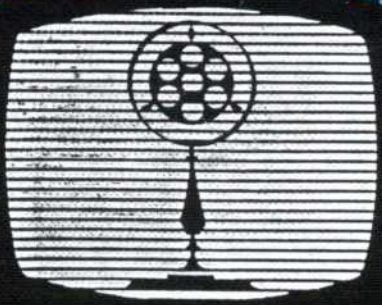
HISTORY OF BROADCASTING:



RADIO TO TELEVISION

Federal Radio Commission

Annual Reports
Numbers 1-7
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HISTORY OF BROADCASTING: RADIO TO TELEVISION

HISTORY OF BROADCASTING: Radio to Television

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ANNUAL REPORT

OF THE

FEDERAL RADIO COMMISSION

TO THE

CONGRESS OF THE UNITED STATES

FOR THE

FISCAL YEAR ENDED JUNE 30, 1927

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1927

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ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION FOR THE FISCAL YEAR 1927

FEDERAL RADIO COMMISSION,
Washington, July 1, 1927.

To the CONGRESS OF THE UNITED STATES:

The Federai Radio Commission submits herewith its report for the fiscal year ended June 30, 1927.

The passage of the radio act of 1927 presented a situation without parallel in the history of American executive departments. A wholly new Federal body was called into being to deal with a condition which had become almost hopelessly involved during the months following July 3, 1926, when it had become clear that the Department of Commerce had no authority under the 1912 radio law to allocate frequencies, withhold radio licenses, or regulate power or hours of transmission. The new law itself was, of course, totally untested, and the Federal Radio Commission was called upon to administer it with no clear knowledge as to the limitations which might be created by subsequent court action.

The act embraces the whole field of radio communication, but public interest was concentrated almost wholly on the single section of it devoted to radio broadcasting. The problems of point-to-point radio communication, of radiotelegraphy, of marine wireless, of power transmission, etc., though of vast importance, did not present such an urgent need for immediate action as the utter confusion within the broadcasting band. Public opinion assumed that the prime purpose of the law in creating the Federal Radio Commission was the immediate establishment of a sound basis, in the interest of the radio broadcast listener, for the orderly development of American broadcasting.

For this reason the work of the Federal Radio Commission from its first meeting, on March 15, 1927, up to June 30, was devoted almost exclusively to clearing up the broadcasting situation. With the physical capacity of the available channels, or wave lengths, already far exceeded by the number of stations actually in operation, and with no provision in the law for the Federal acquisition or condemnation of broadcasting stations in order to reduce the total number, the commission found it necessary to evolve some plan whereby, without any unconstitutional exercise of arbitrary authority, the listening public could receive more dependable broadcasting service, and whereby a gradual and orderly development could be counted on to bring about a progressive reduction in radio interference.

The following record, taken largely from the orders and bulletins of the commission, outlines the steps whereby this plan was evolved and put into execution. These steps were, in brief, four: First, the determination of the best scientific opinion through a series of public

hearings; second, the internal organization of the commission, handicapped as it was by lack of funds, to handle the enormous amount of documentary material which was required; third, the protection of the broadcasters against liability for unlicensed broadcasting until a suitable basis for the new licenses could be worked out; and, fourth, a complete new allocation of frequencies, power, and hours of operation for all of the existing 732 broadcasting stations to provide adequate local separation and a basis for the gradual elimination of distant interference.

Under the radio act of 1927 the Federal Radio Commission was formally organized on March 15, 1927, as follows:

Rear Admiral W. H. G. Bullard, of Media, Pa., commissioner from the second zone, chairman; Judge Eugene O. Sykes, of Jackson, Miss., commissioner from the third zone, vice chairman; O. H. Caldwell, of New York, N. Y., commissioner from the first zone; Henry A. Bellows, of Minneapolis, Minn., commissioner from the fourth zone; Col. John F. Dillon, of San Francisco, Calif., commissioner from the fifth zone.

Sam Pickard, chief of the radio division, Department of Agriculture, was engaged as acting secretary when the commission was organized. Mr. Pickard was made permanent secretary on April 20. 1927.

ASSIGNMENT OF COMMISSIONERS

Chairman Bullard took direct charge of the radio stations in the second zone, embracing Pennsylvania, Virginia, West Virginia, Ohio, Michigan, and Kentucky.

Commissioner Sykes took charge of the third zone, embracing North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Arkansas, Louisiana, Texas, and Oklahoma.

Commissioner Caldwell took charge of the first zone, embracing Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, District of Columbia, Porto Rico, and the Virgin Islands.

Commissioner Bellows took charge of the fourth zone, embracing Indiana, Illinois, Wisconsin, Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, and Missouri.

Commissioner Dillon took charge of the fifth zone, embracing Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Hawaii, and Alaska.

Due to the lack of funds, the commission was forced to open its offices at the Department of Commerce, where Secretary Hoover provided a suite of rooms formerly occupied by the Bureau of Navigation. It was possible to engage only a small office force, and it has been necessary to economize in every possible way.

When the Federal Radio Commission was inaugurated it found a chaotic condition prevailing in the radio field, for after Government control broke down in 1926 many broadcasters jumped their waves, seeking more desirable channels, regardless of their existing occupants. Even the channels reserved for Canada were appropriated, and split frequencies were used, with only a slight separation of from 1 to 5 kilocycles in many instances.

The problem confronting the commission was to try and bring order out of chaos by placing the 732 broadcasting stations on 89

wave lengths, so as not to create serious interference. The first act of the commission was to continue in force all radio amateur and ship licenses issued by the Department of Commerce and all coastal, point to point, technical, training, and experimental radio licenses, in order that attention might be concentrated on the pressing problems within the broadcasting band.

PUBLIC HEARINGS HELPFUL

For the purpose of providing opportunity for the presentation of general suggestions by the public and by qualified experts as to the methods for reducing interference within the broadcasting law, at its first meeting the commission arranged for a series of public hearings for March 29 to April 1, inclusive.

The subjects assigned for discussion were: Broadening the broadcasting band, limitation of power, reducing frequency separation, simultaneous broadcasting with the same frequency, chain broadcasting, division of time, consolidation of broadcasting service, limiting the members of broadcasting stations, and general discussion.

United opposition to widening the broadcasting band in order to accommodate more stations was expressed at the hearings by representatives of the radio art, science, and industry. Diverse views were presented regarding limitation of the power output, with the general opinion prevailing that this should be determined on the basis of area to be served by the respective stations. Stout opposition was registered also against reducing the frequency separation between channels from 10 to 7 kilocycles, while chain broadcasting in the main was indorsed. It was agreed that a division of time by stations is absolutely necessary to relieve to some extent the congestion on the ether channels.

PROMINENT PERSONS OFFER SUGGESTIONS

Among those who took part in the public hearings and made suggestions for the guidance of the commission were:

Paul B. Klugh, representing the National Association of Broadcasters.
Frank D. Scott, general counsel of the National Association of Broadcasters and the Radio Manufacturers' Association.
Jack Binns, treasurer of the Hazeltine Corporation.
R. H. Langley, treasurer of the Crosley Radio Corporation.
Dr. F. A. Kolster, Federal Telegraph Co. of California.
Dr. Alfred N. Goldsmith, chairman of the board of consulting engineers of the National Broadcasting Co.
C. Francis Jenkins, a noted inventor, of Washington, D. C.
Alfred P. Thom, jr., counsel for the American Railway Association.
George T. Stanton, chairman of committee No. 12, radio and wire carrier system, American Railway Association.
Lamden Kay, Atlanta, Ga., director of station operated by the Atlanta Journal.
L. P. F. Raycroft, vice president of National Electrical Manufacturers' Association.
Ray H. Manson, chief engineer, Stromberg-Carlson Telephone Manufacturing Co.
Robert H. Marriott, consulting engineer of New York, representing the Independent Wireless Telegraph Co.
L. W. Wallace, secretary of the American Engineering Council.
Paul Godley, radio engineer of Newark, N. J.
Samuel A. Waite, Worcester Telegram Publishing Co., Worcester, Mass.
L. C. F. Horle, Federal Radio Corporation, Buffalo, N. Y.
H. B. Hough, Fort Worth, Tex., radio announcer.

Edgar H. Felix, representing Radio Broadcast Magazine.
M. P. Rice, General Electric Co., Schenectady, N. Y.
I. S. Bemis, American Telephone & Telegraph Co., New York, N. Y.
D. A. Beane, radio supervisor, Chicago, Ill.
Dr. J. H. Dellinger, Bureau of Standards.
K. B. Warner, secretary of American Radio Relay League, Hartford, Conn.
P. G. Andrews, representing Newcomb-Hawley (Inc.), St. Charles, Ill.
E. M. Terry, University of Wisconsin.
J. C. Jenson, educator, Lincoln, Nebr.
Edward M. Nockles, secretary of the Chicago Federation of Labor.
C. W. Horn, Westinghouse Electric Co.
G. W. Grignon, radio editor, Wisconsin News.
Alfred J. McCosker, L. Bamberger & Co., Newark, N. J.
Glenn J. Fairbrook, attorney, Seattle, Wash.
Arthur Batcheller, United States radio supervisor, New York, N. Y.
Louis Caldwell, attorney for the Chicago Tribune.
Franklin Ford, radio director, New York, N. Y.
H. C. Crowell, Moody Bible Inst.tute, Chicago, Ill.
A. B. Church, radio engineer, Independence, Mo.
R. S. McBride, consulting engineer, Washington, D. C.
W. D. Jameson, attorney, Shenandoah, Iowa.
G. C. Furness, National Carbon Co., New York, N. Y.
P. A. Green, United States Radio Society.
Alfred E. Waller, managing director of National Electrical Manufacturers Association.
Morris L. Ernst, attorney for American Civil Liberties Union.
Elisha Hanson, attorney for American Newspaper Publishers' Association.
Stephen B. Davis, Solicitor for Department of Commerce.
Dr. T. B. Symonds, University of Maryland.

QUESTIONNAIRE SENT TO ALL APPLICANTS

One of the first acts of the commission was to prepare a comprehensive questionnaire, which was sent to all broadcasters, designed to get information on their stations, especially regarding the kind of public service rendered in the past and their plans for the future. All applicants for licenses were told new allocations would be based on frequencies expressed in kilocycles, proceeding by even tens from 540 kilocycles (representing 555.2 meters) to 1,500 kilocycles (representing 199.9 meters).

Based upon the recommendations made at the public hearings, it was decided by the commission that a separation of 10 kilocycles is absolutely necessary to prevent audible heterodyning of carrier waves.

CANADIAN CHANNELS CLEARED

When the commission assumed office there were 41 American stations on or overlapping the six wave lengths assigned to Canada, and they were summarily removed. To clear the Canadian channels, all broadcasters were notified that under the existing agreement with Canada the following channels will not be assigned for use by American broadcasters:

Wave length	Kilocycles
291.1	1,030
312.3	960
329.5	910
356.9	840
410.7	730
434.5	690

On April 24, 1927, the commission granted temporary permits to all broadcasters who held a license, or an extension thereof, issued by the Secretary of Commerce under the act of 1912. That was done mainly to allow stations to operate without rendering their owners liable to the penalties provided by the radio act of 1927.

AIM AND PURPOSE OF TEMPORARY PERMITS

Explaining the aim and purpose of the temporary permits, the commission issued this statement:

Although the temporary permits to broadcasting stations now being issued by the Federal Radio Commission are designed chiefly to protect broadcasters who were licensed under the 1912 law from incurring the penalties provided by the 1927 act for operating without a license, they will also provide an immediate measure of real relief to the radio listeners. When the new law went into effect there were 129 broadcasting stations operating on frequencies outside of the regularly authorized scale.

Originally licenses were issued by the Department of Commerce to use frequencies on a decimal basis, thereby maintaining the necessary separation of 10 kilocycles between frequencies. After July 1, 1926, however, a considerable number of stations selected intermediate frequencies, realizing that the Department of Commerce had no power to prevent such action. Each station thus operating has created interference on three different wave lengths—on the one on which it is actually operated and on the nearest regular wave lengths above and below.

As no temporary permits are being issued for these intermediate frequencies, and as the Federal supervisors are being instructed to watch carefully for any violation of the terms of these permits, all of the 129 stations which have been creating interference on two wave lengths besides their own will within the next week or 10 days be operating on frequencies where they will create interference only with other stations on the same wave length. In many cases it has not been found practicable, on account of interference, to move the stations to the nearest authorized frequency, and accordingly many of them have been assigned to frequencies in less congested parts of the broadcasting band.

Furthermore, the temporary permits state the maximum permissible power, and in a number of cases, particularly where stations are located in congested residential districts, this maximum power is being materially cut down in the interests of the listening public. Thus, although the temporary permits do not represent any complete attempt to solve the broadcasting problem, which will begin with the issuing of short-time licenses as soon as possible after April 24, the commission believes that these temporary permits will in themselves bring about a certain amount of immediate and very desirable relief to the radio listeners of the entire country.

AN OPEN-DOOR POLICY ADOPTED

An "open-door" policy was agreed upon by the commission. Commissioner Bellows was named director of publicity, and twice a week he held conferences with the Washington correspondents. On these occasions Commissioner Bellows outlined as far as practical the plans of the commission and explained action already taken. The keen interest in the problems before the commission was evidenced by the large attendance at the press conferences. Chairman Bullard in explaining the views of the commission with relation to its contact with the public said on one occasion:

The commission has no desire to arrive at any conclusions without taking the public into its fullest confidence, and while its membership is limited by law to five members yet the commission would like to consider that really every listener and every broadcaster, whether owner or operator, is a potential member for submitting constructive ideas to keep the other channels clear that just

as many stations may operate as possible. To use the words of a former President, the commission believes in "open covenants openly arrived at." The only motto we have is the doormat welcome, and there are no czars, as some newspapers like to suggest; we are all equals—the commission and the public—striving to solve many difficult problems and propitiate the ire of perhaps some disgruntled ones.

AN APPALLING RESPONSIBILITY

The spirit with which the commission approached its task was expressed by Commissioner Bellows in an address before the League of Women Voters at a dinner in Washington on April 29, 1927. At that time he said:

Congress has grasped the significance of radio as a vital force in American life and has recently enacted a law which in many ways is absolutely unique. I know of no other activity, conducted entirely through private enterprise, which has seemed to Congress so important and so complex in its problems as to require the creation of a new and separate branch of the Government exclusively for its regulation. Nor do I know of any other law which, like the radio act of 1927, sets up as the sole guide for the body charged with its administration the interest, convenience, or necessity of the public. That, in just four words, is what Congress has told us to do. We are to determine who shall and who shall not broadcast and how such broadcasting shall be carried on, simply in accordance with our conception of public interest, convenience, or necessity.

It is a rather appalling responsibility. The law tells us that we shall have no right of censorship over radio programs, but the physical facts of radio transmission compel what is, in effect, a censorship of the most extraordinary kind. A broadcasting station is in many ways akin to a newspaper, but with this fundamental difference there is no arbitrary limit to the number of different newspapers which may be published, whereas there is a definite limit, and a very low one, to the number of broadcasting stations which can operate simultaneously within the entire length and breadth of our country. This limit has not only been reached, it has been far overpassed; the demand from every section of the country is to cut down the number of broadcasting stations in the interests of the listening public.

What does this mean? It means that the Federal Radio Commission must say to this person, "You may broadcast," and to that person, "You may not broadcast; there is no room for you." It means, in actual practice, that we can not find suitable frequencies, or wave lengths, even for all of the stations already built and in operation, and that to several hundred applicants for new construction permits we can say only, "We are sorry, but we can see no present hope for you." We must say to John Doe, "You are rendering a service of great value in the interest, convenience, or necessity of the public, and you shall have a good wave length, plenty of time, and ample power," while we say to Richard Roe, "We find your service of less value to the public; so you shall have a poorer wave length, less time, and less power, or perhaps no wave length, time, or power at all."

HARD TO MEASURE CONFLICTING CLAIMS

We can not evade this responsibility, for it is the thing which Congress has told us we must do, and it is the thing which the people of America rightly demand shall be done. The variety of broadcasting service has become infinite; how shall we measure the conflicting claims of grand opera and religious services, of market reports and direct advertising, of jazz orchestras and lectures on the diseases of hogs?

It is for help in making such decisions, wisely and justly, that the Federal Radio Commission turns to you and to those who, like you, have the larger and truer vision of what radio can mean in our national life. Congress has said that we shall administer the radio law in the public interest; we in turn ask you to help us define public interest in such a way that this marvelous agency shall be free to play the great part it ought to play in building up and strengthening the understanding of our people.

Every broadcasting station exists for one sole purpose—the creation of public good will for its owners or for the sponsors of its programs. It will broadcast

whatever it believes will best create and maintain that good will. Very rightly, Congress has held that the broadcaster shall not be subject to governmental dictation as to the character of the material he sends out; the Federal Radio Commission, under the present law, can not and will not interfere with any broadcaster's right to control and censor his own programs. In that matter his relations are not with the Government, not with the commission, but with you. It is for you, the listeners, not for us, to censor his programs. It is for you to tell him when he is rendering, or failing to render, real service to the public, and you may be sure that he will listen to your voices.

PUBLIC MUST GUARD FREEDOM OF AIR

Above all, it is for you, not for us of the commission, to safeguard the so-called freedom of the air. Here is a problem which, because you are primarily interested in radio as a means of political education, touches you very closely. You would be quick to see the danger if there could be only a fixed and rather small number of newspapers and magazines published in the United States; you would rightly fear that the newcomer, the nonconformist, the representative of the minority, would have small chance to present his ideas to the public. This is just the situation which exists in broadcasting and which inevitably must continue to exist unless some fundamental change in the science of radio transmission comes about as the result of new discovery, to make possible a totally unforeseen increase in the number of stations which can broadcast simultaneously.

The radio law tells us that we shall not fix any condition "which shall interfere with the right of free speech by means of radio communication," and yet, if radio communication of any kind is to be possible at all we must sharply limit the number of broadcasting stations. The safeguarding of that right of free speech which is essential to intellectual growth lies in the hands of the broadcasters themselves, and, ultimately, in yours, for it is your good will that the broadcasters are seeking. If they and you do not so safeguard it—if you do not make it clear that your understanding of public interest, convenience, and necessity involves a very broad conception of the obligations of the broadcaster to his listeners—then it may be that Congress will feel that there is need for some amendment to the present radio law, an amendment calling for such Government regulation of radio programs as would manifestly be deplorable if it can possibly be avoided.

LISTENERS TO DECIDE FUTURE COURSE OF RADIO

The future of radio broadcasting is in your hands. The broadcasters exist solely to serve you as listeners; they charge you nothing and they ask only your good will. Congress, recognizing the full significance of the problem, has created this new Federal body, of which I have the honor to be a member, solely to administer the law in your interests. The vast scope of this new medium of transmitting ideas passes all comprehension. Your imaginations can not conceive, even though guesswork may boldly state numbers, of the audience which may listen to a single voice. And it is for you to say whether this potent agency shall be used rightly or wrongly. It is for you to say whether it shall degenerate into a mere plaything or develop into one of the greatest forces in the molding of our entire civilization. It is for you to establish close relations with the broadcasters who serve your communities and to show them that it is to their advantage to use their stations for the highest type of public service.

It is as such a mighty power for linking together all parts of our national life, for making better and wiser citizens of our great country, that the Federal Commission conceives of broadcasting. But we can do only what you tell us you want done. Our present problem is to clear the channels of radio communication; yours is to say what commodities of human thought, of reason, and of art shall be borne on those channels to millions of listeners. Our task is not an easy one; yours is, I believe, in the long run, even harder. But I know the broadcasters, many of them, well, and I know that they are eager for your help and cooperation. It is the glory of democracy that the will of the people rules, and to-day the Federal Radio Commission, created to serve the people of the United States, asks of you that you will do your utmost to create a demand for that kind of radio service which will make our country a better and happier and finer place in which to live.

POWER REDUCED IN RESIDENTIAL DISTRICTS

Owing to constant complaints of interference caused by broadcasting stations using too much power within residential sections, the commission issued an order on May 4, 1927, reducing the power of many stations in the large cities. To improve radio reception in New York, Chicago, and other large cities the commission decided that a separation of 50 kilocycles is necessary between local stations. All allocations were made on that basis.

From the beginning of its existence the commission has been literally swamped, almost daily, with letters and telegrams from listeners and broadcasters. At first the listeners confined themselves to suggestions as to ways and means to improve radio reception. Later many of them were enlisted by certain broadcasters in their fight for special consideration in the allotment of waves and power.

"FANS" TELL HOW TO SOLVE PROBLEMS

Some of the proposals of the "fans" were very helpful to the commission, while others were fantastical and impractical. For the guidance of the commission, Ira L. Grimshaw, of the Department of Commerce, spent several weeks reading 3,000 letters and telegrams. His digest was very illuminating. In brief, it follows:

The following suggestions seem to have been made with considerable regularity and unanimity:

1. Whatever plan is followed, every station must remain exactly on its assigned wave length. A crystal or other control should be required to accomplish this purpose.

2. Stations logically should be classified into the big and the little, or the high power and the low power—the local and the national—the general and the special. The higher-grade stations should have greater range and signal strength and more desirable frequencies upon which to operate. They should be subjected to the minimum of regulation by the Government. The other class should take what is left. They should be purely secondary in everything but regulation.

3. Pirates should be given no consideration. Fundamentally they are persona non grata with the rank and file of radio listeners. They simply interfere with good programs.

4. Directly advertising wares must be either entirely prohibited or greatly restricted. It has been suggested daylight hours only be used for advertising directly.

5. All transmitters should be located outside of cities and congested areas, particularly outside of residential districts.

6. Telegraphic interference is either ruining or seriously jeopardizing broadcast reception in many specific localities. Foreign ships and wandering amateurs are charged with this high misdemeanor.

7. Chain broadcasting is either the greatest blessing or curse of broadcasting. The conclusion is dependent entirely upon either the location of the listener or his particular taste. It is noteworthy that but few suggest the elimination of chain broadcasting. Hours of operations and power limitations and specific frequencies come in for appropriate attention when discussing this subject.

NEW ALLOCATION OF FREQUENCIES REDUCES INTERFERENCE

After spending considerable time and thought on formulating important policies and basic principles the members of the commission mapped out a new allocation of frequencies and power which was announced on May 24 to become effective June 15, 1927.

The members of the commission found it possible to reassign the stations to frequencies which would, in their judgment, serve as a

sound basis for the development of good broadcasting to all sections of the country with comparatively little interference and heterodyning.

In working out the new national traffic system for broadcasting the commission's first consideration was to devise ways and means to improve radio reception throughout the United States. While large groups of stations—more than 100—were operating in two centers, New York and Chicago, they were given secondary consideration and were not allowed to dominate the situation.

Practically all stations were given new assignments, and listeners were obliged to scrap their old logs. It was found necessary to place several stations on the same wave and to provide for a division of time, in many instances, in order to give all qualified broadcasters a place on the air. For the most part the broadcasters accepted the new assignments with good grace and showed a fine spirit of cooperation. A few of them demurred and instituted court proceedings. But after a more careful study two of them announced that their suits had been withdrawn.

SHORT-TERM LICENSES ISSUED

In announcing the issuance of the new licenses the commission made the following statement:

The new licenses are all for 60 days, during which period the new allocations can be tested by actual practice. The law provides that any broadcaster who is dissatisfied with his allocation may have a public hearing before the commission, and at such a hearing his claim for a specific frequency or power will be considered in all its relations.

The commission recognizes that no scheme of reallocation which does not at the very outset eliminate at least 400 broadcasting stations can possibly put an end to interference. Accordingly, it regards the new allocations, not as creating in any sense an ideal broadcasting situation, but as providing for the first time a sound basis for radio service to the listener. With the cooperation of the public and the broadcasters, the commission believes that it will be possible to improve conditions progressively by an orderly process of actual experience.

