1,420 kilocycles with 100 watts.

Station WIAS, Ottumwa, Iowa, Poling Electric Co., changed from sharing with KICK on 560 kilocycles with 100 watts daytime to 1,420 kilocycles with 100 watts.

FIFTH ZONE

Station KWG, Stockton, Calif., Portable Wireless Telegraph Co., changed from sharing with KLS on 1,420 kilocycles with 100 watts to 1,200 kilocycles with 100 watts.

Station KFEY, Kellogg, Idaho, Union High School, changed from 1,370 kilocycles with 10 watts to 1,210 kilocycles with 10 watts.

Station KRE, Berkeley, Calif., First Congregational Church, changed from sharing with KFQU and KGTT on 1,500 kilocycles with 100 watts to sharing with KZM on 1,370 kilocycles with 100 watts.

Station KGFL, Raton, N. Mex., N. L. Cotter, changed from 1,210 kilocycles with 50 watts to 1,370 kilocycles with 50 watts.

Station KFUR, Ogden, Utah, Peery Building Co., changed from 1,310 kilocycles with 50 watts to 1,370 kilocycles with 50 watts.

Station KGGM, Albuquerque, N. Mex., Jay Peters, changed from 1,420 kilocycles with 100 watts to 1,370 kilocycles with 100 watts.

Station KXRO, Aberdeen, Wash., KXRO (Inc.), changed from 1,210 kilocycles with 50 watts to 1,420 kilocycles with 50 watts.

Station KFQU, Holy City, Calif., W. E. Riker, changed from sharing with KGTT and KRE with 1,500 kilocycles with 100 watts to sharing with KGTT on 1,420 kilocycles with 100 watts.

Station KGTT, San Francisco, Calif., Glad Tidings Temple and Bible Institute, changed from sharing with KFQU and KRE on 1,500 kilocycles with 50 watts to sharing with KFQU on 1,420 kilocycles with 50 watts.

Station KGCX, Vida, Mont., First State Bank of Vita, changed from 1,370 kilocycles with 10 watts to 1,420 kilocycles with 10 watts.

Station KLS, Oakland, Calif., Warner Bros., changed from sharing with KWG on 1,420 kilocycles with 100 watts to daylight on 1,440 kilocycles with 250 watts.

Station KGY, Lacey, Wash., St. Martin's College, changed from sharing with KKP and KFQV on 1,420 kilocycles with 50 watts to daylight on 1,440 kilocycles with 50 watts.

APPENDIX G (2)

Revised list of broadcasting stations, arranged by frequencies, effective November 11, 1928, with letter of transmittal

FEDERAL RADIO COMMISSION,
Washington, D. C., October 25, 1928.

To all persons holding licenses to broadcast:

The commission has found it necessary to make certain changes in the allocation announced September 10, 1928, effective November 11, 1928. These changes are due in part to the fact that extensive checking has revealed possibilities for deriving greater service to the public on certain channels and for more economical use of daytime hours; in part to the desire to remedy certain injustices to particular stations and certain sections of the country without the expense of a hearing; and in part to the necessity of correcting a few sources of interference. The changes thus made are incorporated in a revised list of stations, a copy of which accompanies this statement. The new list also incorporates such increases of power for existing stations as have been authorized by the commission since the publication of the first list.

Licenses are being issued and mailed to the stations in accordance with the assignments indicated on the list. These licenses will be effective on November 11, 1928, at 3 o'clock a. m., eastern standard time, and will expire on February 1, 1929, at the same hour.

All stations dissatisfied with their assignments under the revised allocation should follow the procedure set forth in the commission's statement of September 11, 1928. Applications must be on forms provided by the commission; these may be obtained from the radio supervisors or from the secretary of the commission. All such applications must specify what frequency, power, and/or

hours of operation are desired by the applicant. No one application may specify more than one frequency. If one applicant files two or more applications for different frequencies, only one of the applications will be set for hearing and consideration of the others will be postponed until the one heard is disposed of; if such an applicant fails to designate which application he desires to be heard first, the commtssion will select such application.

FEDERAL RADIO COMMISSION,
By CARL H. BUTMAN, *Secretary.*

Revised list of broadcasting stations, by frequencies, effective 3 a. m., November 11, 1928, eastern standard time

[This list supersedes the list dated September 8, 1928]

Call letters	Location	Owner	Divides time with	Power
	550 kilocycles			*Watts*
WGR	Buffalo, N. Y.	Federal Radio Corporation		750
WEAO	Columbus, Ohio	Ohio State University	WKRC	750
WKRC	Cincinnati, Ohio	Kodel Radio Corporation	WEAO	500
KFUO	St. Louis, Mo.	Concordia Theological Seminary	KSD	500
KSD	do.	Pulitzer Publishing Co.	KFUO	500
KFDY	Brookings, S. Dak.	South Dakota State College	KFYR-KFJM	500
KFJM	Grand Forks, N. Dak.	University of North Dakota	KFDY-KFYR	500
	560 kilocycles			
WLIT	Philadelphia, Pa.	Lit Bros.	WFI	500
WFI	do.	Strawbridge & Clothier	WLIT	500
KFDM	Beaumont, Tex.	Magnolia Petroleum Co.		500
WMBF	Miami Beach, Fla.	Fleetwood Hotel Corporation		500
WNOX	Knoxville, Tenn.	Sterchi Bros.		1,000
WOI	Ames, Iowa	Iowa State College (daylight)	KFEQ	3,500
KFEQ	St. Joseph, Mo.	Scroggin Company Bank (daylight).	WOI	2,500
KOAC	Corvallis, Oreg.	Oregon State Agricultural College.		1,000
KIZ	Dupont, Colo.	Reynolds Radio Co. (Inc.)		1,000
	570 kilocycles			
WNYC	New York City	Department Plant and Structure	WMCA	500
WMCA	do.	Greeley Square Hotel Co.	WNYC	500
WSYR	Syracuse, N. Y.	Clive B. Meredith		250
WSMK	Dayton, Ohio	Stanley M. Krohn, jr.	WKBN	200
WKBN	Youngstown, Ohio	W. P. Williamson, jr.	WSMK	500
WWNC	Asheville, N. C.	Chamber of Commerce		1,000
KGKO	Wichita Falls, Tex.	Wichita Falls Broadcasting Co.		250
WHA	Madison, Wis.	University of Wisconsin	WPCC-WRM	750
WPCC	Chicago, Ill.	North Shore Congregational Church.	WRM-WHA	500
WRM	Urbana, Ill.	University of Illinois	WPCC-WHA	500
KUOM	Missoula, Mont.	State University of Montana	KXA	500
KMTR	Hollywood, Calif.	KMTR Radio Corporation	KPLA	1,000
KPLA	Los Angeles, Calif.	Pacific Development Radio Co.	KMTR	1,000
KXA	Seattle, Wash.	American Radio Telegraph Co.	KUOM	500
	580 kilocycles (Canadian shared)			
WTAG	Worcester, Mass.	Worcester Telegram Publishing Co.		250
WKAQ	San Juan, P. R.	Radio Corporation of Porto Rico.		500
WOBU	Charleston, W. Va.	Charleston Radio Broadcasting Co.	WSAZ	250
WSAZ	Huntington, W. Va.	McKellar Electric Co.	WOBU	250
KGFX	Pierre, S. Dak.	Dana McNeill (daylight)		200
KSAC	Manhattan, Kans.	Kansas State Agricultural College.	WSUI	500
WSUI	Iowa City, Iowa	State University of Iowa	KSAC	500
	590 kilocycles			
WEEI	Boston, Mass.	Edison Electric Illuminating Co.		500
WEMC	Berrien Springs, Mich.	Emanuel Missionary College (daylight).		1,000
WCAJ	Lincoln, Nebr.	Nebraska Wesleyan University	WOW	500
WOW	Omaha, Nebr.	Woodmen of the World Life Insurance Association.	WCAJ	1,000
KHQ	Spokane, Wash.	Louis Wasmer (Inc.)		1,000

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	600 kilocycles (Canadian shared)			*Watts*
WTIC	Hartford, Conn	Travellers Insurance Co. (temporary assignment pending completion of new 50,000 watt station.)		250
WCAO	Baltimore, Md	Monumental Radio (Inc.)		250
WREC	Whitehaven, Tenn	WREC (Inc.)	WOAN	500
WOAN	Lawrenceburg, Tenn	Church of the Nazarene, and Vaughan School of Music.	WREC	500
WEBW	Beloit, Wis	Beloit College (daylight)		250
KFSD	San Diego, Calif	Airfan Radio Corporation (1,000 day).		500
KFBU	Laramie, Wyo	Bishop N. S. Thomas		500
	610 kilocycles			
WFAN	Philadelphia, Pa	Keystone Broadcasting Co	WIP	500
WIP	do	Gimbel Bros. (Inc.)	WFAN	500
WDAF	Kansas City, Mo	Kansas City Star Co	WOQ	1,000
WOQ	do	Unity School of Christianity	WDAF	1,000
KFRC	San Francisco, Calif	Don Lee (Inc.)		1,000
	620 kilocycles			
WLBZ	Dover-Foxcroft, Mo	Thompson L. Guernsey		500
WDBO	Orlando, Fla	Rollins College (Inc.)	WDAE	1,000
WDAE	Tampa, Fla	Tampa Publishing Co	WDBO	1,000
WTMJ	Brookfield, Wis	The Journal Co		1,000
KGW	Portland, Oreg	Oregonian Publishing Co		1,000
KFAD	Phoenix, Ariz	Electrical Equipment Co		500
	630 kilocycles (Canadian shared)			
WMAL	Washington, D. C	M. A. Leese Co		250
WOS	Jefferson City, Mo	State Marketing Bureau	WGBF-KFRU	500
KFRU	Columbia, Mo	Stephens College	WOS-WGBF	500
WGBF	Evansville, Ind	Evansville on the Air (Inc.)	WOS-KFRU	500
	640 kilocycles			
WAIU	Columbus, Ohio	American Insurance Union (limited time).		5,000
KFI[1]	Los Angeles, Calif	Earl C. Anthony (Inc.) (construction permit issued for 50,000 watts).		5,000
	650 kilocycles			
WSM[1]	Nashville, Tenn	National Life & Accident Insurance Co. (construction permit issued for 50,000 watts).		5,000
	660 kilocycles			
WEAF[1]	Bellmore, N. Y	National Broadcasting Co. (Inc.)		50,000
WAAW	Omaha, Nebr	Omaha Grain Exchange (daylight).		500
	670 kilocycles			
WMAQ	Chicago, Ill	Chicago Daily News (Inc.)		5,000
	680 kilocycles			
WPTF	Raleigh, N. C	Durham Life Insurance Co. (construction permit issued for 10,000 watts).		
KPO	San Francisco, Calif	Hales Bros. and the Chronicle		5,000
	690 kilocycles (Canadian exclusive)			
	700 kilocycles			
WLW	Mason, Ohio	Crosley Radio Corporation		50,000
KFVD	Culver city, Calif	W. J. & C. I. McWhinnie (limited time).		250

[1] See General Order No. 42.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	710 kilocycles			*Watts*
WOR	Newark, N. J.	L. Bamberger & Co.		5,000
	720 kilocycles			
WGN-WLIB	Chicago, Ill.	The Tribune Co.		15,000
	730 kilocycles (Canadian exclusive)			
	740 kilocycles			
WSB	Atlanta, Ga.	Atlanta Journal Co.		10,000
KMMJ	Clay Center, Nebr.	The M. M. Johnson Co. (limited time).		1,000
	750 kilocycles			
WJR-WCX	Pontiac, Mich.	WJR (Inc.)		5,000
	760 kilocycles			
WJZ [1]	New York, N. Y.	Radio Corporation of America.		30,000
WEW	St. Louis, Mo.	St. Louis University (daylight).		1,000
	770 kilocycles			
KFAB	Lincoln, Nebr.	Nebraska Buick Auto Co.	WBBM	5,000
WBBM-WJBT [1]	Chicago, Ill.	Atlas Investment Co.	KFAB	25,000
	780 kilocycles (Canadian shared)			
WBSO	Wellesley Hills, Mass.	Babson's Statistical Organ (Inc.) (daylight).		100
WSEA	Portsmouth, Va.	Virginia Broadcasting Co. (Inc.).	WTAR-WPOR	500
WTAR-WPOR	Norfolk, Va.	Reliance Electric Co. (Inc.)	WSEA	500
WMC	Memphis, Tenn.	Memphis Commercial Appeal (Inc.).		500
KELW	Burbank, Calif.	Earl L. White	KNRC	500
KNRC	Santa Monica, Calif.	Pickwick Broadcasting Corporation.	KELW	500
	790 kilocycles			
WGY [1]	Schenectady, N. Y.	General Electric Co. (limited time).		50,000
KGO	Oakland, Calif.	do		10,000
	800 kilocycles			
WSAI	Mason, Ohio	Crosley Radio Corporation (Lessee) (limited time).		5,000
WBAP [1]	Fort Worth, Tex.	Carter Publications (Inc.)	KTHS	50,000
KTHS	Hot Springs, Ark.	Hot Springs Chamber of Commerce (construction permit issued).	WBAP	5,000
	810 kilocycles			
WPCH	New York, N. Y.	Concourse Radio Corporation (daylight).		500
WCCO	Minneapolis, Minn.	Washburn-Crosby Co.		10,000
	820 kilocycles			
WHAS	Louisville, Ky.	The Courier Journal Co. and the Louisville Times Co. (construction permit issued).		10,000
	830 kilocycles			
KOA	Denver, Colo.	General Electric Co.		12,500
	840 kilocycles (Canadian exclusive)			
	850 kilocycles			
KWKH	Kennonwood, La.	W. K. Henderson	WWL	20,000
WWL	New Orleans, La.	Loyola University (construction permit issued).	KWKH	5,000
KFQZ	Hollywood, Calif.	Taft Radio and Broadcasting Co. (Inc.) (limited time).		1,000

[1] See General Order No. 42.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	860 kilocycles			*Watts*
WABC-WBOQ	New York, N. Y.	Atlantic Broadcasting Corporation.		5,000
	870 kilocycles			
WLS	Crete, Ill.	Sears-Roebuck & Co.	WENR-WBCN	5,000
WENR-WBCN[3]	Chicago, Ill.	Great Lakes Radio Broadcasting Co.	WLS	5,000
	880 kilocycles (Canadian shared)			
WQAN	Scranton, Pa.	Scranton Times	WGBI	250
WGBI	do	Scranton Broadcasters (Inc.)	WQAN	250
WCOC	Columbus, Miss.	Crystal Oil Co.		500
KLX	Oakland, Calif.	Tribune Publishing Co.		500
KPOF	Denver, Colo.	Pillar of Fire (Inc.)	KFKA	500
KFKA	Greeley, Colo.	Colorado State Teachers' College.	KPOF	500
	890 kilocycles (Canadian shared)			
WJAR	Providence, R. I.	The Outlet Co.		250
WMMN	Fairmont, W. Va.	Holt Rome Novelty Co. (daylight).		(2)
WMAZ	Macon, Ga.	Mercer University	WGST	(2)
WGST	Atlanta, Ga.	Georgia School of Technology	WMAZ	(2)
KGJF	Little Rock, Ark.	First Church of Nazarene		250
WNAX	Yankton, S. Dak.	Gurney Seed & Nursery Co. and Radio Apparatus Co.	KFNF-KUSD	500
KUSD	Vermillion, S. Dak.	University of South Dakota	WNAX-KFNF	500
KFNF	Shenandoah, Iowa	Henry Field Seed Co.	WNAX-KUSD	500
	900 kilocycles			
WFBL	Syracuse, N. Y.	The Onondaga Co. (Inc.)	WMAK	750
WMAK	Martinsville, N. Y.	WMAK Broadcasting System (Inc.).	WFBL	750
WKY	Oklahoma City, Okla.	WKY Radiophone Co.		1,000
WFLA-WSUN	Clearwater, Fla.	Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce.		1,000
WLBL	Stevens Point, Wis.	Wisconsin Department of Markets (daylight).		5,000
KHJ	Los Angeles, Calif.	Don Lee (Inc.)		1,000
KSEI	Pocatello, Idaho	KSEI Broadcasting Association		250
KGBU	Ketchikan, Alaska	Alaska Radio & Service Co.		500
	910 kilocycles (Canadian exclusive)			
	920 kilocycles			
WWJ	Detroit, Mich.	The Detroit News		1,000
KPRC	Houston, Tex.	Houston Printing Co.		1,000
WAAF	Chicago, Ill.	Drovers Journal Publishing Co. (daylight).		500
KOMO	Seattle, Wash.	Fisher's Blend Station (Inc.)		1,000
	930 kilocycles (Canadian shared)			
WIBG	Elkins Park, Pa.	St. Pauls Protestant Episcopal Church (daylight).		50
WDBJ	Roanoke, Va.	Richardson-Wayland Electric Corporation.		(3)
WBRC	Birmingham, Ala.	Birmingham Broadcasting Co. (Inc.).		500
KGBZ[3]	York, Nebr.	George R. Miller (construction permit issued).	KMA	500
KMA	Shenandoah, Iowa	May Seed & Nursery Co.	KGBZ	500
KFWM	Oakland, Calif.	Oakland Educational Society	KFWI	500
KFWI	San Francisco, Calif.	Radio Entertainments, (Inc.)	KFWM	500

[1] See General Order No. 42.
[2] 500 watts daylight, 250 watts night.
[3] Stations KGES, KGBY, KGCH, KGEO, and KGDW to combine as KGBZ.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	940 kilocycles			*Watts*
WCSH	Portland, Me	Congress Square Hotel Co		500
WFIW	Hopkinsville, Ky	The Acme Mills (Inc.)		1,000
KOIN	Portland, Oreg	KOIN, (Inc.)		1,000
KGU	Honolulu, Hawaii	Marion A. Mulrony		500
KFEL	Denver, Colo	Eugene P. O'Fallon, (Inc.)	KFXF	250
KFXF	do	Pikes Peak Broadcasting Co	KFEL	250
	950 kilocycles			
WRC	Washington, D. C	Radio Corporation of America		500
KMBC-KLDS	Independence, Mo	Midland Broadcasting Co. and the Reorganized church of Jesus Christ of Latter Day Saints (limited to 9 p. m.)	WHB	1,000
WHB	Kansas City, Mo	Sweeney Automobile School Co.	KMBC-KLDS	1,000
KFWB	Los Angeles, Calif	Warner Brothers Broadcasting Corporation.	KPSN	1,000
KPSN	Pasadena, Calif	Pasadena Star-News Publishing Co.	KFWB	1,000
KGHL	Billings, Mont	Northwestern Auto Supply Co. (Inc.).		500
	960 kilocycles (Canadian exclusive)			
	970 kilocycles			
WCFL [1]	Chicago, Ill	Chicago Federation of Labor (construction permit issued for limited time).		50,000
KJR	Seattle, Wash	Northwest Radio Service Co		5,000
	980 kilocycles			
KDKA [1]	Pittsburgh, Pa	Westinghouse Electric & Manufacturing Co.		50,000
	990 kilocycles			
WBZ	East Springfield, Mass	do	WBZA	15,000
WBZA	Boston, Mass	do	WBZ	500
	1,000 kilocycles			
KGFH	Glendale, Calif	Frederick Robinson (Ltd.)		250
WHO	Des Moines, Iowa	Bankers Life Co	WOC	5,000
WOC	Davenport, Iowa	Palmer School of Chiropractic	WHO	5,000
	1,010 kilocycles (Canadian shared)			
WQAO-WPAP	New York, N. Y	Calvary Baptist Church	WHN-WRNY-	250
WHN	do	George Schubel	WQAO-WPAP-WRNY.	250
WRNY	do	Experimenter Publishing Co	WQAO-WPAP-WHN.	250
KGGF	Picker, Okla	D. L. Connell, M. D	WNAD	500
WNAD	Norman, Okla	University of Oklahoma	KGGF	500
WJBB	Sarasota, Fla	Sarasota County Chamber of Commerce.		250
KQW	San Jose, Calif	First Baptist Church		500
	1,020 kilocycles			
KYW-KFKX	Chicago, Ill	Westinghouse Electric & Manufacturing Co.		5,000
	1,030 kilocycles (Canadian exclusive)			
	1,040 kilocycles			
WKEN	Buffalo, N. Y	Radio Station WKEN (Inc.) (limited time).		1,000

[1] See General Order No. 42.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,040 kilocycles—Contd.			*Watts*
WKAR	East Lansing, Mich.	Michigan State College (daylight).		500
WFAA [1]	Dallas, Tex.	Dallas Morning News (construction permit issued for 50,000 watts).	KRLD	5,000
KRLD	do	KRLD (Inc.)	WFAA [1]	10,000
	1050 kilocycles			
WFBM [1]	Indianapolis, Ind.	Indianapolis Power & Light Co. (construction permit issued for limited time).		25,000
KNX	Hollywood, Calif.	Western Broadcast Co.		5,000
	1060 kilocycles			
WBAL	Baltimore, Md.	Consolidated Gas, Electric Light & Power Co.	WTIC	5,000
WTIC	Hartford, Conn.	Travelers Insurance Co. (temporarily assigned to 606 kilocycles, 250 watts, pending completion of transmitter).		(4)
WJAG	Norfolk, Nebr.	Norfolk Daily News (limited time).		500
KWJJ	Portland, Oreg.	Wilbur Jerman (limited time)		500
	1070 kilocycles			
WAAT	Jersey City, N. J.			(4)
WTAM	Cleveland, Ohio	WTAM & WEAR (Inc.)	WEAR	3,500
WEAR	do	do	WTAM	1,000
WCAZ	Carthage, Ill.	Carthage College (daylight)		100
WDZ	Tuscola, Ill.	James L. Bush (daylight)		100
	1080 kilocycles			
WBT	Charlotte, N. C.	C. C. Coddington (construction permit issued).		10,000
WCBD	Zion, Ill.	Wilbur Glenn Voliva (limited time).	WMBI	5,000
WMBI	Chicago, Ill.	The Moody Bible Institute of Chicago (limited time).	WCBD	5,000
	1,090 kilocycles			
KMOX-KFQA	St. Louis, Mo.	Voice of St. Louis (Inc.)		5,000
	1,100 kilocycles			
WPG	Atlantic City, N. J.	Municipality of Atlantic City	WLWL	5,000
WLWL	New York, N. Y.	Missionary Society of St. Paul the Apostle (6 p. m. to 8 p. m.).	WPG	5,000
KJBS	San Francisco, Calif.	Julius Brunton & Sons Co. (daylight).		100
	1,110 kilocycles			
WRVA	Richmond, Va.	Larus & Bro. Co. (Inc.) (construction permit issued).		5,000
KSOO	Sioux Falls, S. Dak.	Sioux Falls Broadcasting Association (limited time).		1,000
	1,120 kilocycles			
WFBR	Baltimore, Md.	Baltimore Radio Show (Inc.)		250
WBAK	Harrisburg, Pa.	Pennsylvania State Police (daylight).		500
WCOA	Pensacola, Fla.	City of Pensacola		500
WTAW	College Station, Tex.	Agricultural and Mechanical College of Texas.	KUT	500
KUT	Austin, Tex.	University of Texas	WTAW	500
WISN	Milwaukee, Wis.	Evening Wisconsin Co.	WHAD	250
WHAD	do	Marquette University	WISN	250
KFSG	Los Angeles, Calif.	Echo Park Evangelical Association.	KMIC	500
KMIC	Inglewood, Calif.	James R. Fouch	KFSG	500
KRSC	Seattle, Wash.	Radio Sales Corporation (daylight).		50

[1] See General Order No. 42.
[4] Construction permit issued for 50,000 watts. See General Order No. 42.
[5] 300 days till 6 p. m., but not after sunset at Cleveland, Ohio.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,130 kilocycles			*Watts*
WOV	New York, N. Y.	International Broadcasting Corporation (daylight to 6 p. m.).		1,000
KFKB	Milford, Kans.	The KFKB Broadcasting Association (limited time).		5,000
KSL	Salt Lake City, Utah	Radio Service Corporation of Utah (construction permit issued).		5,000
	1,140 kilocycles			
WAPI	Auburn, Ala.	Alabama Ploytechnic Institute (construction permit issued).	KVOO	5,000
KVOO	Tulsa, Okla.	Southwestern Sales Corporation (construction permit issued).	WAPI	5,000
	1,150 kilocycles			
WHAM	Rochester, N. Y.	Stromberg-Carlson Telephone Manufacturing Co.		5,000
KGDM	Stockton, Calif.	E. F. Peffer (daylight)		50
	1,160 kilocycles			
WEAN	Providence, R. I.	The Shepard Co. (daylight)		500
WWVA	Wheeling, W. Va.	West Virginia Broadcasting Corporation.	WOWO	5,000
WOWO	Fort Wayne, Ind.	Main Auto Supply Co.	WWVA	5,000
	1,170 kilocycles			
WCAU	Philadelphia, Pa.	Universal Broadcasting Co. (construction permit issued).		5,000
KTNT	Muscatine, Iowa	Norman Baker (limited time)		5,000
	1,180 kilocycles			
WGBS	Astoria, L. I.	Gimbel Bros., (Inc.) (limited time).		500
WJJD	Mooseheart, Ill.	Supreme Lodge of the World, Loyal Order of Moose (construction permit issued; limited time).		20,000
KEX	Portland, Oreg.	Western Broadcasting Co.	KOB	5,000
KOB	State College, N. Mex.	New Mexico College Agriculture and Mechanic Arts.	KEX	10,000
	1,190 kilocycles			
WRR	Dallas, Tex.	City of Dallas (construction permit issued).	WOAI	5,000
WOAI	San Antonio, Tex.	Southern Equipment Co.	WRR	5,000
	1,200 kilocycles (local)			
WABI	Bangor, Me.	First Universalist Church		100
WCAX	Burlington, Vt.	University of Vermont	WNBX	100
WEPS	Gloucester, Mass.	Matheson Radio Co. (Inc.)	WKBE	100
WIBX	Utica, N. Y.	WIBX (Inc.)		100
WKBE	Webster, Mass.	K. & B. Electric Co.	WEPS	100
WNBX	Springfield, Vt.	First Congregational Church Corporation.	WCAX	10
WBBW	Norfolk, Va.	Ruffner Junior High School		100
WFBE	Cincinnati, Ohio	Parkview Hotel		100
WHBC	Canton, Ohio	St. John's Catholic Church		10
WLAP	Okalona, Ky.	American Broadcasting Corporation of Kentucky.		30
WLBG	Petersburg, Va.	Robert Allen Gamble		100
WNBO	Washington, Pa.	John Brownlee Spriggs		15
WNBW	Carbondale, Pa.	Home Cut Glass & China Co.		5
WPRC	Harrisburg, Pa.	Wilson Printing & Radio Co.	WKJC	100
WKJC	Lancaster, Pa.	Kirk Johnson & Co.	WPRC	100
WQBJ	Clarkesburg, W. Va.	John Raikes (construction permit issued).		65
WABZ	New Orleans, La.	Coliseum Place Baptist Church	WJBW	100
WJBW	do	C. Carlson, jr	WABZ	30
WBBY	Charleston, S. C.	Washington Light Infantry		75
WBBZ	Ponca City, Okla.	C. L. Carrell		100
WFBC	Knoxville, Tenn.	First Baptist Church		50
WRBL	Columbus, Ga.	R. E. Martin		50
KGCU	Mandan, N. Dak.	Mandan Radio Association		100
WJBC	La Salle, Ill.	Hummer Furniture Co.	WJBL	100
WJBL	Decatur, Ill.	William Gushard Dry Goods Co.	WJBC	100