Until such experience has been gained, both the listeners and the broadcasters are urged to exercise patience. The listener will, of necessity, have to relog his receiving set and may find considerable difficulty in locating all the stations he desires to hear. The broadcasters will doubtless find that many of their listeners are at first somewhat bewildered by the changes in frequencies. It is the belief of the commission, however, that within a very few weeks the material reduction of local or regional interference, the redistribution of frequencies so as to clear most of the broadcasting channels, and the decrease of power for stations in residential districts will combine to render radio reception in general very much better than it has been in a long time.

Special attention is called to the fact that the commission has no unused frequencies to allocate. Every broadcasting channel is filled to its apparent capacity and in some cases possibly overcrowded. Accordingly, any listener who wants a different allocation of frequency or power for his favorite station, or any broadcaster who seeks increased facilities for service, must be prepared to show specifically what other station should be required to give up its frequency or have its power reduced in order to make possible the desired reallocation.

CONSOLIDATION OF STATIONS

In an address before the National Press Club, on April 30, 1927, which was widely broadcast, Chairman Bullard said:

One of the plans whereby the commission hopes and expects to help the public to get better broadcasting service, and at the same time to bring about

far greater economy and efficiency in broadcasting service, is that of encouraging the consolidation of radio stations through the use of two or more sets of call letters for a single transmitter. This plan has actually been put into operation in a number of places, with admirable results, and the commission is definitely encouraging it as one way to provide better service for the listening public.

In reviewing the work of the commission up to that time, Chairman Bullard said:

When the commission began its work less than six weeks ago, it was apparent that the first requisite was complete and accurate information as to the actual broadcasting situation. The license applications on file with the Department of Commerce merely showed what the applicants asked for; they did not give any adequate information as to just what power and time each station was actually using, and in some cases they did not even indicate whether the station was actually in operation. The sworn statements made by the broadcasters in their new applications for license, together with the applications for construction permits and the detailed reports of the Federal radio supervisors, have given the commission a complete and accurate picture of the broadcasting situation as it really is to-day, and it is on the basis of this picture that the commission is going ahead with the task of reassigning frequencies, power, and time. Remember, that all this assembling of information had to be done by an entirely new body, with no previously existing staff and with very limited funds. Considering the difficulties which had to be overcome, the commission feels that these six weeks have shown a very satisfactory amount of progress and give the listeners just reason to hope and believe that within the next month or two the commission will have gone far toward solving the problem of untangling the traffic on the channels of radio communication.

Although the temporary permits now in force were issued primarily to save the broadcasters themselves from liabilities under the law, they have resulted in a most gratifying improvement in broadcasting conditions. The six waves reserved for Canada have been entirely cleared, and thus an international radio problem has been very largely solved. One hundred and twenty-nine stations which were operating on "split kilocycle frequencies"—that is to say, on wave lengths where each station caused heterodyning both above and below itself—have been reallocated. Maximum power allowances have been materially cut down for stations located within congested residential districts and in cases where acute interference was reported. Although the definite nation-wide reallocation has yet to be carried out, the progress thus far made is most encouraging and helpful.

PRELIMINARY WORK OF THE COMMISSION

Reviewing the preliminary work of the commission while discussing "The big job yet to be done in radio," Commissioner Caldwell, in an address in Chicago June 11, 1927, said in part:

We have had about six years of radio broadcasting. It was in 1921 that the first station (KDKA) started operating, and soon other stations followed. From 1922 to the middle of 1926 radio grew and grew in popularity, sales mounted, and a great new industry was in the making. Then something happened.

In July, 1926, just 10 months ago, the Attorney General of the United States rendered his famous opinion that the Secretary of Commerce, under the radio law of 1912, was without power to control the broadcasting situation or to assign wave lengths. Thus, after five years of orderly development, control was off. Beginning with August, 1926, anarchy reigned in the ether.

As the result many stations jumped without restraint to new wave lengths which suited them better, regardless of the interference which they might thus be causing to other stations. Proper separation between established stations was destroyed by other stations coming in and camping in the middle of any open spaces they could find, each interloper thus impairing reception of three stations—his own and two others.

Instead of the necessary 50-kilocycle separation between stations in the same community, the condition soon developed where separations of 20 and 10 kilocycles, and even 8, 5, and 2 kilocycles, existed. Under such separations, of

course, stations were soon wildly blanketing each other while distracted listeners were assailed with scrambled programs.

Wave lengths assigned to Canada were violated, in spite of repeated warnings from the Government and even personal appeals from members of the President's Cabinet that national good faith and international good will were at stake. Meanwhile 250 new stations had injected themselves into the already overcrowded situation and undertook to find perches on which to light, without respect to the existing stations.

Some of the older stations also jumped their power, increasing 5 to 10 times their output, and as a result delivering terrific heterodyne interference to distant stations that had been previously undisturbed under the orderly radio pattern developed by the former supervising authorities and heterodyne interference between broadcasters on the same wave length became so bad at many points on the dial that the listener might suppose instead of a receiving set he had a peanut roaster with assorted whistles. Indeed, every human ingenuity and selfish impulse seemed to have been exerted to complicate the tangle in the ether.

NEW LAW BROUGHT RELIEF

On February 23 of this year Congress passed the new radio law of 1927, putting great powers of radio control in the hands of a commission appointed by the President to serve full time for one year in clearing up the radio confusion. For the first 60 days of the law, or until April 23, no penalties were enforceable; but on April 24, when fines up to $5,000 and penitentiary sentences up to five years became effective, the commission actively put into effect its plans and operations to clear out the interference.

The first steps were (*a*) to transfer all stations to authorized channels on "even tens" of kilocycles, (*b*) to clear the Canadian waves, and (*c*) to combine interfering stations and tuck them in wherever possible in the spectrum, in order to keep them in operation without interfering with those stations who had remained faithfully on their assigned channels. This was accomplished for the period of the temporary permits, beginning April 24.

REALLOCATION OF ALL STATIONS

During the meantime, with the public given partial relief, it was possible for the commission to make a careful study of the situation, and by painstaking planning arrange for the second big step—a reallocation of all stations in the best interests of the listening public. When this reallocation took effect listeners found that (*a*) for each locality local stations were well distributed along the dial, with minimum separations of 50 kilocycles; (*b*) stations were recognized in terms of position and time on the basis of their demonstrated capacity to serve the public; and (*c*) heterodyne interference between distant stations, in general, diminished. These improvements have been accomplished by repacking the channels according to an orderly plan, actually increasing the capacity of the 89 channels available, in much the same way that a lumber bin which appeared full when lumber had been carelessly thrown into it from all directions can hold considerably more when the lumber is packed in an orderly fashion and the former wasted open spaces avoided.

Sixty-day licenses issued for June 15 to August 15, and the operation of the new allocation will be carefully watched in the light of actual experience during this period, so that necessary changes can be made where interference is experienced. Such actual experience is necessary in view of the irregular and unpredictable transmission in different directions which almost every station sends out. If the ordinary station's radiation went out equally in all directions, making the station's interference area a big circle, the task of fitting stations together without interference at minimum distances would be simple; but as every listener knows, some stations are unaccountably heard for many miles in one or more directions while being shut off by natural "barriers" in other directions. Advantage must be taken of all these curious unpredictable phenomena and adjustments made before the new station set-up will be really working at its best. Here only actual experience, and not engineering theory, can be the guide. The commission is therefore likely to continue issuing only short-term licenses of 60 to 90 day duration on through the winter months, in order to test out the transmission conditions during the cold-weather period of greatest radio effectiveness, before any long-term licenses are granted.

PUBLIC HEARING DOCKET

Under General Order No. 12, the commission held 16 hearings before June 30, 1927—the period covered by this report—of broadcasters who were dissatisfied with the allocation as to frequency, power, or time division granted them under the 60-day licenses, effective June 15. Because of his legal training and experience, Commissioner Sykes presided at the hearings at the request of Chairman Bullard. The first hearing was held on May 27, 1927, upon application of Station WJAZ, Mount Prospect, Ill., which sought a change in frequency from 1,140 kilocycles to 770 kilocycles. That application was denied. The other hearings, with decisions of the commission, follow:

May 31.—Station WGS, New York, asked for a change in frequency from 1,170 kilocycles to 710 kilocycles. Denied. Station WGL, New York, assigned 1,170 kilocycles, sought 1,070 kilocycles. Denied.

June 1.—Station WDWM, Newark, N. J., licensed to operate on 1,270 kilocycles, sought 1,070 kilocycles. Application denied.

June 2.—Station WGES, Chicago, assigned 1,240 kilocycles, sought 920 kilocycles. Denied.

June 8.—Station WGCP, Newark, N. J., assigned 1,070 kilocycles, sought 810 kilocycles. Denied. Station WLWL, New York, assigned 1,020 kilocycles, sought 810 kilocycles. Approved.

June 10.—Station WBT, Charlotte, N. C., assigned 500 watts power, sought 1,000 watts. Application approved for period 7 a. m. to 7 p. m. Station WGBI, Scranton, Pa., assigned 100 watts, sought 500 watts. Granted 250 watts.

June 14.—Station WBBR, Brooklyn, Assigned 1,170 kilocycles, sought 660 kilocycles. Denied.

June 21.—Station WCGU, Sea Gate, New York Harbor, assigned 1,420 kilocycles, sought 970 kilocycles. Denied. Station WBRS, Brooklyn, N. Y., assigned 1,420 kilocycles, sought 760 kilocycles. Denied.

June 22.—Station WBNY, New York, assigned 1,270 kilocycles, sought 1,070 kilocycles. Denied. Station NHAP, New York, assigned 1,270 kilocycles, sought 1,070 kilocycles. Denied. Station WGBB, Freeport, N. Y., applied for permission to remain at assigned frequency of 1,220 kilocycles. Granted.

GENERAL ORDERS ADOPTED

General orders adopted by the commission outline succinctly the policies agreed upon as the most effective way to put into effect the radio act of 1927. Those approved up to July 1, 1927, follow:

EXTENSION OF AMATEUR AND SHIP LICENSES

[General Order No. 1, March 15, 1927]

The Federal Radio Commission, under authority of the act of February 23, 1927, hereby extends the force and effect of all radio amateur and ship licenses issued by the Department of Commerce from and after this date until further orders from this commission, this extension to be of the same force and effect as though new licenses had been issued by this commission, subject to such general regulations as this commission may from time to time issue.

PUBLIC HEARINGS

[General Order No. 2, March 15, 1927]

For the purpose of providing opportunity for the presentation to the Federal Radio Commission of general suggestions as to methods for reducing interference within the broadcasting band, but not for hearing individual claims or complaints, the Federal Radio Commission hereby sets the dates of Tuesday,

March 29, Wednesday, March 30, Thursday, March 31, and Friday, April 1, for public hearings, to be held in the offices of the Federal Radio Commission, Commerce Building, Washington, beginning each morning at 10 o'clock.

EXTENSION OF LICENSES

[General Order No. 3, March 29, 1927]

All coastal, point-to-point, technical and training, and experimental radio-station licenses in force on the 22d day of February, 1927, are hereby extended until the further order of the commission.

BROADCASTING FREQUENCY BAND

[General Order No. 4, April 5, 1927]

In view of the manifest inconvenience to the listening public which would result from any immediate widening of the frequency band devoted to radio broadcasting, the Federal Radio Commission will not at this time allocate to broadcasting stations frequencies other than those between 550 and 1,500 kilocycles (545.1 to 199.9 meters), except on specific request of such stations. It believes, however, that the band between 1,500 and 2,000 kilocycles (199.9 to 149.9 meters) should, so far as may be practicable, be held open for experimental work in broadcasting and allied forms of radio service, to the end that, with the further development of the art, this band may be eventually made available for broadcasting, whether for the ear or the eye, if it shall prove particularly well adapted to such type of service to the public.

EXTENSION OF BROADCAST LICENSES

[General Order No. 5, April 5, 1927]

On Sunday, April 24, at 11.59 p. m., terminates the period of 60 days during which, under section 40 of the radio act of 1927, no holder of a license or an extension thereof issued by the Secretary of Commerce under the act of August 13, 1912, is subject to the penalties provided in the radio act of 1927 for operating a station without a license.

The Federal Radio Commission will issue a temporary permit to operate a radio broadcasting station, good only until final action is taken by the commission on the application for license, to each holder of a license or an extension thereof from the Secretary of Commerce under the act of August 13, 1912, whose application for a license under the radio act of 1927 has been received by the Federal Radio Commission on or before April 24, 1927, and such temporary permit shall, until withdrawn, be considered as having the force and effect of a license in so far as the penalties provided in the radio act of 1927 are concerned.

After April 24, 1927, any person operating a radio broadcasting station otherwise than under the authority of such a temporary permit or a license issued by the Federal Radio Commission will be deemed by the commission to be operating a broadcasting station without a license.

LICENSES FOR PORTABLE STATIONS

[General Order No. 6, April 26, 1927]

Since the exact location of any radio broadcasting transmitter is an essential feature of the license, the Federal Radio Commission, as already announced, will not consider any application for a broadcasting license, except for a very limited period of time, in which the permanent location of the transmitter is not specified. However, for the purpose of enabling so-called portable stations which were duly licensed under the law of 1912 to render service to the public during the spring and summer months, the Federal Radio Commission will issue to such stations licenses for not more than 120 days, to operate with not more than 100 watts power output, and with frequencies of 1,470 and 1,490 kilocycles only. Any such permit may be revoked by the commission at any time if it be shown that the operation of the station thus licensed is causing interference prejudicial to the public interest.

ONLY HALF KILOCYCLE DEVIATION ALLOWED

[General Order No. 7, April 28, 1927]

The Federal Radio Commission hereby fixes a maximum of one-half kilocycle as the extreme deviation from authorized frequency which will be permitted to any broadcasting station operating under permit or license issued under the terms of the radio act of 1927. The Department of Commerce is hereby requested to notify its proper agents immediately of this order and to direct them to report promptly any apparent violations thereof. Maintenance of the assigned frequency within the limits herein prescribed is the duty of each radio broadcasting station, and violation of this order will be deemed by the Federal Radio Commission cause for revocation of license under section 14 of the radio act of 1927.

To facilitate the execution of this order, each radio broadcasting station is hereby directed, effective 12.01 a. m., local time, Monday, May 9, to announce twice each day, at the beginning and end of its program, that it is broadcasting on a frequency of —— kilocycles by authority of the Federal Radio Commission.

PLAN TO CHECK FREQUENCIES

[General Order No. 8, May 5, 1927]

For the purpose of facilitating a more accurate check on station frequencies both by the Federal radio supervisors of the Department of Commerce and by the public, each radio broadcasting station, licensed under the radio act of 1927, is hereby directed to announce its call letters and location as frequently as may be practicable while it is broadcasting, and in any event not less than once during each 15 minutes of transmission.

It is understood, however, that this requirement is waived when such announcement would interrupt a single consecutive speech or musical number, and in such cases the announcement of the call letters and location shall be made at the beginning and end of such number.

This order becomes effective at 12.01 a. m. Wednesday, May 11, 1927, and will remain in force until further notice.

TO PREVENT SPECULATION IN RADIO STATIONS

[General Order No. 9, May 13, 1927]

Section 12 of the Federal radio act provides that no station license shall be transferred or assigned, either voluntarily or involuntarily, without the consent in writing of the licensing authorities.

It is hereby ordered that any person desiring to purchase a broadcasting station shall make application for a new license to the commission on the application blank forms. In addition thereto, the proposed seller or assignor of the station must also write a letter to the commission to the effect that he desires to sell or transfer this station to the applicant for the above-named license and wishes a license issued to this applicant in place and instead of himself.

The commission may either grant or refuse the license or grant with modification as to frequency and power.

DAYTIME POWER INCREASED IN SPECIAL CASES

[General Order No. 10, May 18, 1927]

For the purpose of facilitating wider and better reception of daytime service programs, such as those of educational and religious institutions, civic organizations, and distributors of market and other news, the Federal Radio Commission will consider applications from holders of broadcasting station licenses for the use, between the hours of 6 a. m. and 6 p. m. local time only, of a larger power output than is authorized by such licenses. Applications for this daytime privilege must be made to the commission in writing and shall specify the maximum daytime power to be used, the approximate daytime broadcasting schedule, and the reasons why, in the applicant's estimation, the granting of such privilege would be in the interest, convenience, or necessity of the public.

In each case where such privilege is granted the Federal Radio Commission will notify the radio division of the Department of Commerce, requesting this division, through the Federal radio supervisors, to check carefully the use of power by such station, both day and night. Any failure to revert to the power specified in the license between 6 p. m. and 6 a. m. will be held cause not only for immediate withdrawal of the daytime power privilege but for reduction of the maximum power authorized for use at night.

TERMINATES TEMPORARY PERMITS

[General Order No. 11, May 21, 1927]

The Federal Radio Commission hereby orders that all temporary permits to operate radiobroadcasting stations under the terms of the radio act of 1927 shall terminate at 3 o'clock, local standard time, on the morning of Wednesday, June 1, 1927, and that thereafter all radiobroadcasting stations subject to the provisions of the radio act of 1927 shall be operated solely in accordance with the provisions of the licenses issued as of June 1, 1927, by the Federal Radio Commission.

RULES FOR HEARINGS BEFORE COMMISSION

[General Order No. 12, May 26, 1927]

In all cases in which the 60-day license, effective June 1, offered the licensee is not in accord with the application, the applicant is hereby notified that the commission has not determined that public interest, convenience, or necessity would be served by the granting of such application.

Any applicant for license who is dissatisfied with the allocation as to frequency, power, or time division granted him in the 60-day license issued by the commission which is effective June 1, and who desires a hearing upon his application, may notify the commission in writing of such desire by June 15, 1927.

The commission will thereupon fix a time and place for such hearing. Pending the hearing and the decision thereon by the commission, the applicant will be permitted to broadcast only under the terms and conditions and in accordance with his 60-day license issued by the commission.

The applicant for license may introduce at the hearing before the Federal Radio Commission any witnesses he may desire. In addition thereto, he may introduce any affidavits relating to relevant facts.

The fact in issue is whether or not public interest, convenience, or necessity will be served by granting to the applicant a license upon the wave length or frequency requested in the application, or in the application as amended in the request for hearing, and with the power therein requested and the place for said station therein designated.

All persons interested in the granting or refusal of the application and the frequency therein applied for, including other licensees authorized to use the frequency requested, licensees upon frequencies where interference is claimed, other applicants for the same frequency, and representatives of the public in general, may appear and will be heard upon any relevant matters. The commission may likewise introduce witnesses or affidavits.

All applications for licenses or copies thereof on file with the commission may be introduced in evidence at the hearing. All temporary permits, temporary licenses or copies thereof, and other records on file with either the Federal Radio Commission or the Department of Commerce may be introduced in evidence at the hearing without any further verification.

The witnesses introduced at the hearing, before testifying will be sworn by a member of the commission. The commission will pass upon the relevancy and competency of the testimony offered to be introduced before it. After the conclusion of the hearing and within a reasonable time the commission will render its decision in writing.

The testimony and proceedings at these hearings will be taken down by shorthand reporters designated by the commission, so that the entire record of the proceedings and hearings may be preserved in case of appeal, as provided by section 16 of the radio act of 1927. All hearings provided for by this order will be public and will be held at the offices of the Federal Radio Commission in Washington.

NEW LICENSES MADE EFFECTIVE JUNE 15, 1927

[General Order No. 13, May 28, 1927]

In consideration of the fact that a certain amount of time is required in many cases for making the changes of equipment required by changes of station frequency and for securing suitable control equipment to maintain frequency without serious variation, the Federal Radio Commission hereby amends General Order No. 11, dated May 21, 1927, to read as follows: "The Federal Radio Commission hereby orders that all temporary permits to operate radio broadcasting stations under the terms of the radio act of 1927 shall terminate at 3 o'clock, local standard time, on the morning of Wednesday, June 15, 1927, and that thereafter all radio broadcasting stations subject to the provisions of the radio act of 1927 shall be operated solely in accordance with the provisions of the licenses issued as of June 1, 1927, by the Federal Radio Commission."

The Federal Radio Commission hereby orders that all licenses for the period of 60 days, issued as of June 1, 1927, shall not become effective until 3 o'clock, local standard time, on the morning of Wednesday, June 15, 1927, and shall continue in effect unless previously revoked or modified by order of the commission, for a period of 60 days after June 15, 1927.

TESTIMONY AS GUIDE TO COMMISSION

[General Order No. 14, June 3, 1927]

Testimony introduced at any hearing relative to any particular station or any particular frequency will, when relevant, be considered as testimony by the commission at any of its subsequent hearings. Applicants may examine these records.

INTERFERENCE HEARINGS

[General Order No. 15, June 7, 1927]

For the purpose of providing an orderly method for the reduction and eventual elimination of interference between radio broadcasting stations operating on the same or on closely adjacent frequencies, the Federal Radio Commission announces the following procedure: "At any time after July 15, 1927, any radio broadcasting station operating under license from the Federal Radio Commission may file with the commission an affidavit certifying that unreasonable and injurious interference with its signals is being caused by the simultaneous operation of another radio broadcasting station, the name or call letters of which must be specified in the affidavit. The affidavit must likewise specify not less than two occasions on which such interference was observed, with the name and address of the person making each of such observations, the type of receiving set used, and the date and hour thereof. On receipt of such affidavit, and if in the judgment of the Federal Radio Commission the interference complained of is actually unreasonable and injurious to the affiant, the commission will appoint a date for a hearing, at its convenience, will notify thereof the parties interested, and on the basis of the testimony presented at such hearing will order such changes of frequency, power, or hours of operation as may appear best to serve public interest, convenience, or necessity."

Respectfully,

W. H. G. BULLARD,
Chairman Federal Radio Commission.

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

▼

COMMISSIONERS

IRA E. ROBINSON, *Chairman*
EUGENE O. SYKES — SAM PICKARD
ORESTES H. CALDWELL — HAROLD A. LAFOUNT
CARL H. BUTMAN, *Secretary*



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1928

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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

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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

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[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	[2] 1,000 [3] 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.	780	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	650	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 [3] 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

[3] 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[4]		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

[4] 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
KOAC	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 [9]		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

[9] 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. K. 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
	1,340 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
	1,330 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.).[9]		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

[9] 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 (38)			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:			
Astoria	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	1,440	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, Vermont	½	½	1
Massachusetts	1½	3	3
Connecticut, Rhode Island	1	1	1
New York	4	7½	7
New Jersey	1½	2½	2
Delaware, Maryland, District of Columbia	1½	½	1
		1	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		Class C	Class B	Class A	Total
Zone I					*Zone III*—Cont.				
Maine		1	1	2	Louisiana	0	2	1	3
New Hampshire		1	1	2	Texas	2	5	4	11
Vermont		1	1	2	Oklahoma	0	2	2	4
Massachusetts	1	4	3	8	Total	6	28	20	54
Connecticut		2	1	3					
Rhode Island		1	1	2	*Zone IV*				
New York	4	10	7	21					
New Jersey	1	4	2	7	Indiana	1	3	2	6
Delaware		1	1	2	Illinois	2	7	5	14
Maryland		2	1	3	Wisconsin	1	3	2	6
District of Columbia		1	1	2	North Dakota	0	1	1	2
Porto Rico					South Dakota	0	1	1	2
Virgin Islands					Iowa	0	3	2	5
					Nebraska	0	2	1	3
Total	6	28	20	54	Kansas	0	2	1	3
					Missouri	1	3	3	7
Zone II					Minnesota	1	3	2	6
					Total	6	28	20	54
Pennsylvania	3	9	7	19					
Virginia	0	3	2	5	*Zone V*				
Ohio	2	6	5	13					
Michigan	1	5	3	9	Montana	0	2	1	3
Kentucky	0	3	2	5	Idaho	0	2	1	3
West Virginia	0	2	1	3	Wyoming	0	1	1	2
					Colorado	1	3	2	6
Total	6	28	20	54	New Mexico	0	1	1	2
					Arizona	0	1	1	2
Zone III					Utah	0	2	1	3
					Nevada	0	1	1	2
North Carolina	1	3	2	6	Washington	1	4	3	8
South Carolina	0	2	1	3	Oregon	0	2	1	3
Georgia	1	3	2	6	California	4	9	7	20
Florida	0	2	1	3	Hawaii & Alaska				
Alabama	1	3	2	6					
Mississippi	0	2	2	4	Total	6	28	20	54
Tennessee	1	2	2	5					
Arkansas	0	2	1	3					

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	B
1,070	Ohio	C	Ohio	C
	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 [1]						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] 430		250	1,320
KGEK	Yuma	Beehler Electrical Equipment Co		[5] 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 / [3] 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 [3]	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		{[4] 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		[4] 5,000	[4] 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.
[7] Construction permit for 10,000 watts issued.
[8] 1,000 watts daytime only.
[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		[13] 500	[13] 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	[8] 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.
[8] 1,000 watts in daytime only.
[13] 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.							
WLWL	Kearny	See New York.		*Watts*			*Watts*	
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	1,320	WCGU-WLTH-WSGH-WSDA.	500	1,400
				CP-250				
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] [22] 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		[37] 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	Beraehah 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.
[10] 2,000 watts in daytime only.
[14] 500 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
	1,280 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		15
KGDA	Dell Rapids, S. Dak.	Home Auto Co.		100
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.		50
KFUR	Ogden, Utah	Peery Building Co.		100
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		50
KFBL	Everett, Wash.	Leese Bros.	KVL	100
KFEC	Portland, Oreg.	Meir & Frank Co.	KFJI	100
KVL	Seattle, Wash.	Arthur C. Baily	KFBL	50
KFJI	Astoria, Oreg.	George Kincaid	KFEC	50
KGFL	Raton, N. Mex.	Lamont A. Hubbard		100
KGGM	Albuquerque, N. Mex.	Jay Peters		
	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 renson 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.
Hieleah, 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.