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,200 kilocycles—Contd.			*Watts*
WWAE	Hammond, Ind	Dr. George F. Courrier	WRAF	100
WRAF	La Porte, Ind	The Radio Club (Inc.)	WWAE	100
WJAM	Waterloo, Iowa	Waterloo Broadcasting Co	KFJB	100
KFJB	Marshalltown, Iowa	Marshall Electric Co	WJAM	100
WCAT	Rapid City, S. Dak	South Dakota State School of Mines.		100
KGDY	Oldham, S. Dak	J. Albert Loesch		15
WMAY	St. Louis, Mo	Kingshighway Presbyterian Church.	KFWF	100
KFWF	do	St. Louis Truth Center (Inc.)	WMAY	100
KFKZ	Kirksville, Mo	Northeast Missouri State Teachers College.		50
KGDE	Barrett, Minn	Jaren Drug Co		50
KGFK	Hallock, Minn	Kittson County Enterprise		50
WCLO	Kenosha, Wis	C. E. Whitmore	WRJN	100
WHBY	West De Pere, Wis	St. Norbert's College		50
WRJN	Racine, Wis	Racine Broadcasting Corporation.	WCLO	100
KFWC	Ontario, Calif	James R. Fouch	KPPC	100
KPPC	Pasadena, Calif	Pasadena Presbyterian Church	KFWC	50
KGEN	El Centro, Calif	E. R. Irey and F. M. Bowles		100
KMJ	Fresno, Calif	The Fresno Bee		100
KSMR	Santa Maria, Calif	Santa Maria Valley R. R. Co		100
KWG	Stockton, Calif	Portable Wireless Telephone Co		100
KGEK	Yuma, Colo	Beehler Electric Equipment Co.	KGEW	50
KGEW	Fort Morgan, Colo	City of Fort Morgan	KGEK	100
KFHA	Gunnison, Colo	Western State College of Colorado.		50
KVOS	Bellingham, Wash	L. Kessler		100
KGY	Lacey, Wash	St. Martin's College (50-day; night).		10
	1,210 kilocycles			
WJBI	Redbank, N. J	Robert S. Johnson	WCOH-WGBB-WINR.	100
WGBB	Freeport, N. Y	Harry H. Carman	WCOH-WJBI-WINR.	100
WINR	Bayshore, N. Y	Radiotel Manufacturing Co. (Inc.)	WCOH-WJBI-WGBB.	100
WCOH	Greenville, N. Y	Westchester Broadcasting Corporation.	WJBL-WGBB-WINR.	100
WOCL	Jamestown, N. Y	A. E. Newton		25
WLCI	Ithaca, N. Y	Lutheran Association of Ithaca		50
WFCI	Pawtucket, R. I	Frank Crook (Inc.)	WDWF-WLSI.	100
WDWF-WLSI	Cranston, R. I	Dutee W. Flint and the Lincoln Studies (Inc.).	WFCI	100
WMAN	Columbus, Ohio	W. E. Hoskitt		50
WLBV	Mansfield, Ohio	Mansfield Broadcasting Association.		100
WEBE	Cambridge, Ohio	Roy W. Waller		100
WBAX	Wilkes-Barre, Pa	John H. Stenger, jr	WJBU	100
WJBU	Lewisburg, Pa	Bucknell University	WBAX	100
WTAZ	Richmond, Va	W. Reynolds, jr. and T. J. McGuire.	WMBG	150
WMBG	do	Havens & Martin (Inc.)	WTAZ	100
WSIX	Springfield, Tenn	638 Tire & Vulcanizing Co		100
WRBU	Gastonia, N. C	A. J. Kirby Music Co		100
WJBY	Gadsden, Ala	Electric Consolidated Co		50
WMBR	Tampa, Fla	F. J. Reynolds		100
WRBQ	Greenville, Miss	J. Pat Scully		100
WGCM	Gulfport, Miss	Golf Coast Music Co. (Inc.)		100
KFDX	Shreveport, La	First Baptist Church	KWEA	100
KWEA	do	William E. Antony	KFDX	100
KDLR	Devils Lake, N. Dak	Radio Electric Co		100
KGCR	Brookings, S. Dak	Cutler's Broadcasting Service		100
KFOR	Lincoln, Nebr	Howard A. Shuman		100
WHBU	Anderson, Ind	Citizens Bank		100
KFVS	Cape Girardeau, Mo	Hirsch Battery & Radio Co	WEBQ	100
WEBQ	Harrisburg, Ill	Tate Radio Co	KFVS	50
WSBC	Chicago, Ill	World Battery Co	WEDC-WCRW	100
WCRW	do	Clinton R. White	WEDC-WSBC.	100
WEDC	do	Emil Denemark (Inc.)	WSBC-WCRW	100
WCBS	Springfield, Ill	Harold L. Dewing and Charles Messter.	WTAX	100
WTAX	Streator, Ill	Williams Hardware Co	WCBS	50
WHBF	Rock Island, Ill	Beardsley Specialty Co		100
WIBA	Madison, Wis	Capital Times-Strand Theater Station.		100
WOMT	Manitowoc, Wis	Mikadow Theater		100

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,210 kilocycles—Contd.			*Watts*
KGDP	Pueblo, Colo	Pueblo Council, Boy Scouts of America.		10
KFEY	Kellogg, Idaho	Union High School		10
KPQ	Seattle, Wash	Archie Taft and Louis Wasmer	KPCB	100
KPCB	do	Pacific Coast Biscuit Co	KPQ	100
	1,220 kilocycles			
WCAD	Canton, N. Y	St. Lawrence University (daylight).		500
WCAE	Pittsburgh, Pa	Kaufman & Baer Co		500
WREN	Lawrence, Kans	Jenny Wren Co	KFKU	1,000
KFKU	do	University of Kansas	WREN	1,000
	1,230 kilocycles			
WNAC-WBIS	Boston, Mass	The Shepard Stores		500
WPSC	State College, Pa	Pennsylvania State College (daylight).		500
WSBT	South Bend, Ind	South Bend Tribune	WFBM-WCWK	500
WFBM	Indianapolis, Ind	Indianapolis Power & Light Co	WCWK-WSBT	500
WCWK	Fort Wayne, Ind	Chester, W. Keen	WFBM-WSBT	500
KYA	San Francisco, Calif	Pacific Broadcasting Corporation.		1,000
KFIO	Spokane, Wash	North Central High School (daylight).		100
KFQD	Anchorage, Alaska	Anchorage Radio Club		100
	1,240 kilocycles			
WGHP	Fraser, Mich	Geo. Harrison Phelps (Inc.)		750
KFQB	Fort Worth, Tex	W. B. Fishburn (Inc.)	WJAD	1,000
WJAD	Waco, Tex	Frank P. Jackson	KFQB	1,000
WQAM	Miami, Fla	Electric Equipment Co	WIOD	750
WIOD	Miami Beach, Fla	Isle of Dreams Broadcasting Co	WQAM	1,000
WRBC	Valparaiso, Ind	Immanuel Lutheran Church (daylight).		500
	1,250 kilocycles			
WGCP	Newark, N. J	May Radio Broadcasting Corporation.	WODA-WAAM	500
WODA	Paterson, N. J	Richard R. O'Dea	WAAM-WGCP	1,000
WAAM	Newark, N. J	WAAM (Inc.)	WODA-WGCP	250
WLB-GMS	Minneopolis, Minn	University of Minnesota	WRHM-KFMX-WCAL	1,000
WRHM	Fridley, Minn	Rosedale Hospital Co. (Inc.)	WLB-KFMX-WCAL	1,000
KEMX	Northfield, Minn	Carleton College	WLB-WRHM-WCAL	1,000
WCAL	do	St. Olaf College	WLB-WRHM-KFMX	1,000
KFON	Long Beach, Calif	Nichols & Warinner (Inc.)	KEJK	1,000
KEJK	Beverly Hills, Calif	R. S. Macmillan	KFON	500
KXL	Portland, Oreg	KXL Broadcasters (Inc.)	KFAU	500
KFAU	Boise, Idaho	Frank L. Hill and C. G. Phillips. D/B as Boise Broadcast Station.	KXL	1,000
	1,260 kilocycles			
WLBW	Oil City, Pa	Petroleum Telephone Co		500
WJAX	Jacksonville, Fla	City of Jacksonville		1,000
KWWG	Brownsville, Tex	Chamber of Commerce	KRGV	500
KRGV	Harlingen, Tex	Harlingen Music Co	KWWG	500
KOIL	Council Bluffs, Iowa	Mona Motor Oil Co		1,000
	1,270 kilocycles			
WRHF	Washington, D. C	American Broadcasting Co. (daylight).		150
WEAI	Ithaca, N. Y	Cornell University (daylight)		500
WASH	Grand Rapids, Mich	Baxter Laundries (Inc.)	WOOD	250
WOOD	do	Walter B. Stiles (Inc.)	WASH	500
WDSU	New Orleans, La	Joseph H. Uhalt		1,000
KWLC	Decorah, Iowa	Luther College (daylight)	KGCA	50
KGCA	do	Chas. W. Greenley (daylight)	KWLC	50
KTW	Seattle, Wash	First Presbyterian Church	KFOA	1,000
KFOA	do	Rhodes Department Stores	KTW	1,000
KFUM	Colorado Springs, Colo	W. D. Corley		1,000

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,250 kilocycles			*Watts*
WCAM	Camden, N. J	City of Camden	WOAX-WCAP	500
WCAP	Asbury Park, N. J	Radio Industries Broadcasting Co.	WCAM-WOAX	500
WOAX	Trenton, N. J	Franklyn J. Wolff	WCAM-WCAP	500
WDOD	Chattanooga, Tenn	Chattanooga Radio Co. (Inc.)		1,000
WDAY	Fargo, N. Dak	WDAY (Inc.)	WEBC	1,000
WEBC	Superior, Wis	Head of the Lakes Broadcasting Co.	WDAY	1,000
KTAB	Oakland, Calif	Associated Broadcasters		500
	1,290 kilocycles			
WNBZ	Saranac Lake, N. Y	Smith & Mace (daylight)		10
WJAS	Pittsburgh, Pa	Pittsburgh Radio Supply House		1,000
KTSA	San Antonio, Tex	Lone Star Broadcast Co. (Inc.)	KFUL	1,000
KFUL	Galveston, Tex	Will H. Ford (daylight)	KTSA	500 1,000
KLCN	Blytheville, Ark	Daily Courier News (daylight)		50
KDYL	Salt Lake City, Utah	Intermountain Broadcasting Corporation.		1,000
	1,300 kilocycles			
WBBR	Rossville, N. Y	Peoples Pulpit Association	WHAP-WEVD-WHAZ.	1,000
WHAP	New York, N. Y	Defenders of Truth Association (Inc.).	WBBR-WEVD-WHAZ.	1,000
WEVD	Woodhaven, N. Y	Debs Memorial Radio Fund	WBBR-WHAP-WHAZ.	500
WHAZ	Troy, N. Y	Rensselaer Polytechnic Institute	WBBR-WHAP-WEVD.	500
KFH	Wichita, Kans	Hotel Lassen	WIBW	1,000
WIBW	Topeka, Kans	C. L. Carrell	KFH	1,000
KGEF	Los Angeles, Calif	Trinity Methodist Church	KTBI	1,000
KTBI	do	Bible Institute of Los Angeles	KGEF	1,000
KFJR	Portland, Oreg	Ashley C. Dixon & Son	KTBR	500
KTBR	do	M. E. Brown	KFJR	500
	1,310 kilocycles			
WKAV	Laconia, N. H	Laconia Radio Club		50
WEBR	Buffalo, N. Y	H. H. Howell		100
WSMD	Salisbury, Md	Tom F. Little		100
WNBH	New Bedford, Mass	New Bedford Broadcasting Co.		100
WNEW	Newport News, Va	Virginia Broadcasting Co. (Inc.)		100
WRK	Hamilton, Ohio	S. W. Doran and John C. Slade		100
WAGM	Royal Oak, Mich	Robert L. Miller	WBMH	50
WBMH	Detroit, Mich	Braun's Music House	WAGM	100
WFDF	Flint, Mich	Frank D. Fallain		100
WNAT	Philadelphia, Pa	Lennig Bros. Co	WFKD-WABY	100
WABY	do	John Magaldi, jr	WFKD-WNAT	50
WFKD	Frankford, Pa	Foulkrod Radio Engineering Co.	WNAT-WABY	50
WHBP	Johnstown, Pa	Johnstown Auto Co	WFBG	100
WFBG	Altoona, Pa	William F. Gable Co	WHBP	100
WRAW	Reading, Pa	Avenue Radio & Electric Shop	WGAL	100
WGAL	Lancaster, Pa	Lancaster Electrical Supply & Construction Co.	WRAW	15
WSAJ	Grove City, Pa	Grove City College		100
WBRE	Wilkes-Barre, Pa	Louis G. Baltimore		100
WMBL	Lakeland, Fla	Benford's Radio Studios		100
WKBC	Birmingham, Ala	H. L. Ansley		10
WRBW	Columbia, S. C	Paul S. Pearce		100
KGHG	McGeehee, Ark	Charles W. McCollum		50
WTHS	Atlanta, Ga	Atlanta Technical High School	WRBI	100
WRBI	Tifton, Ga	Kents Furniture and Music Store.	WTHS	20
WOBT	Union City, Tenn	Tittsworth's Radio and Music Shop.		15
WNBJ	Knoxville, Tenn	Lonsdale Baptist Church		50
KRMD	Shreveport, La	Robert M. Dean	KGGH	50
KGGH	Cedar Grove, La	Bates Radio & Electric Co	KRMD	50
KFPM	Greenville, Tex	The New Furniture Co		15
WDAH	El Paso, Tex	Trinity Methodist Church		100
KGFI	San Angelo, Tex	San Angelo Broadcasting Co		100
KFPL	Dublin, Tex	C. C. Baxter		15
KFXR	Oklahoma City, Okla	Exchange Avenue Baptist Church.		100
WKBS	Galesburg, Ill	Permil N. Nelson	WLBO	100
WLBO	do	Fred A. Trebbe, jr	WKBS	100

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,310 kilocycles—Contd.			*Watts*
WEHS	Evanston, Ill	Victor C. Carlson	WCLS-WKBB-WKBI-WHFC	100
WCLS	Joliet, Ill	WCLS (Inc.)	WEHS-WKBB-WKBI-WHFC	100
WKBB	do	Sanders Bros	WEHS-WCLS-WKBI-WHFC	100
WKBI	Chicago, Ill	Fred Schoenwolf	WEHS-WCLS-WKBB-WHFC	50
WHFC	do	Goodson & Wilson (Inc.)	WEHS-WCLS-WKBB-WKBI	100
KWCR	Cedar Rapids, Iowa	Harry F. Paar	KFJY	100
KFJY	Fort Dodge, Iowa	C. S. Tunwall	KWCR	100
KFGQ	Boone, Iowa	Boone Biblical College		10
WBOW	Terre Haute, Ind	Banks of Wabash Broadcasting Association.		100
WJAK	Kokomo, Ind	J. A. Kautz (Kokomo Tribune)	WLBC	50
WIBC	Muncie, Ind	Donald A. Burton	WJAK	50
WIBU	Poynette, Wis	William C. Forrest		100
KFBK	Sacramento, Calif	Kimball-Upson Co		100
KFCB	Phoenix, Ariz	Nielson Radio Supply Co		100
KFIU	Juneau, Alaska	Alaska Electric Light & Power Co.		10
KGEZ	Kalispell, Mont	Flathead Broadcasting Association.		100
KFXJ	Edgewater, Colo	R. G. Howell	KFUP	50
KFUP	Denver, Colo	Fitzsimmons General Hospital	KFXJ	100
	1,320 kilocycles			
WADC	Akron, Ohio	Allen T. Simmons		1,000
WSMB	New Orleans, La	Saenger Theatres (Inc.) and Maison Blanche Co.		750
KGIO	Idaho Falls, Idaho	Jack W. Duckworth, jr	KGIQ	250
KGIQ	Twin Falls, Idaho	Stanley M. Soule	KGIO	250
KGHF	Pueblo, Colo	Curtis P. Ritchie and Joe E. Finch.		250
KGHB	Honolulu, Hawaii	Radio Sales Co		250
	1,330 kilocycles			
WDRC	New Haven, Conn	Doolittle Radio Corporation	WCAC	500
WCAC	Starrs, Conn	Connecticut Agricultural College	WDRC	500
WTAQ	Eau Claire, Wis	Gillette Rubber Co	KSCJ	1,000
KSCJ	Sioux City, Iowa	Perkins Bros. Co	WTAQ	1,000
	1,340 kilocycles			
WSPD	Toledo, Ohio	Toledo Broadcasting Co		500
KFPW	Siloam Springs, Ark	Rev. Lannie P. Stewart (daylight.)		50
KMO	Tacoma, Wash	KMO (Inc.)	KVI	500
KVI	Near Des Moines, Wash	Puget Sound Radio Broadcasting Co.	KMO	1,000
	1,350 kilocycles			
WBNY	New York, N. Y	Baruchrome Corporation	WMSG-WCDA-WKBQ.	250
WMSG	do	Madison Square Garden Broadcasting Corporation.	WBNY-WCDA-WKBQ.	250
WCDA	do	Italian Educational Broadcasting Co	WBNY-WMSG-WKBQ.	250
WKBQ	do	Standard Cahill Co. (Inc.)	WBNY-WMSG-WCDA.	250
KWK	St. Louis, Mo	Greater St. Louis Broadcasting Corporation.	WIL	1,000
WIL	do	Missouri Broadcasting Corporation.	KWK	1,000
	1,360 kilocycles			
WBET	Medford, Mass	Boston Transcript Co	WMAF	500
WMAF	South Dartmouth, Mass	Round Hills Radio Corporation	WBET	500
WQBC	Utica, Miss	Utica Chamber of Commerce (Inc.).		300
WJKS	Gary, Ind	Johnson-Kennedy Radio Corporation.	WGES	500
WGES	Chicago, Ill	Oak Leaves Broadcasting Corporation (Inc.).	WJKS	500
KFBB	Havre, Mont	Buttrey Broadcast (Inc.)	KGIR	[1]
KGIR	Butte, Mont	Symons Broadcasting Co	KFBB	250
KGB	San Diego, Calif	Southwestern Broadcasting Corporation.		250

[1] 500 daylight, 250 night.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,370 kilocycles			*Watts*
WMBO	Auburn, N. Y.	Radio Service Laboratories		1,00
WSVS	Buffalo, N. Y.	Seneca Vocational School		50
WCBM	Baltimore, Md.	Hotel Chateau		100
WEAM	Plainfield, N. J.	W. J. Buttfield	WIAD	100
WBBL	Richmond, Va.	Grace Covenant Presbyterian Church.		100
WHBD	Bellefontaine, Ohio	First Presbyterian Church		100
WJBK	Ypsilanti, Mich.	Ernest F. Goodwin	WIBM	50
WIBM	Jackson, Mich.	C. L. Carrell	WJBK	100
WRAK	Erie, Pa.	C. R. Cummins		50
WIAD	Philadelphia, Pa.	Howard R. Miller	WEAM	100
WJBO	New Orleans, La.	Valdemar Jenson		100
WHBQ	Memphis, Tenn.	Broadcasting Station WHBQ (Inc.).		100
WRBT	Wilmington, N. C.	Wilmington Radio Association		50
KGFG	Oklahoma City, Okla.	Faith Tabernacle Association (Inc.).	KGCB	50
KGCB	Enid, Okla.	Wallace Radio Institute	KGFG	100
KGCI	San Antonio, Tex.	Liberto Radio Sales	KGRC	100
KGRC	do	Eugene J. Roth	KGCI	100
KFJZ	Fort Worth, Tex.	Henry Clay Allison		100
KGKL	Georgetown, Tex.	M. L. Cates		100
KFLX	Galveston, Tex.	George Roy Clough		100
WFBJ	Collegeville, Minn.	St. Johns University		100
KGDA	Dell Rapids, S. Dak.	Home Auto Co.		15
KWKC	Kansas City, Mo.	Wilson Duncan Broadcasting Co.	KGBX	100
KGBX	St. Joseph, Mo.	Foster-Hall Tire Co.	KWKC	100
KGAR	Tucson, Ariz.	Citizens Publishing Co.		100
KFUR	Ogden, Utah.	Peery Building Co.		50
KOH	Reno, Nev.	Jay Peters (Inc.)		100
KZM	Hayward, Calif.	Leon P. Tenney	KRE	100
KRE	Berkeley, Calif.	First Congregational Church	KZM	100
KGER	Long Beach, Calif.	C. Marwin Dobynes		100
KFBL	Everett, Wash.	Leese Bros.	KVL	50
KFEC	Portland, Oreg.	Meir & Frank Co.	KFJI	100
KVL	Seattle, Wash.	Arthur C. Baily	KFBL	100
KFJI	Astoria, Oreg.	George Kincaid	KFEC	100
KGFL	Raton, N. Mex.	Lamont A. Hubbard		50
KGGM	Albuquerque, N. Mex.	Jay Peters		100
	1,380 kilocycles			
WCSO	Springfield, Ohio	Wittenberg College	KQV	500
KQV	Pittsburgh, Pa.	Doubleday-Hill Electric Co.	WCSO	500
KSO	Clarinda, Iowa.	Berry Seed Co.	WKBH	1,000
WKBH	La Crosse, Wis.	Callaway Music Co.	KSO	1,000
	1,390 kilocycles			
WHK	Cleveland, Ohio	Radio Air Service Corporation		1,000
KLRA	Little Rock, Ark.	Arkansas Broadcasting Co.	KUOA	1,000
KUOA	Fayetteville, Ark.	University of Arkansas	KLRA	1,000
KOW	Denver, Colo.	Associated Industries, Broadcasting (Inc.).		500
KWSC	Pullman, Wash.	State College of Washington	KFPY	500
KFPY	Spokane, Wash.	Symons Investment Co.	KWSC	500
	1,400 kilocycles			
WCGU	Coney Island, N. Y.	United States Broadcasting Corporation.	WSGH-WSDA-WLTH-WBBC	500
WSGH-WSDA	Brooklyn, N. Y.	Amateur Radio Specialties Co.	WCGU-WLTH-WBBC	500
WLTH	do	Voice of Brooklyn (Inc.)	WCGU-WSGH-WSDA-WBBC	500
WBBC	do	Brooklyn Broadcasting Corporation.	WCGU-WSGH-WSDA-WLTH	500
WBAA	La Fayette, Ind.	Purdue University	WCMA-WKBF	500
WCMA	Culver, Ind.	Culver Military Academy	WBAA-WKBF	500
WKBF	Indianapolis, Ind.	Noble Butler Watson	WBAA-WCMA	500
	1,410 kilocycles			
WDEL	Wilmington, Del.	WDEL (Inc.)		500
WSKC	Bay City, Mich.	James E. Davidson		500
KGRS	Amarillo, Tex.	Gish Radio Service	WDAG	1,000

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,410 kilocycles—Contd.			*Watts*
WDAG	Amarillo, Tex	J. Laurence Martin	KGRS	1,000
WHDI	Minneapolis, Minn	William Hood Dunwoody Industrial Institute.	WDGY-KFLV-WHBL.	500
WDGY	do	Dr. George W. Young	WHDI-KFLV-WHBL	500
KFLV	Rockford, Ill	A. T. Frykman	WHDI-WDGY-WHBL.	500
WHBL	Sheboygan, Wis	Press Publishing Co. and C. L. Carrell.	KFLV-WDGY-WHDI.	500
	1,420 kilocycles			
KFXY	Flagstaff, Ariz	Mary M. Costigan		100
KGFJ	Los Angeles, Calif	Ben S. McGlashan		100
KFQU	Holy City, Calif	W. E. Riker	KGTT	100
KGTT	San Francisco, Calif	Glad Tidings Temple and Bible Institute.	KFQU	50
KFXD	Jerome, Idaho	Service Radio Co		50
KGHD	Missoula, Mont	Elmore Nash Broadcasting Corporation.		50
KGCX	Vida, Mont	First State Bank of Vida		10
KFIF	Portland, Oreg	Benson Polytechnic School		50
KMED	Medford, Oreg	W. J. Virgin		50
KORE	Eugene, Oreg	Eugene Broadcast Station		100
KKP	Seattle, Wash	City of Seattle Harbor Department.	KFQW	15
KFQW	do	KFQW (Inc.)	KKP	100
KXRO	Aberdeen, Wash	KXRO (Inc.)		75
WLBH	Farmingdale, N. Y	Joseph J. Lombardi	WHPP-WMRJ	30
WHPP	New York, N. Y	Bronx Broadcasting Co	WLBH-WMRJ	10
WMRJ	Jamaica, N. Y	Peter J. Prinz	WLBH-WHPP	10
WLEX	Lexington, Mass	Lexington Air Station (250-day)	WSSH	100
WTBO	Cumberland, Md	Cumberland Electric Co		50
WSSH	Boston, Mass	Tremont Temple Baptist Church.	WLEX	100
WSRO	Middletown, Ohio	Harry W. Farhlander	WAAD	100
WIBR	Steubenville, Ohio	Thurman A. Owings	WQBZ	50
WAAD	Cincinnati, Ohio	Ohio Mechanics Institute	WSRO	25
WEDH	Erie, Pa	Erie Dispatch Herald		30
WMBC	Detroit, Mich	Michigan Broadcasting Co. (Inc.).		100
WKBP	Battle Creek, Mich	Enquirer News Co		50
WQBZ	Weirton, W. Va	J. H. Thompson	WIBR	60
KGFF	Alva, Okla	Earl E. Hampshire		100
KOCW	Chickasha, Okla	Chickasha Broadcasting Co		100
WKBT	New Orleans, La	First Baptist Church		50
KTAP	San Antonio, Tex	Robert B. Bridge		100
KTUE	Houston, Tex	Uhalt Electric		5
KFYO	Breckenridge, Tex	Kirksey Bros. Battery & Electric Co.		100
KICK	Red Oak, Iowa	Atlantic Automobile Co., Red Oak Radio Corporation lessee.		100
WIAS	Ottumwa, Iowa	Poling Electric Co		100
KGCN	Concordia, Kans	Concordia Broadcasting Co		50
WLBF	Kansas City, Kans	Everett L. Dillard		100
WMBH	Joplin, Mo	Edwin Dudley Aber		100
KGFW	Ravenna, Nebr	Otto F. Sothman		50
KFIZ	Fond du Lac, Wis	Fond du Lac Commonwealth Reporter.		100
	1,430 kilocycles			
WICC	Easton, Conn	Bridgeport Broadcasting Station, (Inc.).	WBRL	500
WBRL	Tilton, N. H	Booth Radio Laboratories	WICC	500
WMBS	Lemoyne, Pa	Mack's Battery Co	WCAH	500
WCAH	Columbus, Ohio	Commercial Radio Service Co	WMBS	250
WGBC	Memphis, Tenn	First Baptist Church (Sunday only).	WNBR	500
WNBR	do	John Ulrich	WGBC	500
	1,440 kilocycles			
WHEC-WABO	Rochester, N. Y	Hickson Electric Co. (Inc.)	WMAC-WOKO	500
WMAC	Cazenovia, N. Y	Clive B. Meredith	WOKO-WHEC-WABO.	500
WOKO	Mount Beacon, N. Y	Harold E. Smith	WHEC-WABO-WMAC	500
WABF	Kingston, Pa	Markle Broadcasting Corporation.	WRAX	250
WRAX	Philadelphia, Pa	Berachah Church (Inc.)	WABF	250

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,440 kilocycles—Contd.			*Watts*
WNRC	Greensboro, N. C	Wayne M. Nelson		500
WTAD	Quincy, Ill	Illinois Stock Medicine Broadcasting Corporation.	WMBD	500
WMBD	Peoria Heights, Ill	Peoria Heights Radio Laboratory.	WTAD	500
KLS	Oakland, Calif	Warner Bros. (day)		250
	1,450 kilocycles			
WBMS	Union City, N. J	WBMS Broadcasting Corporation.	(5)	250
WNJ	Newark, N. J	Radio Investment Co	(5)	250
WIBS	Elizabeth, N. J	New Jersey Broadcasting Co	(5)	250
WKBO	Jersey City, N. J	Camith Corporation	(5)	250
WSAR	Fall River, Mass	Doughty & Welch Electric Co. (Inc.).		250
WJAY	Cleveland, Ohio	Cleveland Radio Broadcasting Corporation.	WFJC	500
WFJC	Akron, Ohio	W. F. Jones Broadcasting, (Inc.)	WJAY	500
KSBA	Shreveport, La	W. G. Patterson		1,000
WTFI	Toccoa, Ga	Toccoa Falls Institute		500
	1,460 kilocycles			
WTFF	Mount Vernon Hills, Va	Independent Publishing Co		10,000
KSTP	Westcott, Minn	National Battery Broadcasting Co.		10,000
	1,470 kilocycles			
WKBW	Amherst, N. Y	Churchill Evangelical Association (Inc.).		5,000
KFJF	Oklahoma City, Okla	National Radio Manufacturing Co.		5,000
WRUF	Gainesville, Fla	University Radio Service Co		5,000
KGA	Spokane, Wash	Northwest Radio Service Co		5,000
	1,480 kilocycles			
WJAZ	Mount Prospect, Ill	Zenith Radio Corporation	WHT-WORD-WIBO.	5,000
WHT	Deerfield, Ill	Radiophone Broadcasting Corporation.	WJAZ-WORD-WIBO.	5,000
WORD	Batavia, Ill	Peoples Pulpit Association	WJAZ-WHT-WIBO.	5,000
WIBO	Desplaines, Ill	Nelson Bros. Bond & Mortgage Co.	WJAZ-WHT-WORD.	5,000
	1,490 kilocycles			
WBAW	Nashville, Tenn	Waldrum Drug Co	WLAC	5,000
WLAC	do	Life & Casualty Insurance Co	WBAW	5,000
	1,500 kilocycles			
WMBA	Newport, R. I	LeRoy Joseph Beebe		100
WLOE	Chelsea, Mass	William S. Pote	WMES	100
WMES	Boston, Mass	Massachusetts Educational Society.	WLOE	50
WNBQ	Rochester, N. Y	Gordon P. Brown		15
WNBF	Endicott, N. Y	Howitt-Wood Radio Co		50
WMBQ	Brooklyn, N. Y	Paul J. Gollhofer	WLBX-WCLB-WWRL.	100
WLBX	Long Island City, N. Y	John N. Brahy	WMBQ-WCLB-WWRL.	100
WCLB	Long Beach, N. Y	Arthur Faske	WMBQ-WLBX-WWRL.	100
WWRL	Woodside, N. Y	William H. Reuman	WMBQ-WLBX-WCLB.	100
WTBQ	Wilmington, Del	E. Brandt Boylan		100
WAFD	Detroit, Mich	Albert B. Parfet Co		100
WKBZ	Ludington, Mich	K. L. Ashbacker		50
WMPC	Lapeer, Mich	First Methodist Protestant Church.		30
WCBA	Allentown, Pa	B. Bryan Musselman	WSAN	100
WSAN	do	Allentown Call Publishing Co. (Inc.)	WCBA	100
WALK	Willow Grove, Pa	Albert A. Walker	WHBW-WOO-WPSW.	50

[5] WBMS, WNJ, WIBS, and WKBO divide time with each other.

Revised list of broadcasting stations, by frequencies, etc.—Continued

Call letters	Location	Owner	Divides time with	Power
	1,500 kilocycles—Contd.			*Watts*
WOO	Philadelphia, Pa.	John Wanamaker	WHBW-WALK-WSPW.	100
WHBW	do	D. R. Kienzle	WALK-WOO-WPSW.	100
WPSW	do	Philadelphia School of Wireless Telegraphy.	WALK-WHBW-WOO.	50
WIBZ	Montgomery, Ala.	Alexander D. Trum		15
KGHI	Little Rock, Ark.	Berea Bible Class		100
WRBJ	Hattiesburg, Miss.	Woodruff Furniture Co.		10
WMBM	Memphis, Tenn.	Seventh Day Adventist Church.		10
KGKB	Goldthwaite, Tex.	Eagle Publishing Co.		100
KGDR	San Antonio, Tex.	Joe B. McShane		100
KGHX	Richmond, Tex.	Fort Bend County School Board.		50
WKBV	Brookville, Ind.	Knox Battery & Electric Co.		100
KPJM	Prescott, Ariz.	Frank Wilburn		100
KWBS	Portland, Oreg.	Schaeffer Radio Co.		15
KWTC	Santa Ana, Calif.	Pacific Broadcasting Federation.	KFWO	100
KFWO	Avalon, Calif.	Lawrence Mott	KWTC	100
KFCR	Santa Barbara, Calif.	Santa Barbara Broadcasting Co.		100
KUJ	Long View, Wash.	Fred W. Lovejoy and R. W. Kerfoot.		10

APPENDIX G (3)

Statement of commission to accompany General Order No. 40, relative to new allocations announced August 30, as effective on October 1, 1928, but postponed under General Order No. 44, issued September 8, 1928, until November 11, 1928

SEPTEMBER 10, 1928.

General Order No. 40, issued yesterday by the Federal Radio Commission, supplies the official basis for an adjustment in the assignment of the country's broadcasting facilities, under a plan which it is believed will provide an improved standard of radio reception generally, and also distribute the broadcasting channels, powers, and periods of time on the air equally among the five radio zones as directed by the last Congress.

The plan provides for full-time assignments for 100-watt stations equaling in number the total of all other classes of broadcasters put together.

Of the 74 channels made available for high-grade reception, 34 will be assigned for regional service, permitting 125 full-time positions for this type of station, and 40 channels will be assigned to stations with minimum power of 5,000 watts and a maximum to be determined by the commission and announced with the allocation. On these 40 channels only one station will be permitted to operate at any time during night hours, thus insuring clear reception of the station's program, up to the extreme limit of its service range. These 40 channels will be assigned 8 to each of the 5 zones, thus insuring wide geographical distribution of the country's higher-power broadcasting facilities to all sections.

On the 34 channels shared by regional stations, ranging in power from 250 to 1,000 watts and assigned 2, 3, or 4 per channel, spacings generally of 1,000 to 1,500 miles have been observed.

Throughout the whole allocation wide geographical spacings have been observed between stations on adjoining channels in order to eliminate objectionable "cross talk."

Summarizing, for 'local" stations of 50 to 100 watt ratings, 150 full-time positions have been provided, or 30 per zone; 125 regional positions have been provided for 250 to 1,000 watt stations; and 40 positions for stations of 5,000 watts and above. Each full-time assignment available for night use, in many instances, is shared by two or more stations or transmitters, depending upon the number of licensed stations to be accommodated in the zone or locality.

Recapitulating by zones, the equal division of the foregoing facilities among the 5 zones will provide each zone with 8 full-time assignments for stations

of 5,000 watts and above, 24 positions for 500-watt and 1,000-watt stations, and 30 positions for 50-watt and 100-watt stations.

In announcing this plan the commission does so realizing that it may have imperfections, but believes it an approach to an ideal situation which may be reached in the future.

APPENDIX G (4)

Analysis of new broadcasting station allocation by Dr. J. H. Dellinger, chief engineer, September 14, 1928

FEDERAL RADIO COMMISSION.
Washington, D. C., September 14, 1928.

The new allocation of broadcasting stations announced by the Federal Radio Commission on September 11, 1928, was prepared in accordance with the allocation plan set forth in the commission's General Order No. 40, of September 7, 1928. Both the plan and the allocation itself were drawn in compliance with the requirements of the 1928 amendment to the radio act as to equalization of broadcasting facilities between the zones and States. The allocation was, furthermore, made in compliance with the commission's decision that no existing stations should be abolished at the time of its inception. It is believed to provide the greatest aggregate of radio service to the country possible under the two conditions just mentioned. Its principal features are: (*a*) It provides a definite, invariant basis of station assignments for each zone and locality; (*b*) it can be improved wherever interference is found to exist in actual operation, through the reduction of power or the elimination of particular stations, without disturbing the station allocation as a whole; (*c*) it eliminates heterodyne interference on 80 per cent of the listener's dial; (*d*) it recognizes the essentially different requirements of local, regional, and distant service.

Proper provision for the differing requirements of the listeners in large rural areas, cities, and intermediate areas made the preparation of this allocation a difficult task. It would have been very easy to allocate all existing stations, and many more, if only local service or the effects a few miles from the station had been considered. As soon as consideration was given to service more than a few miles from a station, serious difficulty arose, since heterodyne interference extends to many times the distance from a station to which actual program service extends. Operation of two or more stations on a channel (i. e., on one frequency or wave length) results in an area of destructive interference very much greater than the area in which program service is provided unless the stations are of low power and widely spaced geographically. It is only when a station has exclusive use of its channel that program service free from interference can be furnished at great distances. But since there are only 90 channels available for broadcasting in the United States, there could not possibly be more than 90 simultaneously operating stations giving service at great distances.

The only reasonable solution of this dilemma is that which the commission has adopted, the setting aside of a certain number of channels (40) for distant or rural service, each with only one station assignment,[1] and the use of the remaining channels for service at more moderate distances with several station assignments on each channel, all with limited power and located systematically at proper distances apart to minimize interference.

The channels used for the latter type of station assignments are subdivided into "regional service" channels, which are kept substantially free from heterodyne interference by restricting power to 1,000 watts and keeping the stations on a given channel, in general 1,000 miles or more apart, and several other types of channels on which heterodyne interference is permitted but which give satisfactory local service.

Besides the channels designated as "local service" there are two classes of "limited-service" channels on which heterodyne interference is permitted. On five of these channels 1,000-watt stations are permitted and on four of them 5-kilowatt stations. These will not give distant service and are in that sense "limited," but will give better local service than the stations on the "local-

[1] The expression "station assignment," or "full-time assignment," indicates full-time operation 24 hours a day by a station, or a group of stations sharing time.

service" channels because of their higher power. In some discussions the 1,000-watt limited-service channels are lumped with the regional-service channels, because there is not a very sharp difference between them—a heavily loaded regional-service channel would be indistinguishable from a 1,000-watt limited-service channel.

There has been no specific designation of a name for the class of channels intended to give distant or rural service. They have been called variously "rural service," "distant service," "cleared," "high-power," "heterodyne-free," and "exclusive" channels. Stations on these channels may be authorized to use power up to 25 kilowatts and, experimentally, up to 50 kilowatts.

The allocation is in harmony with good engineering principles. In the separate provision for high-power exclusive channels and restricted-power local channels and in the geographical spacings of stations on the same and adjacent frequencies and in other vital respects the allocation is in accord with "A statement on engineering principles" presented to the commission on March 30, 1927, by the committee on radio broadcasting of the American Engineering Council. It is also in essential accord with the recommendations of the radio engineers in the April 6, 1928, conference, except that only 40 high-power exclusive channels are provided instead of 50.

SUMMARY OF ALLOCATION PLAN

The allocation plan is set forth in detail in General Order No. 40. Its principal features are indicated in the following table. The available numbers of station assignments have not in all cases been utilized in all the zones in the allocation which the commission has announced.

	High power, 5 kilowatts and up	Regional, 500–1,000 watts	Limited service		Local, 10–100 watts	Total
			5 kilowatts	1,000 watts		
Number of channels	40	35	4	5	6	90
Station assignments per channel	1	[1] 2½	2½	5	25	
Number station assignments in United States	40	90	10	25	150	315
Number station assignments in each zone	8	18	2	5	30	63

[1] Approximate average.

The allocation is based on nighttime transmission conditions. Besides the classes of stations shown in table there are a number of supplementary stations added on some channels These include a number of "daytime-service" stations and "limited-time" stations. The latter are allowed to operate during the day and also during certain time (after late evening in the East by western stations) temporarily not used by the station entitled to the channel. The "daytime-service" stations are allowed to operate only during noninterfering hours. They are required to shut down at sunset. This shall be taken to be sunset at the daytime-service station unless it is the farthest east of the stations on the channel, in which case sunset at the next station west on the same channel. The time of sunset varies from about 4.30 in December to 7.30 in June, local sun time.

THE LISTENER'S DIAL

The choice of particular frequencies for the several classes of stations was influenced in considerable measure by the present frequencies of stations. Thus one reason that the high-power channels are begun at 640 kilocycles rather than at 550 kilocycles is because the public is accustomed to hearing some of the regional-service stations at this end of the spectrum. This principle has permitted reducing as much as possible the average shift of frequency which the stations must make.

The placing of several blocks of regional and local-service channels in different parts of the dial has the advantage that it permits the licensing of more stations in certain places (e. g., Boston and Los Angeles) than would be possible (because of interchannel interference) if the channels of each class of station were all bunched in a single group.

The high-power channels, however, are consolidated into a single block in the spectrum (except for Canadian exclusive and Canadian-shared channels and the group of regional channels from 880 to 950 kilocycles), so that the listeners on these heterodyne-free channels will be as free as possible from interchannel interference from near-by stations of other classes.

The choice of channel locations is expected to have the effect of making programs as available at the high-frequency end of the listener's dial as at the low-frequency end. Thus the entire dial becomes useful for listeners everywhere in the United States.

In the following list the numbers in parentheses after certain frequencies indicate the zone to which that frequency is assigned:

550, 560, 570: Limited service, 1,000 watts.
580, 590, 600, 610, 620, 630: Regional service.
640 (5), 650 (3), 660 (1), 670 (4), 680 (5): Rural service (i. e., high power).
690: Canada.
700 (2), 710 (1), 720 (4): Rural service (i. e., high power).
730: Canada.
740 (3), 750 (2), 760 (1), 770 (4): Rural service (i. e., high power).
780: Regional service (shared with Canada).
790 (5), 800 (3), 810 (4), 820 (2), 830 (5): Rural service (i. e., high power).
840: Canada.
850 (3), 860 (1), 870 (4): Rural service (i. e., high power).
880, 890, 900: Regional service.
910: Canada.
920, 930, 940, 950: Regional service.
960: Canada.
970 (5), 980 (2), 990 (1), 1,000 (4): Rural service (i. e., high power).
1,010: Regional service (shared with Canada).
1,020 (2): Rural service (i. e., high power).
1,030: Canada.
1,040 (3), 1,050 (5), 1,060 (1), 1,070 (2), 1,080 (3), 1,090 (4), 1,100 (1), 1,110 (2): Rural service (i. e. high power).
1,120: Regional service (shared with Canada).
1,130 (5), 1,140 (3), 1,150 (1), 1,160 (4), 1,170 (2), 1,180 (4), 1,190 (3): Rural service (i. e., high power).
1,200, 1,210: Local service.
1,220, 1,230, 1,240, 1,250, 1,260, 1,270, 1,280, 1,290, 1 300: Regional service.
1,310: Local service.
1,320, 1,330, 1,340, 1,350, 1,360: Regional service.
1,370: Local service.
1,380, 1,390, 1,400, 1,410: Regional service.
1,420: Local service.
1,430: Regional service.
1,440, 1,450: Limited service, 1,000 watts.
1,460, 1,470, 1,480, 1,490: Limited service, 5 kilowatts.
1,500: Local service.

EQUALIZATION

The table given above under "Summary of allocation plan" shows how the frequencies are equalized between the zones. Each zone receives exactly one-fifth of the station assignments. In some zones there are a few vacancies in the station assignments, which will be available until future stations are constructed in the localities where those station assignments can be used. The allocation of frequencies and of station assignments to the individual States is closely proportional to population, as the law requires; this correspondence, of course, can not be exact, because the inequalities of State populations lead to many fractional quotas.

The aggregate power assigned to the stations is nearly equal for the five zones and is closely proportional to the populations of the States within each zone. For the future, moreover, the potential power of stations is exactly equalized between the zones, since by General Orders 40 and 42 the same upper limit of power is prescribed for all stations of each class.

The number of licenses is equalized only approximately, as follows: Zone No. 1, 108; zone No. 2, 106; zone No. 3, 115; zone No. 4, 155; zone No. 5, 132. The total number of licenses or stations is 616, an average per zone of 123. The principal disparity is an excess of 32 over the average in the fourth zone

(the Middle West). These departures from equality are inherent in the commission's fundamental decision that no existing stations should be abolished at the time of the inception of the new allocation.

The equalization of time "on the air" is indicated essentially by the distribution of "station assignments," which is equal as between the zones, and reasonably proportional to population as between the States. The equalization of time is somewhat altered, however, by the addition of "daytime service" stations on some of the channels.

CONCLUSION

The channels are carefully cleared of interchannel interference in every part of the dial. This clearing is particularly well effected in zones 3, 4, and 5. Zones 1 and 2 being smaller, the geographical spacings are somewhat less than in the other zones, and interference may in a few cases be perceptible on winter nights.

It is believed that heterodyne interference is eliminated except on the 9 limited-service channels and the 6 local-service channels. If such interference should develop on any of the 75 heterodyne-free channels, the commission may remove it by reducing a station's power or eliminating one or more stations.

The principal features of the allocation, such as the assignment of amounts of power and of particular frequencies to particular localities, can not in general be altered, because of the interdependence of the frequency and distance separations throughout the entire set-up. However, the selection of stations in a given locality to be put in a particular power class, the selection of stations in a locality to be assigned to the specific frequencies allotted to the locality, and the relative amounts of time divisions by groups of stations, are all features which can be changed at any time as the commission sees fit without affecting the soundness of the set-up in any way. Thus the commission will have a quick and definite way of determining what its action should be on all broadcast license applications.

APPENDIX G (5)

Radiobroadcast facilities due each State—An analysis of quotas of respective States on basis of population, with respect to the several classes of channels

[As required by the "equitable allocation" clause of the 1928 act of Congress]

The 1928 radio act, or Davis amendment, approved March 28, 1928, requires that the radio supervising authority "shall as nearly as possible make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave lengths, of periods of time for operation, and of station power, to each of (the five) zones, and shall make a fair and equitable allocation of licenses, wave lengths, time for operation, and station power to each of the States * * * within each zone, according to population."

The proportion of the total national radio facilities due each State is therefore fixed by law and is shown by the percentages in column B below, based upon official estimates of 1928 populations (column A) prepared by the United States Census Bureau.

The maximum of total broadcasting service which can be simultaneously carried on without interference, under the present status of the law and the radio art, has been determined by the Radio Commission and its engineers, after exhaustive study and experiment, as comprising the simultaneous operation of 40 stations of 5 kilowatts and upward, on cleared channels; 125 regional stations of 500 to 1,000 watts, and 150 local stations of 10 to 100 watts. By time divisions, a larger number of actual transmitters can, of course, be operated at different times on these "assignments," but the total stations running at any one moment during the night hours must not exceed the above limit, if good radio reception is to be preserved.

Dividing this national maximum into five equal parts for the zones, and also applying the State percentages of column B, we obtain the number of each class of station "assignments" due each State, as shown in the three right-hand columns.

Number of full-time "assignments" due States

[See notes following table]

	A Population of State (1928)	B Percentage of total national facilities due State	C Rural service, 5 kilowatts and above	D Regional service, chiefly 500–1,000 watts	E "Local"; chiefly 50 watts and 100 watts
FIRST ZONE					
(O. H. Caldwell, commissioner)					
		Per cent			
Maine	795,000	0.6	----------	0.7	0.9
New Hampshire	456,000	.3	----------	.4	.5
Vermont	352,428	.3	----------	.3	.4
Massachusetts	4,290,000	3.1	1.2	3.9	4.7
Connecticut	1,667,000	1.2	.5	1.5	1.8
Rhode Island	716,000	.5	----------	.7	.8
New York	11,550,000	8.4	3.5	10.6	12.7
New Jersey	3,821,000	2.8	1.1	3.5	4.2
Delaware	244,000	.2	----------	.2	.3
Maryland	1,616,000	1.2	.5	1.5	1.8
District of Columbia	552,000	.4	----------	.5	.6
Porto Rico	1,299,809	.9	----------	1.2	1.4
Virgin Islands	26,051	.02	----------	----------	----------
Total	27,385,288	20	8	25	30
SECOND ZONE					
(Ira E. Robinson, commissioner)					
Pennsylvania	9,854,000	7.0	2.8	8.8	10.5
Virginia	2,575,000	1.8	.7	2.3	2.7
West Virginia	1,724,000	1.2	.5	1.5	1.8
Ohio	6,826,000	4.9	2.0	6.1	7.3
Michigan	4,591,000	3.3	1.3	4.1	4.9
Kentucky	2,553,000	1.8	.7	2.3	2.7
Total	28,123,000	20	8	25	30
THIRD ZONE					
(E. O. Skyes, commissioner)					
North Carolina	2,938,000	2.1	.8	2.6	3.1
South Carolina	1,864,000	1.3	.5	1.7	2.0
Georgia	3,203,000	2.3	.9	2.9	3.4
Florida	1,411,000	1.0	----------	1.3	1.5
Alabama	2,573,000	1.8	.7	2.3	2.7
Tennessee	2,502,000	1.8	.7	2.2	2.7
Mississippi	1,790,618	1.3	.5	1.6	1.9
Arkansas	1,944,000	1.4	.5	1.7	2.1
Louisiana	1,950,000	1.4	.5	1.8	2.1
Texas	5,487,000	3.9	1.5	4.9	5.9
Oklahoma	2,426,000	1.7	.7	2.2	2.6
	28,088,618	20	8	25	30
FOURTH ZONE					
(Sam Pickard, commissioner)					
Indiana	3,176,000	2.4	1.0	3.0	3.6
Illinois	7,396,000	5.5	2.2	7.0	8.3
Wisconsin	2,953,000	2.2	1.0	2.8	3.3
North Dakota	641,192	.5	----------	.6	.7
Minnesota	2,722,000	2.0	.8	2.5	3.0
South Dakota	704,000	.5	----------	.7	.8
Iowa	2,428,000	1.8	.7	2.3	2.7
Nebraska	1,408,000	1.1	----------	1.3	1.6
Kansas	1,835,000	1.4	.5	1.7	2.0
Missouri	3,523,000	2.6	1.1	3.3	4.0
Total	26,786,192	20	8	25	30

Number of full-time "assignments" due States—Continued

	A Population of State (1928)	B Percentage of total national facilities due State	C Rural service, 5 kilowatts and above	D Regional service, chiefly 500–1,000 watts	E "Local"; chiefly 50 watts and 100 watts
FIFTH ZONE (H. A. Lafount, commissioner)		*Per cent*			
Montana	548,889	1.0	------	1.2	1.5
Idaho	546,000	1.0	------	1.2	1.4
Wyoming	247,000	.4	------	.5	.7
Colorado	1,090,000	2.0	.8	2.4	2.9
New Mexico	396,000	.7	------	.9	1.0
Arizona	474,000	.8	------	1.0	1.2
Utah	531,000	.9	.4	1.2	1.4
Nevada	77,407	.1	------	.2	.2
Washington	1,587,000	2.8	1.1	3.5	4.2
Oregon	902,000	1.6	.6	2.0	2.4
California	4,556,000	8.2	3.3	10.2	12.1
Territory of Hawaii	[1] 255,912	.5	------	.6	.7
Alaska	[1] 55,036	.1	------	------	.2
Total	11,266,244	20	8	25	30

[1] Population in 1920.

NOTES ON ACCOMPANYING FIGURES SHOWING "RADIO FACILITIES DUE EACH STATE"

"Assignments."—The figures in columns C, D, and E do not show the total number of stations to be licensed. They show only the number of full-time (24-hour) "assignments" due the various States. Each such assignment may be occupied either by one full-time station or by two, three, or more stations sharing time. Such time sharing of assignments will be necessary in States and localities where the number of licensed stations exceeds the number of "assignments" available.

Rural service.—Column C, it will be noted, lists assignments for stations of 5 kilowatts and upward, only where the State's quota is approximately half time or more, on the basis that the great expense of building or operating a 5-kilowatt station would not be justified for less than half-time operation. States whose quotas on these rural-service channels are small fractions will presumably be served by stations in neighboring States (with which their fractional quotas may be combined).

Regional service.—Column D lists assignments for regional stations, including under the allocation plan chiefly 500-watt and 1,000-watt stations, but also a limited number of 250-watt stations (principally on Canadian-shared channels) and also ten 5-kilowatt limited-service stations in the 1,460–1,490-kilocycle range having regional service.

Local service.—Column E lists assignments for "local" community stations with ratings of 10 watts to 100 watts. These assignments provide primarily for communities having no other broadcasting stations, hence such local assignments are automatically not fully available in regions and communities having extensive broadcasting facilities in other classes. "Local" assignments are, however, always fully available in all sections and communities having no other near-by stations.

Daylight service.—The allocation plan is essentially built upon the requirements of nighttime, when transmission distances are greatest and interference is at a maximum. In the daytime, on account of the reduced transmission distances obtainable, simultaneously operating stations can be closer together. In consequence, a number of additional stations for a daylight operation only (equally divided between the zones) can be incorporated into the broadcasting set-up here shown without causing any interference.

APPENDIX H

Address by Commissioner Caldwell on synchronization, October 14, 1927

RELIEF THROUGH SYNCHRONIZING STATIONS ON SAME CHANNEL

By O. H. Caldwell

Commissioner Caldwell discussed synchronization fully before the American Institute of Electrical Engineers in New York on October 14, 1927. He said:

"As is well known, although the audible signal of a 500-watt station may under good average conditions be heard 100 to 200 miles, its carrier under the same conditions will cause heterodynes or 'whistles' up to 1,000 miles. Heterodyning results from the slight difference in frequencies of two stations on the same channel. For example, on the 900-kilocycle channel, if one station is

operating accurately at 900,250 cycles, the listeners between and at a distance from both stations will hear a squeal which is the audible difference between the two frequencies—that is, a musical note of 250 cycles, or about middle C on the piano. If, however, the frequencies of those two stations can be brought into such close synchronism that the difference between their radio-frequencies is less than an audible frequency, the former heterodyne will disappear. The stations can then safely be located closer together geographically up to a minimum distance where the program of one comes in loud enough to appear as 'cross talk' on the other.

"This separation distance, where noticeable cross talk occurs between stations, is from one-quarter to one-tenth of the separation distance at which heterodyning or 'carrier-wave interaction' becomes objectionable. Hence if stations on the same frequency can be accurately synchronized, it will be possible to utilize our present channels manyfold more effectively and to eliminate heterodynes that now persist because of the close duplication of stations necessary on the same frequency channel.