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THIRD ANNUAL REPORT

of the

FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

Covering the period
from October 1, 1928
to November 1, 1929

▼

COMMISSIONERS

IRA E. ROBINSON, *Chairman*

EUGENE O. SYKES
WM. D. L. STARBUCK
C. McK. SALTZMAN
HAROLD A. LAFOUNT

CARL H. BUTMAN, *Secretary*



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1929

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THIRD ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION, COVERING THE PERIOD FROM OCTOBER 1, 1928, TO NOVEMBER 1, 1929

INTRODUCTION

To the Congress of the United States:

The Third Annual Report of the Federal Radio Commission covers the period from October 1, 1928, to November 1, 1929. The financial statement, however, covers only the fiscal year ended June 30, 1929.

After the resignations of Commissioners Sam Pickard, of Kansas, and O. H. Caldwell, of New York, on January 31, 1929, and February 23, 1929, respectively, there were two vacancies on the commission which continued until May 2, 1929.

Maj. Gen. Charles McK. Saltzman, United States Army, retired, former head of the United States Army Signal Corps, and William D. L. Starbuck, an engineer and patent lawyer of New York, were nominated as members of the commission by the President and were confirmed by the Senate on May 2, 1929.

The principal efforts of the commission during the year have been in the fields of eliminating erroneous or impracticable features of the general broadcast allocation, designating frequencies for general communication purposes, and providing a proper regulatory basis for the rapid development of the radio art. In these efforts basic policies have been outlined as clearly as the state of radio technique has permitted and future developments may be expected upon a sound regulatory background.

Efforts have been made, by rules and regulations, to codify the regulatory features for all types of radio stations in order to obtain the widest and most useful public service.

During the year the commissioners personally reviewed and passed upon 6,927 applications. Two hundred and twenty-nine hearings were held before final action on these applications.

The surprising manner of the growth of radio communication during its progress from experimental to established uses has required constant study and research by the commission in order that its decisions may conform to sound principles of law, physical science, and economics.

Applications for use of radio facilities made by newspapers and press associations, public and private point to point telegraph companies, aviation, municipalities for fire and police use, geophysical exploration, Alaska packers, ship and coastal services, and certain portable services have presented important problems of national scope.

In the broadcasting field the commission permits a maximum deviation of one-half kilocycle from the assigned frequency. To meet the requirement, broadcasting stations are being urged to install modern control equipment. This will eliminate much of the heterodyne interference.

Standardized designation of the frequencies above 1,500 kilocycles has been adopted.

The commission, on May 20, 1929, decided that licenses for experimental stations, including relay broadcasting, visual broadcasting, and experimental aircraft, will be issued for periods of one year instead of three months as heretofore.

Experimental stations can be used only for experimental purposes. They are not licensed to conduct message traffic of any kind.

A suitable, economical, and comprehensive plan for the radio requirements of aviation has been adopted. To coordinate the use of radio facilities as an aid to aviation and to secure a maximum of flexibility, certain frequencies were set aside solely for aviation.

The commission has adopted a policy of issuing licenses (as far as practicable) for point to point stations, for general communication purposes, only to individuals or corporations which have assumed a public utility obligation as common carriers.

Television, even in its present experimental stage, requires frequency bands at least 100 kilocycles in width. Some scientists estimate that a band in excess of 1,000 kilocycles in width may be necessary to give satisfactory detail in a moving picture transmitted by radio. Very serious problems will soon confront the commission if frequency bands are to be made available for regular television service.

The problems before the commission are so numerous, important, and ramified that it is possible to give only a mere outline in the space of this report. For reasons of economy, it is thought advisable to include only major acts and policies. Numerous tables of the type included in the second annual report are not included. Many matters of a technical and scientific nature are also omitted in order to confine this report to reasonable size. Detailed information regarding decisions, permits, and licenses, and data on which they are based, are available at the offices of the commission.

The range of radio-frequencies is assumed to extend from 10 to 60,000 kilocycles, although frequencies above 23,000 kilocycles are still in a laboratory or experimental stage of use. The entire range is referred to as the radio spectrum, generally considered as consisting of three major ranges of frequencies, usually described as (1) the low-frequency (long wave) range; (2) the broadcast band, and (3) the high-frequency (short wave) range.

A comprehensive view of this spectrum showing the different "channels" and their uses can be had by reference to the colored chart made a part of this report,[1] which was prepared by the engineering division.

Much attention is given by the commission to the legal aspects of radio regulation. Many important steps taken by the commission are being challenged in the courts. Litigation has, however, had the effect of settling some of the commission's problems.

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[1] See page 14.

While radio broadcasting has made progress, much remains to be desired. Many programs are still of doubtful value. Offensive sales talks are too common. The attitude of the listening public will tend ultimately to cause the correction of such defects.

The radio act specifies that the commission shall exercise no censorship over programs. Nevertheless, the kind of service rendered by a station must be a means of appraising its relative standing and must be considered by the commission in making assignments.

The commission had at all times the hearty cooperation of the radio division, Department of Commerce. The constructive assistance of its head, Mr. W. D. Terrell, and his staff, has been of great value.

The State Department has maintained a constant interest in the international phases of radio regulation, cooperating with the commission as to representation at international conferences, and furnishing it with many comprehensive reports on the progress of radio communication throughout the world.

I. FINANCIAL STATEMENT

(July 1, 1928, to June 30, 1929)

Appropriation

Total appropriation	$355, 182. 88

Expenditures

Total salaries, departmental service	203, 553. 11
Supplies and material	55, 127. 37
Communication service	2, 277. 37
Printing and binding, etc	9, 520. 82
Travel expenses, etc	4, 866. 12
	275, 344. 79

II. PERSONNEL AND ORGANIZATION

Due to the increased number of applications and the greater scope of the commission's regulation it has been necessary during the year to increase the personnel in every section and division. The total personnel on July 1, 1928, was 31, including the commissioners. This had increased to a total of 90 on July 1, 1929.

1928		1929	
Commissioners	5	Commissioners	5
Commissioners' secretaries	5	Commissioners' secretaries	5
Secretary's office	5	Secretary's office	8
Legal division	3	Legal division	16
Engineering division	5	Engineering division	16
Press	1	Press	3
		Investigation division	2
License division	3	License division	17
		Disbursing office	1
Personnel and supplies	3	Personnel and supplies	7
		Correspondence section	4
Files	1	Files	6
Total	31	Total	90

A. ORGANIZATION FOR ADMINISTRATION

The following rules and regulations were passed by the commission on September 10, 1929, to facilitate its work:

For the internal management of the commission the following regulations are adopted:

1. *Legal division.*—One member of the commission will have general supervision over the policies, activities, and conduct of the legal division, and shall consult with the general counsel with reference to the management thereof. * * *

2. *Engineering division.*—One member of the commission will have general supervision over the policies, activities, and conduct of the engineering division, and shall consult with the chief engineer with reference to the management thereof. * * *

3. *Field investigations.*—One member of the commission will have general supervision over investigations made by the commission, and will consult and advise with the general counsel with reference to legal matters thereupon arising. * * *

4. *Liaison.*—One member of the commission is designated as liaison member and in this capacity will be responsible for contacts with governmental and quasi-public bodies interested in the regulation and advancement of radio communication. He shall represent the commission wherever advisable at meetings of the interdepartmental radio advisory committee, and interdepartmental committee for coordination of activities in aid of aviation, the Army Signal Corps, the division of naval communications, the radio service of the Bureau of Standards, etc. He will also keep in contract with proposals for international conferences and conventions.

5. *Secretary.*—Except as above indicated the secretary will be the administrative officer of the commission. In this capacity he will have supervision of the license section, personnel and supply, the disbursing officer, mail and files, the typist pool, the messengers, and the maintenance of records and forms. He shall also be in charge of the information service of the commission, and in

this capacity shall supervise the press service and general correspondence of the commission, and shall conduct personal interviews with those seeking information or desiring action.

The secretary shall serve as budget officer and classification officer of the commission and will have final approval of all leave with the exception of that of the general counsel and chief engineer, whose leave will be approved by the commissioners respectively supervising their activities.

* * * * * * *

6. *Committees of the commission.*—The following four subcommittees are established:

(*a*) Hearings, court and legislation.
(*b*) Budget and personnel.
(*c*) Planning and policy.
(*d*) Procedure and publicity.

Ordinarily hearings will be conducted by a member of the hearings committee, or, preferably, by an examiner assigned to that duty. Such commissioner or examiner shall take and report the evidence for decision thereon by the full membership of the commission or a quorum thereof.

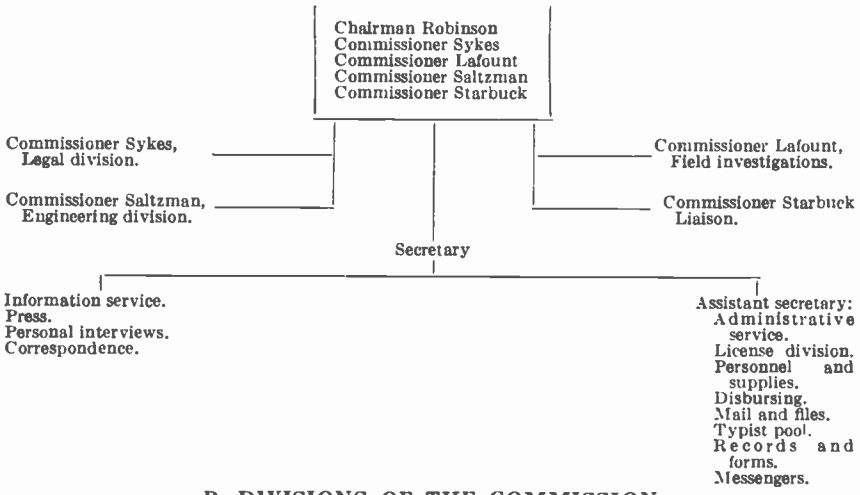
The budget and personnel committee will serve in an advisory capacity to the secretary. The budget and personnel committee will represent the commission in hearings before the Budget Bureau and Appropriations Committee, and before the Personnel Classification Board on the more important positions involving the higher grades and technical personnel.

The planning and policy committee shall actively pursue studies along the line of planning and policy and shall initiate and present definite recommendations to the commission.

The procedure and publicity committee shall interpret and give force and effect to all policies laid down by the commission by the presentation of appropriate orders and regulations, and by the supervision of the publicity policy.

7. The following is adopted as the official organization chart of the commission:

FEDERAL RADIO COMMISSION



B. DIVISIONS OF THE COMMISSION

1. The Secretary's Office

The functions of the office of the secretary have been as follows:

(1) Administrative.
(2) Contacts.
(3) Minutes.
(4) Correspondence.
(5) Information.

The secretary, as administrative officer of the commission, has exercised supervision over clerical personnel, budget relations and disbursements, purchase of supplies, printing and binding, clerical details in connection with handling applications and issuing licenses, and notifications and orders of the commission.

In order to relieve individual commissioners of routine duties, the secretary's office has handled relationships with various Government departments, such as the Bureau of the Budget, Civil Service Commission, Personnel Classification Board, General Accounting Office, Treasury, and the Department of Commerce. As far as possible, the secretary's office has relieved the commissioners of personal interviews with licensees, applicants, and the general public.

The secretary's office recorded the minutes of the commission and made them available to the public.

A great volume of mail from enthusiasts and applicants has been handled.

The secretary has on occasion furnished statistical information to the commissioners and to Members of Congress.

a. LICENSE SECTION

The license section of the secretary's office issues formal authorizations and notifications, based on decisions of the commission.

This section operates as a medium in direct contact with the Radio Division, Department of Commerce, through which all applications are received and all forms of authorization are transmitted to applicants. It also maintains relationship with the airways division, Bureau of Lighthouses, Department of Commerce, to which division all applications for aeronautical and aircraft radio stations are referred for certification, in order that action of the commission on such applications may be in accord with policies of the airways division.

For statistical purposes, several filing arrangements have been installed for the maintenance of records of applications received and the recording of action of the commission relative thereto.

To maintain adequate records, three receiving desks were established to record incoming applications, one for broadcasting, one for ship services, and one for other services. Through these three desks a total of 6,927 applications were received during the year ending June 30, 1929, all of which were entered of record and assigned working file numbers according to service. For identification purposes it was also necessary to assign working file numbers to the large number of applications pending July 1, 1928. The applications were acknowledged and action sheets prepared showing all pertinent facts of existing licenses or construction permits and all changes requested in the current applications. Lists of applications received, with a synopsis of each request, are prepared daily for the information of the commission and the press bureau. All applications received were given a preliminary examination to determine whether or not they were in proper form.

A large number of applications are returned to applicants because they are improperly signed or executed, had alien officers or directors, or were otherwise not in proper form.

A transfer desk was created to record and control the movement of applications to and from the various divisions and offices of the commission and the Department of Commerce.

Forms of authority were prepared and issued to 6,433 approved applicants.

Hearing notices indicating the place and date of hearings were prepared and mailed to 1,744 applicants whose applications were designated for hearing. Applications of those who did not indicate a desire to be heard or who failed to appear at their hearings were submitted to the commission for further consideration. A majority of these applications were denied.

A station history record file was established to show all changes made in the location of apparatus, power, frequency, hours of operation, and ownership. A file was also established to record, in chronological order, all applications received. A master record, by kilocycles, has been kept to date, showing stations assigned to each frequency. A similar record, alphabetically by call letters, has also been kept to date. A register of applications has been established. It was also found necessary to compile and maintain records of broadcasting stations according to the States within each zone.

A large volume of correspondence pertaining to procedure, the filing of applications, incomplete applications, and discrepancies has been conducted. Special lists of pending applications and authorized radio stations by services have been prepared. Lists of frequency assignments have been compiled and transmitted to the international bureau of the telegraph union.

Lists of broadcasting stations have been compiled at the beginning of each license term and mimeographed for distribution, one arrangement being by call letters, and the other, by kilocycles of frequency. Supplements to these lists are prepared for release on the first of each month.

A mailing list of all licensees is maintained for transmitting general orders and rules and regulations of the commission.

b. PRESS SERVICE

This bureau has made available radio information and news originating in the commission. Its activities have increased because of the increasing public interest in radio and the decisions of the commission.

A large number of specialized radio writers and representatives of newspapers located throughout the Nation communicate with the bureau daily. The press is furnished with information about applications awaiting commission action, the commission's decisions, licenses, and construction permits issued and a variety of miscellaneous information. The bureau's activities are confined to news, no propaganda being prepared or encouraged, thereby permitting writers to place their individual interpretations on the acts of the commission.

All applications for the erection of new stations or for the modification of station licenses are announced daily.

Decisions of the commission, with proper details, are announced soon after they are rendered. The aim has been to give the public a correct expression of the commission's problems and policies. The

bureau maintains a mailing list and keeps log-book publishers informed of changes in the broadcasting allocation. It was found necessary to install a special filing system to facilitate instant furnishing of press material.

The general public has also freely used this bureau so that constructive information concerning the work of the commission has been constantly available. Until July 1, 1929, a clipping service was maintained. Radio articles in leading newspapers were clipped and sent to the commissioners to inform them of radio developments. This service was discontinued following a ruling by the Comptroller General that no funds of the commission could be used for such purposes.

c. STATISTICAL RECORDS

In order to facilitate the handling of applications, the commission has compiled the following statistical records:

(1) *World list of stations.*—This list consists of a card index system listing all stations of the world by frequencies. It is kept up to date with the lists published by the International Bureau at Berne and all other proper sources of information.

(2) *Frequency charts.*—These charts are similar to the radio spectrum chart which is made a part of this report. A system of colors is used to define the services to which the frequency bands have been allocated.

(3) *Service charts.*—These consist of large outline maps of the United States on which the various stations are marked to show their location. A separate map is used for each service. All coastal stations, for example are shown only on one map with appropriate symbols to indicate frequencies in use at each location.

Maps of a similar nature will be compiled when time permits, showing the location of transmitting and receiving stations in all parts of the world.

2. Legal Division

The increased work of the commission during the past year has called for an increased personnnel to handle the growing volume of legal problems and has necessitated the establishment of the legal division on a permanent basis. Under the supervision of a general counsel and two assistant general counsels the legal division prepares for all litigation in which the commission is involved, assists in the conduct of public hearings, reviews incoming applications and renders opinions relative thereto. The general counsel further acts as advisor to the commission in the preparation of rules and regulations, in construing and defining provisions of the radio act and in the formulation of commission policies.

For purposes of administration the division is divided into five sections:

(1) Litigation.
(2) Hearings.
(3) Research.
(4) Complaint and investigation.
(5) License and authorization.

(1) *Litigation.*—This section advises the commission in the preparation of its statements of fact and grounds for decision in cases which

are appealed under section 16 of the act. It prepares all briefs and and other court papers necessary in the course of litigation. The presentation of cases to the court is under the personal direction of the general counsel, assisted by an assistant general counsel.

(2) *Hearings.*—One or more members of the legal division are present at each hearing conducted by the commission. The attorney so attending advises the commision as to the status of the matter being heard, the rights of respondents and protestants, the admissibility of evidence and other legal questions. On behalf of the commission, he cross-examines witnesses, avoiding, however, the advocacy of the claims of any applicant, respondent, or protestant. In proper cases he also presents evidence in the commission's interest.

(3) *Research.*—In the absence of legal precedents and codified radio laws, constant research work of a legal nature has been necessary. The problems of other administrative bodies have been studied in minute detail with the view of applying existing principles to situations confronting the commission. The research section drafts and correlates the opinions of the general counsel and arranges for the publication thereof. It has charge of the law library and the collection of all special publications which might be of use to the commission. Correspondence from the radio division of the Department of Commerce requesting a legal opinion in regard to the various kinds of applications filed with it is also referred to this section.

The managing attorney, whose duties are somewhat similar to a clerk of court, sets for hearing all cases to be heard by the commission and keeps a calendar thereof. He is responsible for notifying all respondents and interested parties.

(4) *Complaint and investigation.*—All complaints of violation of the radio act or rules or regulations of the commission are referred to this section which keeps a record thereof and sees that all papers and documents are in proper form for action by the commission or for transmission to the Department of Justice. It cooperates with and advises the chief investigator in respect to all matters requiring field investigation and refers to the commission such cases as in its opinion merit revocation of license, denial of application, setting for hearing, etc.

(5) *License and authorization.*—This section prepares and approves all forms of applications and authorizations. Incoming applications, licenses, construction permits, and other authorizations issued under special terms and conditions presenting legal questions are reviewed by it and opinions furnished to the commission. Proposed orders and minutes of the commission are also examined for legality and accuracy.

a. OPINIONS OF THE GENERAL COUNSEL

The commission is constantly confronted with difficult questions involving interpretation and application of the radio act. Legal questions so arising in the course of the commission's duties are referred to the legal division for opinion and the opinions thus rendered are preserved as Opinions of the General Counsel.

During the year the opinions heretofore rendered by the general counsel have been revised and classified, and new opinions have been written. The following is a list of the titles of the opinion thus far presented to the commision by the general counsel:

No. 1. Broadcasting of programs furnished by one radio station to another station.

No. 2. Construction of sections 13, 15, and 17 of the radio act of 1927 in reference to whether a violation of these sections may be the basis for revoking the license of a broadcasting station.

No. 3. Construction of section 11 in regard to whether advertising and slander over the air may be made the basis for refusing a renewal of license.

No. 4. Interception and publication of messages addressed exclusively from one station to another.

No. 5. Construction of section 11 of the radio act of 1927 in reference to whether transmission of television on a channel in the broadcasting band meets the test of public interest, convenience or necessity.

No. 6. Delegation of power to the Federal Radio Commission and validity of the standard to be applied.

No. 7. Licensing of a State or political subdivision under the radio act of 1927.

No. 8. Assignment of broadcasting frequencies to Government stations.

No. 9. Rights reserved by the countries subscribing to the International Radiotelegraph Convention 1927.

No. 10. Operation of radio transmitter aboard ship station by automatic keying device—necessity of properly licensed operator in attendance.

No. 11. Construction of section 1 with reference to amateur licenses.

No. 12. Construction of the radio act of 1927 involving action by the commission as "licensing authority."

No. 13. Jurisdiction of the Federal Radio Commission over the Island of Guam.

No. 14. Jurisdiction of the Radio Commission over broadcasting stations in regard to private debts and claims.

No. 15. Power of the commission to issue ship licenses prior to inspection.

No. 16. Proper licensee for ship stations as between ship owners and a corporation furnishing services in connection with operation of the station.

No. 17. Construction of that portion of section 10 of the act which relates to the signing of an application by applicant under oath or affirmation—Sufficiency of postmaster's seal.

No. 18. Validity of telegraphic authority as a substitute for a permit or a license.

No. 19. Payment of expenses of witnesses summoned to testify on behalf of the commission in hearings held before the commission.

No. 20. Right of the United States to enjoin the operation of a radio broadcasting station.

No. 21. Construction of section 21 of the radio act of 1927 with reference to terms of licenses issued after issuance of construction permit.

No. 22. Power of the radio commission to suspend licenses.

No. 23. Acknowledgment of telegrams received by broadcasting stations.

No. 24. Amateur mobile stations.

No. 25. Relationship of Federal Radio Commission to the Department of Justice under section 16 of the radio act.

No. 26. Nomination and confirmation of Federal Radio Commissioners.

No. 27. Right of broadcasting stations to contract for exclusive service involving the policy of "block booking."

No. 28. Construction of section 13 of the radio act of 1927, with respect to certain application of the Radio Corporation of America.

No. 29. Construction of ownership provisions (secs. 9 and 29) of the radio act of 1927.

No. 30. Application of the act of June 24, 1910, to motor vessels.

No. 31. Necessity for a hearing when frequency is to be changed in a renewal license.

No. 32. Petition of Adrien M. Kelly—concerning advertisement of Lucky Strike cigarettes.

No. 33. Construction of section 21 of the radio act of 1927.

No. 34. Painting and illuminating radio station towers.

No. 35. Construction of the term "commercial correspondence" as used in amateur regulations of September 1, 1928.

No. 36. Construction of section 21 of the radio act in reference to whether a construction permit is required for a portable station built before the act took effect.