SYNCHRONIZING BY WIRE, RADIO, AND MATCHED CRYSTALS

"Three methods for such station synchronization appear to promise excellent possibilities:

"1. *Wire control of two or more stations from a common source of radio-frequency.*—This plan is being operated with success nightly between station WBZ, Springfield, Mass., and its auxiliary WBZA, in Boston, a distance of 100 miles. Those two stations operate on the 900-kilocycle channel at precisely the same frequency without heterodyning. While they deliver the same program, their successful operation indicates the possibility of synchronizing stations farther apart, at 'nonecross-talk' distances, and transmitting different programs. Similar wire synchronizing of stations is now contemplated in several other locations. When further developed, this plan offers an economic solution of the serious problem of chain-program operation, where 20 to 40 channels are now sometimes tied up with an identical program. If such chain programs could be limited to one or two channels, obviously many channels now tied up would be freed for other services.

"2. *Radio synchronizing of stations.*—A receiving set is installed 6 to 10 miles away from the station to be synchronized. On this set the incoming carrier wave from the distant station on the same channel is picked up and transmitted by telephone to the station-control room. By the zero-beat method the local station is synchronized with the distant station. Operation then continues without heterodyning, and this is accomplished under separations between stations which would produce terrific beats or howls if the ordinary method of approximate frequencies were employed. This plan is successfully employed by station WDRC at New Haven, Conn., to avoid a bad heterodyne that would otherwise occur from the 5,000-watt station WAIU on the same channel at Columbus, Ohio, only 500 miles distant.

"3. *Identical or matched crystals, maintained under standard temperature conditions at the two or more stations to be synchronized, offer another means of economizing wave areas.*—Manufacturers of crystal-control apparatus give assurance that they can now guarantee crystals so accurately matched that no audible heterodyne will result between stations so controlled. No broadcasting stations have so far been equipped in this way, but it is to be hoped that the method will be practically tried out by stations in the near future.

"The commission, of course, has no authority to order stations which operate on the same frequency to install mutual synchronizing equipment, either wire, radio, or crystal. But stations which undertake such improvement in operation, eliminating heterodynes, will be authorized by the commission to operate at closer geographical separations and so will be able to maintain positions on superior wave lengths not otherwise possible."

APPENDIX I

Receiving sets estimated in use as of May, 1928, by States

TWELVE MILLION RADIO SETS IN USE MAY, 1928—RADIO AUDIENCE NUMBERS 40,000,000

A nation-wide survey completed in May, 1928, conducted by "Radio Retailing," in compliance with a request of the Federal Radio Commission, shows that

nearly 12,000,000 radio receiving sets are in use in the United States, and they serve an audience of no less than 40,000,000 persons.

In making the survey, so as to obtain a complete report and the most reliable data, appeals for all available statistics were addressed to trade bodies, trade publications, and others in close touch with radio industry activities. The figures show that 7,500,000 standard receiving sets, with loud-speaker volume, are now in use in the United States.

The figures do not include crystal or one-tube receivers of obsolete type. The survey indicates that if all these crystal units and single-tube sets, which are still in wide use on farms and in rural sections, were counted, the total number of sets in actual service would approach 12,000,000.

These statistics were used by the radio industry and the National Association of Broadcasters in their hearing on April 23, 1928, before the Radio Commission on the reallocation plan. They show a close parallel with the number of automobiles in use in the same territory. Income taxes paid proved to be the dominating influence in the size of the local radio audiences. The table follows:

Radio receiving sets in use, by States, compared with automobiles, income taxes, population, etc.

State	Number of homes with radio sets, Jan. 1, 1928 [1]	Volume radio business, 1927 [2]	Personal incomes, 1924	Passenger automobiles registered, 1927	Population, 1928 [1]
New York	853,000	$12,003,074	$5,144,766,182	1,508,314	11,550,000
Pennsylvania	613,000	7,064,000	2,548,132,809	1,264,453	9,854,000
Illinois	578,000	8,771,406	2,413,605,350	1,195,897	7,396,000
California	536,000	9,308,560	1,741,063,671	1,384,152	4,556,000
Ohio	463,000	6,060,875	1,403,748,590	1,295,020	6,826,000
Michigan	321,000	3,123,490	1,045,850,046	969,686	4,591,000
Massachusetts	307,000	3,592,694	1,320,156,959	593,234	4,290,000
New Jersey	295,000	4,575,628	1,177,421,081	531,702	3,821,000
Texas	266,000	1,667,650	638,109,285	944,905	5,487,000
Missouri	221,000	2,847,811	632,532,962	587,856	3,523,000
Wisconsin	194,000	2,407,640	496,659,728	581,994	2,963,000
Indiana	190,000	2,390,318	461,717,343	665,126	3,176,000
Minnesota	178,000	1,057,001	375,588,940	559,128	2,722,000
Iowa	177,000	2,843,368	298,734,381	648,218	2,428,000
Washington [3]	129,200	2,382,374	[3] 393,961,927	410,386	1,587,000
Connecticut	123,100	2,223,372	478,174,249	222,283	1,667,000
Oklahoma	123,000	926,429	211,271,658	449,955	2,426,000
Florida	122,100	438,453	250,963,654	331,892	1,411,000
Maryland	122,000	1,987,341	467,225,699	240,743	1,616,000
Kansas	114,500	1,671,885	203,034,515	441,373	1,835,000
North Carolina	104,500	545,449	200,888,953	352,217	2,938,000
Georgia	96,500	404,393	210,908,421	241,949	3,203,000
Virginia	95,500	755,166	231,055,514	273,764	2,575,000
Nebraska	93,500	1,367,217	189,371,665	337,989	1,408,000
Kentucky	88,000	495,003	238,094,411	252,632	2,553,000
Tennessee	85,000	367,650	224,184,198	254,342	2,502,000
Arkansas	80,500	1,367,100	110,255,418	179,480	1,944,000
Alabama	71,000	126,183	159,918,982	197,983	2,573,000
Louisiana	69,500	183,200	221,133,422	204,000	1,950,000
West Virginia	66,000	410,281	226,999,720	201,645	1,724,000
Colorado	64,000	671,974	205,087,973	227,708	1,090,000
Oregon	62,200	869,407	189,884,373	214,946	902,000
South Carolina	55,500	562,250	79,613,886	163,551	1,864,000
Mississippi	44,500	80,248	82,652,945	184,133	1,790,000
Maine	42,500	542,150	135,221,259	124,158	798,000
District of Columbia	40,700	817,594	253,312,253	97,794	552,000
South Dakota	33,000	394,000	66,124,303	153,840	704,000
North Dakota	32,900	493,400	48,689,794	145,571	641,192
Rhode Island	31,800	322,600	191,556,190	91,798	716,000
Utah	17,200	462,400	82,088,417	72,880	531,000
New Hampshire	15,600	427,417	94,132,914	78,400	456,000
Montana	14,000	277,692	107,241,911	88,840	548,889
Arizona	13,500	291,500	58,273,049	63,294	474,000
New Mexico	13,000	383,250	31,951,117	53,173	396,000
Idaho	12,600	129,700	52,301,491	86,339	546,000
Vermont	12,000	283,621	63,630,620	68,524	352,428
Delaware	10,500	255,800	64,179,747	36,246	244,000
Wyoming	5,800	48,410	60,751,853	44,358	247,000
Nevada	2,600	103,985	27,534,276	19,300	77,407
Total	7,500,300	[2] 90,785,050	25,656,153,454	19,237,171	120,013,000

[1] Estimated. [2] Incomplete returns. [3] Including Alaska.

APPENDIX J

Allocation of bands of frequencies under International Radiotelegraph Convention, effective January 1, 1929

Services	Frequencies in kilocycles per second (kc/s)	Approximate wave lengths in meters
Fixed services	10– 100	30,000 –3,000
Fixed services and mobile services	100– 110	3,000 –2,725
Mobile services	110– 125	2,725 –2,400
Maritime mobile services, open to public correspondence exclusively	[1] 125– 150	[1] 2,400 –2,000
Mobile services	150– 160	2,000 –1,875
(a) Broadcasting		
(b) Fixed services		
(c) Mobile services		
The conditions for use of this band are subject to the following regional arrangements:		
All regions where broadcasting stations now exist working on frequencies below 300 kc/s (above 1,000 meters): Broadcasting	160– 194	1,875 –1,550
Other regions: Fixed services; Mobile services		
Regional arrangements will respect the rights of other regions in this band		
(a) Mobile services		
(b) Fixed services		
(c) Broadcasting		
The conditions for use of this band are subject to the following regional arrangements:		
Europe: (a) Air mobile services exclusively; (b) Air fixed services exclusively; (c) Within the band 250–285 kc/s (1,200–1,050 meters); fixed services not open to public correspondence; (d) Broadcasting within the band 194–224 kc/s (1,550–1,340 meters)	194– 285	1,550 –1,050
Other regions: (a) Mobile services except commercial ship stations; (b) Fixed air services exclusively; (c) Fixed services, not open to public correspondence		
Radio beacons	285– 315	1,050 – 950
Air mobile services exclusively	315– [2] 350	[2] 950 – 850
Mobile services not open to public correspondence	350– 360	850 – 830
(a) Radio-compass service		
(b) Mobile services, on condition that they do not interfere with radio-compass service	360– 390	830 – 770
Mobile services	390– 460	770 – 650
Mobile services (except damped waves and radiotelephony)	460– 485	650 – 620
Mobile services (distress call, etc.)	[3] 485– 515	[3] 620 – 580
Mobile services, not open to public correspondence (except damped waves and radiotelephony)	515– 550	580 – 545
Broadcasting	[4] 550– 1,300	[4] 545 – 230
(a) Broadcasting		
(b) Maritime mobile services, waves of 1,365 kc/s (220 meters) exclusively	1,300– 1,500	230 – 200
Mobile services	1,500– 1,715	200 – 175
Do		
Fixed services	1,715– 2,000	175 – 150
Amateurs		
Mobile services and fixed services	2,000– 2,250	150 – 133
Mobile services	2,250– 2,750	133 – 109
Fixed services	2,750– 2,850	109 – 105
Mobile services and fixed services	2,850– 3,500	105 – 85
Mobile services		
Fixed services	3,500– 4,000	85 – 75
Amateurs		
Mobile services and fixed services	4,000– 5,500	75 – 54
Mobile services	5,500– 5,700	54 – 52.7
Fixed services	5,700– 6,000	52.7 – 50
Broadcasting	6,000– 6,150	50 – 48.8
Mobile services	6,150– 6,675	48.8 – 45
Fixed services	6,675– 7,000	45 – 42.8
Amateurs	7,000– 7,300	42.8 – 41
Fixed services	7,300– 8,200	41 – 36.6
Mobile services	8,200– 8,550	36.6 – 35.1
Mobile services and fixed services	8,550– 8,900	35.1 – 33.7
Fixed services	8,900– 9,500	33.7 – 31.6

[1] The wave of 143 kc/s (2,100 meters) is the calling wave for mobile stations using long continuous waves.
[2] The wave of 333 kc/s (900 meters) is the international calling wave for air services.
[3] The wave of 500 kc/s (600 meters) is the international calling and distress wave. It may be used for other purposes on condition that it will not interfere with call signals and distress signals.
[4] Mobile services may use the band 550 to 1,300 kc/s (545–230 meters) on condition that this will not cause interference with the services of a country which uses this band exclusively for broadcasting.

Allocation of bands of frequencies under International Radiotelegraph Convention, effective January 1, 1929—Continued

Services	Frequencies in kilocycles per second (kc/s)	Approximate wave lengths in meters
Broadcasting	9,500– 9,600	31.6 – 31.2
Fixed services	9,600–11,000	31.2 – 27.3
Mobile services	11,000–11,400	27.3 – 26.3
Fixed services	11,400–11,700	26.3 – 25.6
Broadcasting	11,700–11,900	25.6 – 25.2
Fixed services	11,900–12,300	25.2 – 24.4
Mobile services	12,300–12,825	24.4 – 23.4
Mobile services and fixed services	12,825–13,350	23.4 – 22.4
Fixed services	13,350–14,000	22.4 – 21.4
Amateurs	14,000–14,400	21.4 – 20.8
Fixed services	14,400–15,100	20.8 – 19.85
Broadcasting	15,100–15,350	19.85– 19.55
Fixed services	15.350–16,400	19.55– 18.3
Mobile services	16,400–17,100	18.3 – 17.5
Mobile services and fixed services	17,100–17,750	17.5 – 16.9
Broadcasting	17,750–17,800	16.9 – 16.85
Fixed services	17,800–21,450	16.85– 14
Broadcasting	21,450–21,550	14 – 13.9
Mobile services	21,550–22,300	13.9 – 13.45
Mobile services and fixed services	22,300–23,000	13.45– 13.1
Not reserved	23,000–28,000	13.1 – 10.7
Amateurs and experimental	28,000–30,000	10.7 – 10
Not reserved	30,000–56,000	10 – 5.35
Amateurs and experimental	56,000–60,000	5.35– 5
Not reserved	Above 60,000	Below 5

NOTE.—It is recognized that short waves (frequencies from 6,000 to 23,000 kc/s approximately—wave lengths from 50 to 13 meters approximately) are very efficient for long-distance communications. It is recommended that as a general rule this band of waves be reserved for this purpose, in services between fixed points.

APPENDIX K

List of stations in the low-frequency bands (exclusive of ship and aircraft stations) where authorized by commission.

ABBREVIATIONS USED IN THIS LIST

Nature of service:
PG=General public.
PR=Limited public.
P=Private (limited commercial and special).
FX=Fixed station (point-to-point communication).
Radio companies:
I. R. T. Co.=Intercity Radio Telegraph Co.
M. R. T. Co.=Mackay Radio & Telegraph Co.
R. C. A.=Radio Corporation of America.
R. M. C. A.=Radiomarine Corporation of America.
T. R. T. Co.=Tropical Radio Telegraph Co.

Station	Call signal	Service	Station controlled by—
Aberdeen, Wash	KZE	P	Grays Harbor Stevedore Co.
Akutan, Alaska (Aleutian Islands)	KMW	P	The Warehouse Co.
Alabat, P. I. (Tayabas)	KZBB	PG	Philippine insular government.
Alitak, Alaska (Kodiak Island)	KYL	FX	Alaska Packers' Association.
Alpena, Mich	WGI	PG	Alpena Marine Radio Service.
Do	WNO	P	Huron Transportation Co.
Anchorage, Alaska	KWL	PG	Alaska Railroad.
Annette Island, Alaska	KFA	PG	Annette Island Packing Co.
Anniston (permanently moored vessel near Mobile, Ala.).	WPK	FX	U. S. S. B.
Aparri, P. I. (Cagayan)	KZAD	PG	Philippine insular government.
Bacharof, Alaska	KUD	P	Alaska Packers' Association.
Balabac, P. I. (Palawan)	KEW	PG	Philippine insular government.
Balangiga, P. I. (Samar)	KZBL	PG	Do.

Station	Call signal	Service	Station controlled by—
Baltimore, Md	WMH	PG	R. C. A.
Bartlesville, Okla	KJM	FX	Phillips Petroleum Co.
Bacso, P. I. (Batanes)	KZAB	PG	Philippine insular government.
Batangas, P. I. (Batangas)	KPC	PG	Do.
Baytown, Tex	KJV	FX	Humble Oil & Refining Co.
Beaumont, Tex	WOD	P	Magnolia Petroleum Co.
Belmar, N. J. (see New Brunswick, N. J.)	WII		
Big Creek (Camp 62), Calif	KXU	FX	Southern California Edison Co.
Big Creek (Camp 63), Calif	KRY	FX	Do.
Big Port Walter, Alaska	KPV	FX	Port Walter Herring & Packing Co.
Birmingport, Ala	WPM	P	Inland Waterways Corporation.
Boca de Quadra, Alaska	KZS	FX	A. A. McCue.
Bolinas, Calif	KPH	PG	R. C. A.
Bongao, P. I. (Sulu)	KEO	PG	Philippine insular government.
Borger, Tex. (near)	KJS	FX	Phillips Petroleum Co.
Borongan, P. I. (Samar)	KZBN	PG	Philippine insular government.
Boston, Mass	WEY	P	Boston fire department.
Do	WBF	PG	T. R. T. Co.
Bowling Green, Ky	WJA	FX	Illinois Pipe Line Co.
Breckenridge, Tex	KSU	FX	Phillips Petroleum Co.
Buffalo, N. Y	WAM	PG	I. R. T. Co.
Do	WBL	PG	R. C. A.
Butler, Pa	WBR	P	Pennsylvania state police.
Cagayan de Sulu, P. I. (Sulu)	KEV	PG	Philippine insular government.
Calapan, P. I. (Mindoro)	KZAC	PG	Do.
Camp Eustis, Va. (Flagship Div. 1)	WPF	P	U. S. S. B.
Candle, Alaska	KGF	FX	Robinson & Greenberg.
Cape Chacon, Alaska	KFN	P	Alaska Consolidated Canneries.
Caramoan (Camarines Sur), P. I	KZMN	PG	Philippine insular government.
Cascada, Calif	KLF	FX	Southern California Edison Co.
Casper, Wyo	KDC	FX	Illinois Pipe Line Co.
Catanuan, P. I. (Tayabas)	KZKN	PG	Philippine insular government.
Catbalogan, P. I. (Samar)	KZCT	PG	Do.
Cebu, P. I	KPI	PG	Do.
Cedar Falls, Wash	KFR	FX	City of Seattle, lighting department.
Ceiba, P. R	WKK	PG & LP	Bureau of insular telegraph.
Chatham, Mass. (see Marion, Mass)	WSO		
Chatham, Mass	WIM	PG	R. C. A.
Cheboygan, Mich	WPJ	FX	Warren W. Kathan.
Chicago, Ill	WCF	PG	Chicago Federation of Labor.
Do	WGO	PG	Illinois Radio Corporation of America.
Chicagof, Alaska	KRX	PG	Chicago Development Co.
Chignik, Alaska	KHC	FX	Alaska Packers' Association.
Do	KJB	P	Northwestern Fisheries Co.
Do	KNP	FX	Columbia River Packer's Association.
Chomly, Alaska	KDP	FX	Alaska Consolidated Canneries.
Clarks Point, Alaska	KHG	FX	Alaska Packers' Association.
Clearwater, Calif. (Los Angeles)	KNR	FX	M. R. T. Co.
Do	KOK	PG	Do.
Cleveland, Ohio	WCY	PG	R. C. A.
Do	WTK	PG	I. R. T. Co.
Do	WTL	FX	Do.
Columbus, Ohio	WCL	FX	Do.
Culion, P. I. (Palawan)	KPJ	PG	Philippine insular government
Cuyo, P. I. (Palawan)	KIX	PG	Do.
Dallas, Tex	KFB	FX	Dallas News and Dallas Jounral.
Daly, Alaska	KDJ	FX	Alaska-Portland Packers' Association.
Dapa, P. I. (Surigao)	KZDP	PG	Philippine insular government.
Dapitan, P. I. (Zamboanga)	KZDN	PG	Do.
Davao, P. I. (Mindinao Island)	KIF	PG	Do.
Dearborn, Mich	WAV	P	Ford Motor Co.
Detroit, Mich	WBM	FX	Detroit-Edison Co.
Do	WDI	PG	I. R. T. Co.
Duluth, Minn	WME	PG & FX	Do.
Do	WRL	PG	R. C. A.
Dundas, Alaska	KEY	P	Northwestern Fisheries Co.
East Hampton, N. Y	WSE	PG	R. M. C. A.
East Moriches, N. Y	WSH	PG	Do.
East Pittsburgh, Pa	WKA	FX	Westinghouse Electric & Manufacturing Co.
Egegik, Alaska	KMF	FX	Libby, McNeill & Libby.
Ekuk, Alaska	KMG	FX	Do.
Eldorado, Kans	WAH	FX	Skelly Oil Co.
Ensenada, P. R	WPR	PG	South Porto Rico Sugar Co. of Porto Rico.
Evans Bay, Alaska	KUR	FX	Franklin Packing Co.
Everett, Wash	KFT	PG	American Tug Boat Co.

Station	Call signal	Service	Station controlled by—
Fairport, Va	WOZ	P	Edwards-Slaughter Co.
False Pass, Alaska	KJL	P	P. E. Harris & Co.
Fort Morgan, Ala	WIO	PG	T. R. T. Co.
Fort Worth, Tex	KMB	FX	Carter Publications (Inc.).
Frankfort, Mich	WFK	PG	Ann Arbor R. R. Co.
Funter, Alaska	KXK	P	Sunny Point Packing Co.
Galveston, Tex	WGV	PG	R. C. A.
Greensburg, Pa	WJL	FX	Pennsylvania State police.
Harrisburg, Pa	WBA	FX	Do.
Do	WKB	FX	Headquarters Troop, One hundred and fourth Cavalry, Pennsylvania National Guard.
Hawk Inlet, Alaska	KPD	P	P. E. Harris & Co.
Heceta Island, Alaska	KGG	P	Nakat Packing Corporation.
Hialeah, Fla	WAX	PG	T. R. T. Co.
Hidden Inlet, Alaska	KQL	P	Nakat Packing Corporation.
Hillsboro, Oreg. (Portland)	KEK	PG	M. R. T. Co.
Do	KGH	FX	Do.
Hilo, Hawaii	KLN	PG	Mutual Telephone Co.
Hinatuan, P. I. (Surigao)	KZHN	PG	Philippine insular government.
Honolulu, Hawaii	KOG	FX	Mutual Telephone Co.
Hoquiam, Wash	KJQ	P	Twin Harbor Stevedoring Co.
Houston, Tex	KQM	FX	Houston Printing Co. (Post-Dispatch).
Hunters Bay, Alaska	KQI	FX	Northwestern Fisheries Co.
Hyder, Alaska	KDF	FX	Hyder Radio & Telephone Co.
Ikatan, Alaska	KXW	PG	Pacific-American Fisheries.
Iloilo, P. I. (Iloilo)	KPM	PG	Philippine insular government.
Infanta, P. I. (Tayabas)	KZBP	PG	Do.
Isabela de Basilan, P. I. (Zamboanga)	KPN	PG	Do.
Jackson, Ohio	WJQ	FX	Ford Motor Co.
Johnswood, Mich	WMF	FX	Kreetan Co.
Jolo, P. I. (Sulu)	KIL	PG	Philippine insular government.
Kahuku, Hawaii (Oahu Station)	KGI	FX	R. C. A.
Kake, Alaska	KGP	P	Sunny Point Packing Co.
Karluk, Alaska (Kodiak Island)	KYK	FX	Alaska Packers' Association.
Kasaan, Alaska	KMC	FX	Northwestern Fisheries Co.
Katalla, Alaska	KSC	PG	Chilkat Oil Co.
Kaunakakai, Hawaii (island of Molokai).	KHO	FX	Mutual Telephone Co.
Kawaihae, Hawaii	KHN	FX	Do.
Kenai, Alaska	KLD	FX	Northwestern Fisheries Co.
Do	KYZ	P	Libby, McNeill & Libby.
Killisnoo, Alaska	KQU	FX	Killisnoo Fisheries (Inc.).
King Cove, Alaska	KJK	PG	Pacific-American Fisheries Co.
Koggiung (permanently moored scow in Koggiung River).	KUB	FX	Alaska Packers' Association.
Koggiung, Alaska	KVV	FX	Libby, McNeill & Libby.
Koko Head, Hawaii (see Kahuku)	KIE		
Kukak Bay, Alaska	KJP	FX	Hemrich Packing Co.
Kusilof, Alaska	KZY	FX	F. W. Williamson.
Kvichak, Alaska	KHB	FX	Alaska Packers ' Association.
Kvichak (permanently moored scow in Koggiung River, Alaska).	KVQ	FX	Do.
Kvichak, Alaska	KYM	P	Bristol Bay Packing Co.
Lake Bay, Alaska	KZC	FX	F. C. Barnes Co.
L'Anse, Mich	WCT	P	Ford Motor Co.
Latouche, Alaska	KIM	PG	Pennecott Copper Corporation.
Lazy Bay, Alaska	KPS	FX	Alitak Packing Co.
Lebak, P. I	KPX	PG	Philippine insular government.
Legaspi, P. I	KZAJ	PG	Do.
Libbyville, Alaska	KMT	PR	Libby, McNeill & Libby.
Lihue, Hawaii	KHM	FX	Mutual Telephone Co.
Lima, Ohio	WBY	FX	Illinois Pipe Line Co.
L. McN. & L. VI No. 1 (permanently moored vessel in Kvichak River, Alaska).	KTQ	P	Libby, McNeill & Libby.
Lockanok, Alaska	KML	FX	Do.
Loring, Alaska	KRI	P	Alaska Packers' Association.
Los Angeles, Calif. (see Wilmington)	KSE		R. C. A.
Los Angeles, Calif	KHX	P	George C. Tichenor (Los Angeles Athletic Club.)
Do	KVT	FX	Boulevard Express.
Do	KYY	FX	Los Angeles County forestry department.
Ludington, Mich	WLD	PG	Pere Marquette Railway Co.
Lumarso, P. I	KZAP	P	Hercules Lumber Co.
Mackinac Island, Mich	WHQ	PG	Mackinac Radio Service (E. M. Tellefson.
Malabang, P. I. (Mindanao Island)	KIZ	PG	Philippine insular government.
Malita, P. I. (Davao)	KPW	PG	Do.
Manila, P. I	KZRC	PG	Radio Corporation of the Philippines
Manistique, Mich	WMX	PG	Ann Arbor R. R. Co.
Manitowoc, Wis	WMW	PG	Do.

Station	Call signal	Service	Station controlled by—
Marion, Mass	WCC	PG	R. C. A.
Marion, Mass. (Matapoisett)	WRQ	FX	Do.
Marion, Mass. (see Chatham)	WSO	FX	Do.
Marshall, Calif. (see Bolinas)	KET		
Mary Island Lighthouse, Alaska	KJJ	P	G. E. Maddox.
Marshfield, Oreg	KGN	PG	W. K. Harris.
Marysville, Mich	WPV	FX	Detroit Edison Co.
Mati, P. I. (Davao)	KPZ	PG	Philippine insular government.
Mazama (permanently moored vessel at Herendeen Village, Alaska).	KHE	FX	Everett Packing Co.
Memphis, Tenn	WPI	P	Inland Waterways Corporation.
Menominee, Mich	WDM	PG	Ann Arbor R. R. Co.
Do	KYN	P	Commercial Pacific Cable Co.
Minneapolis, Minn	KQP	P	Inland Waterways Corporation.
Do	WLP	FX	Northern States Power Co.
Mobile, Ala	WNN	PG	T. R. T. Co.
Do	WPP	P	Inland Waterways Corporation.
Mount Baker (moored vessel near Ugashik, Alaska).	KYD	P	Red Salmon Canning Co.
Nakeen, Alaska (Bristol Bay)	KJI	P	Nakat Packing Corporation.
Do	KHT	P	Do.
Do	KMK	FX	Naknek Packing Co.
Do	KOM	P	Northwestern Fisheries Co.
Naknek, Alaska (Hyades moored vessel)	KPB	FX	Naknek Packing Co.
Nelson Lagoon, Alaska	KXV	FX	Pacific American Fisheries.
New Brunswick, N. J. (see Belmar)	WII	FX	R. C. A.
New Brunswick, N. J. (Bound Brook)	WRT	FX	Do.
New London, Conn	WSA	PG	R. M. C. A.
New Orleans, La	WNU	PG	T. R. T. Co.
New York, N. Y	WCG	PG	I. W. T. Co.
New York, N. Y. (Borough of Brooklyn)	WNY	PG	R. C. A.
New York, N. Y	WHI	FX	John Wanamaker.
Do	WPY	P	City of New York police department.
Nushagak, Alaska	KLJ	FX	Columbia River Packers Association.
Do	KNJ	P	Northwestern Fisheries Co.
Do	KNO	FX	Libby, McNeill & Libby.
Do	KZV	P	Alaska Salmon Co.
Owensboro, Ky	WJC	FX	Indian Pipe Line Co.
Palm Beach, Fla	WOE	PG	Palm Beach Radio Co.
Palo Alto, Calif	KFS	PG	M. R. T. Co.
Pandan, P. I. (Catanduanes Islands)	KZPN	PG	Philippine insular government.
Pasay, P. I	KZCM	PG	Do.
Philadelphia, Pa	WDH	FX	First Troop, Philadelphia City alry, Headquarters Troop, Fifty-second Cavalry Brigade.
Do	WHE	FX	John Wanamaker.
Do	WNW	PG	Tidewater Wireless Telegraph Co.
Pillar Bay, Alaska	KYV	FX	Fidalgo Island Packing Co.
Pilot Point, Alaska	KUL	FX	Alaska Packers' Association.
Pirate Cove, Alaska	KOX	FX	Union Fish Co.
Point Armstrong, Alaska	KHH	P	Buchan & Heinen Packing Co.
Point Reyes, Calif. (Bolinas)	KDU	FX	R. C. A.
Point Warde, Alaska	KLH	FX	Whitworth Fisheries.
Port Alexander, Alaska	KPR	FX	Karl Hansen.
Port Althorp, Alaska	KLW	P	Deep Sea Salmon Co.
Port Arthur, Tex	WPA	PG	Gulf Refining Co.
Port Beauclaire, Alaska	KWO	P	Beauclaire Packing Co.
Port Graham, Alaska	KFQ	P	T. H. Killam.
Port Hobron, Alaska	KGL	PG	The Warehouse Co.
Portland, Oreg	KLB	FX	Northwestern Electric Co.
Do	KPK	PG	Merchants Exchange.
Port Moller, Alaska	KWR	FX	Pacific-American Fisheries.
Puerto Princesa, P. I. (Palawan)	KIV	PG	Philippine insular government.
Pybus Bay, Alaska	KFC	FX	Alaska Consolidated Canneries.
Quadra, Alaska	KHD	P	Do.
Do	KOR	FX	Northwestern Fisheries Co.
Quincy, Mass	WPC	P	Bethlehem Shipbuilding Corporation.
Radioville, Alaska	KWW	PG	Joseph T. Bauer.
Rasberry Island, Alaska	KMQ	FX	Caw Packing Co.
Red Bluff Bay, Alaska	KXS	PG	Baranof Packing Co.
Reedville, Va	WRX	P	Marine Products (Inc.).
Rocky Point, N. Y	WNL	FX	American Telephone & Telegraph Co.
Rocky Point, N. Y	WQM	FX	R. C. A.
Rogers, Mich	WLC	PG	Michigan Limestone & Chemical Co.
Rose Inlet, Alaska	KJC	FX	Alaska Consolidated Canneries.
Ruby (permanently moored vessel in Koggiung River, Alaska).	KDR	FX	Alaska Packers' Association.
Saginaw Bay, Alaska	KFJ	P	Port Walter Herring & Packing Co.
St. Croix Falls, Wis	WPL	FX	Norhtern States Power Co.
Saltchuck, Alaska	KWQ	FX	Alaska Palladium Co.

Station	Call signal	Service	Station controlled by—
San Francisco, Calif. (see Palo Alto, near)	KFS	.....	PG.
San Francisco, Calif. (see Bolinas)	KPH	.....	R. C. A.
San Francisco, Calif	KUO	P	Examiner Printing Co.
San Francisco, P. I. (Camotes, Cebu)	KPY	PG	Philippine insular government.
San Jose, P. I. (Mindoro Island)	KIY	PG	Do.
Seattle, Wash	KPE	PG	City of Seattle harbor department.
Do	KVW	FX	City of Seattle light department.
Seldovia, Alaska	KEA	PG	Adam Lipke.
Shakan, Alaska	KVN	P	Northwestern Fisheries Co.
Sheboygan, Wis	WSK	PG	Reiss Steamship Co.
Shelby, Mont	KVX	FX	Illinois Pipe Line Co.
Siasi, P. I. (Sulu)	KED	PG	Philippine insular government.
Siginaka Island, Alaska	KXD	FX	W. M. Cook.
Skagit Power Site, Wash	WJE	FX	City of Seattle light department.
Skellytown, Tex	KHI	FX	Skelly Oil Co.
Snagpoint, Alaska	KHF	P	Alaska Packers' Association.
Snug Harbor, Alaska	KVC	P	Snug Harbor Packing Co.
Sogod, P. I. (Leyte)	KZSD	PG	Phillippine insular government.
Springfield, Ohio	WNA	FX	Ford Motor Co.
Steamboat Bay, Alaska (Noyes Island)	KUU	P	New England Fish Co.
Superior, Mich	WRH	FX	Detroit-Edison Co.
Surigao, P. I. (Surigao)	KZAM	PG	Philippine insular government.
Taku Harbor, Alaska	KVG	P	Libby, McNeill & Libby.
Tampa, Fla	WPD	PG	Gulf Radio Service.
Tandag, P. I. (Surigao)	KZTG	PG	Philippine insular government.
Tenakee, Alaska	KOU	FX	Alaska Consolidated Canneries
Todd, Alaska	KFP	FX	Peril Straits Packing Co.
Torrance, Calif. (Los Angeles)	KSE	PG	R. C. A.
Tuckerton, N. J	WCI	FX	Do.
Do	WGG	FX	Do.
Do	WSC	PG	Do.
Tulsa, Okla	WEH	FX	Shelly Oil Co.
Tyee, Alaska	KSR	P	Sebastian Stuart Fish Co.
Uganik, Alaska	KLP	P	Kodiak Island Fishing & Packing Co.
Uganik, Alaska (Port O'Brien, Kodiak Island)	KVF	P	San Juan Fishing & Packing Co.
Ugashik, Alaska	KMU	FX	Red Salmon Canning Co.
Underwood, Wash. (near)	KFL	FX	Northwestern Electric Co.
Union Bay, Alaska	KOX	PG	Nakat Packing Corporation.
Uyak, Alaska (KHA)	KHA	FX	Alaska Packers' Association.
Uyak, Alaska (KHV)	KHV	FX	Northwestern Fisheries Co.
Uzinki, Alaska	KZU	P	Katmai Packing Co.
Vestal Substation, Calif	KQY	FX	Southern California Edison Co.
Vieques, P. R	WGW	PG	Bureau of Insular Telegraph.
View Cove, Alaska	KSJ	FX	Pacific Coast Cement Co.
Virac, P. I. (Albay)	KZAH	PG	Philippine insular government.
Wahiawa, Hawaii (Island of Oahu)	KHK	PG	Mutual Telephone Co.
Wailuku, Hawaii	KHL	FX	Do.
Warm Springs Bay, Alaska	KNH	FX	United States-Alaska Packing Co.
Warren, Alaska	KHU	FX	Alaska-Portland Packers' Association.
Waterfall, Alaska	KZN	P	Nakat Packing Corporation.
West Reading, Pa	WMB	FX	Pennsylvania State police.
Wyandotte, Mich	WCV	P	Wyandotte Transportation Co.
Wyoming, Pa	WDX	FX	Pennsylvania State police.
Yakutat, Alaska	KKA	FX	Libby, McNeil & Libby.
Yes Bay, Alaska	KRU	FX	Alaska Consolidated Canneries.
Zacher Bay, Alaska	KFX	P	Robinson Packing Corporation.
Zamboanga, P. I. (Mindanao Island)	KIW	PG	Philippine insular government.
PORTABLE			
Los Angeles, Calif	KFV	FX	Los Angeles County, forestry department.

APPENDIX L (1)

Partial list of persons attending high-frequency hearing on January 17, 1928, and interests represented by them

Name	Address	Representing
Armstrong, R. B	1219 National Press Building	Los Angeles Times.
Arnold, John W	195 Broadway, New York	Western Union Telegraph Co.
Baker, L. S	1265 Broadway, New York	National Association Broadcasters.
Bankat, Henry W	Tenth Avenue and Thirty-sixth Street, New York.	McGraw Hill Publishing Co.
Beakes, W. E	1 Federal Street, Boston	Tropical Radio Tel. Co.

Partial list of persons attending high-frequency hearing on January 17, 1928, and interests represented by them—Continued

Name	Address	Representing
Beane, E. A	549 West Washington Boulevard, Chicago, Ill.	E. A. Beane, engineers.
Bender, T. J	New York	United Press.
Blair, R. H., lieutenant commander, U. S. Navy.	Washington, D. C	Navy Department.
Blair, Wm. R	Munitions Building, Washington, D. C.	War Department.
Blanchard, M. J	1725 Liberty Bank Building, Buffalo, N. Y.	Universal Wireless Communication Co. (Inc.).
Bracelan, C. M	195 Broadway, New York	American Telegraph & Telephone Co.
Brown, Royal	Akron, Ohio	Firestone Tire & Rubber Co.
Byrne, W. F	Third and B Streets SW., Washington, D. C.	Do.
Caldwell, Louis	Chicago, Ill	Chicago Tribune.
Campbell, John	39 Boylston Street, Boston	Edison Electric Light Co., Boston.
Capron, H. L. M	Herald Square, New York	R. H. Macey Co. (Inc.).
Carlton, Dave P	905 Humble Building, Houston	Humble Oil & Refining Co.
Chase, A. H	1208 Decatur Street, Washington, D. C.	Self.
Cochrane, Geo. D	730 Fifth Avenue, New York	Universal Pictures Co. (Inc.).
Coleman, J. O'R	New York	National Electric Light Association (N. Y.).
Conwell, R. N	80 Park Place, Newark, N. J	Do.
Cornell, H. L	26 Broadway, New York	Standard Shipping Co. and Standard Oil Co. of New Jersey.
Corwith, H. B	195 Broadway, New York	Western Union Telegraph Co.
Costello, John D	901 Crocker First National Bank Building, San Francisco, Calif.	Examiner Printing Co.
Counick, Harris D. H	60 Broadway, New York	Wired Radio (Inc.).
Craven, T. T., captain, U. S. Navy.	Washington, D. C	U. S. Navy.
Crittenden, R. F	Roger City, Mich	Michigan Limestone & Chemical Co.
Creichton, Thos. H., jr	Northbrook, Ill	Wireless Tel. & Communicating Co.
Davis, Manton	233 Broadway, New York	Radio Corporation of America.
Deegan, Wm. J	253 Broadway, New York	Mackay Radio & Tel. Co.
Dodds, C. B	1221 National Press Building, Washington, D. C.	Bee Publishing Co., Fresno, Calif.
Dowd, Fayette B	Munsey Building, Washington, D. C	Oil Industry.
Duncan, R. D., jr	60 Broadway, New York	Wired Radio (Inc.).
Dowd, Thos. P	1418 New York Avenue, Washington, D. C.	Postal Telegraph Co.
Espenschief, Lloyd	195 Broadway, New York	American Telegraph & Telephone Co.
Felix, Edgar H	Garden City, Long Island	Radio Broadcoast Magazine.
Fetzer, John E	Berrien Springs, Mich	Radio Station WEMC.
Finch, Wm. G. H	246 West Fifty-ninth Street, New York City.	Hearst Publications.
Ford, Richard A	1719 K Street NW., Washington, D. C.	Radio Corporation of America.
Ford, Sherman	Munsey Building, Washington, D. C.	Texas Co.
Freeman, John H	Houston, Tex	Anderson, Clayton & Co.
Froelich, J. M	435 Sixth Avenue, Pittsburgh	Duquesne Light Co.
Gager, E. H	Straus Building, Chicago	Great Lakes Radio Broadcast Co.
Gardner, Capt. John H	War Department, Washington, D. C	Alternate for War Department.
Glatzel, Earle D	2000 Second Avenue, Detroit	Detroit Edison Co.
Gedley, Paul F	New York, N. J	New York Evening News.
Goldsmith, Dr. A. M	Van Courtlandt Park South and Saxon Avenue, New York City.	National Broadcasting Association.
Goulden, S. W	66 Broad St., N. Y. City	Radio Corporation of America.
Greene, Alfred D	New York City	United Press.
Grotzinger, John	Akron, Ohio	Goodyear Tire & Rubber Co.
Guthrie, F. P	1112 Connecticut Avenue, Washington, D. C.	Radio Corporation of America.
Haig, J. Donald	Pier 98, South Wharves, Philadelphia	Tidewater Wireless Tel. Co.
Hawkins, E. P	215 West Eighty-third Street, New York City.	Himself.
Heintz, Ralph N	Crocker First National Bank Building, San Francisco, Calif.	Examiner Printing Co.
Herd, W. L	Richmond, Mich	Industrial Radio Tel. Co.
Herdman, W. J	253 Broadway, New York City	Mackay Radio & Tel. Co.
Hill, Capt. Guy	War Department, Washington, D. C	Alternate for War Department.
Hogan, John V. L	41 Park Row, New York City	Himself.
Hooper, Capt. S. C	Washington, D. C	U. S. Navy.
Hooven, M. D	80 Park Place, Newark, N. J	Public Service Electric & Gas Co.
Horn, C. W	East Pittsburgh, Pa	Westinghouse Electric & Mang. Co.
Horn, Milton V	75 Progressive Avenue, Buffalo	
Howeth, J. M	Tilghman, Md	
Hughes, Chas. E., jr	100 Broadway, New York City	Mackay Radio & Tel. Co.

Partial list of persons attending high-frequency hearing on January 17, 1928, and interests represented by them—Continued

Name	Address	Representing
Jamieson, W. D	Northbrook, Ill	Wireless Tel. & Communicating Co.
Janskey, C. M., jr	University of Minnesota, Minneapolis	American Petroleum Institute.
Jewett, F. B	195 Broadway, New York City	American Telegraph & Telephone Co.
Jolliffee, C. B	Washington, D. C	Bureau of Standards.
Kannestine, F. M	65 Broadway, New York City	Geo. Research Co.
Keenan, Geo. M	117 East Broad Street, Hazleton, Pa	Pennsylvania Power & Light Co.
Kennedy, John A	302 Hearst Building, Washington, D. C	San Francisco Examiner.
Kepp, Roger S	512 Evans Building, Washington, D. C	
Kane, John H	Bartlesville, Okla	Philips Petroleum Co.
Langley, R. H	Cincinnati, Ohio	Crosley Radio Corporation.
Leathers, W. H	420 Lexington Avenue, New York City	Graybar Electric Co.
LeClair, Lieut. Commander H. P.	Navy Department, Washington, D. C	U. S. Navy.
Lewis, A. D	Hagerstown, Md	Potomac Edison Co.
Linz, Bertram F	622 Albee Building, Washington, D. C	Washington Radio News Service.
Loeb, Louis M	New York City	New York Times and Cook, Nathan & Lehman.
Lohnes, Horace L	Munsey Building, Washington, D. C	American Petroleum Institute.
Lowe, M. B	Tulsa, Okla	Skelley Oil Co. and Phillips Petroleum Co.
Lord, A. D	Jersey City	DeForest Radio Co. (receiver).
McBreen, T. J	Evening Star Building, Washington, D. C.	Consolidated Press Association.
McCallum, W. R	Washington, D. C	Evening Star.
McCandlish, B. V	Navy Department, Washington, D. C	U. S. Navy.
McErlean, Thomas	50 Church Street	American Seismos Co.
McMahon, T. J	Houston, Tex	The Texas Co.
Maresca, J. B	New York City	Experimenter Publishing Co.
Marriott, R. H	1470 East Eighteenth Street, Brooklyn	International News.
Martin, M. C	Tribune Square, Chicago	Chicago Tribune.
Meinholtz, F. E	229 West Forty-third Street, New York	New York Times.
Michel, Charles J	5757 North Sixth Street, Philadelphia, Pa.	Himself.
Milnor, J. W	195 Broadway, New York	Western Union Telegraph Co.
McFadden, Barclay	121 Chestnut Street, Philadelphia	George H. McFadden & Bro.
Nelson, Ira R	Bond Street, Newark, N. J	Radio Station WAAM (also 2XEA).
Nockels, N. N	Chicago, Ill	American Federation of Labor Chicago Federation of Labor.
Parker, J. W	2000 Second Avenue, Detroit	Detroit Edison Co.
Parker, W. E	Washington, D. C	U. S. Coast and Geodetic Survey.
Patterson, Edw. B	Camden, N. J	Victor Talking Machine Co.
Payne, George E	New York	R. H. Macey & Co., New York.
Petsing, Capt. Edwin R	War Department, Washington, D. C	Altenate for War Department.
Phelps, Boyd	3 South Williams Street, New York	Anderson, Clayton & Co.
Phelps, Howard S	Tribune Tower, Chicago	American Publishers Committees.
Poe, Merle M	Findlay, Ohio	Illinois Pipe Line Co.
Pope, R. A	36 West Forty-fourth Street, Seattle, Wash.	Alaska Communication Service.
Poppelle, J. R	Newark, N. J	L. Bamberger & Co.
Pratt, Harriden	Washington, D. C	Bureau of Standards.
Quigley, E. T	do	Universal Wireless Comm.
Sadtler, Otis K	Munitions Building, Washington, D. C.	U. S. Army.
Scofield, Frederick C	Roger City, Mich	Intercity Radio Tel. Co.
Scott, Frank D	220 Munsey Building, Washington, D. C.	Radio Manufacturers Association and National Association of Broadcasters.
Searle, Don	Council Bluffs, Iowa	Mona Motor Oil Co.
Searle, H. A	do	Do.
Sherley, Swagar	Metropolitan Bank Building, Washington, D. C.	Radio Corporation of America.
Shoup, Stanley	Washington, D. C	Department of Commerce.
Sibley, Eugene	do	Airways, Department of Commerce.
Simon, E. J	President, Intercity Radio Tel. Co., Rockefeller Building, Cleveland.	Intercity Radio Tel. Co.
Simpson, Frederick G	311 California Street, San Francisco	Robert Dollar Co.
Simpson, Frederick G	1518 L. C. Smith Building, Washington, D. C.	Simpson Radio Corporation.
Skirrow, John F	253 Broadway, New York	Mackay Companies.
Smith, W. C	31 St. James Avenue, Boston	Boston Elevated Ry.
Squier, General	Washington, D. C	Self.
Stanton, G. T		American Railway Association.
Stark, K. H	11 Wall Street, New York	S. P. Radio Co..
Stevens, A. M	World Building, New York	Examiner Printing Co.
Stevens, T. M	66 Broad Street, New York	Radio Marine, Radio Corporation, America.

Partial list of persons attending high-frequency hearing on January 17, 1928, and interests represented by them—Continued

Name	Address	Representing
Stewart, Chas. H	St. Davids, Pa	Vice president, American Railway League.
Taff, H. F	708 Fourteenth Street NW., Washington, D. C.	Western Union Telegraph Co.
Taylor, A. Hoyt	Anacostia, D. C.	U. S. Navy.
Terven, L. A	14 Wood Street, Pittsburgh, Pa	West Penn Power Co.
Thom, Alfred P., jr	902 Transportation Building, Washton, D. C.	American Railway Association.
Trautwein, Paul K	15 Albany Street, New York	West Indies Radio Telegraph Association.
Tuel, A. Y	San Francisco, Calif	Mackay Radio & Telegraph Co.
Twyford, G. T	Hagerstown, Md	Potomac Edison Co..
Urie, Frank D	Elgin, Ill	WNBT Elgin National Watch Co.
Vallance, Wm. Roy	3016 Forty-third Street NW., Washington, D. C.	State Department.
Walls, H. J	Washington, D. C	Bureau of Lighthouses.
Warner, K. B	1711 Park Street, Hartford, Conn	American Radio Relay League.
Websterm, B. M., jr	Department of Justice	Radio Commission.
Webster, Lieut. E. M	Fourteenth. and E Streets NW., Washington, D C.	U. S. Coast Guard.
Weeks, R. Stuart	Richmond, Mich	Industrial Radio Tel. Co.
Wentworth, Brandon	Akron, Ohio	Goodyear Tire & Rubber Co.
Westworth, Wm. A	Berrien Springs, Mich	Station WEMC.
Wills, H. L	Atlanta, Ga	Georgia Power Co.
Wilson, Eugene S	195 Broadway, New York	American Telegraph & Telephone Co.
Windmuller, Lewis	40 West Street, New York	Bull Insular Line.
Wing, John E	72 West Adams Street, Chicago, Ill	Great Lakes Radio Broadcasting Co.

APPENDIX L (2)

Discussion of high-frequency spectrum by Dr. J. H. Dellinger, January 17, 1928

THE HIGH-FREQUENCY SPECTRUM

By Dr. J. H. Dellinger, Bureau of Standards

The problem faced by the Federal Radio Commission in high frequencies is similar to that in broadcasting. In any part of the radio spectrum the number of channels is definitely limited at any given stage of radio development. The difficulty of the problem, and in fact the very reason why there is need for a Federal Radio Commission, is the simple fact that the number of channels is limited.

The waves available.—The spectrum under consideration extends from 2,000 to 23,000 kilocycles. This spectrum of waves was divided up into 36 small bands by the recent International Radio Conference to various services, as set forth in the attached appendix. This allocation will come into force January 1, 1929, and it is assumed that allocations will be made in accordance with it henceforth. Several bands of frequencies are available to mobile services, several to fixed services, several to broadcasting, and several to amateurs. "Mobile services" refers to communication with ships, aircraft, or vehicles. "Fixed services" refers to communication between stations permanently fixed in position. The bands allocated to "broadcasting" are largely, as far as this country is concerned, for the use of broadcast relay stations.

General characteristics.—Considerable experience has been accumulated in the past four years in experimental use of the high frequencies, and certain conclusions can now be drawn as to the number and character of the available communication channels. There is by no means unanimous agreement on precise details among those who have had most experience, and I must, therefore, sound a note of warning. Any statements either by myself or others giving actual figures for width of channel, available number of channels, distance ranges, etc., are only approximations. The primary physical fact characterizing high frequencies is that they are subject to greater vagaries than radio waves of lower frequency. It is never certain that the performance observed at one time can be exactly duplicated at any other time. The conclusions which can be tabulated are averages of a great deal of experience

A factor of safety must be allowed in order to insure genuine communication service when high frequencies are used. Much of the information in the hands of the public is based on sensational reports of great distances worked by amateurs with small power. It is true that a boy in the United States will occasionally communicate with a boy in Australia, using 50 watts or even 5 watts. But such communication is of no use commercially. Sufficient power must be provided to carry the messages through under severe conditions of fading, atmospherics, low-wave intensity, and interference. As an illustration, the British Government paid over $200,000, exclusive of the land occupied, for the high-frequency station to communicate with Canada, and the company which furnished it lost money on it.

It is by no means possible to say that an operating channel in the high-frequency spectrum is N kilocycles wide where N can be immediately specified and the number of channels easily computed by dividing the total width of this part of the spectrum by N. The conditions are very different in different parts of the frequency spectrum. These conditions, aside from the existence of vagaries and irregularities which I mentioned, are such things as the selectivity of receiving sets, accuracy of maintenance of frequency, skip distance, and the different carrying power of the waves at different hours of the day and night.

I regret having to mention such a collection of technical factors, but I know no other way of making it clear to you how far we are from a situation in which we can merely list the frequency channels and parcel them out according to demand. The task of the Federal Radio Commission in this field is far more complicated than that.

Width of channels.—Every radio-transmission potentially is capable of interfering with every other. This is avoided by virtue of the fact that receiving sets have a certain amount of selectivity or discriminating power for signals of differing frequency. If receiving sets had unlimited selectivity it would be possible to receive without interference continuous-wave transmissions separated only a few hundred cycles from one another and telephone transmissions separated only 5 kilocycles, and this would be true regardless of the propinquity of transmitting stations to the reception point. As we actually utilize real receiving sets rather than ideal ones, channels of greater width are necessary. Taking into account the actual average power (usually 1 to 10 kilowatts) and distance of transmission, and the selectivity of existing receiving sets, it turns out that reception can be carried on without excessive interference with an average frequency separation of about 5 kilocycles at a frequency of 5,000 kilocycles and this same proportionate separation of 1 in 1,000 holds pretty well throughout the whole high-frequency spectrum. Continuous waves (called type A1 in the international convention) and radiotelephony (type A3) are in view. It is assumed that no damped waves (type B) will be allowed.

On the basis of this rough rule it can be calculated that there are something like 2,000 channels available in the frequency spectrum under consideration. These are not all available for use in the United States. As I shall explain later, the higher frequency channels are essentially adapted to very long distances and hence international working.

There is a possibility of increasing somewhat the number of channels if advantage is taken of a certain principle. This principle, well recognized in the allocation of the very low frequencies for transoceanic telegraphy, is that adjacent frequencies should be assigned to transmitting stations close to one another geographically. Then a receiving station at a given point is subject, on the average, to less interference from near-by stations. The use of this principle permits the use of a smaller frequency separation between stations. It is uncertain how extensive use can be made of it in the high-frequency field. Some experiments have been made on this basis by the Army and a definite improvement obtained. It is also possible that more stations can be accommodated by duplicating the use of a channel at widely separated points. On account of the great carrying power of high frequencies, however, any duplication, even with low power, must be considered experimental until it has been proved that negligible interference results.

Accuracy of frequency.—Another limitation on the number of communication channels available is the lack of perfect constancy of station frequencies. Departure of a station's frequency from its licensed value is a most important source of interference. A very small percentage variation, indeed, will cause a transmitting station to invade the frequency limits of some other station. If the frequency separation between stations is the amount I mentioned, 0.1

per cent, it follows that a variation of 0.1 per cent in the frequency of one station will put it exactly on the channel occupied by another station. Frequencies must, therefore, be maintained much more accurately than 0.1 per cent. This is a rigorous requirement, more so than the present ruling of the Federal Radio Commission on the maintenance of frequencies of broadcasting stations. As it is difficult for some of the broadcasting stations to comply with this requirement, it follows that accuracy of frequency is at the present time a limitation forbidding the use of a number of frequency channels much in excess of what I have indicated.

The practicable limit in present practice is just about 0.03 per cent, the limit of the commission's present requirement for broadcasting stations. Even this requires great care on the part of the station operator. As temperature-controlled piezo oscillators come into use, the accuracy can be expected to advance and frequencies maintained perhaps ten times as close. In any event proper operation of high-frequency stations is bound to take on something of laboratory character, for the maintenance of accurate frequency is far more important than in the lower parts of the spectrum. This fact in itself gives notice that all those who secure the privilege of using high-frequency channels must expect to provide themselves with precision apparatus for maintaining frequency with great accuracy.