No. 37. Construction of section 12 of the radio act of 1927 in regard to the sale, mortgage, or lease of radio stations.

No. 38. Right of the Federal Radio Commission to compel the attendance of witnesses to testify or produce documentary evidence before it.

3. Engineering Division

At the beginning of the fiscal year organization of the engineering division had just commenced. Only two engineers were on the rolls of the commission. Appropriations for engineers did not become available until July 1, 1928. Soon thereafter the commission engaged a chief engineer and several assistants. Within a period of three months four additional engineers were procured and a working organization was inaugurated. Dr. J. H. Dellinger was placed in charge of the engineering division as chief engineer on August 1, 1928, and served until March 31, 1929. Capt. Guy Hill, Signal Corps, United States Army, was appointed acting chief engineer on April 1, 1929.

The engineering division is divided into three sections:

1. Broadcasting section (550 kilocycles to 1,500 kilocycles).
2. Low and high frequency section (10 to 549 kilocycles and 1,501 to 23,000 kilocycles and above).
3. Statistical, drafting, and clerical section.

In general, the work of the engineering division falls under the classifications given below:

1. Reviewing applications and making recommendations thereon.
2. Furnishing expert technical information to the commission.
3. Making detailed studies and report on allocation of frequencies to various services.
4. Furnishing expert testimony at hearings relative to interference, allocation, equipment, etc.
5. Preparation of technical statistics and data for permanent records and plans for future allocations.
6. Cooperation with the State Department and other governmental departments for the purpose of preparing preliminary material affecting international radio problems.
7. Preparing answers to letters that require engineering study.

Due to the large number of applications received, a great deal of the time of the engineering division is devoted to this work as a memorandum report is submitted on each application received.

If an application is not in conflict with international regulations as to frequency assignments, it is examined to see if it complies with the engineering principles approved by the commission. If it does not conflict with these, careful consideration is then given to determine whether the proposed service will cause interference with existing services.

The entire radio spectrum is becoming crowded and the maximum use can not be made of the facilities available unless the proper type of apparatus is used and unless applications are confined to the bands of frequencies allocated to the various services. The division makes recommendations regarding the portion of the radio spectrum that should be assigned to the various services and recommendations regarding the type of apparatus that should be required.

Since the original organization of the commission the duties of the chief engineer have been performed by an engineer borrowed from some other department of the Government. On account of the importance of the engineering problems of the commission it is believed that the commission should have this position permanently filled by its own engineer, and it is recommended that legislation be enacted establishing the position of chief engineer, with a salary commensurate with the importance of the work.

4. Investigation Division

During the past year the organization of the commission was modified so as to include a separate division devoted to investigation. It is under the direction of a chief investigator, who in turn is under the immediate supervision of one of the commissioners.

The work of this division is divided into two classes: (1) Special legal investigation by direction of the general counsel of the commission, and (2) investigations preliminary to the issuance of a license or permit.

The former are handled under the personal supervision of the assistant general counsel, the result being compiled and given to the commission at and as a part of a hearing.

Investigations of the second class originate in several ways—e. g., by the direction of the commission, by information developed in other investigations, and in some cases on direct information received from a member of the general public.

In order to keep a check on the statements made in applications it is sometimes necessary that a personal examination be made on the premises. Where there is anything questionable about the applicant this can be brought to light by such investigation.

Although the radio division of the Department of Commerce has in the past done police work for the commission, this did not include such work as is now contemplated for the investigation division. The duties of the Department of Commerce have been more specifically defined by the radio act and this new activity of the commission is intended to supplement rather than duplicate those activities. The continued cooperation of the Department of Commerce will, to a marked extent, facilitate the work of this division.

The chief investigator will examine into complaints of interference, the presentation of programs reported not to be in the public interest, and whether licensees are putting their assigned frequencies to a beneficial use, as well as to the use for which they were licensed. In addition, reported violations of the commission's regulations or of the radio act will first be investigated by this particular division before such information is turned over to the Department of Justice for prosecution under the penal provisions of the radio act.

80966—29——2

III. ADMINISTRATION AND POLICY

A. THE RADIO SPECTRUM

There is submitted herewith a graphic representation in chart form of the entire range of radio frequencies from 10 kilocycles to upward of 60,000 kilocycles. The various station bands therein included are blocked in with color symbols indicating the uses to which they are susceptible and the services for which they have been designated by international agreement, rules of law, or by allocations or decisions of the commission.*

Determinations of this character must, of course, have a flexibility sufficient to provide for the changing requirements of the radio technique. However, the degree of certainty thus far attained in the distribution to services must tend to a beneficial stability.

1. Low and Intermediate Frequencies

(10 to 550 kilocycles)

The principles governing the allocation of frequencies in the low and medium frequency bands, 10 to 100 kilocycles and 100 to 500 kilocycles, have been established for many years.

Because of the international character of communication in these bands, study was made of foreign assignments before allocations were made.

In the low-frequency band it has been the commission's policy to consider foreign stations operating on frequencies between 10 and 75 kilocycles to have a prior right to such frequencies.

The low-frequency band (10 to 100 kilocycles) is for fixed (point to point) service, and stations therein are of the superpower type. It is obvious that no duplication on the same channel with high power should be permitted. However, intermediate frequency communication is carried out with transmitters of less power, and duplication of assignments may be allowed on certain of these frequencies whenever it is certain that the ratio of power to distance is such that no interference will result between stations. Ships, for example, operating in the Pacific may use the same working frequencies that are assigned to ships operating in the Atlantic.

*Publisher's Note: The chart referred to is reproduced in black and white.

RADIO SPECTRUM

DISTRIBUTION OF CHANNELS

BROADCASTING

1 Clear Channel
2 Regional, Max. 1000 watts
3 Local, Max. 100 watts
4 Canadian Shared (Regional) Max. 500 watts
5 Canadian Shared (Local) Max. 100 watts.

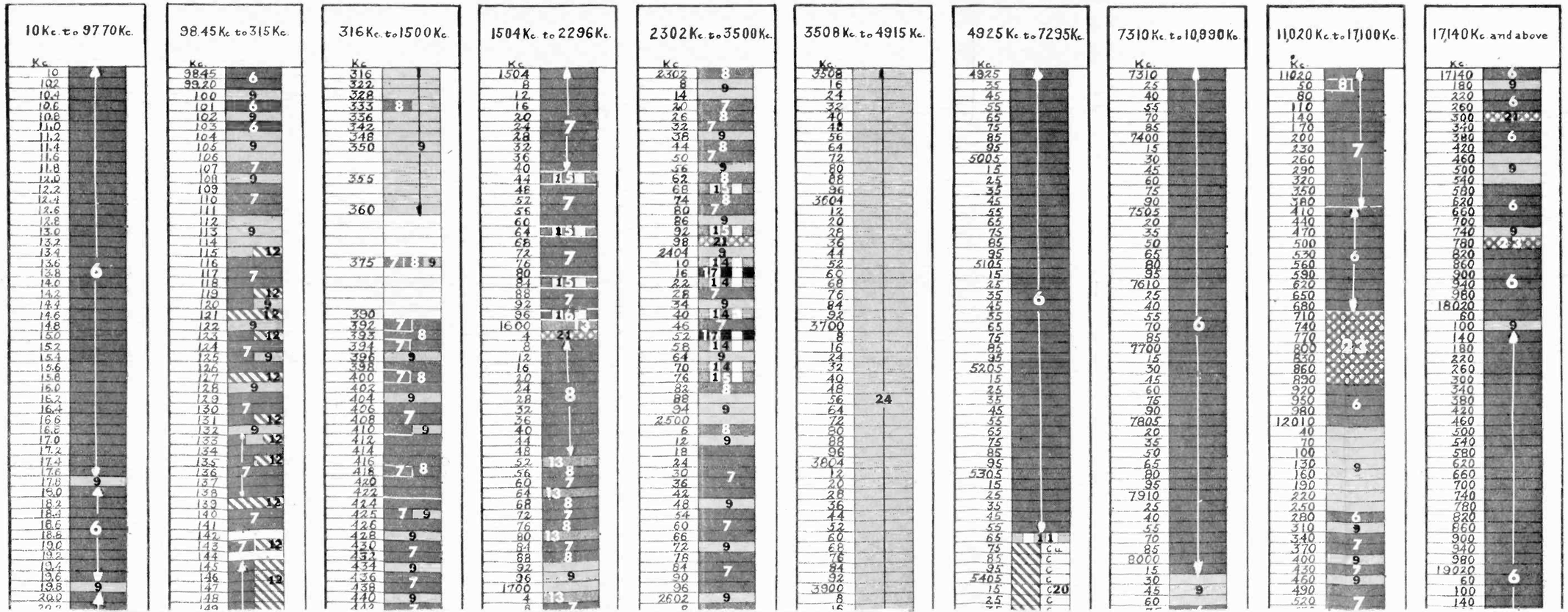
6 Fixed Point to Point
7 Maritime Mobile
8 Aviation
9 Government
10 Emergency
11 Agriculture

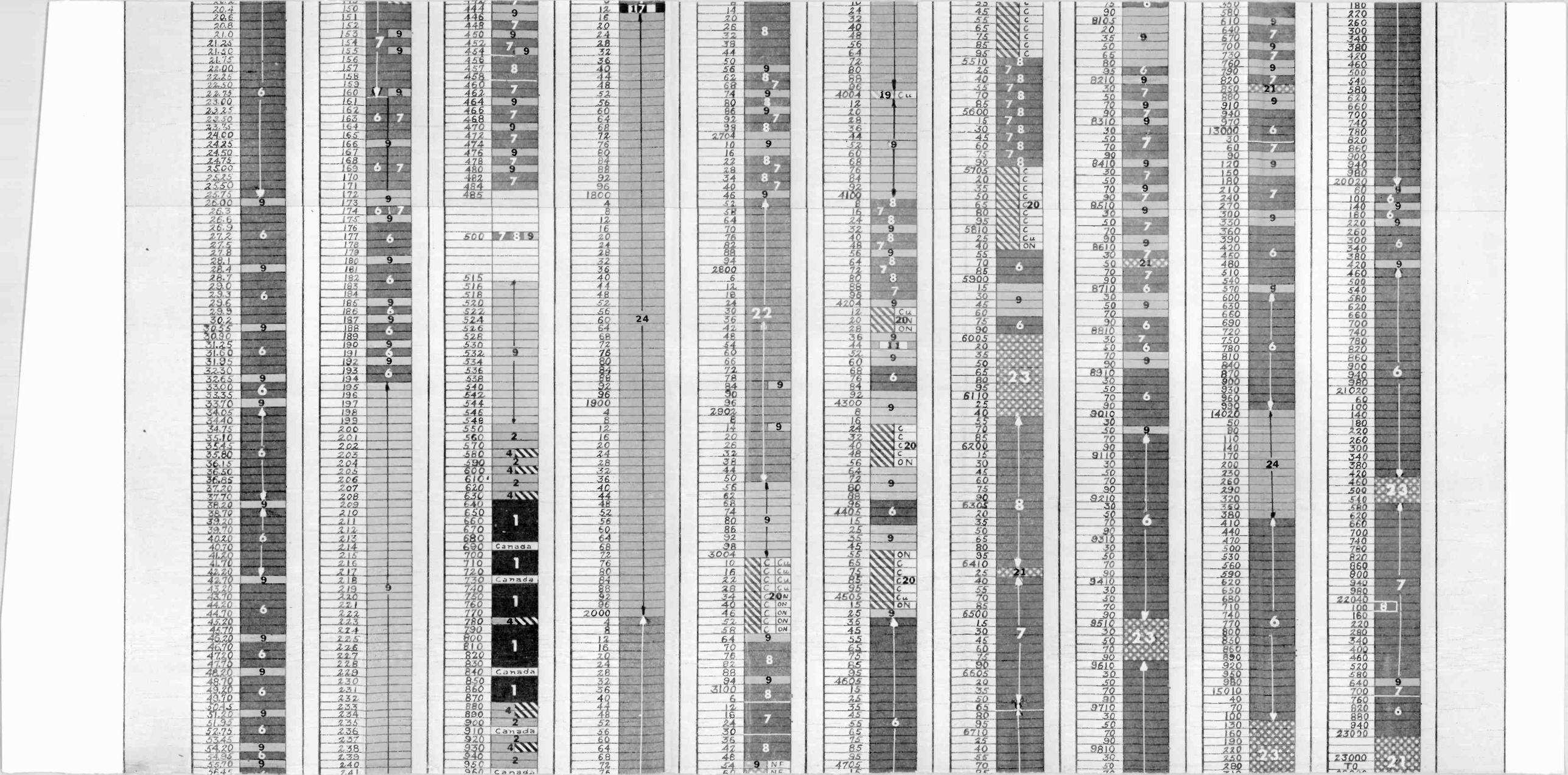
12 Shared with foreign coastal stations
13 Portable (including geophysical)
14 Special Mobile except portable
15 Temporary Mobile
16 Emergency Fire (Marine)
17 Emergency Police

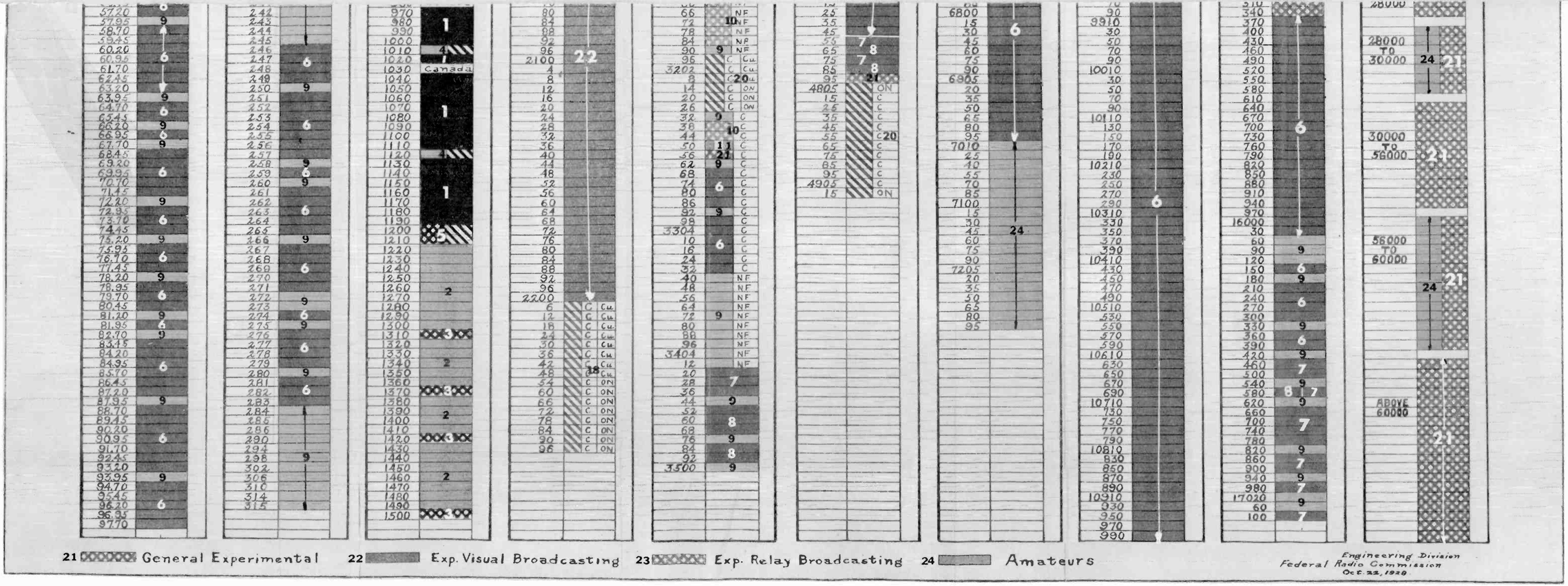
OTHER REGIONS

18 U.S. Stations must not interfere
19 Priority as follows:
20 C - Canada Cu. - Cuba
NF - Newfoundland
ON - Other Nations

Channels shared between services, or between the U.S. and other regions are appropriately marked




Canada
Canada
Canada
Canada
NF
NE


21 General Experimental
22 Exp. Visual Broadcasting
23 Exp. Relay Broadcasting
24 Amateurs
Canada
ABOVE 60000
Engineering Division
Federal Radio Commission
Oct. 22, 1929

a. Allocations to services in the low and intermediate frequency bands

[10 to 550 kilocycles]

Kilocycle band	Service	Channel width in kilocycles	Number of channels	Not available to commission		Channels available to commission
				United States	Foreign	
10 to 21	Fixed	0. 20	56	2	[1] 26	28
21.25 to 26	do	.25	20	1	[1] 8	11
26.3 to 30.2	do	.30	14	1	[1] 8	5
30.55 to 37.2	do	.35	20	3	[1] 7	10
37.70 to 49.7	do	.50	25	4	[1] 3	18
50.45 to 99.2	do	.75	66	14	[1] 8	44
100 to 109	Fixed and mobile	1	10	6		4
110 to 124	Mobile	1	15	4		11
125 to 149	Mobile (marine P. G.)	1	25	2	[2] 6	17
150 to 159	Mobile	1	10	2		8
160 to 194	Fixed and mobile	1	35	10		25
195 to 245	Fixed and mobile (Government)	1	51	51		0
246 to 284	Fixed services	1	39	9		30
285 to 315	Radio beacon (Government)	5	5 [4]	5		0
315 to 350	Air mobile (Government)	6	6	6		0
350 to 360	Mobile (Government)	10	1	1		0
360 to 390	Radio compass	[3] 30	1	[4] 1		0
392 to 460	Air mobile and marine	[5] 2	35	8		[5] 27
462 to 484	Mobile (except damped waves and radio telephony).	2	12	4		8
485 to 515	Mobile (distress call, etc.)	30	1	1		0
516 to 550	Mobile (Government)	2	18	18		0
	Total		465	153	66	246

[1] Foreign stations established on frequencies from 10 to 75 kilocycles, with power in excess of 10 kilowatts are considered to have an exclusive right to such frequencies.

[2] Foreign stations in the reserved wave band (125 to 150 kilocycles) are given priority to such channels, but may be assigned to United States stations where no interference will result to foreign stations.

[3] The band, 360 to 390 kilocycles, inclusive, is reserved for radio compass work on 375 kilocycles.

[4] The radio compass frequency, 375 kilocycles, is available to the commission for assignment to ships and aircraft only.

[5] The band 392 to 460 kilocycles contains channels as follows:

Marine 2-kilocycle channels:		Aviation 6-kilocycle channels:		Government 2-kilocycle channels:	
Exclusive	10	Exclusive	2	Exclusive	8
Shared with Government	3	Shared with marine	3	Shared with marine	3
Shared with aviation	4				
Total channels	17	Total channels	5	Total channels	11

2. Broadcast Band

(550 to 1,500 kilocycles)

The broadcast band extends in frequency from 550 to 1,500 kilocycles.

The band is divided into 96 channels or frequencies 10 kilocycles apart, that separation being considered necessary to avoid interference. Six of these channels are given over for exclusive use by Canadian stations and 11 of the remaining channels are shared by Canadian stations and stations in the United States. There are therefore 79 channels available for exclusive use in the United States and possessions, and 11 additional channels available on the sharing arrangement with Canada.

While many channels are still much overloaded, and there is considerable congestion in some sections, the commission has gradually been reducing the number of stations on the air. When the commission was organized on March 15, 1927, there were 732 stations licensed in the broadcast band. That number had been reduced to 677 on July 1, 1928.

During the past year 28 new stations were added and 121 deleted, leaving the number 584 licensed as of November 1, 1929. On that date, however, the licenses of 20 stations were withheld because no applications for renewals had been received.

New stations have been authorized only in sections of the country lacking radio facilities.

The commission has not seen fit during the past year to make any important changes in the reallocation of November 11, 1928, which is discussed in the Second Annual Report.

Some changes were made in the assignments of stations in Florida and the Middle West for the purpose of improving reception.

During the year the commission has made 54 changes in frequency assignments, 162 changes in power assignments, 31 in the time of operation.

a. NOTE ON SYNCHRONIZATION OF BROADCASTING STATIONS

The commission has received applications from several stations for authority to operate simultaneously with the intention of synchronizing their carrier frequencies to prevent heterodyne interference. Ordinarily the distance between stations on the same frequency must be several times greater than the service radius of the stations to prevent heterodyne interfernce.

If synchronizing could be practically carried out in such a manner that the present heterodyne interference which exists on some frequencies might be eliminated, a great public benefit would result.

At the present time the commission has no knowledge of any synchronizing that has proved of real value except where it has been accomplished by direct wire circuits between stations.

The commission has authorized two stations sharing time on a cleared channel to conduct synchronziing tests. The results of these tests have been unsatisfactory.

The commission has recently authorized additional experiments after midnight; results of these tests have not yet been reported.

b. MECHANICAL REPRODUCTIONS

The commission has repeatedly stated that the paramount interest in radio broadcasting is that of the listening public. There can be no conclusion more definitely established from an examination of the radio act of 1927 than the one that any broadcast which tends to deceive the listening public in any respect is contrary to the public interest, convenience, and necessity.

Throughout its examination of the type of broadcasting being conducted the commission has realized that there is no field in which deception can more readily take place than in the nature of announcements preceding the rendition of selections from a recorded medium. The extreme diversity of the announcements which have been from time to time prepared for use in this connection, and the inevitable tendency of the announcer to state the character of the number in the light most favorable to the station, has made it absolutely necessary that the commission indicate a precise form of announcement for phonograph records, player piano selections, and other mechanical and electrical reproductions of the type that can be obtained by the

public for reproduction upon their own instruments. For this purpose General Order No. 52 prescribes that these performances shall be indicated as "phonograph records," "mechanical piano player," etc. The commission has required that every number be so specifically designated as it is well known that a radio audience is transient and that individual listeners enter into a program at different points in its sequence.

The essence of this paragraph of General Order No. 52 is the prevention of deception and experience of the commission in connection with these matters has compelled the commission to indicate the exact language by means of which that deception must be avoided. This paragraph of the general order has not been intended as a disapproval of phonograph records and similar productions. The question of the use of these instrumentalities is one for the station to determine, and each station's record in connection therewith is judged by the commission upon a basis of a number of factors, such as the time and extent of the use of records, the purposes for which they are used, the availability of local talent, etc. The commission has expressed itself as not believing that the excessive use of these instrumentalities is in the public interest.

An entirely different situation is presented by the type of reproduction referred to in the second paragraph of General Order No. 52.

Thus, it is not beyond the range of possibility that American broadcasting stations will consider it desirable to rebroadcast programs originating in Europe. Because of the great difference of time existing between the European and the American continents an international audience could not ordinarily be secured by the simultaneous broadcast of the same program in both countries. There are indications that it may be necessary to record a European program upon wax or film and rebroadcast that program a few hours later in this country at a time when an audience can be secured.

Similarly there are a number of concerns engaged in the preparation of complete programs for the use of stations. These programs are not ordinary phonograph records available to the general public, but they include musical selections, advertising, and other announcements, and in some instances even the call letters of the station. Such programs are recorded specifically for broadcasting purposes, and the commission does not consider it proper to require that they be described as phonograph records. For this reason such programs have been specifically exempted from that requirement by the terms of General Order No. 52.

This does not mean, however, that the commission is any the less intent upon avoiding deception in this connection. Such programs are not original programs; they obviously do not represent the then existing rendition of present artists. They are generally received by mail, and they represent the intervening instrumentality of a mechanical or electrical recording.

The second paragraph of General Order No. 52 does not give the station using such productions the discretion of selecting any type of announcement it wishes. Stations are specifically required by that paragraph to use only such announcements as do not "deceive, or tend to deceive the public as to the character of the reproduction broadcast."

The station is further required to keep a record of the phrases actually used and is required to communicate such phrases to the commission upon request. Thus the obligation is placed upon the station, as it is placed in so many other features of regulation, to maintain the highest standards of accuracy, fairness, and honesty. The broadcasting of programs of this character with announcements that would in any way tend to deceive the public would, of course, be a feature of the station operation which would justify the commission in refusing to renew the license of the station at the termination of any of its license periods.