Day and night distances.—The frequency required for any given kind of service depends upon the distance of transmission and the time of day in which the station must operate. In the first place, it is a remarkable characteristic of the very high frequencies that they carry better to great distances than to certain short distances. This is known as the skip-distance effect. Because of this, the recent International Radio Conference stipulated that as a general rule frequencies above 6,000 kilocycles should be reserved for long-distance communications (as far as fixed services are concerned). The following statements may be taken as a rough guide to the uses of various parts of the high-frequency spectrum:

Between 2,000 and 3,000 kilocycles the waves are suitable for short distances of the order of a hundred miles in the daytime and several hundred miles at night. Obviously these channels can all (or nearly all) be used in the United States with little regard to their use by other countries. Examples of services suitable for allocation to this band are aircraft telephony and emergency communication between substations of power companies.

Between 3,000 and 6,000 kilocycles the waves carry a few hundred miles by day and a thousand or more miles at night. While these waves can be allocated freely for national use as far as daytime is concerned, their use in other parts of the world must be considered when night transmission is desired.

Above 6,000 kilocycles we have very great distances of transmission both by day and night, with a skipped zone of a few hundred miles around the transmitting station. The uses of such waves in all parts of the world must be considered in allocating these frequencies. They are suitable for transoceanic services, such as commercial telegraphy and relaying of broadcast programs.

Above about 15,000 kilocycles the waves are useful only for daytime communication, and 23,000 kilocycles is about the limit at which the waves have any use at all for long-distance communication on this planet.

On account of the differing transmitting conditions for day and night, it follows that stations which must carry on service throughout the whole 24 hours may need to have two different frequencies for operation at different times of day.

Conclusion.—Summarizing, it appears that there are some 2,000 channels available between 2,000 and 23,000 kilocycles. This number might conceivably be increased as the selectivity of receiving sets and the accuracy of frequency control are improved by future design; but, on the other hand, the probable increase of power used in the future may compensate for this, so that this number can be taken as a guide for discussion. In order that this number of channels may be used all stations must provide special means for maintaining their frequencies with great accuracy. The assignment of frequencies for any given service must take account of the physical facts in regard to distance which is best covered by any particular frequency. Among the most interesting of these facts are that the higher frequencies are better adapted for long-distance than for short-distance communication, and that for a given distance a different frequency is required in the daytime than at night.

If I have accomplished nothing else, I shall be glad if I have made it clear that radio transmission at high frequencies is subject to greater vagaries than low-frequency transmission. All principles must be applied with caution. My brief summaries of existing knowledge will be supplemented by the statements of others, and I am entirely prepared to have some of my statements controverted.

It is impossible to give a neat set of rules that can be immediately applied to setting up a system of high-frequency stations that will work together with maximum efficiency and harmony. The problem is very much more difficult than that of the broadcast frequencies because of greater variability of the high-frequency waves, the greater difficulty of maintaining accurate frequencies, the differences between day and night transmission, and the relative lack of extensive experience in the practical use of high-frequency waves.

APPENDIX L (3)

Remarks made by Capt. S. C. Hooper at public hearing on high frequencies held on January 17, 1928

Mr. Chairman and gentlemen, a study has been made by the radio division of the Bureau of Engineering to determine possible number of high-frequency channels when various phases of the radio art are considered.

The table on the following pages shows the allocation of bands to the various services in accordance with the 1927 International Radio Conference.

It is expected, of course, that the United States will allocate high-frequency channels and license radio stations in accordance with the provisions of the radio conference.

The following table shows the channels available for the various classes of services as allocated by the 1927 International Radio-Telegraph Conference between 1,500 kilocycles and 60,000 kilocycles:

Channels and percentages of accuracy

	0.1 per cent	0.05 per cent	0.025 per cent	0.02 per cent	0.01 per cent
Mobile services	250	425	670	760	1,069
Mobile services Fixed services Amateur services	103	161	227	247	303
Mobile services Fixed services	316	537	833	943	1,288
Fixed services	388	715	1,241	1,452	2,240
Broadcasting	23±4	32±6	42±10	44±11	52±12
Amateurs	31	58	98	113	170
Not reserved	390	759	1,443	1,758	3,155
Amateurs and experimental	67	131	250	304	549
	1,568	2,818	4,804	5,621	8,826

The following table shows the channels available for the classes of service and for the percentage of accuracies indicated between 4,000 kilocycles and 23,000 kilocycles. These frequencies, by virtue of their extreme range for limited power, may cover great distances and must be considered international in character:

Channels and percentages of accuracy

	0.1 per cent	0.05 per cent	0.025 per cent	0.02 per cent	0.01 per cent
Mobile services	138	255	439	513	777
Mobile services Fixed services	198	351	570	655	939
Fixed services	375	694	1,212	1,420	2,201
Broadcasting	23±4	32±6	42±10	44±11	52±12
Amateurs	31	58	98	113	170
	765	1,390	2,361	2,745	4,139

STANDARD OF ACCURACY

The standard of accuracy which may be reasonably required of all high-frequency stations—ship and shore—may be subject to considerable argument. Considering the monetary value of a channel which carries for thousands of miles, it seems reasonable to require transmitting stations to comply with such accuracy as necessary in order to accommodate as many applicants for station licenses as possible.

The following methods of controlling frequencies are in actual use:

(*a*) Piezo electric crystals.
(*b*) Harmonics from a tuning fork.
(*c*) Harmonics from a constant-speed generator employed in Germany in broadcasting band.

The following methods of controlling frequencies are possibilities for the future:

(*a*) Harmonics of longitudinal oscillations in magnetic metal bars.
(*b*) Frequency multipliers by stepping up time intervals from standard clocks.

Theoretically, and based on results with our most modern naval circuits, a percentage of accuracy of 0.02 of 1 per cent is possible. However, it is realized that many stations are not prepared to adopt this standard at the present time.

Therefore, the following accuracy is recommended, with a guard band of 2,000 cycles between channels (combined constancy and absolute accuracy):

	Per cent
Jan. 1, 1928, to Jan. 1, 1930	0.05
Jan. 1, 1930, to Jan. 1, 1933	0.025
After Jan. 1, 1933	0.01

I am not fully informed whether a large percentage of foreign stations can maintain an accuracy of 0.05 per cent. Probably they can maintain an accuracy of only 0.1 per cent at the present time.

However, it will be to the advantage of the United States, in securing as large a percentage of high-frequency channels as possible, to allocate frequencies on the basis of 0.05 per cent if we feel that foreign stations will not interfere.

In the use of high frequencies for long distances most stations will require two frequencies, that is, one for day and one for night communication. A few stations will require three and four frequencies, such including those used in broadcasting weather, press, ships, and aircraft. So for this reason the number of stations which can be licensed would probably be half those indicated above in the band 4,000–23,000 kilocycles, i. e.—

0.05 per cent accuracy, ½×1,390	695
0.025 per cent accuracy, ½×2,361	1,281
0.02 per cent accuracy, ½×2,745	1,373

It is desired to point out that the longer the United States delays in putting its high-frequency circuits on the map internationally, the larger will be the proportion of channels occupied by foreign stations.

If we take on, say, 10 per cent for the United States of the theoretical (0.01 per cent accuracy) high-frequency channels, we will have at a guess 10 per cent multiplied by 4,137©414 channels. Cutting this in half, to give day and night channels to a station, would give the United States ½×414=212 stations.

Reducing this to a present-day basis of 0.05 per cent accuracy would give $\frac{1}{3}\times\frac{1}{2}\times139=70$ stations between 4,000 and 23,000 kilocycles.

If we could obtain 20 per cent of the available channels for the United States there could be accommodated 139 stations.

NUMBER OF EXISTING HIGH-FREQUENCY STATIONS

I have no accurate list of existing high-frequency stations. An incomplete list, probably very incomplete, is appended. It will be desirable that licenses be issued bearing in mind existing stations throughout the world. The accurate list would of course have to be obtained from the international bureau.

PRIORITY OF STATIONS

The stations which must be accommodated in the high-frequency spectrum would take a priority somewhat as follows:

(1) Those for maritime purposes. Separate bands are provided for these in the International Radio Conference agreement; therefore they need not be discussed, as they will not interfere with the bands allotted to shore stations.

(2) Those required for national defense.

(3) Those required for long-distance rebroadcasting, or broadcasting, as assigned by the international radio conference. Special bands are allocated for these.

(4) Those required for long-distance point-to-point communication, paid traffic, public service.

(5) Those required for long-distance communication, nonpaid traffic, public service, which are necessary, due to impracticability of obtaining wire services.

(6) Same as (5), except that they parallel wire services.

(7) Other services, in order of their importance to the public.

Amateurs are provided their own high-frequency bands by the international radio conference; therefore need not be considered at this conference.

In this connection attention is invited to the recommendation of the international radio conference that high frequencies be reserved for long-distance communication (rather than short-distance communication) in services between fixed points. The Navy Department has for two years realized the importance of conserving high frequencies for long-distance communication, and with that in mind has installed intermediate and low-frequency apparatus (even at much greater cost) for communicating at distances of 500 miles and less, rather than use high-frequency equipment at less cost, but which would interfere at great distances. It is believed that this policy is necessary if a maximum advantage to radio is to be secured throughout the world.

For ready reference the following table, showing allocation of frequencies, is reproduced from the report of the 1927 international radio conference. This table shows the channels for various percentages of accuracy, with a minimum guard band of 2,000 cycles between channels.

Service	Frequency	Channels					Distance	
		0.1 per cent	0.05 per cent	0.025 per cent	0.02 per cent	0.01 per cent	Day	Night
Mobile	1,500- 1,715	41	59	77	81	92	Max. 100	Max. 250
Mobile, fixed, and amateur	1,715- 2,000	50	74	97	104	121	Max. 100	Max. 250
Mobile and fixed	2,000- 2,250	40	61	82	88	103	100- 150	250- 450
Mobile	2,250- 2,750	71	111	154	166	200	100- 150	450- 750
Fixed	2,750- 2,850	13	21	29	32	39	100- 150	750- 850
Mobile and fixed	2,850- 3,500	78	125	181	200	246	150- 300	850-1,400
Mobile, fixed, and amateur	3,500- 4,000	52	87	130	143	182	150- 300	1,400-1,900
Mobile and fixed	4,000- 5,500	130	222	342	384	508	300- 600	1,900-3,600
Mobile	5,500- 5,700	14	26	42	47	64	300- 700	3,600-4,200
Fixed	5,700- 6,000	22	38	61	69	95	300- 700	4,200-5,000
Broadcasting	6,000- 6,150	4-7	6-9	6-11	6-12	7-13	500- 800	Over 5,000
Mobile	6,150- 6,675	35	62	100	115	160	600-1,100	Over 5,000
Fixed	6,675- 7,000	21	37	60	69	96	700-1,200	Over 5,000
Amateur	7,000- 7,300	18	33	54	61	87	700-1,200	Over 5,000
Fixed	7,300- 8,200	51	92	153	176	254	800-1,700	Over 5,000
Mobile	8,200- 8,550	19	34	56	65	95	800-1,700	Over 5,000
Mobile and fixed	8,850- 8,900	18	32	55	64	93	1,000-2,000	Over 5,000
Fixed	8,900- 9,500	29	53	91	105	156	1,500-2,400	Over 5,000
Broadcasting	9,500- 9,600	4-5	4-5	4-7	4-7	4-8	2,100-2,600	Over 5,000
Fixed	9,600-11,000	62	114	196	228	344	2,600-3,250	Over 5,000
Mobile	11,000-11,400	16	30	53	62	94	3,250-3,400	Over 5,000
Fixed	11,400-11,700	12	22	38	45	70	3,400-3,800	Over 5,000
Broadcasting	11,700-11,900	4-6	6-9	8-12	8-13	9-16	3,800-4,000	Over 5,000
Fixed	11,900-12,300	15	28	50	58	90	4,000-5,000	Over 5,000
Mobile	12,300-12,825	19	36	63	75	116	Max. 5,000	Over 5,000
Mobile and fixed	12,825-13,350	18	35	61	72	113	5,000-6,000	Over 5,000
Fixed	13,350-14,000	22	41	74	87	137	Max. 6,000	Over 5,000
Amateur	14,000-14,400	13	25	44	52	83	Over 7,000	Over 5,000
Fixed	14,400-15,100	22	42	75	88	141	Over 7,000	Over 5,000
Broadcasting	15,100-15,350	5-6	7-10	9-14	9-15	11-19	Over 7,000	Over 5,000
Fixed	15,350-16,400	31	59	106	126	203	Over 7,000	Over 5,000
Mobile	16,400-17,100	19	37	67	80	131	Over 7,000	Over 5,000
Mobile and fixed	17,100-17,750	17	33	60	72	118	Over 7,000	Over 5,000
Broadcasting	17,750-17,800	1	1-2	2-3	2-3	2-3	Over 7,000	Over 5,000
Fixed	17,800-21,450	88	168	308	371	615	Over 7,000	Over 5,000
Broadcasting	21,450-21,550	1-2	2-3	3-5	3-5	4-7	Over 7,000	Over 5,000
Mobile	21,550-22,300	16	31	58	69	117	Over 7,000	Over 5,000
Mobile and fixed	22,300-23,000	15	29	52	63	107	Over 7,000	Over 5,000
Not reserved	23,000-28,000	94	182	338	408	705	No data.	----------
Amateur and experimental	28,000-30,000	33	65	121	147	256	No data.	----------
Not reserved	30,000-56,000	296	577	1,105	1,350	2,450	No data.	----------
Amateur and experimental	56,000-60,000	34	66	129	157	293	No data.	----------
Not reserved	60,000 up.	------	------	------	------	------	----------	----------

The following table showing the allocation of frequencies is reproduced from the 1927 International Radio Conference. This table shows the channels for various percentages of accuracy with a minimum guard band of 2,000 cycles between channels. The figures for the broadcasting bands are based on a modulated side band of 5,000 and 10,000 cycles and a nonused guard band of 2,000 cycles between each channel:

International Radio Conference allocation

Services	Frequencies in kilocycles per second	Approximate wave lengths in meters	0.1 per cent		0.05 per cent		0.025 per cent		0.02 per cent		0.01 per cent		Approximate distances in miles	
			Sep.	Number of channels	Sep.	Number of channels	Sep.	Number of channels	Sep.	Number of channels	Sep.	Number of channels	Day	Night
Mobile	1,500– 1,715	200 –175	5.21	41	3.61	59	2.80	77	2.64	81	2.32	92	(Max.) 100	(Max.) 250
Mobile, fixed, and amateur	1,715– 2,000	175 –150	5.71	50	3.86	74	2.93	97	2.74	104	2.36	121	(Max.) 100	(Max.) 250
Mobile and fixed	2,000– 2,250	150 –133	6.25	40	4.13	61	3.05	82	2.85	88	2.42	103	100– 150	250– 450
Mobile	2,250– 2,750	133 –109	7.00	71	4.50	111	3.25	154	3.00	166	2.50	200	100– 150	450– 750
Fixed	2,750– 2,850	109 –105	7.60	13	4.80	21	3.40	29	3.12	32	2.56	39	100– 150	750– 850
Mobile and fixed	2,850– 3,500	105 – 85	8.35	78	5.18	125	3.59	181	3.27	200	2.64	246	150– 300	850–1, 400
Mobile, fixed, and amateur	3,500– 4,000	85 – 75	9.50	52	5.75	87	3.85	130	3.50	143	2.75	182	150– 300	1, 400–1, 900
Mobile and fixed	4,000– 5,500	75 – 54	11.50	130	6.75	222	4.38	342	3.90	384	2.95	508	300– 600	1, 900–3, 600
Mobile	5,500– 5,700	54 – 52.7	13.20	14	7.60	26	4.80	42	4.24	47	3.12	64	300– 700	3, 600–4, 200
Fixed	5,700– 6,000	52.7 – 50	13.70	22	7.85	38	4.93	61	4.34	69	3.16	95	300– 700	4, 200–5, 000
Broadcast	6,000– 6,150	50 – 48.8		4–7		6–9		6–11		6–12		7–13	500– 800	Over 5, 000
Mobile	6,150– 6,675	48.8 – 45	14.83	35	8.41	62	5.20	100	4.57	115	3.28	160	600–1, 100	Over 5, 000
Fixed	6,675– 7,000	45 – 42.8	15.67	21	8.84	37	5.42	60	4.73	69	3.36	96	700–1, 200	Over 5, 000
Amateur	7,000– 7,300	42.8 – 41	16.30	18	9.15	33	5.58	54	4.86	61	3.42	87	700–1, 200	Over 5, 000
Fixed	7,300– 8,200	41 – 36.6	17.50	51	9.75	92	5.87	153	5.10	176	3.54	254	800–1, 700	Over 5, 000
Mobile	8,200– 8,550	36.6 – 35.1	18.75	19	10.38	34	6.19	56	5.35	65	3.68	95	800–1, 700	Over 5, 000
Mobile and fixed	8,550– 8,900	35.1 – 33.7	19.45	18	10.73	32	6.36	55	5.49	64	3.74	93	1, 000–2, 000	Over 5, 000
Fixed	8,900– 9,500	33.7 – 31.6	20.40	29	11.20	53	6.60	91	5.68	105	3.84	156	1, 500–2, 400	Over 5, 000
Broadcast	9,500– 9,600	31.6 – 31.2		4–5		4–5		4–7		4–7		4–8	2, 100–2, 600	Over 5, 000
Fixed	9,600–11,000	31.2 – 27.3	22.60	62	12.30	114	7.15	196	6.12	228	4.06	344	2, 600–3, 250	Over 5, 000
Mobile	11,000–11,400	27.3 – 26.3	24.40	16	13.20	30	7.60	53	6.48	62	4.24	94	3, 250–3, 400	Over 5, 000
Fixed	11,400–11,700	26.3 – 25.6	25.10	12	13.55	22	7.77	38	6.62	45	4.30	70	3, 400–3, 800	Over 5, 000
Broadcast	11,700–11,900	25.6 – 25.2		4–6		6–9		8–12		8–13		9–16	3, 800–4, 000	Over 5, 000
Fixed	11,900–12,300	25.2 – 24.4	26.20	15	14.10	28	8.05	50	6.84	58	4.42	90	4, 000–4, 900	Over 5, 000
Mobile	12,300–12,825	24.4 – 23.4	27.13	19	14.56	36	8.28	63	7.03	75	4.51	116	5, 000	Over 5, 000
Mobile and fixed	12,825–13,350	23.4 – 22.4	28.18	18	15.09	35	8.54	61	7.24	72	4.62	113	5, 000–6, 000	Over 5, 000
Fixed	13,350–14,000	22.4 – 21.4	29.35	22	15.68	41	8.84	74	7.47	87	4.73	137	6, 000	Over 5, 000
Amateur	14,000–14,400	21.4 – 20.8	30.40	13	16.20	25	9.10	44	7.68	52	4.84	83	Over 7, 000	Over 5, 000
Fixed	14,400–15,100	20.8 – 19.85	31.50	22	16.75	42	9.38	75	7.90	88	4.95	141	Over 7, 000	Over 5, 000
Broadcast	15,100–15,350	19.85– 19.55		5–6		7–10		9–14		9–15		11–19	Over 7, 000	Over 5, 000
Fixed	15,350–16,400	19.55– 18.3	33.75	31	17.88	59	9.94	106	8.35	126	5.17	203	Over 7, 000	Over 5, 000
Mobile	16,400–17,100	18.3 – 17.5	35.50	19	18.75	37	10.37	67	8.70	80	5.35	131	Over 7, 000	Over 5, 000
Mobile and fixed	17,100–17,750	17.5 – 16.9	36.85	17	19.43	33	10.71	60	8.97	72	5.49	118	Over 7, 000	Over 5, 000
Broadcast	17,750–17,800	16.9 – 16.85		1		1–2		2–3		2–3		2–3	Over 7, 000	Over 5, 000
Fixed	17,800–21,450	16.85– 14	41.25	88	21.63	168	11.81	308	9.85	371	5.93	615	Over 7, 000	Over 5, 000
Broadcast	21,450–21,550	14 – 13.9		1–2		2–3		3–5		3–5		4–7	Over 7, 000	Over 5, 000
Mobile	21,550–22,300	13.9 – 13.45	45.85	16	23.93	31	12.96	58	10.77	69	6.39	117	Over 7, 000	Over 5, 000
Mobile and fixed	22,300–23,000	13.45– 13.1	47.30	15	24.65	29	13.33	52	11.06	63	6.53	107	Over 7, 000	Over 5, 000
Not reserved	23,000–28,000	13.1 – 10.7	53.10	94	27.55	182	14.78	338	12.22	408	7.10	705	No data.	No data.
Amateur and experimental	28,000–30,000	10.7 – 10	60.00	33	31.00	65	16.50	121	13.60	147	7.80	256	No data.	No data.
Not reserved	30,000–56,000	10 – 5.35	88.00	296	45.00	577	23.50	1,105	19.20	1,350	10.60	2,450	No data.	No data.
Amateur and experimental	56,000–60,000	5.35– 5	118.00	34	60.00	66	31.00	129	25.20	157	13.60	293	No data.	No data.
Not reserved	Above 60,000	Below 5.												

APPENDIX L (4)

MEMORANDUM OF MARCH 20, 1928, ON ALLOCATION OF HIGH-FREQUENCY CHANNELS

Subject: Allocation of high-frequency radio channels.

The following rules for allocation of high-frequency channels are recommended for approval:

(1) Use a separation between channels of 0.1 per cent (requiring frequency stability of 0.05 per cent of the average frequency of each band for all services except television. This includes mobile, fixed, broadcast (relay broadcast), and shared bands, each licensed frequency to be in the middle of the respective channel and located from the top of each service band by one-half the average width (to nearest round number) of the channels in the particular band of services.

(2) Grant licenses only for every other channel for the present. Later on, when stations have become proficient in maintaining the necessary accuracy, each channel may be assigned. This is particularly necessary, due to the instability of many foreign stations (as well as many domestic stations). It will be at least a year before every channel can be licensed, instead of alternate channels, at 0.1 per cent separation. Still later, perhaps in two or three years, one additional channel may be licensed between each pair of channels, which would make a separation of 0.05 per cent practicable. And still later, perhaps in five years, it may again be possible to subdivide, using 0.025 per cent separation, and so on as the art advances.

(3) This separation will be adequate for all services except television, for which a band of at least 100,000 cycles is required. It would appear desirable to reserve such a band in the spectrum for television experimental work, dividing the use of this band between all television experimenters on the division of time basis. A part of the unreserved band above 23,000 kilocycles is believed to be most suitable for this. Further recommendations on this point will be made upon receipt of the recommendations from television experimenters.

(4) All existing licensed high-frequency stations (and all licensed stations in the future) should be notified at once that they must take immediate steps to maintain a frequency stability of 0.05 per cent and that beginning April 1, 1929, they will be required to maintain a frequency stability of 0.025 per cent. In view of the value of high-frequency channels, and the demand for these channels, they should be required to use the most modern equipment for this purpose.

NOTE.—The Department of Commerce (radio division) should be requested to assign the necessary personnel and equipment in each district for measuring high frequencies within an accuracy of 0.025 per cent, such facilities to be available April 1, 1929. It should be suggested to the radio division that it might be desirable that at least one inspector on each coast give his entire time to checking high-frequency stability, at least for the present, until danger of drifting of stations no longer exists. If one station drifts to the extent of interfering with another station, important business will be interfered with, and immediate action will be necessary. It will be well to suggest to the radio division that the inspectors constantly engaged in checking high-frequency stations, when undue drift is apparent, immediately and by dispatch notify the district supervisor in which territory the offending station is located, and the latter immediately require the offending station to cease operating until corrective measures are taken.

APPENDIX L (5)

List of the world's high-frequency stations as of May 12, 1928

The commission's technical staff submitted to the commission on May 12, 1928, the following list based on data available on that date of the world's listed high-frequency stations (6,000–23,000 kilocycles) point-to-point in fixed service and shared fixed-mobile bands:

	Fixed bands	Mobile fixed bands	Exclusive channels		Fixed bands	Mobile fixed bands	Exclusive channels
United States of America (Government 81, remainder commercial)	188	34	125	Russia	15	9	2
Philippines	20	4	8	Estonia	0	4	0
British Empire	87	38	36	Liberia	3	1	1
Egypt	3	2	2	Mexico	16	3	2
Germany	64	17	40	Hungary	1	0	1
France and possessions	41	15	12	Panama	1	0	1
Italy and possessions	15	13	5	Finland	0	1	0
Belgium and possessions	5	3	1	Salvador	0	1	0
Holland and possessions	59	16	29	Guatemala	2	0	0
Spain and possessions	2	0	1	Honduras	3	2	0
Japan and possessions	30	6	7	Costa Rica	6	3	3
Sweden	4	13	1	Nicaragua	1	0	1
Portugal and possessions	3	3	1	Brazil	12	12	4
Albania	0	1	0	Chile	1	0	0
Argentine	9	1	5	Colombia	6	2	1
Norway	8	1	2	Venezuela	5	0	2
Austria	2	2	1	Cyrenecia	1	1	0
China	9	1	1	Total	646	216	295
Cuba	14	0	0	Grand total stations listed	862		
Denmark and possessions	4	4	0				

List A (appended) gives details for each nation.

There is a total of 884 channels for all nations, using 0.1 per cent separation, or 442 channels at 0.2 per cent separation, for fixed services (6,000–23,000 kilocycles), including all fixed bands and all mobile-fixed shared bands.

Total occupied as national exclusive channels	295
Total jointly occupied by more than one nation	91
Total channels occupied	386

The location of stations is not in accordance with any system of separation calculations; and, by examination of the spectrum, taking into consideration existing assignments of all nations, there still remain, roughly, 126 clear channels separated 0.2 per cent from existing stations.

The increase in foreign stations recorded since the March 20 memorandum was submitted is at least 50 per cent as compared with 2 per cent in the United States, therefore, it would be only fair for the United States to use the March 20 figures in calculating the 20 per cent for the United States rather than the figure of May 12, as the March 20 figure more nearly represented the situation as it existed upon the conclusion of the International Radio Convention. Upon the basis of the March 20 memorandum the United States should allocate approximately 55 channels for fixed service between 6,000 and 23,000 kilocycles.