The commission does not feel called upon to provide stations with an exact form of announcement to use for programs of this character. It realizes that great ingenuity is being exercised in the preparation of these programs; it realizes that use of such programs under proper circumstances may well be in the public interest. It squarely places upon each station the burden of so announcing such programs that no one can possibly be deceived or led to think that they represent an actual rendition by present artists.

3. High Frequencies

a. General considerations applicable

Owing to the undeveloped state of the art, prior to 1927, practically all communication on a commercial scale was carried on at low or medium frequencies; that is, frequencies less than 550 kilocycles; and the equipment required to carry on efficient and continuous long-distance communication was almost prohibitive in cost. Partly for this reason, commercial communication has until recently been unprofitable.

For certain purposes, under certain conditions, and between certain points, low-frequency transmission is still employed. But for ordinary use in commercial service between relatively distant points high frequencies are almost universally used. Modern high frequency transmitters are less expensive and much more efficient. But the use of high frequencies depended upon developments in the art and the transition from the old to the new form of transmission has required time and expense. Practically all available low frequencies were in use for old established services, mobile and fixed, and it was therefore impracticable, if not impossible, to inaugurate new and extensive services requiring additional low frequencies. Hence, development in the art making high frequencies available has made it possible to reconsider and develop programs for service establishment.

Prior to the period covered by this report, high-frequency channels were sparingly assigned for the reasons that the commission did not think it was sufficiently informed to make an allocation in this band; it was the general principle to which the commission had adhered that licenses should not be granted where the projects involved duplication of the communication facilities; it had not been decided how many high frequencies would be required for governmental services, aircraft, ship, etc.; there was no general agreement among engineers as to the number of frequencies which were available, the separation it was necessary to maintain the service and nuisance

ranges of particular frequencies, etc.; and until the proclamation of the International Radiotelegraph Convention in January, 1929, there was no authoritative guide by which frequencies which have an international service and interference range could be administered.

Applications have been before the commission for the assignment of literally thousands of frequencies more than are available, after the depletions required by treaties, governmental services and services having a paramount to assignment.

Administration has therefore gone forward with the utmost caution.

It must, of course, be remembered that the assignment of frequencies to stations can, under no circumstances, be construed as a gift or grant of such a thing as a "channel." The commission believes that in the field of high-frequency communication, the public interest requires a degree of permanence and certainty. It does not, however, take the position that the designation of a frequency is the grant of a facility. The statutory power of the commission is to issue a license for the conduct of a specific communication service for a limited period of time, not to exceed one year. In order to prevent interference, the commission designates the frequency and power to be used by individual transmitters. The licensing authority must always retain control over these features. It can not make any award or grant of nonexisting channels or frequencies and has not attempted to do so.

b. HIGH-FREQUENCY CHANNELING SYSTEM

The commission by General Order No. 62 ordered that in the frequencies exceeding 1,500 kilocycles per second, a channel of radio communication shall be regarded as a band of frequencies, the width of which varies according to its position in the spectrum. The width increases with frequency according to the following table:

Frequency (kilocycles)	Channel width (kilocycles)	Frequency (kilocycles)	Channel width (kilocycles)
1,500 to 2,198	4	8,210 to 10,980	20
2,200 to 3,313	6	10,990 to 16,405	30
3,316 to 4,400	8	16,420 to 21,960	40
4,405 to 5,490	10	21,980 to 32,780	60
5,495 to 8,202.5	15		

NOTE.—A visual broadcasting channel shall not be more than 100 kilocycles in width. A commercial telephone channel below 3,313 kilocycles shall be regarded as 6 kilocycles in width. A relay broadcasting channel between 6,000 and 9,600 kilocycles shall be regarded as 20 kilocycles in width.

In issuing licenses, the commission specifies the frequency in the center of the particular channel licensed to be used, but authorizes the licensee to occupy a center frequency and, in addition, such adjacent frequencies (within the limit indicated on the above table) as may be permitted by the frequency-maintenance tolerance and required by the type of emission the station may be authorized to use.

The channeling system described above represents an approximate 0.2 per cent basis of separation. If, by international agreement, the world should recognize an approximate 0.1 per cent system of channeling, it will be necessary to revise all existing high-frequency licenses to conform with the new system of channeling.

c. CONTINENTAL BAND

(1,500 to 6,000 kilocycles)

By reason of the provisions of the International Radiotelegraph Convention, and because of the physical characteristics of the emissions at these frequencies, the range of frequencies from 1,500 to 6,000 kilocycles is primarily allocated for the purpose of communication within the limits of the North American Continent. The interference range of frequencies of this order is such that their distribution to services and among nations is properly the subject of regional or continental agreement.

The North American Radio Conference affecting the distribution of channels among countries became effective on March 1, 1929. It remains in force until January 1, 1932, and therefore for an intermediate period, and until one year from the day on which the denunciation thereof shall be made by any two of the contracting parties.

The text of the agreement is available at the Government Printing Office as Treaty Series, No. 777–A.

By its terms the United States is assigned 146 exclusive channels; Canada and Newfoundland, 103 exclusive channels; Cuba, 20 exclusive channels; and other countries, 24 exclusive channels.

The following is a summary showing the allocation of frequencies made by the commission based on the North American Radio Conference:

(1) Summary of Channel Distribution in the Continental Band

[1,500–6,000 kc.]

Service	Class	Total each class (0.2 per cent channels)
Mobile	Ship and/or coastal stations	54
	Ship stations only	2
	Coastal stations only	8
	Mobile press	2
	Temporary mobile	6
	Portable (including geophysical)	5
	Emergency police	3
	Emergency fire (marine)	1
	Special mobile other than portable	5
	Aircraft and/or aeronautical	62
	Aircraft only	1
	Total mobile services	149
Fixed	Point to point (exclusive)	78
	Point to point (shared)	10
	Point to point (exclusive for other nations; United States stations must not interfere)	66
	Total fixed services	154
Experimental visual boadcasting (four 100-kilocycle channels shared with other nations)		84
Experimental visual broadcasting (one 100-kilocycle channel—other nations priority, United States stations must not interfere)		16
General experimental (shared)		4
Agriculture		3
Emergency (shared)		7
Government (shared with other nations)		54
Government (exclusive)		34
Amateurs		134
Total special services		336
Total all services		639

(2) Summary of Domestic Communication Systems Authorized by the Commission

In addition to the extensive mobile, experimental, and special services provided for in this range of frequencies, the commission has been able to allocate frequencies for the development of general public service communication systems. A view of these systems can best be given in tabulated form. The following table indicates their more important features and includes all systems for domestic communication regardless of the range of frequencies employed:

Licensees	Number of cities	Number 0.2 per cent channels 1,500–6,000	Number 0.1 per cent channels 1,500–6,000	Number 0.2 per cent channels 6,000–23,000 [1]	Number 0.1 per cent channels 6,000–23,000 [1]	Number low and intermediate frequency channels 10–550	Comment
Universal Wireless Communication Co.	112	40	76	0	0	0	General public service, point to point; nation-wide system.
Press	Indefinite.[2]	20	36	0	0	0	Public service to all newspapers and press associations on equal terms, multidirectional; also nation-wide system.
Western Radio Telegraph Co.	13	5	8	0	0	4	General public service, point to point, Southwest.
Intercity Radio Telegraph Co.	8	1	1	1	1	4	General public service, point to point, Great Lakes.
Mackay Radio & Telegraph Co.	4	5	8	4	12	12	General public service, point to point, Pacific coast.
R. C. A. Communications (Inc.).	12	20	33	30	35	0	General public service, domestic and international feeder; nation-wide, trunk-line system.

[1] Auxiliary use.
[2] The number of cities to be served by the domestic press communications service is not ascertained because permits have not yet been issued, this being merely a classification. The number of cities served must always be variable due to the multidirectional service to be offered by press associations and syndicates in the distribution of news items to a great many points.

It should be observed that no analysis is here made of point to point services of small scope or of those for specialized traffic such as for communication between airports, etc.

The number of standard channels at 0.2 per cent separation within the band from 1,500 to 6,000 kilocycles, which are assigned to these systems, is shown by the following table:

	United States exclusive	Canadian shared	Canadian exclusive
Universal	35	5	----
Press	20	----	----
R. C. A.	15	5	----
Western	2	----	2
Mackay	5	----	----
Total	77	10	2
Total United States exclusive and Canadian shared	87		----

A discussion of the principles involved in the making of these allocations and the general considerations which indicated the selection of the agencies to be licensed will be found elsewhere in this report at pages 37 to 43.

Visual broadcasting is also conducted in this frequency range. This enterprise is still in an experimental stage and is governed by the following regulations adopted by the commission February 18, 1929:

(3) EXPERIMENTAL VISUAL BROADCASTING

That visual broadcasting be designated to include both television broadcasting and picture broadcasting, or moving-picture broadcasting and still-picture broadcasting, and that all licenses issued be of an experimental nature for a period of six months only, the licensees to report to the commission the results of their experiments; the transmitters to be located outside the city limits and sufficiently distant from important receiving centers to avoid interference.

For joint use to visual broadcasting licensees, the commission authorizes the following bands of frequencies for experimental use only: 2,000 to 2,200 and 2,750 to 2,950 kilocycles. In addition, the commission will authorize the operation of visual radio broadcasting transmitters in the band between 2,200 and 2,300 kilocycles, on the condition that they do not interfere in any way whatever with the services of any other nation on the North American Continent and in the West Indies, and that licenses be subject to revocation in case there are any complaints from any other nation of any such interference. The commission may continue to issue experimental television or visual licenses in the broadcast band for operation between 1 and 6 a. m. only, in accordance with General Order 50.

The commission adopted the following rules of priority in the granting of applications:

1. Those engaged in experimentation to improve the technique of visual broadcasting.

2. Those who employ methods which give the maximum definition with the minimum radio frequency band widths.

Further discussion of experimental visual broadcasting is found below at page 28.

d. TRANSOCEANIC BAND

(6,000 to 23,000 kilocycles)

The band of frequencies between 6,000 and 23,000 kilocycles has been allocated to fixed services for international and national long-distance communication, and to mobile services for maritime and aeronautical communication, so as to conform with the requirements of the International Radio Telegraph Convention.

The following is a summary as of November 1, 1929, showing the distribution of transoceanic channels by the commission:

(1) *Summary of channel distribution in the transoceanic band*

[6,000 to 23,000 kilocycles]

Service	Class	Total each class (0.2 per cent Ch.)
Mobile	Ship stations [1]	16
	Coastal stations	68
	Mobile press	8
	Aircraft and/or aeronautical [2]	18
	Maritime calling [2]	3
	Total mobile services	113

[1] Ship stations may also use coastal station frequencies when directed to do so by coastal stations controlling the frequency.

[2] Aircraft may use ship frequencies when on sea flights.

(1) *Summary of channel distribution in the transoceanic band*—Continued

Service	Class	Total each class (0.2 per cent Ch.)
Fixed	Point-to-point	370
	Relay broadcasting [3]	34
	Total fixed services	404
Government [4]		70
Amateurs		33
General experimental		4
Total special services		107
Total all services		624

[3] Actually there are 31 relay broadcasting channels which conform with the commission's channeling system prescribed in General Order No. 62.
[4] Designated by Executive order of the President.

This frequency range is primarily suitable for long-distance international communication and the international recognition sought for American enterprises in this field required an early assignment of frequencies of this character. This was discussed in the second annual report of the commission. No important reallocation has been made in this field.

(2) Experimental Relay Broadcasting

Relay broadcasting is also conducted in this range. This enterprise is still in an experimental stage and is governed by the following regulations adopted by the commission February 18, 1929:

Relay broadcasting is defined as the transmission on high frequencies over long distances of broadcast programs from one broadcasting station to another such station or stations which rebroadcast the program to the public on the regular broadcast frequency of the receiving station. Licenses will be issued only when applicants agree to arrange for a rebroadcasting on regular broadcast channels of their program transmitted initially on a high-frequency relay channel.

The frequencies designated to be assigned to relay broadcasting stations in North America are:

6,020	6,120	9,570	11,840	15,250	21,500
6,040	6,140	9,590	11,880	15,290	21,540
6,060	9,510	11,720	15,130	15,340	
6,080	9,530	11,760	15,170	17,780	
6,100	9,550	11,800	15,210	21,460	

The use of these frequencies will not be designated exclusively to licensees but will be shared jointly by the licensees authorized to operate experimental relay broadcast transmitters. The commission requires detailed reports from licensees as to the use made of these frequencies and the results accomplished. Based upon results of the experimental licensees, and others which may be designated, the commission may issue licenses for a longer period than six months to those found qualified after six months' experimental operation. The commission will only issue licenses to applicants who are qualified to operate experimental relay stations over long distances, transoceanic or transcontinental, strictly for relay broadcast use or experimental relay broadcasting. The priority of assignment will be given to applicants who present satisfactory evidence that they will provide (1) adequate power for transoceanic distribution, (2) satisfactory programs for transoceanic distribution, (3) adequate and regular reception and distribution of their programs.

Since local broadcasting would utilize for short distances radio frequencies which should be reserved primarily for long distances and would be a duplication

of a possible service available by wire lines, applications for such a service will be considered only in the exceptional cases where wire-line service is not available.

Local broadcasting on these high frequencies would likewise utilize for short distances radio frequencies which should be reserved primarily for long distances and would furthermore duplicate the service given on 550 to 1,500 kilocycles, thus requiring special receiving apparatus on the part of listeners. Local broadcasting will not be permitted on these high frequencies.

Experimental licenses will be granted only to those who are seriously engaged in improving the technique of the art and show satisfactory evidence of being able to contribute substantially toward its progress.

Further discussion of relay broadcasting is found below at page 28.

4. Special Services

b. amateur stations

Both the radio act of 1927 and the International Radio Telegraph Convention specifically recognize amateur stations as an already existing service. The inference follows that they are to be continued and regulated as such.

An amateur station in the words of the convention and the commission's regulations (General Order No. 24) "is a station operated by a person interested in radio technique solely with a personal aim and without pecuniary interest." It follows that they are not under the head of public utilities or subjected to a common-carrier obligation.

In applying the standard of "public interest, convenience, or necessity" to amateur stations, the commission must obviously consider other elements than in the case of commercial stations. Amateurs should unquestionably continue to be licensed, but on the theory their activities are in the public interest and so reconciled with the legislative standard. In addition, it is quite clear that in the case of amateur stations there is no need for choosing among applicants but only the necessity for recognizing an established radio service. In so doing the commission is acting under a general rather than a legalistic interpretation of the phrase "public interest, convenience, or necessity."

The principles here expressed must necessarily guide the radio supervisors of the Department of Commerce when they are called upon to approve the issuance of amateur-station licenses by the Radio Commission. The administrative organization needed for this phase of the commission's activities was found to be already existing in the organization of the radio division of the Department of Commerce with the result that all amateur licenses are first approved by the department before being issued by the commission. The details of this work would have constituted a tremendous burden for the commission had it not been thus relieved by the radio division.

As various legal questions are presented concerning applications for amateur-station licenses, they are usually referred to the general counsel of the commission for opinion. In this way the status of the amateur under the radio act is being gradually defined so as to permit more certainty.

The latest available figures disclose that during the year ending June 30, 1929, there were 12,646 amateur-station licenses issued. The total number of such station licenses outstanding at the same date was 16,829.

The licensees of amateur stations are not restricted by any regulations other than those embodied in their own code of ethics and the commission's General Order No. 24. These have proved very broad in scope and offer the amateur a wide latitude in the pursuit of his art. The commission having adopted this policy of encouraging the amateur, much greater progress may be expected than ever before.

b. AVIATION

Recent developments make radio an important adjunct to aviation, and of vast assistance to flyers in keeping them on their routes, advising them of weather conditions, and by aiding them to locate airports.

A public hearing was held by the commission on March 11, 1929, for the purpose of coordinating the views of the various aviation operating companies and others interested in establishing and perfecting means for communication between aircraft and ground stations, and between ground stations along aviation routes. As a result of that meeting and subsequent conference with aviation officials, the commission on September 9, 1929, adopted an aviation operating plan.

The plan provides for adequate services, without discrimination, for all aircraft of whatever nature. Point to point service between aeronautical ground stations is authorized only where wire lines are not available, or where the delay in the transmission of wire messages is such as to create a hazard to life or property, and then solely for emergency messages and for meteorological services. All licensees of point-to-point services are required to transmit emergency messages for the general public, relating to the safety of life or property.

The text of the aviation plan is as follows:

It appearing that representatives of the aviation transport companies and agencies have conferred with members of the commission and responsible officials of the Army, Navy, Department of Commerce, and Bureau of Standards, to the end that a suitable, economical and comprehensive plan for the radio requirements of aviation be adopted; and

It appearing that all of the representatives of said companies and agencies and officials of the Government have carefully considered and approved such a plan; and

It further appearing that said plan provides for an economical and scientific use of the frequencies involved, in the public interest, convenience and necessity, now, therefore, acting under section 4 (c) of the radio act of 1927, as amended.

It is ordered that said plan be adopted by the commission to be followed in the designation of frequencies for aviation purposes, as follows:

1. To coordinate the use of radio facilities for the purposes of aviation and to secure a maximum of flexibility in the use of the same, the commission will, and it hereby does, reserve the frequencies now set aside for use in aviation service and, in addition, reserves the frequencies 3,136, 3,142, and 3,148 solely for this use. Upon proper application of any companies or agencies maintaining, or proposing to maintain, aeronautical stations, if the commission is satisfied that the particular applicant is qualified and that the issuance of the license or licenses in question would serve public interest, convenience or necessity, the frequencies will be designated solely for use by all of said stations comprising a continuous series, or chain, along a particular airway. The commission will recognize new or different chains from time to time and frequencies will be designated to them in accordance with this plan.

2. Aeronautical stations licensed pursuant to this plan will provide adequate service, without discrimination, for all and any aircraft of whatever nature. Where the service provided by a chain is a regularly used, as distinguished from casual, incidental, or emergency use, the owners of the aircraft which use such chain or chains, shall cooperate among themselves as to the operation, mainte-

nance, and liability of the stations: *Provided, however*, That nothing herein will impose upon the commission any authority or responsibility whatever with reference to the private business or transactions of any licensee.

3. All frequencies reserved for aviation purposes shall be designated in three classes as follows:

(*a*) Frequencies used by aeronautical or aircraft stations on a chain or chains for communication purposes.

(*b*) Frequencies used for distress, calling, and navigational service.

(*c*) Experimental frequencies which will include all communication frequencies other than those in use on a chain or chains, and all such experimental frequencies shall be subject to change by the commission during the term of the license without advance notice or hearing.

4. Frequencies designated for use by aeronautical stations shall not be used for point to point service: *Provided, however*, That point to point service may be carried on only where wire lines are not available or where the delay in the transmission of wire messages is such as to create a hazard to life or property and then solely for emergency messages and for meteorological service. Any licensee of point to point service shall be required to transmit emergency messages for the general public relating to the safety of life or property.

5. The airways division of the Department of Commerce has established a master map showing (1) the location of all aeronautical stations, (2) all navigational aids, and (3) the frequencies which have been designated by the commission for use on particular chains; and all proposed chains (following, connecting with or independent of existing chains) will be referred to this map, of which the commission will maintain an exact copy.

6. The initial chains will be established as indicated upon this map in colored lines, the colors having the following designations and frequency designations:

Brown	Universal Air Lines Aviation Corporation Braniff Air Lines Central Air Lines Continental Air Lines Northern Air Lines	5,600, day, aircraft and aeronautical station.
	Southern Air Transport Texas Air Transport Gulf Air Lines Interstate Air Lines Clifford Ball Colonial Air Transport	3,484, night, aircraft and aeronautical station.
Blue	Western Air Express Standard Air Lines Mid-Continent West Coast Air Transport	3,070, point to point, aeronautical. 5,690, point to point, aeronautical and aircraft and aeronautical. 3,460, aircraft and aeronautical station. 8,015, point to point aeronautical, day only.
Green	Transcontinental Air Transport. National Air Transport	2,344, day, aircraft and aeronautical station.
	Northwest Airways Pitcairn Aviation Maddux Air Lines	1,624, night, aircraft and aeronautical station.
Red	Boeing Air Transport Pacific Air Transport	5,660, day, aircraft and aeronautical station.
	Stout Air Services Varney Air Lines National Parks Airways	3,142, night, aircraft and aeronautical station.
Pan-American Grace Airways Pan-American Airways		8,015, point to point, aeronautical, day only. 5,690, aircraft and aeronautical station, day only; also point to point aeronautical, night only. 2,662, navigation. 3,070, night, aircraft and aeronautical station.

The distress, calling, and navigational frequencies shall be assigned as follows:

278 kilocycles: Calling and working frequency from all ground stations to itinerant airplanes. Power not to exceed 10 watts.
333 kilocycles: International air calling frequency.
375 kilocycles: Radio compass.
500 kilocycles: International calling and distress frequency for ships and aircraft over the seas.
3,106 kilocycles: National calling frequency for all transport and itinerant airplanes.
5,525, 11,050, 16,580 kilocycles: Primarily for coastal stations and ships; may also be assigned to aircraft only for purpose of calling a U. S. coastal station when aircraft is in flight over the sea.
393, 400, 414, 420, 457 kilocycles: For stations on chains, providing no interference is caused with other services.
333 to 500 kilocycles, calling; 414 to 457 kilocycles, working; 375 kilocycles, compass: For airplanes on sea flights desiring intermediate frequencies. Those desiring high frequencies will use those for maritime calling and working.

7. No aeronautical station will be licensed to use more than 1 kilowatt power on frequencies of 1,500 kilocycles and above.

8. All aeronautical stations will maintain a watch on such frequencies and for such periods as the airways division of the Department of Commerce may designate.

9. For the purpose of the foregoing, two types of aircraft are defined: (*a*) Transport airplanes—those commercially transporting persons and/or property and operating regularly on fixed routes, and (*b*) itinerant airplanes—all those other than transport or Government airplanes. An aeronautical station shall be understood as being capable of giving:

(1) Ground to plane communication.
(2) Point to point communication.
(3) Distress, calling and navigational service.

10. From time to time after the adoption of this order representatives of the aviation companies and agencies mentioned herein, together with representatives of all aviation companies or agencies which wish to participate herein, shall confer with members of the commission and responsible officials of the Army, Navy, and Department of Commerce, to the end that this plan may be modified so as to conform with experience in the operation thereof and developments in the arts of radio and aeronautics.

11. This order is and shall be construed as a regulation of the commission, violation of which will be cause for revocation, as provided by the radio act of 1927, as amended.

On October 1, 1929, the commission adopted the following amendment to the aviation plan of September 9, 1929:

1. That the frequencies 12,180 and 12,210 kilocycles, designated by the President as reserved for Government experimental stations, but available for assignment to commercial companies subject to recall by the Government upon six months' notice, be made available on such temporary basis for emergency aeronautical point-to-point communications on chains during daylight hours only, provided, however, applicants desiring the use of such frequencies can show by reason of distance to be worked that such frequencies are required.

2. That the channels, 6,155 to 6,410 kilocycles, inclusive, heretofore designated for aviation be made available to all chains for primary assignment to plane-to-ground and ground-to-plane communication, and secondarily for emergency aeronautical point-to-point service.

3. That paragraph 6 of the September 9 plan be modified with respect to the blue chain to read as follows:

Blue	Western Air Express	3,070, aeronautical and aircraft.
	Standard Air Lines	3,460, point-to-point aeronautical.
	Mid-Continent	6,350, primarily for aircraft and aeronautical; secondarily for point-to-point aeronautical.
	West Coast Air Transport	8,015, 12,180, point-to-point aeronautical, day only.

4. That such existing licenses for aeronautical and aircraft stations as do not conform to the plan of September 9, and amendment thereto, be so modified as to conform to said plan.