List A

	Listed stations in fixed band	Listed stations probably fixed in bands other than fixed		Listed stations in fixed band	Listed stations probably fixed in bands other than fixed
United States of America	186	34	Spain	2	0
Great Britain	30	14	Japan	30	6
India	2	0	Sweden	4	13
Ireland	0	1	Portugal	2	2
British Mediterranean group	4	1	Portuguese West Africa	1	1
New Zealand	5	1	Argentine	9	1
Union of South Africa (British)	3	0	Austria	2	2
Australia	20	9	China	9	1
Canada	15	10	Cuba	14	0
British East Indies	6	2	Denmark	4	4
British West Indies	2	0	Egypt	3	2
Philippine Islands	20	4	Estonia	0	4
Porto Rico	2	0	Liberia	3	1
Germany	64	17	Mexico	16	3
France	28	10	Norway	8	1
French Indo-China	3	1	Panama	1	0
Morocco	4	2	Salvador	0	1
French Equatorial Africa	0	0	Guatemala	2	0
French West Africa	3	1	Honduras	3	2
Tunis	1	1	Hungary	1	0
Syria	2	0	Nicaragua	1	0
Italy	12	10	Brazil	12	12
Madagascar	0	0	Chile	1	0
Tripoli	0	1	Colombia	6	2
Italian Samaliland	3	2	Costa Rica	6	3
Eritria	0	0	Cyrenecia	1	1
Belgium	5	3	Albania	0	1
Belgium Congo	0	0	Finland	0	1
Holland	26	10	Venezuela	5	0
Dutch East Indies	25	5	Russia	15	9
Surinam	1	0	Total	646	216
Dutch West Indies	7	1			

APPENDIX L (6)

List of high frequencies reserved for United States Government use under President's Executive order of March 30, 1928

Kilocycles	Kilocycles	Kilocycles	Kilocycles	Kilocycles
2, 010	3, 340	4, 255	8, 310	13, 095
to	3, 345	4, 265	8, 410	13, 110
2, 020	3, 345	4, 295	8, 470	13, 125
2, 240	3, 350	4, 300	8, 510	13, 140
to	3, 355	4, 305	8, 530	13, 155
2. 250	3, 360	4, 310	8, 590	13, 290
2. 305	3. 365	4, 365	8, 600	13, 305
2. 315	3. 370	4, 370	8, 610	13, 308
2, 335	3, 375	4, 375	8, 620	13, 320
2, 355	3, 380	4, 380	8, 730	13, 335
2. 385	3, 385	4, 385	8, 740	13, 575
2, 405	3, 385	4, 430	8, 750	16, 060
2. 435	3, 390	4, 435	8, 760	16, 068
2. 465	3, 395	4, 436	8, 770	16, 080
2, 485	3, 400	4, 440	8, 860	16, 100
2, 515	3, 405	4, 445	8, 870	16, 120
2, 545	3, 410	4, 525	8, 872	16, 180
2, 575	3, 415	5, 920	8, 880	16, 320
2, 605	3, 445	5, 925	8, 890	16, 340
2, 655	3, 475	5, 930	9, 050	16, 420
2, 675	3, 500	5, 935	12, 045	16, 540
2, 685	to	5, 940	12, 051	16, 620
2, 705	4, 000	5, 945	12, 060	16, 820
2, 715	4, 015	5, 950	12, 075	16, 940
2, 745	4, 017	5, 955	12, 090	17, 020
2, 885	4, 020	5, 960	12, 135	17, 060
2, 915	4, 025	8, 030	[1] 12, 150	17, 180
2, 955	4, 030	8, 034	12, 165	17, 200
2, 960	4, 045	8, 040	[1] 12, 180	17, 460
2, 965	4, 050	8, 050	[1] 12, 195	17, 480
2, 970	4, 055	8, 060	[1] 12, 210	17, 500
2, 975	4, 060	8, 090	12, 225	17, 540
2, 980	4, 065	[1] 8, 100	12, 240	17, 720
2, 995	4, 070	8, 110	12, 255	17, 740
3, 005	4, 075	[1] 8, 120	12, 315	17, 744
3, 035	4, 080	[1] 8, 130	12, 405	18, 100
3, 065	4, 085	[1] 8, 140	12, 465	20, 085
3, 095	4, 090	8, 150	12, 615	20, 125
3, 155	4, 105	8, 160	12, 705	20, 150
3, 195	4, 135	8, 170	12, 765	20, 225
3, 235	4, 155	8, 180	12, 795	20, 400
3, 265	4, 205	8, 210	12, 885	22, 625
3, 295	4, 235	8, 270	12, 900	

[1] These frequencies available for assignment to commercial companies subject to recall for Government use upon 6 months' notice.

APPENDIX L (7)

Partial list of persons attending transoceanic high-frequency hearing on May 14, 1928

On May 14, 1928, a public hearing was held to consider the pleas of applicants for public-service licenses in the transoceanic field. On that occasion the commission granted all applicants an opportunity to state fully and truly the kind of public service they had in contemplation.

Among those in attendance were:

Name	Address	Represented
John W. Arnold	195 Broadway, New York	Western Union Telegraph Co.
Lieut. Commander R. H. Blair.	Naval Communications	U. S. Navy.
Capt. T. T. Craven	do	Do.
H. P. Conwith	195 Broadway, New York	Western Union Telegraph Co.
Raymond Clapper	315 World Building, New York	Karl A. Bickel, president of United Press.
Owen Bulbertson		Radio Corporation of America.
Louis G. Caldwell		Chicago Tribune.
Manton Davis	233 Broadway, New York	Radio Corporation of America.
Thomas P. Dowd	Washington, D. C.	Postal Telegraph Cable Co.
Lloyd Espenscheid	195 Broadway, New York	American Telephone & Telegraph Co.
Chas. E. Hughes, jr	100 Broadway, New York	Mackay Radio & Tel. Co.
W. J. Herdman	253 Broadway, New York	Do.
Robert Hertzberg	230 Fifth Avenue, New York	Radio News Magazine.
Dr. Alfred N. Goldsmith	New York City	Radio Corporation of America.
John M. High	Riverdale-on-Hudson, N. Y	S. P. Radio Co. (Inc.).
Frank B. Jewett	195 Broadway, New York	American Telephone & Telegraph Co.
J. C. Karcher		Geophysical Research Corporation.
Louis M. Loeb	111 Broadway, New York	New York Times.
Ormsby McHarg	522 Fifth Avenue, New York	S. P. Radio Co. (Inc.).
F. E. Meinholtz		New York Times.
Joseph Pierson	Chicago Tribune	American Publishers' Committee.
Oswald F. Schutte	134 South La Salle Street, Chicago, Ill.	Radio Protective Association.
Ernest Wilkinson	Ouray Building, Washington, D. C.	Pacific Communication Syndicate of San Francisco, Calif.
L. E. Whittemore	New York, N. Y.	American Telephone & Telegraph Co.
Robert D. Heinl	Washington, D. C.	Washington Post.

APPENDIX L (8)

Engineering memorandum of May 18, 1928, setting forth general principles to be followed in allocating fixed services in the band of 6,000 to 23,000 kilocycles

GENERAL PRINCIPLES TO BE FOLLOWED IN ALLOCATING FIXED SERVICES, 6,000 TO 23,000 KILOCYCLES

1. Licenses can only be granted to those agencies which will operate in the public interest, convenience, and necessity.

2. Competition is necessary to insure the advance of the art and its maximum value to the public.

3. Companies having demonstrated their fitness to serve and their ability should have prior consideration in so far as possible, bearing in mind that competition is necessary.

4. The same technical standard should be required for all applicants, and extra channels for relaying should not be granted to one company if another company is granted channels for direct communication without necessity for relaying.

5. The number of competing companies should be limited to two for parallel services. This is necessary in order that the United States may use its limited quota of frequencies to best advantage in maintaining contact with all nations.

6. The value of high frequencies increases with the distance; therefore, the most desirable frequencies should be assigned for circuits of maximum distance.

7. Frequencies should be assigned in blocks to individual agencies as far as practicable in order to permit the more progressive agencies to increase the number of channels within their respective blocks as rapidly as their skill permits.

8. Licenses shall state which circuits each frequency is licensed for.

9. If the United States grants licenses to competing interests to communicate internationally, definite assurance should be obtained that these competing interests will not be so keen in their efforts to obtain foreign contracts that the domination of communications, as between the United States and other nations, will not pass into the control of foreign nations which do not permit competition.

10. All licenses should be nontransferable. This is necessary to prevent traffic in sale of frequencies.

11. Licensees shall be required to present copies of their specifications and contracts for radio stations and of service contracts with stations which they will communicate with (if not owned by them) within 90 days from date of granting license. Failing in this, licenses should be revoked. This latter procedure is necessary; otherwise there will be danger that the channels which the United States has registered in the international bureau may be appropriated by another nation.

APPENDIX L (9)

ALLOCATION OF SPECIFIC CHANNELS FOR FIXED TRANSOCEANIC SERVICES IN THE BAND OF 6,000 TO 23,000 KILOCYCLES

Allocation of high-frequency channels for commercial interests approved June 2, 1928, by the Federal Radio Commission in accordance with its action on May 24, 1928, includes the assignment of new channels and the reassignment of channels to all existing licensed stations:

1. *Tropical Radio Telegraph Co.—7 frequencies*

6, 770	10, 470	12, 970
6, 785	12, 940	17, 580
10, 450		

2. *American Publishers' Committee—20 frequencies*

7, 340	7, 850	15, 700
7, 355	7, 925	15, 730
7, 370	7, 955	15, 760
7, 625	15, 580	15, 850
7, 640	15, 610	15, 880
7, 820	15, 640	15, 910
7, 835	15, 670	

3. *Robert Dollar Steamship Co.—8 frequencies*

7, 430	10, 930	18, 820
7, 445	14, 860	22, 660
9, 410	14, 890	

4. *American Telephone & Telegraph Co.—14 frequencies*

6, 755	13, 390	19, 820
9, 170	14, 470	18, 340
9, 750	14, 590	21, 060
9, 870	16, 270	21, 420
10, 550	19, 220	

5. *Radio Corporation of America—65 frequencies*

6, 710	8, 990	13, 720
6, 725	9, 010	13, 780
6, 740	9, 450	13, 840
6, 845	9, 470	13, 870
6, 860	9, 490	13, 900
6, 890	10, 390	13, 930
6, 920	10, 410	14, 800
6, 935	10, 610	14, 830
6, 950	10, 630	14, 920
6, 965	11, 680	15, 040
7, 400	11, 950	15, 430
7, 415	13, 420	15, 460
7, 520	13, 450	15, 490
7, 715	13, 480	15, 970
8, 950	13, 690	16, 000

16,030	18,860	20,260
17,860	18,900	20,780
17,900	18,940	20,820
17,940	18,980	21,220
17,980	19,020	21,260
18,020	20,100	21,300
18,060	20,180	

6. *Mackay Radio & Telegraph Co.—37 frequencies*

6,815	9,280	17,660
6,875	10,490	17,700
7,670	10,810	18,260
7,655	10,830	18,780
7,730	13,000	19,540
7,745	13,030	19,580
7,760	13,750	19,620
8,075	13,960	19,740
8,720	14,680	20,300
8,850	14,710	20,980
8,930	14,740	21,380
8,970	14,770	
9,070	17,420	

APPENDIX L (10)

Commission's statement filed with Court of Appeals, District of Columbia, on appeal of International Quotations Co. (Inc.)

FEDERAL RADIO COMMISSION,
Washington, D. C., September 27, 1928.

The Federal Radio Commission has filed in the Court of Appeals of the District of Columbia the following statement of facts and grounds for refusing the application of the International Quotations Co. for a permit to erect an experimental point-to-point radio station to carry on communication between the United States and France:

IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

International Quotations Company (Inc.), Appellant, *v.* The Federal Radio Commission, Ira E. Robinson, chairman; Eugene O. Sykes, Orestes H. Caldwell, Sam Pickard, Harold A. Lafount, appellees	Proceedings, statement of facts, and grounds for decision

PROCEEDINGS

This is a proceeding under the radio act, 1927, approved February 23, 1927, and the amendment thereto approved March 28, 1928, and is before the court by virtue of section 16 of the act, which section provides in part as follows:

"Any applicant for a construction permit * * * whose application is refused by the licensing authority shall have the right to appeal from said decision to the Court of Appeals of the District of Columbia; * * * by filing with said court, within 20 days after the decision complained of is effective, notice in writing of said appeal and of the reasons therefor."

This statement of facts and grounds for decision is submitted in compliance with section 16 of the act, which provides in part as follows:

"Within 20 days after the filing of said appeal the licensing authority shall file with the court the originals or certified copies of all papers and evidence presented to it upon the original application for a permit or license, or in the hearing upon said order of revocation, and also a like copy of its decision thereon and a full statement in writing of the facts and the grounds for its decision as found and given by it."

The applicant is the International Quotations Co. (Inc.), a Delaware corporation, and appellant herein.

On November 16, 1927, applicant filed with the Federal Radio Commission an application for a radio station construction permit, in the name of S. P. Radio Co., a subsidiary of de Saint Phalle & Co., 11 Wall Street, New York City. Applicant proposed to erect an experimental point-to-point station "to carry on communication between the United States and France."

Under date of May 7, 1928, applicant submitted an amendment to its application whereby applicant proposed, in part, to use the proposed station—

"For the transmission of intelligence for the public on a toll or public utility basis at all hours of the day and night, including such part of the time particularly reserved above as may not be required by the applicant for the transmission of intelligence relating to its own business."

On May 14, 1928, after due notice to applicant, a hearing was held before the commission on all applications for public-service licenses in the transoceanic field, at which hearing applicant was afforded the opportunity of presenting evidence. Applicant was represented at said hearing by Ormsby McHarg, Esq.

Under date of May 24, 1928, the commission found that public interest, convenience, or necessity would not be served by the granting of said application, and the same was denied.

On June 4, 1928, applicant filed a "supplemental" application for a radio station construction permit and under date of June 8, 1928, made request for a hearing on the same.

This request was granted, and on August 21, 1927, a hearing was held before the commission, at which evidence was adduced on behalf of the applicant and on behalf of the commission.

Prior to said hearing applicant had changed its corporate name to "International Quotations Co. (Inc.)."

On August 23, 1928, said application was denied, the commission finding that public interest, convenience, or necessity would not be served by the granting thereof.

Applicant's request for a reopening of the hearing was denied.

On September 6, 1928, applicant filed its notice of appeal, pursuant to section 16 of the radio act.

STATEMENT OF FACTS AND GROUNDS FOR DECISION

Applicant proposes to—

"engage in the business of transmitting and carrying news and other intelligence in which is disclosed current prices and quotations on stocks, securities, and commodities dealt in on the exchanges and commodity markets of the principal cities of the United States, and unlisted securities, and news items relating to conditions affecting the property dealt in on said exchanges and in said markets together with any and all services usually performed and required to be performed by a public utility employing facilities of the character described in this application as being necessary in order to enable it to engage in and carry on the business of transmitting social and business intelligence for toll or hire, the transmission station of said applicant to be at or near the city of New York."

Applicant proposes to transmit official quotations from various stock and commodity exchanges of the United States in cipher to European stations at which these quotations will be deciphered and distributed to subscribers as a service approximating the ticker service now existing in the United States.

Applicant is a corporation organized under the laws of the State of Delaware. No stock has been sold in said corporation, but the preliminary financing has been undertaken by the De Saint Phalle Co., a partnership engaged in the stock and commodity brokerage business in Paris, London, Brussels, New York, and Philadelphia. This partnership consists of 11 members, at least 4 of these not being citizens of the United States. The number of companies or individuals immediately interested in receiving quotations in the form proposed by the applicant is at the present time four European brokerage houses, several firms of this country with offices in Europe, and the De Saint Phalle interests. Their chief interest is predicated upon the possibility of increasing the sale of American stocks and commodities in Europe.

From testimony and affidavits introduced at the hearings the persons primarily interested in sending commodity and stock quotations in the form proposed are brokers dealing in these stocks and commodities and producers of the commodities. A considerable number of affidavits were introduced by applicant

from persons who are of the opinion that a wider dissemination of market information, particularly with reference to the price of cotton, would be efficacious in creating a demand for this product in European markets. These affiants, however, were not qualified with reference to their knowledge of the operation of communicating systems with Europe, including radio communication, and their opinion as to the probable effect of a communicating system such as applicant proposes to operate is not entitled to great weight. The effect upon the commodity and stock markets of this country is also largely conjectural.

The problem of reception and distribution of the information proposed to be transmitted has not been worked out by applicant from a technical standpoint, nor has applicant made any arrangements or tentative investigations with respect to the establishment of stations within the boundaries of those European nations to which applicant desires to communicate.

The subject matter which applicant desires to communicate to European centers is a species of property owned and controlled by the various stock and commodity exchanges, and applicant has made no satisfactory showing that such property is available to applicant for transmission.

There is no custom in Europe of transmitting minute-to-minute or instantaneous quotations from stock exchanges located in the different countries, with the possible exception of Germany, and there appears to be opposition in European markets to the handling of their own stock quotations in such a manner.

The De Saint Phalle Co., the concern immediately interested in the establishment of the proposed stations, now transmits instantaneous quotations on approximately 160 stocks and 25 special stocks to its London and Paris branches by existing methods of communication.

Considerable testimony was adduced to the effect that communication services of similar nature are now in existence, are operated by established news agencies with no financial or market connections, and that such communication agencies are available to any and all individuals; that every country in Europe now receives stock quotations from the various exchanges in the United States to the extent of the trade interest therein; that use is made of telegraphic and radio facilities in carrying this information.

The number of stations that may transmit radio communications from the United States to European countries is limited by physical factors inherent in the nature of the transmissions. At the present stage of radio development transmitting frequencies of from 6,000 to 23,000 kilocycles per second are alone adapted for the purposes of this applicant. The nature of the transmitting (electromagnetic) waves and the lack of constancy of the transmitting apparatus in maintaining the desired frequency results in interference when two or more stations transmit at or about the same frequencies. In order to reduce this interference to the extent that effective communication may be established for each station, it is necessary to divide the kilocycle spectrum into channels.

As a compromise between the objective of minimum interference and the desire to provide for the maximum number of channels, the commission has considered that a separation of approximately two-tenths of 1 per cent of the assigned frequencies should exist as between stations. The number of channels thus provided for the form of communication which applicant desires to establish is limited further by reason of the agreement entered into by the United States and other nations as set forth in the articles and regulations of the International Radio Telegraph Convention, 1927, effective January 1, 1929. This convention allocated to different classes of services those bands of frequencies best adapted to each class of service.

There are approximately 439 channels adaptable for transoceanic service such as applicant proposes to render. All nations may share in the use of these channels. Foreign nations occupy approximately 225; stations of the United States Government use 52 channels for services of the Army, Navy, etc., and approximately 185 channels are now in use by stations licensed by this commission. In some cases the same channel is used by two or more stations by dividing the time of operation. The same channel may also be used in the case of stations operating at the lower frequencies when there is a wide geographical separation of such stations.

For the purpose of promoting the fullest use of all channels this commission has assigned shared channels when serious interference would not be caused thereby.

Notwithstanding this the commission had before it at the time the application of the appellant herein was considered applications for the use of 201 channels,

APPENDIX L (11)

Commission's statement filed with Court of Appeals, District of Columbia, on appeal of Bull Insular Line (Inc.)

FEDERAL RADIO COMMISSION,
Washington, D. C., October 5, 1928.

The Federal Radio Commission has filed in the Court of Appeals of the District of Columbia the following statement of facts and grounds for its decision in refusing the Bull Insular Line (Inc.) four applications for radio station construction permits.

IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

Bull Insular Line (Inc.), appellant *v.* The Federal Radio Commission, Ira E. Robinson, chairman; Eugene O. Sykes, Orestes H. Caldwell, Sam Pickard, Harold A. Lafount, appellees	Proceedings, statement of facts, and grounds for decision

PROCEEDINGS

This is a proceeding under the radio act, 1927, approved February 23, 1927, and the amendment thereto, approved March 28, 1928, and is before the court by virtue of section 16 of said act. The applicant and appellant herein is the Bull Insular Line (Inc.).

This appeal is from a finding made by the Federal Radio Commission that public interest, convenience, or necessity would not be served by the granting of certain applications for radio station construction permits and experimental licenses to said applicant. Said applications are hereinafter set forth.

On or about June 7, 1928, applicant filed applications with this commission for radio station licenses as follows:

1. For experimental station located at San Juan, P. R.
2. For an experimental station located at pier 8, Locust Point, Baltimore, Md.
3. For an experimental station located at New York City.

The above stations, at the time the applications were filed, were operating under temporary licenses granted by the Federal Radio Commission for a definite period and expiring June 17, 1928.

On June 11, 1928, applicant filed four applications for radio station construction permits, as follows:

1. For a station to be located at Pier 8, Locust Point, Baltimore, Md., for the purpose of communicating with New York City; San Juan, P. R.; Tampa, Fla.; and Santo Domingo City, Republic of Santo Domingo.
2. For a station to be located at San Juan, P. R., for the purpose of communicating with New York City; Baltimore, Md.; Tampa, Fla.; and Santo Domingo City, Republic of Santo Domingo.
3. For a station to be located at Tampa, Fla., for the purpose of communicating with San Juan, P. R.; Baltimore, Md.; New York City; and Santo Domingo City, Republic of Santo Domingo.
4. For a station to be located at New York City for the purpose of communicating with San Juan, P. R.; Baltimore, Md.; Tampa, Fla.; and Santo Domingo City, Republic of Santo Domingo.

On June 18, 1928, the experimental licenses hereinbefore set forth were extended until July 1, 1928, by order of the commission, and later temporarily extended to August 1, 1928, by order of the commission dated June 29, 1928.

On July 27, 1928, the commission, after an examination of the three applications for experimental station licenses and the four applications for construction permits, as hereinbefore set forth, and having further considered the previous applications of the applicant, superseded by the seven applications above, and not reaching a decision that public interest, convenience, or necessity would be served by the granting of any or all of the aforesaid applications, ordered that a hearing be held on August 24, 1928, on said applications.

Applicant was duly notified of the time and place of such hearing and on the last-mentioned date a hearing was held before the commission upon the aforesaid applications, at which hearing testimony was presented on behalf of the applicant and on behalf of the commission.

On August 1, 1928, the commission extended the three experimental station licenses hereinbefore referred to until September 1, 1928, pending further action.

On August 29, 1928, the commission made a finding that public interest, convenience, or necessity would not be served by the granting of any or all of said applications and denied the same.

On September 14, 1928, applicant filed with the commission a certified copy of its "Notice of appeal" from said finding to the Court of Appeals of the District of Columbia.

FINDING OF FACTS

Applicant, the Bull Insular Line (Inc.), is a corporation organized under the laws of the State of Maine, and is a subsidiary of A. H. Bull Steamship Co., 40 West Street, New York City.

Applicant has been operating three stations for experimental purposes under licenses granted by this commission. Said stations are located at San Juan, P. R.; New York City; and Baltimore, Md.

Applicant proposed to construct stations to be located as follows: Baltimore, Md.; San Juan, P. R.; Tampa, Fla.; and New York City, all of said stations to communicate with Santo Domingo City, Republic of Santo Domingo, and to intercommunicate.

Applicant proposed to use these stations for public-service correspondence and to operate them continuously, and further proposed to form a separate corporation for conducting this wireless communication service.

The usual routing of messages from Baltimore and Tampa to San Juan is by land wire, i. e., telegraph, to New York and from New York by radio to San Juan. Messages coming from Porto Rico are delivered via radio to New York and there distributed by telegraph. The commission judicially notices that there are also cable connections between New York and Porto Rico via Haiti.

New York and Baltimore are approximately 1,700 miles distant from San Juan. Tampa is approximately 1,300 miles distant from San Juan. Applicant proposes to give Baltimore and Tampa a direct contact with San Juan and Santo Domingo by radio.

The applicant operates a steamship line between Baltimore and Porto Rico and also between other points, and is the one primarily interested in establishing the proposed system of communication. Prior applications for licenses made by the applicant herein proposed only a private use of of the contemplated stations.

Other parties interested in using the proposed system of communication are certain steamship companies operating between the United States and Porto Rico and persons active in the shipping industry, particularly Baltimore shippers. It appears from the evidence that the shippers of Baltimore will be the group most benefited. Witness Pouder testified as follows:

"At present we have about 200 active shippers in Baltimore, many of them engaged in weekly communication, sometimes daily communication with the island. A number of them find the present method of indirect communication via New York when there is an immediate need for speed is unsatisfactory, and I believe that the volume of our business and the contributions which these local shippers are making to American water-borne commerce merit some consideration of their views."

The port of New York handles the largest tonnage to and from Porto Rico of any of the Atlantic coast, ports, Baltimore being second in this respect. As has already been found, there is a direct radio connection between New York and Porto Rico.

Applicant did not inform the commission as to the amount of communication between this country and Porto Rico and Santo Domingo nor the number of prospective patrons. Its own monthly business can be conducted in two days of continuous operation.

The number of channels available for communication between this continent and stations located outside the continent, i. e., transoceanic stations, is very

limited. There are at the present stage of radio development approximately 439 such channels, all nations being entitled to a share of these channels. Foreign nations now occupy approximately 225 channels; stations of the United States Government use 52 channels for purposes in connection with the Army, Navy, Coast Guard, etc. Approximately 185 channels are now in use by stations licensed by this commission. By assigning channels on a shared basis this commission has endeavored to promote the fullest use of all channels.

At the time the applications herein mentioned were considered there were applications pending before this commission for 201 channels. Without considering the latter, the channels available for assignment are practically exhausted.

GROUNDS FOR DECISION

This commission considers that public interest, convenience, or necessity is best subserved by conserving the channels of communication, so limited in number, to their most vital uses, and avoiding the chaos of uncoordinated traffic which would result from a policy of making assignments in accordance with demands. The commission desires to avoid the loss of use of any of these channels arising from the presence of a greater number of stations than can be accommodated and the resulting interference.

In the transmission of private messages radio has its peculiar advantages as well as inherent disadvantages.

A complete communication system between continents or between continents and insular bodies contemplates many different points on each continent or island from which messages may be sent as well as an extensive distribution system for such messages after they are received. In view of the limited number of channels available, the use of radio must be confined to a relatively small number of points and reliance made on existing systems for the distribution and collection of messages. With reference to the island of Porto Rico, it is apparent without further consideration that, although radio stations at all Atlantic and Gulf ports might be desirable for direct communication with this island, such a use of channels would be uneconomic and wasteful in view of the large number of islands and countries on other continents precluded from receiving direct communication with this country by reason of the scarcity of channels.

Only a limited number of persons would be served by the proposed system of communication, even under the most optimistic assumptions. It is noteworthy that many of the merchants petitioning this commission did so on the ground that they were desirous of obtaining the "benefit of all communication facilities possible." The extent of the benefit in any case is problematical. The commission considers that it must be guided by the facts before it and not by the opinions of those unfamiliar with the inherent limitations of radio communication and the needs of other localities for this service.

In view of the fact that channels in a limited portion of the frequency band—i. e., 6,000 to 23,000 kilocycles per second—are adaptable for intercontinental services, this commission considers that those channels should be put to their maximum use and that such factors as the extent of the territory to be served, the population, economic interests, etc., should receive adequate consideration.

The commission further considers that the primary purpose of applicant is to subserve its own interests and that public use is incidental, this in view of the fact that its previous applications provided for private use only. The amount of public business available does not justify the use of an additional channel for the purpose of furthering competition because the resultant economic waste would be, as an end result, destructive of any benefit that might be achieved thereby.

The grounds for decision are applicable to the proposed communication system with both San Juan and Santo Domingo.

From all the evidence before it and a consideration of the various factors involved this commission concluded that public interest, convenience, or necessity required a denial of the seven applications hereinbefore enumerated.

Pursuant to section 16 of the radio act, 1927, appelee herewith files the originals or certified copies of all papers and evidence presented to it, upon the original and subsequent applications of the appellant and in the hearing upon said applications, together with its orders relating thereto.

APPENDIX M (1)

Brief of Dr. Alfred N. Goldsmith, filed April 6, 1928, on subject of international relay broadcasting

RELAY BROADCASTING

In a brief filed with the commission on April 6, 1928, Dr. Alfred N. Goldsmith, chief broadcast engineer of the Radio Corporation of America, explained the purposes and the national and international significance of international relay broadcasting. He said:

"Relay broadcasting is the method whereby programs originating in one country or continent are carried over a radiotelephone channel of high quality to other countries and continents. In effect it links the nations of the world into an international broadcasting network.