C. EXPERIMENTAL

The commission, in its General Order No. 64, ordered all licensees of experimental stations to file with the commission, reports for each quarter of the year setting forth the nature of the experiments conducted and the results thereof. These reports contain the following statements:

(*a*) The specific hours of operation on each frequency during the period reported, together with a duly authenticated copy of the station log for that period.

(*b*) The general results accomplished in the period.

(*c*) The technical studies and progress at the time of filing.

The following frequencies have been set aside for experimental work:

(*a*) General experimental: 1,604, 2,398, 3,256, 4,795, 6,425, 8,650, 12,850, 17,300, 23,000, and above.

(*b*) Experimental visual broadcasting: 2,000 to 2,100; 2,100 to 2,200; 2,200 to 2,300 [2]; 2,750 to 2,850; 2,850 to 2,950.

(*c*) Experimental relay broadcasting: 6,020, 6,400, 6,060, 6,080, 6,100, 6,120, 6,140, 9,510, 9,530, 9,550, 9,570, 9,590, 11,720, 11,760, 11,800, 11,840, 11,880, 15,130, 15,170, 15,210, 15,250, 15,290, 15,340, 17,780, 21,460, 21,500, 21,540.

The general results accomplished during the year and reported to the commission are briefly as follows:

(*a*) *General experimental.*—Development of directive antennas for long-distance transmission; extension of operation of high-power sets to very high frequencies; frequency stabilization; accurate measurement of frequencies; determinations of the height of the Heaviside layer; transmission data with respect to distance versus frequencies at different times of the day and in different seasons of the year; further development of apparatus for airplane communication; improved antenna design; receiving-set improvements; etc.

(*b*) *Experimental visual broadcasting.*—Important preliminary information has been obtained on received field intensities necessary for adequate scanning of radio motion pictures in various types of apparatus; requisite receiver design and the necessary relation of selectivity and band admission for proper scanning; the relative definition of 24–48–, and 60-line scanning under various conditions; the improvement of light intensity and picture definition obtainable by the use of a special type of scanning now in experimental use, etc. By actual radio transmission and reception, the first dependable information as to the effects of density, contrast, and image-form in special films has been developed.

Tests by radio have been made of a special system of scanner-synchronizing indication and satisfactory results obtained.

(*c*) *Experimental relay broadcasting.*—Information has been obtained on methods of eliminating local disturbances to reception. Skip distance effects as the various distances employed have been definitely calculated for the different hours of the day.

Some programs have been picked up both in this country from foreign stations and by foreign stations from transmitters in the United States and rebroadcast in the ordinary broadcast band with fair fidelity.

[2] On condition that no interference will result to other North American nations.

The technical studies now in progress are along high order of modulation, skip distance at all times of the day or night and fading with the use of various powers and antenna systems.

d. MARITIME

On May 10, 1929, the commission approved a maritime-mobile allocation plan, listing high, low, and medium frequencies for ship and coastal stations.

Following the adoption of the plan, the commission modified all existing maritime radio licenses to conform with the plan.

The maritime plan is as follows:

MARITIME MOBILE FREQUENCY ALLOCATION PLAN

Ocean-going vessels

143 kilocycles: Calling, CW only.
151 kilocycles: Working, CW, ICW, only.
153 kilocycles: Working, CW, ICW, only.
155 kilocycles: Working, CW, ICW, only.
157 kilocycles: Working, CW, ICW, only.
159 kilocycles: Working, CW, ICW, only.
160 kilocycles: Working, CW, ICW, only.
375 kilocycles: Radio compass.
400 kilocyles: CW, ICW, only; working.
410 kilocycles: CW, ICW, damped; working.
425 kilocycles: CW, ICW, damped; working.
454 kilocycles: CW, ICW, damped; working.
468 kilocycles: CW, ICW only; working.
500 kilocycles: Calling, distress, CW, ICW, damped.
5,525 kilocycles: Calling.
5,555 kilocycles: Working.
5,615 kilocycles: Working.
6,590 kilocycles: Working.
6,605 kilocycles: Working.
6,620 kilocycles: Working.
6,635 kilocycles: Working.
8,290 kilocycles: Working.
8,330 kilocycles: Working.
8,450 kilocycles: Working.
11,050 kilocycles: Calling.
11,110 kilocycles: Working.
11,230 kilocycles: Working.
13,240 kilocycles: Working.
13,270 kilocycles: Working.
16,580 kilocycles: Calling.
16,660 kilocycles: Working.
16,860 kilocycles: Working.
22,100 kilocycles: Calling.
22,220 kilocycles: Working.
22,460 kilocycles: Working.

Also working frequency of individual coastal station when directed to do so by coastal station controlling the frequency.

Great Lakes vessels

143 kilocycles: Calling, CW only.
151 kilocycles: Working, CW, ICW only.
153 kilocycles: Working, CW, ICW only.
155 kilocycles: Working, CW, ICW only.
157 kilocycles: Working, CW, ICW only.
375 kilocycles: Radio compass.
394 kilocycles: Working, CW, ICW only.
410 kilocycles: Calling, CW, ICW, damped.
425 kilocycles: Working, CW, ICW, damped.
5,525 kilocycles: Calling.
5,555 kilocycles: Working.
5,615 kilocycles: Working.
8,330 kilocycles: Working.

GENERAL PUBLIC COASTAL STATIONS

Coastal station calling frequencies

High frequency:
5,525 kilocycles.
11,050 kilocycles.
16,575 (channel 16,580).
22,100.

Low frequency:
143 kilocycles.
410 kilocycles (Great Lakes only).
500 kilocycles (except Great Lakes).

Coastal working low frequencies

RADIOMARINE CORPORATION OF AMERICA

111 kilocycles, East Moriches.
117 kilocycles, Marion.
119 kilocycles, Palm Beach.
126 kilocycles, Bolinas.
129 kilocycles, Marion.
131 kilocycles, Port Arthur.
133 kilocycles, Tuckerton, Torrance.
135 kilocycles, New York, Baltimore.
136 kilocycles, Bolinas.
137 kilocycles, East Moriches.
141 kilocycles, Marion.
161 kilocycles, Cleveland, Buffalo.
167 kilocycles, Chicago, Duluth.
394 kilocycles, Palm Beach.
406 kilocycles, Chatham.
408 kilocycles, Torrance.
418 kilocycles, Baltimore, Galveston, Port Arthur.
425 kilocycles, Cleveland, Buffalo, Chicago, Duluth.
436 kilocycles, Bolinas.
442 kilocycles, New York.
454 kilocycles, Cleveland, Chicago, Buffalo, Duluth.
462 kilocycles, Tuckerton.
476 kilocycles, New London.

MACKAY RADIO TELEGRAPH CO.

107 kilocycles, Sayville.
109 kilocycles, Palo Alto.
121 kilocycles, Palm Beach.
123 kilocycles, Palo Alto.
131 kilocycles, New York.
392 kilocycles, Sayville.
392 kilocycles, West Palm Beach.
418 kilocycles, New York, Hillsboro, Clearwater, Palo Alto.

TROPICAL RADIO TELEGRAPH CO.

145 kilocycles, Miami.
147 kilocycles, Boston, Mobile.
149 kilocycles, New Orleans.
436 kilocycles, Boston.
442 kilocycles, Fort Morgan, Mobile.
448 kilocycles, New Orleans.
482 kilocycles, Miami.

OTHER COMPANIES

163 kilocycles, West Coast, Great Lakes.
165 kilocycles, Great Lakes.
169 kilocycles, Great Lakes.
171 kilocycles, Great Lakes.
174 kilocycles, Great Lakes.
425 kilocycles, Great Lakes.
438 kilocycles, East Coast.
454 kilocycles, Great Lakes.
460 kilocycles, West Coast.

Coastal working high frequencies

RADIOMARINE CORPORATION OF AMERICA COASTAL STATIONS

4,188 kilocycles.
4,775 kilocycles.
6,440 kilocycles.
6,455 kilocycles.
6,470 kilocycles.
6,485 kilocycles.
6,500 kilocycles.
8,350 kilocycles.
8,370 kilocycles.
8,390 kilocycles.
8,430 kilocycles.
8,570 kilocycles.
12,430 kilocycles.
12,490 kilocycles.
12,520 kilocycles.
12,550 kilocycles.
12,580 kilocycles.
12,640 kilocycles.
12,670 kilocycles.
12,730 kilocycles.
12,820 kilocycles.
13,210 kilocycles.
16,700 kilocycles.
16,740 kilocycles.
16,780 kilocycles.
21,700 kilocycles.
21,740 kilocycles.
21,780 kilocycles.
21,820 kilocycles.
21,860 kilocycles.
21,900 kilocycles.
21,940 kilocycles.
21,980 kilocycles.
22,040 kilocycles.
22,520 kilocycles.

MACKAY RADIO TELEGRAPH CO. COASTAL STATIONS

4,196 kilocycles.
4,755 kilocycles.
5,675 kilocycles.
6,560 kilocycles.
6,575 kilocycles.
8,670 kilocycles.
8,690 kilocycles.
11,320 kilocycles.
11,350 kilocycles.
11,380 kilocycles.
13,060 kilocycles.
16,900 kilocycles.
16,980 kilocycles.
21,580 kilocycles.
21,620 kilocycles.
21,660 kilocycles.
22,700 kilocycles.

TROPICAL RADIO TELEGRAPH CO. COASTAL STATIONS

4,148 kilocycles.	8,550 kilocycles.	17,100 kilocycles.
4,172 kilocycles.	11,290 kilocycles.	22,280 kilocycles.
6,650 kilocycles.	12,340 kilocycles.	22,340 kilocycles.
6,665 kilocycles.	12,370 kilocycles.	22,400 kilocycles.
8,490 kilocycles.	13,180 kilocycles.	22,580 kilocycles.

FOR ASSIGNMENT TO OTHER COMPANIES

4,116 kilocycles.	11,020 kilocycles.	11,200 kilocycles.
6,515 kilocycles.	11,080 kilocycles.	16,900 kilocycles.
8,630 kilocycles.	11,140 kilocycles.	22,160 kilocycles.

B. GROUNDS FOR DECISIONS OF THE COMMISSION

The following are excerpts from statements of the commission and grounds for its decisions filed in the Court of Appeals of the District of Columbia showing the policy and practice of the commission in the exercise of its licensing power.

1. Broadcasting Cases

Licensee as trustee.

Technical Radio Laboratory *v.* Federal Radio Commission, No. 4835.

* * * This commission considers that the Technical Radio Laboratory, and all other stations operating under Government license, are trustees of public property, this property to be used for the benefit of the public; that the trust so imposed upon this applicant and assumed by it has not been fully kept, in that there have been no regular hours of operation; the programs have not been of the standard to which the public is accustomed, particularly in view of the extensive use of commercial phonograph records; that operations have been suspended entirely at times. * * * This commission further considers that the failure of applicant to report its programs, as required by law, is, alone, sufficient cause for denial of said application. * * *

Broadcasting by municipal corporation.

City of New York *v.* Federal Radio Commission, No. 4898

* * * The commission found that although station WNYC is operated and supported wholly by the City of New York, it is not by reason thereof to be distinguished from those broadcasting stations privately owned. The fact that a political subdivision of the State of New York is engaged in the operation of a broadcasting station does not of itself furnish the commission with any basis for making a determination that public interest, convenience or necessity is served by its operation. * * * The City of New York, in the operation of its radio station WNYC, is subject to the radio act in the same manner and to the same extent as a private individual or corporation. * * *

Portable broadcasting stations.

C. L. Carrell *v.* Federal Radio Commission, No. 4899

* * * Stations having permanent locations can be so spaced geographically that these areas of interference are reduced to a minimum. The operation of a portable station in first one locality and then another does not permit the maintenance of this geographical separation between stations and, consequently, areas of interference will be set up corresponding to the position of the portable stations at any given time. As a result dependable service can not be given by these fixed stations operating on the same channel with migratory portable stations. * * * To permit appellant to rove at will over a portion of the country on any one channel is simply to deprive the public of the economical and beneficial use of a channel to capacity in terms of service to the listener.

Priority, when considered—Public interest, convenience, or necessity, what is.

In the matter of the application of Great Lakes Broadcasting Co. No. 4900; Agriculture Broadcasting Co., No. 4902; Wilbur Glenn Voliva, No. 4901

* * * The first important general principle in the validity of which the commission believes is that, as between two broadcasting stations with otherwise equal claims for privileges, the station which has the longest record of continuous service has the superior right. This is not a doctrine of vested rights or an extension of the property law to the use of the ether; it applies only as between private individuals or corporations operating stations and not as between either of them and the plenary power of the United States to regulate interstate commerce. * * *

Where two contesting broadcastings do not have otherwise equal claims the principle of priority loses its significance in proportion to the disparity between the claims. In a word, the principle does not mean that the situation in the broadcast band is "frozen" and that existing stations enjoying favorable assignments may not have to give way to others more recently established.

One clear instance where priority has had to give way, and in proper cases will continue to have to give way, is where the junior applicant proceeds from a zone or State which is not getting the equal or the fair and equitable share of broadcasting service to which it is entitled under the law. This is a logical corollary of established public utility law. Since the total available broadcasting facilities are so limited, it is axiomatic that all parts of the United States should be afforded at least a fair degree of broadcasting service before the claims of any particular community to a greater share of service can justly be recognized. * * *

Another exception to the rule of priority arises when the controversy is between stations of different classes with respect to power. * * * The point which the commission desires to make is that when a controversy arises between a cleared-channel station and a regional or local station, or between any stations of different classes, the principle of priority can not control. * * *

Is the rule of priority, however, to govern in all controversies between stations of the same power class, located in and serving the same region? The present controversy is of this character; all three stations are located in the Chicago area and have power of 5,000 watts or more. If the service given by such stations were equal under the standard of public interest, convenience, or necessity, then the commission believes that the rule of priority should control; if there is a substantial disparity between the respective service, the commission believes that on a proper showing the claim of priority must give way to the superior service. * * *

Broadcasting stations are licensed to serve the public and not for the purpose of furthering the private or selfish interests of individuals or groups of individuals. The standard of public interest, convenience, or necessity means nothing if it does not mean this. The only exception that can be made to this rule has to do with advertising; the exception, however, is only apparent because advertising furnishes the economic support for the service and thus makes it possible. As will be pointed out below, the amount and character of advertising must be rigidly confined within the limits consistent with the public service expected of the station.

The service to be rendered by a station may be viewed from two angles, (1) as an instrument for the communication of intelligence of various kinds to the general public by persons wishing to transmit such intelligence, or (2) as an instrument for the purveying of intangible commodities consisting of entertainment, instruction, education, and information to a listening public. As an instrument for the communication of intelligence, a broadcasting station has frequently been compared to other forms of communication, such as wire telegraphy or telephony, or point-to-point wireless telephony or telegraphy, with the obvious distinction that the messages from a broadcasting station are addressed to and received by the general public, whereas toll messages in point-to-point service are addressed to single persons and attended by safeguards to preserve their confidential nature. If the analogy were pursued with the usual legal incidents, a broadcasting station would have to accept and transmit for all persons on an equal basis without discrimination in charge, and according to rates fixed by a governmental body; this obligation would extend to anything and everything any member of the public might desire to communicate to the listening public, whether it consist of music, propaganda, reading, advertising, or what-not. The public would be deprived of the advantage of the self-imposed censorship exercised by the program

directors of broadcasting stations who, for the sake of the popularity and standing of their stations, will select entertainment and educational features according to the needs and desires of their invisible audiences. In the present state of the art there is no way of increasing the number of stations without great injury to the listening public, and yet thousands of stations might be necessary to accommodate all the individuals who insist on airing their views through the microphone. If there are many such persons, as there undoubtedly are, the results would be, first, to crowd most or all of the better programs off the air, and second, to create an almost insoluble problem, i. e., how to choose from among an excess of applicants who shall be given time to address the public and who shall exercise the power to make such a choice.

To pursue the analogy of telephone and telergaph public utilities is, therefore, to emphasize the right of the sender of messages to the detriment of the listening public. The commission believes that such an analogy is a mistaken one when applied to broadcasting stations; the emphasis should be on the receiving of service and the standard of public interest, convenience or necessity should be construed accordingly. This point of view does not take broadcasting stations out of the category of public utilities or relieve them of corresponding obligations; it simply assimilates them to a different group of public utilities, i. e., those engaged in purveying commodities to the general public, such, for example, as heat, water, light, and power companies, whose duties are to consumers, just as the duties of broadcasting stations are to listeners. The commodity may be intangible but so is electric light; the broadcast program has become a vital part of daily life. Just as heat, water, light, and power companies use franchises obtained from city or State to bring their commodities through pipes, conduits, or wires over public highways to the home, so a broadcasting station uses a franchise from the Federal Government to bring its commodity over a channel through the ether to the home. The Government does not try to tell a public utility such as an electric-light company that it must obtain its materials such as coal or wire, from all comers on equal terms; it is not interested so long as the service rendered in the form of light is good. Similarly, the commission believes that the Government is interested mainly in seeing to it that the program service of broadcasting stations is good, i. e., in accordance with the standard of public interest, convenience, or necessity.

It may be said that the law has already written an exception into the foregoing viewpoint in that, by section 18 of the radio act of 1927, a broadcasting station is required to afford equal opportunities for use of the station to all candidates for a public office if it permits any of the candidates to use the station. It will be noticed, however, that in the same section it is provided that "no obligation is hereby imposed upon any licensee to allow the use of its station by any such candidate." This is not only not inconsistent with, but on the contrary it supports, the commission's viewpoint. Again the emphasis is on the listening public, not on the sender of the message. It would not be fair, indeed it would not be good service, to the public to allow a one-sided presentation of the political issues of a campaign. In so far as a program consists of discussion of public questions, public interest requires ample play for the free and fair competition of opposing views, and the commission believes that the principle applies not only to addresses by political candidates but to all discussions of issues of importance to the public. The great majority of broadcasting stations are, the commission is glad to say, already tacitly recognizing a broader duty than the law imposes upon them. * * *

An indispensable condition to good service by any station is, of course, modern efficient apparatus, equipped with all devices necessary to insure fidelity in the transmission of voice and music and to avoid frequency instability or other causes of interference. * * *

There are a few negative guides to the evaluation of broadcasting stations. First of these in importance are the injunctions of the statute itself, such, for example, as the requirement for nondiscrimination between political candidates and the prohibition against the utterance of "any obscene, indecent, or profane language" (sec. 29). In the same connection may be mentioned rules and regulations of the commission, including the requirements as to the announcing of call letters and as to the accurate description of mechanical reproductions (such as phonograph records) in announcements. * * *

For more positive guides the commission again finds itself persuaded of the applicability of doctrines analogous to those governing the group of public utilities to which reference has already been made. If the viewpoint is found that the service to the listening public is what must be kept in contemplation in con-

struing the legal standard with reference to broadcasting stations, the service must first of all be continouus during hours when the public usually listens, and must be on a schedule upon which the public may rely. * * *

Furthermore, the service rendered by broadcasting stations must be without discrimination as between its listeners. Obviously, in a strictly physical sense, a station can not discriminate so as to furnish its programs to one listener and not to another; in this respect it is a public utility by virtue of the laws of nature. Even were it technically possible, as it may easily be as the art progresses, so to design both transmitters and receiving sets that the signals emitted by a particular transmitter can be received only by a particular kind of receiving set not available to the general public, the commission would not allow channels in the broadcast band to be used in such fashion. By the same token, it is proceeding very cautiously in permitting television in the broadcast band because. during the hours of such transmission, the great majority of the public audience in the service area of the station, not being equipped to receive television signals, are deprived of the use of the channel.

There is, however, a deeper significance to the principle of nondiscrimination which the commission believes may well furnish the basic formula for the evaluation of broadcasting stations. The entire listening public within the service area of a station, or of a group of stations in one community, is entitled to service from that station or stations. If, therefore, all the programs transmitted are intended for, and interesting or valuable to, only a small portion of that public, the rest of the listeners are being discriminated against. This does not mean that every individual is entitled to his exact preference in program items. It does mean, in the opinion of the commission, that the tastes, needs, and desires of all substantial groups among the listening public should be met, in some fair proportion, by a well-rounded program, in which entertainment, consisting of music of both classical and lighter grades, religion, education and instruction, important public events, discussions of public questions, weather, market reports, and news, and matters of interest to all members of the family find a place. With so few channels in the spectrum and so few hours in the day, there are obvious limitations on the emphasis which can appropriately be placed on any portion of the program. There are parts of the day and of the evening when one type of service is more appropriate than another. There are differences between communities as to the need for one type as against another. The commission does not propose to erect a rigid schedule specifying the hours or minutes that may be devoted to one kind of program or another. What it wishes to emphasize is the general character which it believes must be conformed to by a station in order to best serve the public. * * *

In such a scheme there is no room for the operation of broadcasting stations exclusively by or in the private interests of individuals or groups so far as the nature of the programs is concerned. There is not room in the broadcast band for every school of thought, religious, political, social, and economic, each to have its separate broadcasting station, its mouthpiece in the ether. If franchises are extended to some it gives them an unfair advantage over others, and results in a corresponding cutting down of general public-service stations. It favors the interests and desires of a portion of the listening public at the expense of the rest. Propaganda stations (a term which is here used for the sake of convenience and not in a derogatory sense) are not consistent with the most beneficial sort of discussion of public questions. As a general rule, postulated on the laws of nature as well as on the standard of public interest, convenience, or necessity, particular doctrines, creeds, and beliefs must find their way into the market of ideas by the existing public-service stations, and if they are of sufficient importance to the listening public the microphone will undoubtedly be available. If it is not, a well-founded complaint will receive the careful consideration of the commission in its future action with reference to the station complained of.

The contention may be made that propaganda stations are as well able as other stations to accompany their messages with entertainment and other program features of interest to the public. Even if this were true, the fact remains that the station is used for what is essentially a private purpose for a substantial portion of the time, and in addition, is constantly subject to the very human temptation not to be fair to opposing schools of thought and their representatives. By and large, furthermore, propaganda stations do not have the financial resources nor do they have the standing and popularity with the public necessary to obtain the best results in programs of general interest. The contention may also be made that to follow out the commission's viewpoint is to make unjustifiable concessions to what is popular at the expense of what is important and serious. This

bears on a consideration which the commission realizes must always be kept carefully in mind and in so far as it has power under the law it will do so in its reviews of the records of particular stations. A defect, if there is any, however, would not be remedied by a one-sided presentation of a controversial subject, no matter how serious. The commission has great confidence in the sound judgment of the listening public, however, as to what types of programs are in its own best interest.

If the question were now raised for the first time, after the commission has given careful study to it, the commission would not license any propaganda station, at least, to an exclusive position on a cleared channel. Unfortunately, under the law in force prior to the radio act of 1927 (see particularly Hoover *v.* Inter-City Radio Co., 286 Fed. 1003), the Secretary of Commerce had no power to distinguish between kinds of applicants and it was not possible to foresee the present situation and its problems. Consequently there are and have been for a long time in existence a number of stations operated by religious or similar organizations. Certain enterprising organizations, quick to see the possibilities of radio and anxious to present their creeds to the public, availed themselves of license privileges from the earlier days of broadcasting, and now have good records and a certain degree of popularity among listeners. The commission feels that the situation must be dealt with on a common-sense basis. It does not seem just to deprive such stations of all right to operation and the question must be solved on a comparative basis. While the commission is of the opinion that a broadcasting station engaged in general public service has, ordinarily, a claim to preference over a propaganda station, it will apply this principle as to existing stations by giving preferential facilities to the former and assigning less desirable positions to the latter to the extent that engineering principles permit. In rare cases it is possible to combine a general public-service station and a high-class religious station in a division of time which will approximate a well-rounded program. In other cases religious stations must accept part time on inferior channels or on daylight assignments where they are still able to transmit during the hours when religious services are usually expected by the listening public.

It may be urged that the same reasoning applies to advertising. In a sense this is true. The commission must, however, recognize that, without advertising, broadcasting would not exist, and must confine itself to limiting this advertising in amount and in character so as to preserve the largest possible amount of service for the public. The advertising must, of course, be presented as such and not under the guise of other forms on the same principle that the newspaper must not present advertising as news. It will be recognized and accepted for what it is on such a basis, whereas propaganda is difficult to recognize. If a rule against advertising were enforced, the public would be deprived of millions of dollars worth of programs which are being given out entirely by concerns simply for the resultant good will which is believed to accrue to the broadcaster or the advertiser by the announcement of his name and business in connection with programs. Advertising must be accepted for the present as the sole means of support for broadcasting, and regulation must be relied upon to prevent the abuse and overuse of the privilege.

It may be urged that if what has heretofore been said is law, the listening public is left at the mercy of the broadcaster. Even if this were so, the commission doubts that any improvement would be effected by placing the public at the mercy of each individual in turn who desired to communicate his hobby, his theory, or his grievance over the microphone, or at the mercy of every advertiser without regard to the standing either of himself or his product. That it is not so, however, is demonstrable from two considerations. In the first place, the listener has a complete power of censorship by turning his dial away from a program which he does not like; this results in a keen appreciation by the broadcaster of the necessity of pleasing a large portion of his listeners if he is to hold his audience, and of not displeasing, annoying, or offending the sensibilities of any substantial portion of the public. His failure or success is immediately reflected on the telephone and in the mail, and he knows that the same reaction to his programs will reach the licensing authority. In the second place, the licensing authority will have occasion, both in connection with renewals of his license and in connection with applications of others for his privileges to review his past performances and to determine whether he has met with the standard. A safeguard which some of the leading stations employ, and which appeals to the commission as a wise precaution, is the association with the station of an advisory board made up of men and women whose character, standing, and occupations will insure a well-rounded program best calculated to serve the greatest portion of the population in the region to be served.

Evidence before commission, weight attached—Station catering to a group.

Chicago Federation of Labor *v.* Federal Radio Commission, No. 4972

* * * Station WCFL based its application for modification of its broadcasting license on the ground that it is owned by the Chicago Federation of Labor and broadcasts programs of interest to organized labor. Applicant claimed there are many people, all members of some labor organization, who are interested in these programs. At the hearing on the application a large number of verified resolutions adopted by various labor organizations were filed with this commission. Nearly all these resolutions were duplicate mimeographed forms, sent out by the applicant, identical in purport. They indorsed the application for modification of applicant's license, but stated no facts to support their conclusions. It is well known that petitions and resolutions are easily procured. Those who sign them never have all the facts before them, and this is especially true in a technical matter such as the licensing and regulating of radio stations. To evidence in such form, the commission, like a court of law, must attach very little weight. Radio is a highly technical subject, and this commission must be extremely cautious in getting the facts with respect to any application. Cases heard before it are appealable to the Court of Appeals of the District of Columbia, and for that reason resolutions stating conclusions without giving the facts on which they are based can be given but little probative value before this commission. No court would consider a resolution by any organization or association which indorsed one side or the other of a suit pending before it and asked that a judgment be rendered in favor of some party to such case, and this would be especially true when such resolution merely stated a conclusion in an ex parte way with no opportunity afforded for cross-examination.

The applicant insisted that the membership of various bodies constituting the American Federation of Labor is large enough to warrant the allocation by this commission of a frequency to be used for the exclusive benefit of organized labor. It was the opinion of this commission, and it so found, that there are numerous groups of the general public that might similarly demand the exclusive use of a frequency for their benefit. There are nearly five million Masons in the United States and about as many Odd Fellows. Their fraternal interests might be urged as a reason for having specific frequencies set aside for them, if it could be demanded of this commission that it set aside a frequency for every large group of citizens having common interests. This classification could be carried on until more classes than frequencies would be found. It is the opinion of this commission, and it so found, that there are not enough frequencies within the broadcast band to give to each of the various groups of persons in the United States a channel on which to operate a broadcasting station. It must follow as a natural consequence that if one large group is entitled to such privilege, others are entitled to the same privilege. If this commission should grant the exclusive right to the use of a specific frequency to a central organization of Methodists to further the interests of that church and the millions who belong to it, the Baptists, Catholics, and others would by the same token be entitled to the same right.

Since there is only a limited number of available frequencies for broadcasting, this commission was of the opinion, and so found, that there is no place for a station catering to any group, but that all stations should cater to the general public and serve public interest as against group or class interest.

Davis amendment—Use of words "fair and equitable."

The Head-of-the-Lakes Broadcasting Co. *v.* Federal Radio Commission, No. 4976

* * * The use of the words "fair and equitable" in the Davis Amendment precludes any argument that the distribution of facilities between States must attain an absolute numerical ideal based on population. The commission here have a discretionary authority. In the exercise of such discretion, the licensing authority, in order to determine whether the granting or modification of a license is fair and equitable, must consider whether or not public convenience, interest or necessity will be served by the granting of such license or modification. * * *

The standard of public interest, convenience, or necessity can only be applied on a comparative basis so that here the decision of the commission could not be made simply on the basis of service rendered by station WEBC. The granting of unlimited time of operation to station WEBC means that station WDAY must either be denied the right to continue its broadcasting service or be assigned

to another frequency occupied by other stations. The rights of other stations must necessarily be considered whenever privileges are granted to any single station. But since the rights of the listening public are superior to the rights of any individual broadcaster, the commission considers that the creation of an area of interference where none previously existed and depriving the people of a large area of radio service, is opposed to the public interest. * * *

Application of Davis amendment—Letters and resolutions not sworn to incompetent evidence.

Norman Baker *v.* Federal Radio Commission, No. 5004

* * * the commission could not grant appellant's application for modification of station KTNT's license seeking full time, with 10,000 watts power, on 1,170 kilocycles, a cleared channel assigned to the second zone. To do so would result in adding a cleared channel to a state and zone already over quota, while interfering with and destroying the effectiveness of the broadcasting of a station of high quality already licensed by the commission to operate full time on 1,170 kilocycles, located in a State and zone having less than the quota of radio facilities to which they are entitled under the law, and in direct violation of General Order No. 40. * * *

It is an established rule of the commission, to which it has adhered in every case, that letters and resolutions not sworn to are not competent to be received as evidence by the commission. * * *

2. General Communication Cases

Application for short waves by corporation for private point to point communication.

By-Products Coal Co. *v.* Federal Radio Commission, No. 4984

* * * Those applicants proposing to engage in the communication business serving the entire public or a particular class of the entire public, and assuming the duties, obligations and responsibilities of common carriers are deemed to be in a better position to meet the standard of public interest than any of the other applicants. * * *

Application for short waves by corporation for public point to point communication—Individual press communication companies—Uneconomic.

Universal Service Wireless (Inc.) *v.* Federal Radio Commission, No. 5005

* * * The issuance of construction permits for press public service to one general public utility corporation to serve all the press rather than to a number of companies organized by a subsidiary to individual newspapers and press associations is in the public interest, convenience and necessity, because:

(*a*) It will permit the constant lessening of frequency separation between stations as the radio science develops and hence most economically exploit the use of radio facilities.

(*b*) Only thus can General Order No. 62 of the commission be taken advantage of to increase the number of frequencies in use.

(*c*) It will promote a more efficient management of press communication.

(*d*) It will provide the only means for flexibility of frequency use to take care of the changing situs of important news events.

(*e*) It will prevent an uneconomic duplication of facilities.

(*f*) It will prevent ruinous competition between communications agencies of the same character, while at the same time creating an agency of sufficient strength to engage in healthy competition with other large radio communication companies.

(*g*) It will be the only means of preserving a reserve of radio facilities for use in case of important news events or great need for emergency communication.

(*h*) It will guarantee neutrality of use and will prevent the otherwise certain monopoly of a subsidiary's facilities by the parent newspaper companies.

(*i*) It will avoid congestion in some frequencies and idleness on others by a proper distribution of traffic.

(*j*) It will provide for the assignment of radio facilities from a national standpoint as distinguished from a local assignment based upon needs of individual newspapers.

(*k*) It will provide the only practical guarantee that facilities will be available for newspapers and press associations hereafter desiring to use radio facilities.

(*l*) It will provide increased facilities for multi-directional transmission to large numbers of newspapers served by press associations.

(*m*) It will afford an opportunity for the participation of agencies prevented by their charters from forming subsidiary public utility companies.

(*n*) It will provide the only method for the grouping of adjacent frequencies in one transmission to give to newspapers the advantage of facsimile transmission by radio. * * *

Intercity Radio Telegraph Co., appellant, *v.* Federal Radio Commission, No. 4987; Wireless Telegraph & Communications Co., appellant, *v.* Federal Radio Commission, No. 4988; R. C. A. Communications (Inc.), appellant, *v.* Federal Radio Commission, No. 4900; Mackay Radio & Telegraph Co., appellant, *v.* Federal Radio Commission, No. 4991.

Basis of the licensing power.—The radio act of 1927, as amended, creates the Federal Radio Commission to license the construction and operation of radio transmitting stations. The practical basis upon which the licensing power rests is the physical fact of interference. The legal basis is the fact that transmissions and interference have an interstate effect. Were it not for interference, there would be no necessity for the exercise of the licensing function, and were it not for the effect of that interference upon the interstate transmission of messages and intelligence, there would be no legal validity to the Federal control.

Necessity for a licensing standard.—The mere prevention of interference, however, can not be the criterion for the licensing of stations. If it were, radio communication would be permanently hampered. A condition of fixation would result wherein existing stations, regardless of merit, would remain permanently established, in that new services could not be permitted to interfere. No test of merit would be available.

It is therefore necessary that a standard be developed to govern licensing. The standard by which applications are to be tested must be in accord with the nature of the art to which it is applied. To be applicable to radio communication it must be broad enough to cover all the aspects of that art. It must provide a full control of technical standards while at the same time encouraging scientific development. It must provide the utmost of protection and facilities to the public which uses radio. The essential characteristics of such a standard must be breadth and flexibility. * * *

Undisputed rules for the application of the standard.—The commission must apply the standard prescribed by law to the innumerable applications before it for licenses and construction permits for domestic service. It is the application of the standard by the commission which the appellants seek to have reviewed in their several appeals to this court.

It has been determined what facilities remain for consideration after the legal and technical depletions of the spectrum. * * *

Press communication classification.—It is well known that in the wire-communication business it is the practice of the telegraph companies to lease wires to newspaper services. One of the reasons for this situation is that the flow of press traffic is practically continuous. By far the largest part of published news is telegraphic news, the essence of news being the smallness of the time intervening between the event and the publication. From this it follows that, in so far as radiotelegraphic communication is capable of either supplanting or supplementing the wire telegraph services, news traffic will form a large part of the material transmitted by radio.

Where a wire telegraph company, with its special facilities, has constructed telegraph lines at great expense, there can be no objection to the lease of those lines so long as others are available for public use. The medium of radio communication is not created or constructed by communication companies. It is a natural facility. The commission can not believe that station bands may be assigned to one for lease to another. Any such lease would inevitably involve a compensation to the lessor, not only for apparatus and personnel but also for the channel itself. Hence the commission does not feel that it can permit leased radio circuits. Therefore, if this important press traffic is to have its proper share of radio facilities, assignments should be made to press communication agencies.

In this manner, important economies in the use of station bands can be effectuated. The situs of important news events changes from day to day and from hour to hour. An important governmental event in Washington may be followed by a noteworthy sporting event in New York City, to be in turn supplanted in the public eye by local floods, tornadoes, or earthquakes. The proper utilization of radio in the collection and distribution of news will thus require a rapid shifting of the number of operating station bands from point to point entirely from a standpoint of news values. The general public service communications company with its requirements for constant availability of facilities throughout its system, is unable to accommodate itself to news events. The economies of utilization thus indicated as available through press assignments will benefit both the press and the general communications companies, relieving the latter of the necessity for complying with heavy and sporadic demands for service at individual localities. The public must benefit both as a user of the general communication service and as a "consumer" of news.

Another consideration indicates the desirability of a reasonable designation of facilities to the press. Radio is a multidirectional service, the wires are not. Press associations, distributing news to hundreds of member and subscriber newspapers, can take extensive advantage of this natural phenomenon by the multidirectional distribution of news service to innumerable newspapers which are unable to obtain those services by wire because of excessive expense. This can only be accomplished by the designation of station bands for the use of the press—if leased circuits are to be avoided—inasmuch as general communications companies are compelled to keep their facilities open for the demands of unidirectional traffic.

These are some of the considerations underlying the commission's classification of June 20, 1929, for limited public service, open to all newspapers and press associations on equal terms, and in no way representing an abandonment of the public service principle. * * *

Statutory standard must be applied from a national viewpoint.—The principle that the standards of public interest, convenience, and necessity must be applied from a national or nation-wide point of view would seem to follow logically from the undisputed principles heretofore discussed. It is particularly imposed upon the commission by the facts of scarcity of station bands and of the nation-wide interference effect of transmissions in the band 3,154 to 5,990 kilocycles wherein the United States general communications channels are located.

The band scarcity requires that the utmost utilization be made of facilities to accomplish the greatest possible communication both in distance and geographical breadth. These considerations are fortified by the fact that, in any event, the transmissions are apt to extend for large distances.

Moreover, the utility to the public of a radio-communication system increases in geometric proportion as the number of communities are increased. A system between two cities, A and B, can accept messages from A to B and from B to A, a total of two services. But if the circuits are doubled, the range of the system for public use is increased by the multipler 6. By adding cities C and D, messages can be sent from A to B, A to C, A to D, B to A, B to C, B to D, C to A, C to B, C to D, D to A, D to B, and D to C, a total of 12 services.

All considerations would seem to point, therefore, to the desirability, generally speaking, of establishing systems of comprehensive scope.

There are, however, certain very important limiting factors to be considered in the application of this test, which may be briefly summarized as follows:

(1) The geometric increase of service range involves also a geometric increase of the amount of traffic handled. Hence a system using a restricted number of station bands can not increase the number of cities served beyond the point at which the station bands will be completely saturated. Thus any given communication system is self limited, the point of limitation in the case of any system being determined by (*a*) the amount of radio traffic available at the cities chosen for station location, and (*b*) the number of stations the system is able to operate upon a standard station channel because of technical ability, duplication, and band shifting.

(2) The comprehensiveness of the system must be scrutinized to determine its effect upon other services, its reasonableness and its choice of cities with respect to other factors to be considered in determining the requirements of public interest. * * *

The application of the statutory standard to point to point domestic communication.—It has been pointed out how fixed physical and legal factors limit the number of station bands assignable for domestic communication.

The general rules for the application of the standard of public interest, convenience, or necessity have been pointed out in so far as they are agreed to by

the commission and all appellants. Certain limitations on and exceptions to these general rules, which have encountered but litte objection on the part of any appellant, have been indicated.

It is plain that the commission could not by extended discussion prescribe a definite set of rules by means of which the statutory standards can be applied to all contemplated systems of domestic communication. Controlling features, as has been pointed out, differ from case to case.

The commission can here present only a general outline of considerations of public interest in so far as it has conceived them to be applicable to applications here involved or mentioned.

Existing communication facilities must be considered.—It has already been pointed out that the commission takes into consideration the availability of wire-communication facilities in considering applications for licenses for the establishment of a regional radiotelegraph system.

In March, 1927, when the commission was organized, the position was taken that applications would not be granted for service which would duplicate that already furnished by land-line companies. The public was well and widely served with facilities operated on a public-utility basis, and the commission's decision that, for the time being at least, parallel radio service would not be authorized, was dictated by a desire to conserve the limited number of frequencies available for domestic service until such time as a provident allocation could be made.

It may be that the commission owes the wire telegraph companies no duty to protect them from competition by radio services. But there is a much broader consideration than this. The commission, while encouraging the development of radio, should nevertheless, in applying the statutory standard, take into consideration the possibility of a radio company competing unfairly with a wire service to such an extent that the general public may suffer. On December 31, 1928, the Western Union Telegraph Co. service extended to 24,842 offices. The Postal System reaches 2,127 offices in the United States. Telegrams can be sent by wire to and from thousands of hamlets and remote villages. These systems cover almost the entire United States, and they must do so in order to be of great importance in national communication.

No commercial enterprise can be expected to operate at a loss. A wire system is entitled to a reasonable profit from its operations.

Obviously there is no constant relationship between the capital, personnel, and maintenance expenses of a wire circuit on the one hand and its volume of traffic on the other. The company's cost of a wire circuit between small communities is not always justified by the income from traffic. The offices in small communities must be maintained to preserve the utility of the entire service to all the people of the Nation. The charges for message traffic over the more profitable circuits between large centers of population must include some charge for the maintenance of the less profitable circuits. The wire companies' charges for their readiness to serve are thus equitably distributed.

With the wire communication companies thus situated, the commission can not, from the standpoint of the national welfare, encourage the establishment of radio communication systems based solely upon the selection of the most profitable points of communication. Radio companies taking the "cream" of the business at reduced rates might impair the utility and the economic structure of the wire companies, for the latter, in order to meet competition, might be compelled to abandon unprofitable circuits.

On the other hand, this principle is limited by physical factors which, in the present state of the radio-communication technique, prevent the establishment of radio services in any way approaching the extent of the wire systems.

This being true, the commission must exercise a discrimination between the penetrating radio system and the selective one, between the radio system offering service on a nation-wide basis and that offering a service only on the most profitable circuits.

Upon the same considerations, the commission must not lend itself to the establishment of radio circuits which will rely upon the handling at reduced rates of the bulk traffic of individual large corporations between their various offices, to the practical exclusion of the less profitable occasional traffic of the general public, especially under circumstances where the wire communication companies are prevented by law or regulation from making such preferential and discriminatory arrangements. To this extent, where there are wire communication facilities available, the commission must carefully scrutinize the location of the proposed stations of any radio communication company.

This discussion is not intended to indicate that proper competition by radio with wire lines is not desirable.

The international communications of an applicant for domestic service must be considered.—Early in the commission's consideration of the problems of licensing in the higher frequency ranges it became apparent that it must proceed with the allocation of frequencies for transoceanic service if a fair share of the high frequencies useful for long distance communication were to be reserved for use by the United States. A substantial portion of the useful frequencies have an international service and interference area, which means that, generally speaking, they must be used exclusively by one station in order to avoid interference in other parts of the world. And the commission was bound by international agreement—if not by its own interest in similarly protecting the use of frequencies it allocated—not to designate such frequencies if they had been registered by another country at Berne. Moreover, because of the competition factor, viz, the desire on the part of the American companies to maintain leadership in world communication, the projects before the commission for this type of service were mature and satisfactory. Therefore, in May, 1927, applications were granted on the following basis:

Tropical Radio Telegraph Co., 7 station bands.
American Publishers Committee, 20 station bands.
Robert Dollar Steamship Co., 8 station bands.
American Telephone & Telegraph Co., 14 station bands.
Radio Corporation of America, 65 station bands.
Mackay Radio & Telegraph Co., 37 station bands.

Intercity Radio Telegraph Co., Wireless Communications Co., and Universal Wireless Communications Co. were not applicants for this type of service.

All these were standard 0.2 per cent station bands in the international range, use of which has now been materially expanded by General Order 62 permitting the subdivision of station bands.

Two station bands were similarly designated for shared use by Firestone Planations Co. for service to Liberia and by Standard Oil Co. for service to Bolivia, but it was stipulated that such frequencies should be used on a public-service basis.

On May 24, 1928, in granting applications for transoceanic service, the commission announced the following principle: All construction permits issued for transoceanic short-wave service are to be for general service stations.

Radio Corporation of America Mackay Radio & Telegraph Co., and the American publishers committee also filed applications for permits and licenses authorizing their entry into domestic communication. They intend to operate in connection with the designations made in May for transoceanic communication. Though it can not be said that the two types of service are absolutely independent, since the Intercity and other companies were willing to attempt operation without the use of foreign circuits, it was nevertheless apparent that the two services are interrelated.

The interrelationship, of course, lies in the fact that international facilities are useless without international traffic. It is not possible for a communication agency to successfully operate international circuits on the basis of traffic available to and from the seaboard cities in which its transmitters are located. The success of the company's operation and its utility to the Nation as a whole depend upon its having facilities for the collection and delivery of messages to and from foreign countries.

Hence, in applying the statutory standard to problems of licensing domestic communication, the commission must consider the status of agencies licensed to conduct international communication with respect to facilities available to them for the collection and distribution of their traffic domestically.

Competition between radio services must be considered.—If there were a sufficient number of station bands available to make frequency designations possible to all applicants desiring to establish domestic communication services, economic considerations would nevertheless make it contrary to the statutory standard to permit the establishment of too many such systems.

A very small fraction of available domestic telegraph business is now handled by radio. It is plain that a profitable quantity of such business will not be available overnight upon the opening of radio circuits. The volume of traffic must be developed in competition with existing circuits upon the bases of rates, service, popular appeal, and the development of new traffic.

The field from which radio traffic will come is, to some extent, a selective field. Too many competing radio services can not be established to serve the same localities. Ruinous competition between radio companies for a limited volume

of traffic would impair the development of radio communication. The public is the ultimate loser from competition of this character.

At the same time the commission can not lend itself to the creation of a monopoly in radio communication. While it is true that wire companies will preserve competitive conditions in the communication field, the commission should, so far as station bands are available, bear in mind the desirability of fostering a healthy competition between radio services.

It is hardly necessary to mention that factors of competition can not be considered from an individual or local standpoint, but that the considerations must be applied in the broadest manner. Nor may these considerations control, so as to require the granting or denial of licenses regardless of other aspects of public interest.

It is equally plain that tests and standards can be applied only to actual applications before the commission, and that a competitive ideal can only be approached to the extent that there are proper proposals on file.

A proposal should conform generally to sound economic principles.—As was mentioned above, this statement can not point out all the factors which enter into the determination of whether a communication system complies with the statutory standard, particularly with reference to the very important economic principles involved.

The radio act contemplates that the commission shall consider the "financial ability" of an applicant to carry out its proposal. This is due not only to the large expense of installing apparatus but also to the necessity of continuous operation in the paramount interest of the public. It may, and probably will, be necessary for domestic communication systems to operate at a loss during a developmental period. Such has been the experience of radio companies in the past. The mere fact of loss must not interfere with efficient operation if public interest is to be served.

However, the testimony before the commission indicates that all the applicants have the necessary finances for this purpose. Some, it is true, might be able to so continue for a longer time than others, but the commission does not expect any interminable period of unprofitable operation. The conduct of a losing system for too long a period would be inimical to the public interest and convenience.

It may be a restatement of this same principle to say that a proposed communication system must be economically feasible. Part of the burden resting on an applicant before the commission is to convince it that the proposed system will succeed, for certainly considerations of public interest prevent the commission from licensing a system doomed to failure. Various factors which may be taken into consideration in this connection are proposed rate schedules, the availability of message traffic, and the demand for service, the location of the circuits with respect to railroads, waterways. and air routes, and similar matters.

Technical considerations.—In testing proposals by a technical standard, it first became apparent to the commission that the technical proficiency of any scheme could not be tested only on the basis of what the proponent had done on a large scale in the past. The rapid development of the radio technique, the radio patent situation, and many other factors require the commission to hold an open mind in connection with plans outlined by new enterprises.

Any other attitude would result in a frozen condition in the communication field, because the extensive demonstration of technical proficiency in actual practice involves the holding of licenses. A probability of monopoly inheres in the granting of licenses to only those who have been already engaged in communication.

A technical program must, of course, be severely scrutinized, particularly if new. In this connection the commission is fortunate in having within its organization a competent engineering division with a large personnel of trained radio technicians who are able to give the commission impartial scientific advice on the engineering aspects of communication systems, existing or proposed. The commission has also availed itself of the advice available to it from the radio experts attached to the Army, the Navy, and the Bureau of Standards.

Service to station band ratio.—Other factors being equal, it is plain that an applicant is most entitled to assignments who, by reason of advanced equipment or methods, is able to furnish the most service on the fewest number of station bands. Otherwise expressed, that applicant should prevail whose plan will provide the highest ratio of service to number of station bands.