"The human value of a service of this sort and the interest which it will arouse can hardly be overestimated. For the first time internationally famous men and women can deliver their message not only to the people of their own country but equally to people in foreign lands. The contact thus established between the leading thinkers of each nation and the remainder of the world can not fail to exercise a profound cultural influence upon the development of humanity. As a means of reducing the likelihood of international misunderstanding, in so far as these occur through lack of contact, international broadcasting is a most powerful agency.

"The emotional appeal of many events which can be internationally broadcast is also extremely great. Such events as solemn religious services, for example, at Christmastide in the Holy Land, when spread over the entire world, will bring home realities of religion to the peoples of many countries in a way which is otherwise unimaginable.

"Similarly, great educators can deliver their messages to the world at large; pioneers of thought in every field can become internationally known by direct contact; poets and authors need not attend upon the slow dissemination of their work through the printing press to enable it to reach many lands; and scientists can spread their most recent discoveries by an instantaneous vehicle of communication.

"Nor is international broadcasting less important relatively in the esthetic field of music. If one imagines the broadcasting of the Wagner festival from Beyreuth, in Germany, it becomes at once apparent that musical events of unique and universally appealing character can be thus brought from their localized environment to the entire world.

"In the field of sociology the cooperation and understanding between labor and employing groups in all countries become more readily possible. The interchange of political ideas through international discussion of debating becomes readily possible.

"In proposing that relay broadcasting shall have assigned to it a limited number of channels at this time, a recommendation is being made which is definitely in the direct line of human progress and the approval of which would necessarily give a great incentive to the development of international good will through broadcasting and all that it implies to the world."

SPECIFIC JUSTIFICATION FOR GRANT OF EXPERIMENTAL LICENSES FOR INTERNATIONAL RELAY BROADCASTING TO THE RADIO CORPORATION OF AMERICA

It may be mentioned that the frequencies requested for international relay broadcasting as listed in Appendix A, attached hereto, are the result of a careful engineering and traffic analysis and represent an agreement between groups of experienced experts of the Radio Corporation of America. The following considerations justify the grant of the licenses in question to the Radio Corporation of America:

1. Relay broadcasting is a point-to-point telephone service of high grade, requiring a well-nigh perfect channel at least 20 kilocycles wide for both the modulation side bands. The Radio Corporation of America has had long experience in handling point-to-point services on a large scale, in fact it has probably had the widest experience in this field of any commercial organization in the world.

2. The particular wave lengths used for effective transmission depends on the distance of transmission, the direction of transmission, the time of day, the

season of the year, and sometimes on other factors as well. The choice of wave lengths to meet given conditions requires a wide knowledge of radio-transmission conditions over long distances, based on extensive experience, such as has been accumulated by the Radio Corporation of America over a period of many years.

3. Highly special and elaborate transmitting and receiving equipment and associated antennas are required, and skilled operation by thoroughly experienced persons is needed. Low-grade or occasional reception of the programs to be relay broadcast is useless. A mastery of receiving technique is necessary. The Radio Corporation has had a thorough experience in transoceanic radio reception on short waves extending over a period of years.

4. To make relay broadcasting effective requires that wire-line connections and a truly national network of outlet broadcasting stations shall be available. The Radio Corporation of America is in a position to furnish the use of the leading radiobroadcasting networks in the United States for this purpose, namely, the well-known red, blue, and Pacific networks of the National Broadcasting Co.

5. Foreign contacts and working agreements are required, so that programs sent from the United States may be suitably rebroadcast in foreign countries and that foreign programs suitable for rebroadcasting in America will be provided by the foreign correspondents. The Radio Corporation of America has extremely wide contacts and numerous contractual arrangements with other radio organizations all over the world and is capable of extending this radio service in the direction of relay broadcasting as may prove necessary and desirable.

6. Elaborate studio and program-producing facilities are needed, which programs should be of high quality and typical of the best current practice in the United States. What are probably the most perfect studio and program staffs and facilities in the world are available to the Radio Corporation of America through its relations with the National Broadcasting Co.

7. The relay broadcasting organization requires elaborate research and development staffs and facilities so that the standards of operation shall be maintained and the United States kept in the lead in this field. The research and engineering staffs of the Radio Corporation of America, General Electric Co., and Westinghouse Electric & Manufacturing Co. are available for any development of international relay broadcasting which may be undertaken by the Radio Corporation of America. Many hundreds of engineers and millions of dollars in laboratory and station equipment are available for research and development activities along radio lines. The Radio Corporation of America also has access to and the right to use for international relay broadcasting the developments originating in the laboratories of the Bell System (American Telephone & Telegraph Co. and Western Electric Co.).

8. Long experience in the fields of transoceanic communication with their stringent requirements is necessary for the relay broadcasting organization in order that it may know how to handle such traffic systematically and reliably. The Radio Corporation of America is in an obvious position of leadership in its knowledge of radio-traffic handling.

9. The service itself and the groups giving it must be of such status and dignity and have had such experience as to command international respect, else the allocations of short-wave lengths in the United States can not be maintained in the face of world needs for short waves and the urgent demands of many nations for such wave lengths. It is believed that a great radio public-service organization, such as the Radio Corporation of America, most fittingly meets these requirements.

10. The early assignments of short-wave lengths for relay broadcasting from this country is necessary if the United States is to maintain its leadership in this field. Already other radio services and the stations of other nations are engaging in this field and rapidly developing it. Only an active and progressive organization, such as the Radio Corporation of America, with adequate facilities, can hope to hold its position in the development of this field.

11. The proven and the desirable principle of encouragement of research and development should be accepted and carried forward; and it should be understood that experimental services, if successful, will then be converted into regular services for the public. The Radio Corporation of America can readily do this, in line with its traditions of high quality to the public.

12. It is entirely fitting that so important a radio activity as mass communication from one nation to another should be suitably recognized by short-wave assignments. The Radio Corporation of America is skilled in conducting relationships with foreign governments and is competent to handle both the development and regular operation of international relay broadcasting services.

It is to be noted that the six frequencies requested for international relay broadcasting in Appendix A are in the band assigned to "broadcasting" by the International Radio Conference of 1927. In asking for such frequencies in these particular bands, it is understood that the request is made only on the basis and assumption that the assignments of frequency for international broadcasting will be exclusive, not only for the United States but for the world. International relay broadcasting channels are useless if their frequency assignment is not an exclusive one, for obvious reasons, inasmuch as they must reach distant nations with a clear signal, free from interference from other stations on the same frequency.

If the Federal Radio Commission is not prepared to give an exclusive assignment on these six requested frequencies of international relay broadcasting, and if it is not the policy of the Government of the United States to support the stand that such frequency assignments shall be exclusive for the entire world, the Radio Corporation of America, of necessity, would desire to alter its requests for international relay broadcasting frequencies by moving them from the so-called "broadcasting" band into the bands open to point-to-point services. In these latter point-to-point service bands it is understood that the assigning of exclusive frequencies on a world-wide basis is an accepted principle. A similar principle must be applied to international relay broadcasting frequencies, even if they are placed in the so-called "broadcasting" short-wave bands. If this can not be done, as previously stated, international relay broadcasting frequencies must necessarily fall in the point-to-point bands.

APPENDIX M (2)

Brief of Dr. Alfred N. Goldsmith, filed May 14, 1928, on subject of television

TELEVISION, OR SEEING AT A DISTANCE

Dr. Alfred N. Goldsmith, chief broadcast engineer of the Radio Corporation of America, filed with the commission on May 14, 1928, a brief on television. The brief, in part, follows:

"Radio television is at a stage where it is prepared to leave the seclusion of the research laboratory and enter into the daily affairs and uses of man. Intensive development work of an experimental nature has already been carried on and transmission of television material is at hand through confidential experiments and transmissions carried on at Schenectady, Pittsburgh, and New York. In other words, television is not a vague and remote project, but, while still experimental, is an imminent and plausible probability. Indeed, a fair parallel is to compare television in its present state of development with ordinary broadcasting in its condition in 1921. The wise policy of the Government which encouraged the development of broadcasting at that time, is similarly applied to television at the present time, will lead to a tremendous and desirable growth of that art as a service to the public.

"The usefulness of television as a service is self-evident. At the risk of repeating the obvious, it should be pointed out that man gets his impressions of the outside world through two major channels, sight and sound. It is not clear which of these channels is the more effective, but assuredly each of them is of tremendous value to mankind, and, in consequence, their combination is more potent than either alone.

"In effect, the broadcasting stations of the United States send their messages to millions of blind listeners. In removing the darkness from the home of the listener-in, in a literal sense, and adding the television picture, a degree of closeness of contact between the artist, speaker, or minister hitherto unobtainable at once becomes possible.

"When one considers the number of important forms of television programs which could be sent to the broadcast listeners-in and lookers-in, one is compelled to curb one's imagination. Everything that the drama can afford, that the

musical comedy has to offer, that the debating stage can provide, that the concert stage can furnish, that the motion picture has given to humanity, can be brought into the home with synchronized sound as a complete source of thoroughly satisfying and highly interesting human entertainment, instruction, and edification.

"In carrying forward so serious and important a program, it is desirable to consider the various types of television service which will be required, since these form three main divisions corresponding, approximately, to the existing or projected types of sound broadcasting:

"1. *Urban service.*—The first type of service to be considered is service to persons residing in a typical city of considerable size, where the problem of distribution of radio waves through steel structures having marked absorption for such waves exist. A certain band of wave lengths or frequencies is believed to be suitable for television in such district, and will be first experimentally tested for the purpose and later utilized on a systematic service basis.

"2. *Suburban and rural service.*—Outside of the large towns reside great groups of prospective lookers-in who will find in television service a new means of contact with persons outside of their normal range of travel. These areas are much greater in dimensions than the city areas and, in addition, have a different type of terrain. As a result, a different band of wave lengths or frequencies is anticipated to be necessary for satisfactory television service to this group of lookers-in.

"3. *International service.*—Just as in the case of broadcasting it becomes necessary for many personal, national, and international reasons to foster the development and growth of international broadcasting through the assignment of relay broadcasting channels, so it is necessary in the field of television to provide for international television through relay television broadcasting channels. These channels are intended to span oceans or continents and to carry the television image from one country or continent to one or more other countries or continents. Since the distance to be covered and the nature of the intervening territory (generally an ocean) is entirely different in these cases from the two preceding, relay television broadcasting will require its own separate allocation of channels.

"An explanation of the 100-kilocycle channel width requested for television broadcasting in these initial assignments is of interest.

"The width of channel in television broadcasting (expressed in kilocycles) determine the field of view of the picture and also its clarity or fineness of detail. For example, a narrow band of frequencies assigned to television would permit the transmission only of unpleasantly crude images of restricted dimensions, and would therefore at once block the development and public appreciation of this new art. Even the 100-kilocycle bands which have been recommended are capable of giving only a picture of moderate dimensions and of fairly acceptable sharpness and clarity. To narrow the bands below the 100-kilocycle value would necessarily block effective progress in this new field.

"The granting of experimental licenses on the various recommended television broadcasting channels will encourage a rapid development of this new art and its corresponding coordination with broadcasting, which will lead to the provision of a completely satisfactory, and hitherto unobtainable, radio sight-and-sound service to the people of the United States and even of the entire world.

"To develop the three basic types of television broadcasting requires permission from the Federal Radio Commission to explore experimentally the television transmitting capabilities of a considerable number of 100-kilocycle bands between 1,500 and approximately 17,000 kilocycles. We know very little of the television transmission capability of these bands, and we shall never determine how to utilize them effectively for the entertainment and instruction of the public by television unless encouragement is given those planning to develop the art through authorization experimentally to transmit television material on such wave lengths and to determine conclusively the sort of service given in urban, suburban and rural, and international television services on each of these bands."

SPECIFIC JUSTIFICATION FOR GRANT OF EXPERIMENTAL LICENSES FOR RADIO TELEVISION BROADCASTING TO THE RADIO CORPORATION OF AMERICA

1. Television is a more difficult service even than telephone broadcasting and requires its own special assignments. If television is placed on ordinary broad-

casting wave lengths the listeners will hear unpleasant sounds. Conversely, television receivers tuned to broadcasting wave lengths will receive a blur, but no picture, from an ordinary telephone broadcasting station. Permanent television broadcasting of high quality appears more likely upon the shorter wave lengths. The Radio Corporation of America has had wide experience in the handling of these short waves.

2. The establishment of a television service opens up an entirely new channel of mass communication—broadcasting for the sense of sight. In other words, optical and electrical experts are required for the development of television transmission and reception. Such men are available to the Radio Corporation in its own staff, and on the staffs of the General Electric Co., Westinghouse Electric & Manufacturing Co., and Radio Corporation of America Photophone (a recently formed organization for the production of sound-motion pictures).

3. All considerations justifying the grant of short waves to relay broadcasting which have been mentioned hold as well for television broadcasting. As has been pointed out previously, the Radio Corporation meets the necessary requirements very fully.

4. Television broadcasting also requires special wave bands suitable for urban, suburban and rural, and international transmission to television programs, respectively. These wave bands will not be interchangeable at any given time. Through extensive experience in the short-wave band, both in transmission and reception, the engineers of the Radio Corporation of America are able to select the most suitable wave bands and utilize them effectively.

5. The major television service over long distances will presumably be in Europe, with extensions of service as soon as possible to South America and to Hawaii, the Philippines, and the Far East, respectively. The Radio Corporation has the necessary foreign contacts or stations at the points in question. An interesting example of this is broadcasting station KZRM, at Manila, the station of the Radio Corporation of the Philippines, which is a subsidiary of the Radio Corporation of America.

6. Many careless statements have been made as to the frequency band width required for television. Television pictures are made by rapidly drawing a series of lines of variable darkness below each other, the process being so rapid that the lines in question blend into a composite and apparently continuous image. The Radio Corporation can be depended upon, on the basis of its long experience in radio broadcast transmission and the furnishing to the American public of radio-receiving equipment on the largest scale, to develop television broadcasting along constructive and satisfactory lines, and in such fashion as to give a service of permanent value to the public.

7. The band widths required (for single side-band transmission) for various types of television are as follows:

For a 24-line pictures, 5 kilocycles.
For a 48-line picture, 20 kilocycles.
For a 96-line picture, 80 kilocycles.

When it is considered that even fairly crude newspaper halftone illustrations have from 150 to 300 lines, it will be appreciated that pictures of continuing interest to moderately discriminating lookers-in will require at least 100 kilocycle bands. This will suffice merely for showing action of two or three figures clearly with a certain amount of background detail.

In other words, a 5-kilocycle band will permit the television broadcasting of a crude image of a head, with comparatively little detail. A 20-kilocycle band will permit the broadcasting of the head and shoulders of the actor or speaker with more detail. An 80-kilocycle band will permit the transmission of the picture of two or three actors with fairly acceptable detail.

The allocation of bands 100 kilocycles wide for television is strongly advocated, since this is clearly the minimum basis of a true television service of permanent interest to the public. It may be anticipated that uninformed or nonconservative television broadcasters would transmit an endless series of wabbly, blurred, fuzzy, or silhouette pictures, with bad flicker and of limited area. This would be called "television," but would truly be no more a useful example of television than a child's wavering drawing is a masterpiece of art by Rembrandt. "Television," so called, from irresponsible sources will benefit only the oculists of the United States in proportion as it ruins the eyesight of the public "lookers-in."

In the interest of saving both the vision and the television of the public, only an experienced and responsible organization, such as the Radio Corpora-

tion of America, should be granted licenses to broadcast television material, for only such organizations can be depended upon to uphold high ideals of service.

The Radio Corporation of America can be depended upon to broadcast television material with high technical and program quality, just as it has in the broadcasting field. It points to the consistently high standards of its broadcasting record in making its request for licenses permitting it to carry forward the equally successful development of television broadcasting and the consequent creation of a great new service to the public.

There seems to be much confusion in the public mind regarding terms used in television. Experts claim there is a vast difference between the transmission of an actual scene as it occurs and the transmission of a picture or document in facsimile.

R. H. Langley, an outstanding radio engineer, has cleared up some misconceptions regarding television. He said:

"Television means 'seeing at a distance.' On this basis any method of re-creating on the screen a moving distant scene simultaneously with the action itself is television. The simultaneity is, however, absolutely essential.

"A motion picture is a record of a moving scene, and a motion picture itself constitutes television, except that it lacks the essential element of simultaneity.

"The transmission over wires and re-creation on the screen of a distant moving scene is television. The same transmission is also television and may be called radio television, but the contraction 'radio vision' is likely to be decidedly misleading. There is already one corporation which uses this word in its corporate title and yet is not offering anything approaching television or radio television.

"The transmission and reproduction of a still scene or a still picture is not television and should be called picture transmission, whether by wire or by radio.

"Because there are to-day several reasonably successful methods of picture transmission, it can not be inferred that true television is near at hand. The problems of true television are entirely different and enormously more difficult than the problems of picture transmission."

APPENDIX M (3)

Form letter and questionnaire sent by commission on June 22, 1928, to all applicants for high-frequency broadcasting on television licenses

Commissioners Sykes and Caldwell, members of the short-wave committee, on June 22, 1928, sent the following letter to each applicant for a high-frequency broadcast license:

"The commission has completed the allocation of high frequencies in the mobile, mobile-fixed service, and fixed-service frequency bands 6,000-23,000 kilocycles, in accordance with the International Radio Convention, 1928. Study is now being made of the frequency bands designated by the convention as broadcast-service bands, together with the applications for high-frequency broadcasting, relay broadcasting; also television in so far as the latter may be considered in these particular bands.

"The high-frequency bands now under consideration are as follows (approximate distance range shown after each band):

	Day	Night		Day	Night
	Miles	*Miles*		*Miles*	*Miles*
6,000 to 6,150 kilocycles	500	4,000	15,100 to 15,350 kilocycles	2,500	5,000
9,500 to 9,600 kilocycles	1,200	5,000	17,750 to 17,800 kilocycles	3,000	6,000
11,700 to 11,900 kilocycles	2,500	5,000	21,450 to 21,550 kilocycles	4,000	7,000

The commission's technical adviser, Capt. S. C. Hooper, United States Navy, has made the following pertinent suggestions relative to the frequencies under consideration and concerning high-frequency broadcasting, relay broadcasting, and television:

Broadcasting bands	Width No.	Width of each broadcasting channels			Number of broadcasting channels			Number of bands 10 k. c.
		Present	Later	Possible ultimate	Present	Later	Possible ultimate	
6,000 to 6,150 kilocycles	150	40	20	10	3	6	15	15
9,500 to 9,600 kilocycles	100	40	20	10	2	4	10	10
11,700 to 11,900 kilocycles	200	40	20	10	4	10	20	20
15,100 to 15,350 kilocycles	250	40	20	10	6	12	25	25
17,750 to 17,800 kilocycles	50	40	20	10	1	2	5	5
21,450 to 21,550 kilocycles	100	40	20	10	2	4	10	10

"For television it is suggested that experimental development stations be licensed between 4,500 and 5,000 kilocycles on five 100-kilocycle channels, one channel to be assigned to each zone for night use, and all five channels to be assigned to each zone for day use.

"In addition, one 100-kilocycle channel in the 15,100 to 15,350 kilocycle band (or the 11,700 to 11,900 band) and two 100-kilocycle channels above 23,000 kilocycles are recommended for television experimental work.

"If television experimental work is licensed in the band 4,500 to 5,000 kilocycles, this will reduce the number of 0.1 per cent channels for national and continental fixed service telegraph communication from approximately 275 to 200 in the bands having distance daylight range 50 to 700 miles, or from 150 to 110 in the bands having daylight-distance ranges 300 to 700 miles.

"Forty applications for the 18 (or 36 depending on separation) channels available have been received. As there are a number of foreign stations already engaged in this type of service, it is obvious that only a portion of this total is available for use by the United States stations. These 40 applications include requests for from one to seven frequencies each. Therefore, on account of the shortage of available channels, it will be necessary to arrange the applications in priority of importance as regards 'interest, necessity, and convenience' to the public and to approve only the most important applications.

"The following priority has been suggested:

"1. Overseas and international relay broadcasting.

"2. Long-distance broadcasting beyond reliable distance range of national broadcast network (550 to 1,500 kilocycles) transmissions.

"3. Television experimental and development work.

"4. National (within United States) relay broadcasting.

"It must be borne in mind that high frequencies are primarily valuable due to their great carrying range, at low cost, and that they cause international interference. Therefore, they must be primarily assigned for long-distance uses when low frequencies are not practicable.

"Your company is listed, on the records of the commission, as being an applicant for service of the class to be included in the high-frequency broadcast bands. It is, therefore, requested that you comment on the suggestions made by the technical advisor and transmit your comments to the commission with any pertinent suggestions.

"There is no available accurate list of the high-frequency broadcast and relay-broadcast stations located in foreign countries, so if you have made recent observations which are convincing concerning foreign stations of this character now on the air, the commission would be glad to obtain your record of these stations, their call letters, frequencies, and hours of service. Such data will be greatly appreciated.

"Will you, therefore, kindly fill out attached questionnaire and submit to the commission at an early date?"

The questionnaire referred to follows:

1. Location of station_____
2. Name of applicant_____
3. Address_____
4. Citizenship_____
5. Capital stock of company_____
6. Names of directors_____
_____
_____

7. Purpose of station:

(A) Give full details, including convincing reasons why such station will be in the interest and of value to the public_____
_____

(B) If relay broadcasting, what station will it work with? Give full details_____
_____

(C) What type and power of equipment will be used? Attach description
_____
What width of frequency band will be required for each channel requested?_____
_____
What limits of variation will be guaranteed? State method of frequency control to be used_____
_____

(D) How many frequencies desired? _____
What will be the area of reception served by the transmitting station? _____
_____
What will be the hours of operation? _____
_____
Power of transmitter (radiated)? _____
What will be the nature of programs broadcasted? _____
_____
_____

(E) Will the station be operated for advertising purposes of a private interest or will it be open to general public-service advertising in any form? _____
_____
_____
_____

Date _____

-- _____
(Signature of applicant)

APPENDIX M (4)

Partial list of persons at broadcasting conference on April 23, 1928

Clive B. Meredith, WSYR, Syracuse, N. Y. (owner).
Ex-Senator A. O. Stanley, 1317 F Street NW., Washington, D. C.
Morse Salisbury, chief, radio service, Department of Agriculture.
E. E. May (owner), KMA. Shenandoah, Iowa.
J. C. Rapp, radio station, KMA. Shenandoah, Iowa.
J. F. Sinn, KSO, Clarinda, Iowa.
E. A. Davies, WIP, Philadelphia, Pa.
Daniel G. Murphy, WCAU, Philadelphia. Pa.
Willard S. Wilson, radio station WDEL, Wilmington, Del.
Charles E. Campbell, president, Camith Corporation (owners WKBO), Jersey City, N. J.
H. L. Andrews, WKBO, Jersey City, N. J.
Harold R. Young, 1009 Munsey Building, Washington, representing National Retail Dry Goods Association.
Dailey Paskman, director radio station WGBS, Gimbel Bros., New York City.
Ellis A. Gimbel, jr., Gimbel Bros., New York City.
Alfred J. McCosker, station WOR and Columbia broadcasting system of 17 stations.
Paul Schubert, 56 West Ninety-seventh Street, Putnam's Syndicate, New York City.
F. P. Guthrie, Radio Corporation of America.
R. H. Langley, director of engineering, Crosley Radio Corporation, station WLW, Cincinnati, Ohio.
W. J. Damm, WTMJ, Milwaukee Journal, Milwaukee. Wis.
Robert H. Marriott, consulting engineer, 1470 East Eighteenth Street, Brooklyn, N. Y.

Congressman Lloyd Thurston, of Iowa.
Louis B. F. Raycroft, vice president, National Electrical Manufacturers Association.
Ray H. Manson, chief engineer Stromberg-Carlson Telephone Manufacturing Co., Rochester, N. Y.
Leon Levy, station WCAU.
George Schubel, WHN, 1540 Broadway, New York City.
M. A. Leese, WMAL, Washington, D. C.
Charles I. Stengle, WTFF, Mount Vernon Hills, Va.
William C. Green, station KSTP, St. Paul, Minn.
C. W. Horn, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
C. B. Jolliffe, Bureau of Standards, Washington, D. C.
L. J. Shields, KSTP, National Battery Broadcasting Co., Wescott, Minn.
E. A. Beane, stations WJDD and WCFL, Chicago, Ill.
Louis G. Caldwell, representing stations WGN, WLIB, WTAS, WGES, WTMJ, and WRRS.
John M. Clayton, secretary, Institute of Radio Engineers, New York, N. Y.
C. M. Jansky, jr., consulting radio engineer.
L. E. Whittemore, Institute of Radio Engineers.
M. B. Lowe, city of Tulsa, Okla.
E. H. Gager, station WENR, Chicago.
Congressman O. J. Kvale, of Minnesota.
Edwin M. Spence, director WPG, Atlantic City, N. J.
J. P. Lorentzon, assistant counsel Bankers Life Co., Des Moines, Iowa, station WHO.
John E. Wing, stations WENR and WBCN, Chicago, Ill.
William H. Heinz, manager, station WHO, Des Moines, Iowa.
Oswald F. Schuette, Radio Protective Association, Chicago, Ill.
W. H. Leathers, manager, radio and Government sales, Graybar Electric Co., 420 Lexington Avenue, New York City.
J. C. Gurney, WNAX, Yankton, S. Dak.
Edgar H. Felix, contributing editor, radio broadcast and technical adviser to the Federal Radio Commission, Ridgewood, N. J.
Samuel J. Gellard, president, Voice of Brooklyn (Inc.), Brooklyn, N. Y.
Harold E. Gray, WJAY, Cleveland, Ohio.
Stanley W. Barnett, WBAL, Baltimore, Md.
G. W. Cooke, WBAL, Baltimore, Md.
W. S. McCochren, WMBS, Harrisburg, Pa.
J. A. Reinemund, KFNF, Shenandoah, Iowa.
Rev. B. Bryan Musselman, WCBA, Allentown, Pa.
A. J. D. Haines, WSAN, Allentown, Pa.
George O. Squier.
Lester E. Noble, representing Radio Manufacturing Association, Buffalo, N. Y.
Mellen C. Martin, representing stations WGH, WFIB, and WTAS, Chicago, Ill.
A. H. Kirchhofer, Buffalo Evening News.
Ralph L. Cherry, Washington Radio News Service.
M. A. Howlett, WHK, Cleveland, Ohio.
R. S. McBride, Washington, D. C.
Edgar L. Bibb, WLS, Chicago, Ill.
Don Searle, KOIL, Council Bluffs, Iowa.
George E. Strong, National Metropolitan Bank Building, Washington, D. C.
Swagar Sherley, Metropolitan Bank Building, Washington, D. C.
G. C. Furness, National Carbon Co., New York City.
Maurice Clements, McGraw-Hill Publishing Co., New York City.
H. J. Bremen, WJAS, Pittsburgh, Pa.
Martin P. Rice, General Electric Co., Schenectady, N. Y.
Charles W. Burton, WEEI, Boston, Mass.
I. R. Lounsberry, WMAK, Buffalo, N. Y.
Arthur B. Church, Stations KMBC-KLDS, Kansas City, Mo.
Manton Davis, Radio Corporation of America, New York City.
K. H. Berkeley, assistant manager Station WRC, National Broadcasting Co.

○