This rule should apply in any event from economic principles but it becomes of the utmost importance in the present field because of the scarcity of station bands, the variety of circuits and channelling proposed by various applicants,

the economic necessity of providing comprehensive national systems, and the general principles underlying the commission's General Order 62.

Development possibilities.—Another important consideration in subjecting any proposed communication system to technical test is the possibility which it contains for development. Radio communication systems must develop and grow. No system can be said to be in the public interest unless it has reasonable provisions for growth. That growth must take place internally to accommodate the increase in traffic which may be reasonably expected to occur. To accommodate this, there must be provision for decreasing frequency separation (or some similar expedient) in step with growth, or the system must originally provide for that growth. As between different plans, in this regard, the commission should prefer that which is most economical of station bands. There should also be a corresponding plan for a geographical growth by the reasonable addition of new points of communication as those may be required for the efficiency of the system and the needs of the Nation.

Here, also, the development feature must be gauged by the service-station band ratio.

Obviously the development potentialities of a system must be appraised independently of any suggested request for the assignment of additional station bands. With the recognized scarcity of bands, no plans should be made for the growth of one system at the expense of another. The merit of a system in this connection lies in is ability to grow within its assignments.

Technical resources of the applicant.—The radio act contemplates the consideration by the commission of the "technical ability" of an applicant. The commission should not only consider the technical merit of the applications and plans themselves but it must look to the actual installation and establishment of facilities, and their operation throughout the license period. It must, so far as they are material in any case, determine the facts with reference to the applicant's ability technically to carry out the meritorious proposals. In so doing it should consider:

(1) The personnel of the applicant organization.

(2) The ability of the applicant to obtain the apparatus and equipment necessary for the proper installation and operation of its system and its rights under patents or licenses to make use of the apparatus.

Technical feasibility of the plan.—The test of practicability must, of course, be applied to any plan submitted to the commission. The various expedients to which an applicant proposes to resort in order to make its plan conform to the general rules must be examined and their feasibility determined.

The American committee of technical experts, in its material submitted to the C. C. I. R., says:

"In order that maximum world-wide use may be made of the available frequencies throughout the radio spectrum it is necessary that full consideration be given to such factors as:

"a. Geographical location and hours of operation.

"b. Directional communication.

"c. Multiplexing.

"d. Other factors."

As other factors, the committee refers to power and skip-distance effect.

Possibilities of the shifting of station bands from one point to another as traffic needs may require must also be considered and tested.

The merit of an application is enhanced by its recognition of sound engineering principles and the application of those principles to the plan proposed. Similarly the merit of an application is decreased, other factors being equal, by its failure to take advantage of expedients which are feasible.

Coherence.—The commission has always followed the policy, as far as its routine permits, of indicating apparent defects in applications presented to it. Ample opportunity is given for the amendment of applications. Its engineering division has often discussed proposals with applicants and has made suggestions when consistent with the policy and impartiality of the commission.

Nevertheless, the commission does not consider itself in a position to draw up operation plans for applications. Neither can it revise the plans presented. It feels that it may deny an application or grant it, or it may grant it in part. But applications must stand on their own bases. Otherwise the commission can not act as the standard applying body. Hence preference must be given to that plan which is presented as a complete and coherent entity over that which is incoherent, inconsistent, or haphazard. The technical problems which require solution in any plan of operation must be solved by the applicant, not by the commission. * * *

IV. PROCEDURE

A. HEARINGS

During the period October 1, 1928, to November 1, 1929, 266 hearings were held at the offices of the commission in Washington. Of this number 67 applications were granted and 167 denied while 32 remain undecided. The following tables indicates the kinds of applications upon which hearings were held:

Summary of hearings before commission

Total number of cases heard	224
Number of applications granted after hearing	67
Number of applications denied after hearing	167
Number of cases undecided after hearing	32
Total	[3] 266

Hearings were held on the following classes of applications:

Broadcasting station assignment of license	1
Broadcasting station license	3
Broadcasting station construction permit	74
Broadcasting station modification of license	68
Broadcasting station renewal of license	25
Commercial station construction permit	28
Commercial station license	17
Commercial station renewal license	1
Experimental station construction permit	20
Experimental station license	8
Experimental station renewal license	1
Geophysical station construction permit	9
Television station construction permit	8
Television station license	1
High frequency broadcasting station construction permit	2
Relay broadcasting station construction permit	3
Total	266

The managing attorney, under the direction of the general counsel, performs duties similar to a clerk of court and is responsible for the expeditious handling of the docket of pending cases.

Formal hearings are held on every day of the week except Monday, which is usually reserved for the closed meetings of the commission. It was formerly the rule to have a quorum of the commission present at the hearings but under present procedure one commissioner has been designated to conduct hearings and make his report thereon. After the conclusion of the hearings it is the practice to enter an order either granting or denying the applications.

There follows a complete list of the hearings held by the commission during the period.

[3] In each of 2 cases 1 application was granted and 1 denied.

Hearings held by the commission during the period October 1, 1928, to November 1, 1929

[Symbols: B, broadcasting; C, commercial; E, experimental; G, geophysical; F, television; A, relay broadcasting; Lic., license; Mod. L., modification of license; Ren. L., renewal license; A. of L., assignment of license; C. P., construction permit]

Date of hearing	Call letters	Applicant and location	Nature of application	Power and frequency	Decision (granted or denied)
1928					
Oct. 16	WJAR	The Outlet Co., Providence, R. I	(B) C. P	1,000 w	Granted.
Do	WEPS	Matheson Radio Co. (Inc.), Gloucester, Mass	do	500 w	Denied.
Do	WLBH	Jos. J. Lombardi, Farmingdale, Long Island, N. Y	do	290 kc., 250 w	Do.
Do		State Federation Joint Marketing Service, Sacramento, Calif.	(C) C. P		Granted.
Do	WOV	International Broadcasting Corporation, New York, N. Y	Mod. L. (B)		Denied.
Do		Pickwick Broadcasting Corporation, San Francisco, Calif	(B) C. P	50,000 w	Do.
Do	KNRC	Pickwick Broadcasting Corporation, Los Angeles, Calif	do	1,000 w	Do.
Do	KFSD	Airfan Radio Corporation, San Diego, Calif	(B) Ren. L	600 kc., 1 kw.; day, 500 w.; night	Granted.
Do	WBNY	Baruchrome Corporation, New York, N. Y	(B) Mod. L	900 kc	Denied.
Oct. 17	WNAC, WBIS	The Shepard Stores, Boston, Mass	do	1,230 to 590 kc., 500 w	Do.
Do	WEAN	The Shepard Co., Providence, R. I	do	250 w., 550 kc	Granted.
Oct. 22	WIBS	New Jersey Broadcasting Corporation, Elizabeth, N. J	do	1,450 kc., 250 to 500 w	Denied.
Do	WHAD	Marquette University, Milwaukee, Wis	do	1,120 to 900 kc.; 250 to 1,000 w. day; 750 w. night.	Do.
Oct. 25	WLTH	Voice of Brooklyn (Inc.), Brooklyn, N. Y	do	1,400 to 920 kc.; 250 to 1,000 w	Do.
Oct. 29	KWK	Greater St. Louis Broadcasting Corporation, St. Louis, Mo.	do	1,350 kc., one-half to full time	Granted.
Oct. 30		The Robert Dollar Co., San Francisco, Calif	(C) C. P		Denied.
Nov. 16	WKBO	Camith Corporation, Jersey City, N. J	(B) C. P	1,450 kc., 1,000 w	Do.
Oct. 30	WMBJ	Rev. John W. Sproul, Pittsburgh, Pa	do	1,500 kc., 100 w	Granted.
Nov. 1	KFJZ	Henry Clay Allison, Fort Worth, Tex	(B) Mod. L	1,370 to 1,240 kc., 100 to 2,000 w	Denied.
Do	WCGU	United States Broadcasting Corporation, New York, N. Y	do	1,400 to 920 kc., 500 to 1,000 w	Do.
Do	WSSH	Tremont Temple Baptist Church, Boston, Mass	do	1,420 to 1,360 kc., 100 to 500 w	Do
Do	WODA	Richard E. O'Dea, Paterson, N. J	do	920 kc	Do.
Do	WNJ	Radio Investment Co., Newark, N. J	do	145 to 1,120 kc., 250 w	Do.
Nov. 2	WNAX	Gurney Seed & Nursery Co., Yankton, S. Dak	do	890 to 570 kc, 890 to 570 kc.; 500 to 1,000 w	Granted.
Do	WIBO	Nelson Bros. Bond & Mortgage Co., Chicago, Ill	do	1,480 to 570 kc.; 1,000 to 5,000 w	Do.
Do	WHT	Radiophone Broadcasting Corporation, Chicago, Ill	do	1,480 to 570 kc., 1,000 to 5,000 w	Denied.
Nov. 8	WMES	Massachusetts Educational Society, Boston, Mass	do	1,500 to 1,120 kc., 50 to 100 w	Do.
Do	KOOS	H. H. Hanseth, Marshfield, Oreg	(B) C. P	1,450 kc., 50 w	Granted.
Nov. 9	WGES	Oak Leaves Broadcasting Station (Inc.), Chicago, Ill	(B) Mod. L	1,360 kc., 500 to 1,000 w	Denied.
Nov. 13		McCollum Geological Explorations, Washington, D. C	(G) C. P		Do.
Do		Geophysical Research Corporation, New York, N. Y	do		Granted.
Do		Humble Oil & Refining Co., Houston, Tex	do		Do.
Do		The Texas Co., Houston, Tex	do		Do.
Do		Geophysical Exploration Co., Beaumont, Tex	do		Do.
Do		Marland Production Co., Ponca City, Okla	do		Do.
Do		F. Cushing Moore, Spokane, Wash	do		Denied.
Do		Interstate Geophysical Exploration Co., St. Louis, Mo	do		Granted.

Hearings held by the commission during the period October 1, 1928, to November 1, 1929—Continued

Date of hearing	Call letters	Applicant and location	Nature of application	Power and frequency	Decision (granted or denied)
1928					
Nov. 14	WENR WBCN	Great Lakes Broadcasting Co., Chicago, Ill	(B) Mod. L	870 kc.; one-half time 5,000–50,000 w	Granted power. Denied operating hours.
Do	WLS	Edward L. Bill, Chicago, Ill	do	870 kc., 5,000 w.; from five-seventh to full time.	Denied.
Do	WCBD	Wilbur Glenn Voliva, Zion, Ill	do	1,080 to 870 kc., 5,000 w.; change hours operation.	Do.
Nov. 15		The Shepard Norwell Co., Boston, Mass	(F) C. P		Do.
Do		Frank L. Carter, Long Island City, N. Y	do		Do.
Do		Aero Products Co., Chicago, Ill	do		Granted.
Do		Brooklyn Broadcasting Co., Brooklyn, N. Y	do		Denied.
Do		Walter J. Allen, Salina, Kans	do		Do.
Nov. 16	WNYC	Department of Plant and Structures, New York, N. Y	(B) Mod. L	Full time; 570 kc., 500 w	Do.
Nov. 20		Raymond Concrete Pile Co., Hayward, Calif	(C) C. P		Do.
Do		United Artists Corporation, Hollywood, Calif	do		Do.
Do		Iowa Nebraska Light & Power Co., Lincoln, Nebr	do		Do.
Nov. 21	KQP	Inland Waterways Corporation, New Orleans, La	do		Granted.
Nov. 23	WODA	Richard E. O'Dea, Paterson, N. J	(B) Mod. L	Full or one-half time; 1,250 kc., 1,000 w	Do.
Do	WAAM	Radio Station WAAM (Inc.), Newark, N. J	do	One-half or full time; 1,250 kc., 250 to 500 w	Do.
Nov. 24	WOAI	Southern Equipment Co., San Antonio, Tex	do	Full time (divides with WRK, 1, 190 kc., 5000 w.	Do.
Do	KFDM	Magnolia Petroleum Co., Beaumont, Tex	do	560 to 1,190 kc., 500 to 1,000 w	Denied.
Nov. 26	WFAA	Dallas News and Dallas Journal, Dallas, Tex	do	Full time (divides with KRLD), 1,040 kc., 5,000 to 25,000 w.	Do.
Nov. 27		Elwood W. Lippincott, Long Beach, Calif	(B) C. P	1,010 kc., 50 to 500 w	Do.
Dec. 4	WRNY	Experimenter Publishing Co., New York, N. Y	(B) Mod. L	One-half time 1,010 kc., 250 to 500 w	Granted 3/7 time.
Dec. 5		James A. Bennett, Chester, Pa	(B) C. P	1,500 kc., 100 w	Denied.
Dec. 6	WEY	Boston Fire Department, Boston, Mass	(C) C. P		Granted.
Dec. 7		Francis X. Eberle, Los Angeles, Calif	(B) C. P	2,000 or 3,300 kc., 50 w	Denied.
Dec. 11		William Thompson, Bridgeport, Ohio	(E) C. P	1,500–1,666 kc., 75–250–500 w	Do.
Do		Caw Packing Co., Seattle, Wash	(C) C. P	3,333 kc., 50 w	Do.
Do	WSAR	Doughty & Welch Electric Co., Fall River, Mass	(B) C. P		Do.
Do		Sun Oil Co., Beaumont, Tex	(G) C. P		Granted.
Do		Chester Radio Laboratories, Chester, Pa	(E) C. P	1,000–5,000 w	Denied.
Dec. 12	WKBG	C. L. Carrell, Chicago, Ill	(B) Ren. L.; portable		Do.
Do	WHBM	do	do		Do.
Do	WIBJ	do	do		Do.
Dec. 14	KPK	Merchants Exchange, Portland, Oreg	(C) Lic	476 kc., 750 w	Do.
Dec. 18		The Texas Co., Houston, Tex	(C) C. P. (2 applications.)	140	Granted.

Do		Illinois Pipe Line Co., Findlay, Ohio	(C) Ren. L. (6 applications).		Denied.
Do		Boyd Phelps, Jamaica, N. Y	(F) C. P		Do.
Dec. 20		Richmond Development Corporation, Roanoke, Va	(B) C. P (2 applications).		Do.
1929					
Jan. 16	KFCB	Nielson Radio Supply Co., Phoenix, Ariz	(B) C. P. Mod. L	1,310 to 1,440 kc., from 100 w, 250 a, to 500 w.	Granted.
Jan. 22	New	E. V. Rideout Co., San Francisco, Calif	(C) C. P	250–2,700 kc., 5 w	Denied.
Do	do	Robert M. Riculfi, Tuscon, Ariz	(B) C. P	1,150 kc., 1,000 w	Granted.
Feb. 14		L. Bamberger & Co., Kearney, N. J	(E) C. P		Do.
Feb. 12	New WCT WBO.	Ford Motor Co., Detroit, Mich	(C) C. P. (1 application), Lic. (5 applications).		Denied.
Do	New	Southern Radio Corporation, New York, N. Y	(C) C. P	8,000 kc., 1,000 w	Do.
Feb. 13	do	S. Ernest Philpitt & Son, Miami, Fla	(B) C. P	25 w., kc. not specified	Do.
Do	KFT	American Tug Boat Co., Everett, Wash	(C) Mod. L		Do.
Do	WLI	The J. P. Button Coal Co., Cleveland, Ohio	(C) Lic	From 250 to 500 w	Do
Do	WLG	The By-Products Coal Co., Bypro, Ky	do	do	Do.
Do	KPE	City of Seattle, harbor department, Seattle, Wash	do		Do.
Do	KOFH	Frederick Robinson, Glendale, Calif	(B) C. P		Do.
Feb. 15		Chicago Federation of Labor, Chicago, Ill	(C) Lic	8,050 kc., 500 w	Do.
Do	New	Intercity Radio Tel., Chicago, Ill	(C) Assignment C. P.	8,050 kc., 1,000 w	Do.
Feb. 19	KZE	Grays Harbor Stevedore Co., Aberdeen, Wash	(C) Lic	200 w	Granted.
Do	New	The N. Y. Central R. R. Co., New York, N. Y	do	50 w	Denied.
Do	WCV	Wyandotte Trans. Co., Detroit, Mich	do	From 750 to 500 w	Do.
Do		City of New York, department of plants and structures, New York, N. Y.	(C) C. P	500, 429.9, 410.9 kc., 200 w	Granted.
Feb. 20	KVOO	Southwestern Sales Corporation, Tulsa, Okla	(B) Mod. L	From 1,140 to 850 kc., 5,000 w	Denied.
Feb. 26	WRAK	Clarence R. Cummins, Erie, Pa	(B) Ren. L	1,370 kc., 50 w	Granted.
Feb. 27	New	C. C. Crawford, Roxana Pet. Co., Haynesville, La	(B) C. P	710 kc., 50 w	Denied.
Do	KOCW	Oklahoma College for Women, Chickasha, Okla	(B) Mod. L	From 1,140 to 1,220 kc., from 100 to 1,000 w	Granted.
Mar. 5	KFWI	Radio Entertainments (Inc.), San Francisco, Calif	do	930 kc., 500 w	Denied.
Mar. 6	WCLB	Arthur Faske, Long Beach, N. Y	(B) Ren. L	1,500 kc., 100 w	Granted.
Do	WKBO	Camith Corporation, Jersey City, N. J	do	1,450 kc., 250 w	Do.
Do	WIBS	New Jersey Broadcasting Corporation, Elizabeth, N. J	do	do	Do.
Do	WLBX	John N. Brahy, Long Island City, N. Y	do	1,500 kc., 100 w	Do.
Mar. 7, 8, 9		Consolidated Press Association, Washington, D. C	(C) C. P		Denied.
Do		New York Herald-Tribune, New York City	do		Do.
Do		International News Service (Inc.), New York City	do		Do.
Do		Illinois Publishing & Printing Co., Chicago, Ill	do		Do.
Do		New York Times, New York City	do		Do.
Mar. 12	WLAC	Life & Casualty Insurance Co., Nashville, Tenn	(B) Mod. L	1,490 kc., 5,000 w.; full time	Granted.
Do	New	M. L. Cates, Georgetown, Tex	(B) C. P	1,370 kc., 200 w	Denied.
Do	WEBC	Head of the Lakes Broadcasting Co., Superior, Wis	(B) Mod. L	1,280 kc., 1,000 w.; full time	Do.
Do	New	A. Torigian, Rockham, S. Dak	(B) C. P		Do.
Mar. 13	do	Charles P. Hewitt, Oak Harbor, Ohio	do	1,500 kc., 15 w	Do.
Do	WAAT	Bremer Broadcasting Corporation, Jersey City, N. J	(B) Mod. L	1,070 kc., 300 w	Do.
Mar. 14	WABF	Markle Broadcasting Corporation, Kingston, Pa	(B) Ren. L		Do.
Do	WMBR	F. J. Reynolds, Tampa, Fla	(B) C. P	1,210 kc., from 100 to 1,000 w	Do.
Do		do	(E) C. P	15,000 to 7,500 kc., 100 w	Do.
Do	WSGH WSDA	Amateur Radio Specialty Co., Brooklyn, N. Y	(B) Ren. L	1,400 kc., 500 w	Granted.

Hearings held by the commission during the period October 1, 1928, to November 1, 1929—Continued

Date of hearing	Call letters	Applicant and location	Nature of application	Power and frequency	Decision (granted or denied)
1929					
Mar. 19	WLTH	Voice of Brooklyn (Inc.), Brooklyn, N. Y.	(B) Mod. L.	1,400 kc., from 500 to 5,000 w. night, 1,000 day.	Denied.
Do.	WBBC	Brooklyn Broadcasting Corporation, Brooklyn, N. Y.	do.	1,400 kc., from 500 to 5,000 w. night, 1,000 day.	Denied in part.
Mar. 20	WNW	Tidewater Wireless Telegraph Co., Philadelphia, Pa.	(C) C. P., 1-P-C-512, 2-P-C-538 and 2-L-C-38.		Granted in part.
Do.	New	Wired Radio, Ind., New York, N. Y.	(E) C. P.	20,000 w.	Denied.
Do.		Don Lee (Inc.), Los Angeles, Calif.	(B) C. P.	5,500 kc., 250 w.	Do.
Do.	WPF	U. S. Shipping Board, Washington, D. C.	(C) C. P.	2,000 w.	Granted.
Mar. 21	New	Babin & Boyett-Radio Co., Trees, La.	(B) C. P.	1,360 kc., 50 w.	Denied.
Do.		F. L. Beglin, Tacoma, Wash.	do.	750 kc., 100 w.	Do.
Do.	New	J. L. Echols & J. W. Fondren, The Music Shoppe, Goose Creek, Tex.	do.	1,360 kc., 100 w.	Do.
Do.	do.	Kidd-Russ Trunk & Bag Co., Beaumont, Tex.	do.	do.	Do.
Mar. 27		Great Lakes Broadcasting Co., Chicago, Ill.	do.	6,000 kc., 5,000 w.	Granted.
Do.		Baltimore Radio Show (Inc.), Baltimore, Md.	(E) Lic., Exp. Dev.	500 w.	Do.
Do.	New	Great Lakes Radio Broadcasting Co., Chicago, Ill.	(F) C. P.	20,000 w.	Do.
Do.	do.	The Associated Broadcasters, Oakland, Calif.	(E) C. P.	9,600 kc., 100 w.	Denied.
Do.		R. J. Rockwell, Omaha, Nebr.	(E) Lic.	2,800 kc., 100 w.	Do.
Apr. 2	WBMH	Braun's Music House, Detroit, Mich.	(B) Ren. L.	1,310 kc., 100 w.	Do.
Do.	WIBZ	Alexander D. Trum, Montgomery, Ala.	do.	1,500 kc., 15 w.	Do.
Apr. 3	New	Clarence Leonard Nelson, Corpus Christi, Tex.	(B) C. P.	1,300 kc., 250 w.	Do.
Do.	KFUL	Will H. Ford, Galveston, Tex.	(B) Mod. L.	1,290 to 1,120 kc., 500 to 1,000 w. night, 1,000 day.	Do.
Do.	KTSA	Lone Star Broadcasting Co. (Inc.), San Antonio, Tex.	(B) C. P.	1,290 kc., 1 kw. night, 2 kw. day.	Do.
Apr. 4	WHBQ	Broadcasting Station WHBQ (Inc.), Memphis, Tenn.	do.	1,370 to 1,290 kc., from 100 to 500 w.	Do.
Apr. 16	WCFL	Chicago Federation of Labor, Chicago, Ill.	(B) Mod. L.	970 to 770 kc., 1½ kw. to 25,000 w., and 25,000 exp.	Do.
Do.		do.	(E) C. P.	15,000, 10,000, 5,000 kc., 500 w.	Granted.
Apr. 18		R. H. Macy & Co., New York City.	do.	500 w.	Denied.
Do.		Davison-Paxon Co., Atlanta, Ga.	do.	do.	Do.
Do.	New	Moeller's Radio Shop, Bastrop, La.	(B) C. P.	1,420 kc., 100 w.	Do.
Do.	do.	Universal Pictures Co. (Inc.), New York City.	(E) C. P.	15,000 and 7,500 kc., 500 w.	Do.
Do.	WRBC	Immanuel Lutheran Church, Valparaiso, Ind.	(B) Mod. L.	1,240 kc., 500 w.	Do.
Do.	New	The LaSalle & Koch Co., Toledo, Ohio.	(E) C. P.	70,000-6,500 kc., 500 w.	Do.
Do.	do.	The C. Reiss Coal Co., Sheboygan, Wis.	(C) License.	500 w.	Do.
Apr. 23	do.	Arizona Appliance Co., Glendale, Ariz.	(B) C. P.	1,210 kc., 100 w.	Do.
Apr. 24	WPR	South Porto Rico Sugar Co., Ensenada, P. R.	(C) License.	10,000 w.	Granted.
Do.	KPA	Lincoln L. Jackson, Seattle, Wash.	do.	500 w.	Denied.
Do.	KFZ, KGV	Russell Reed, Los Angeles, Calif.	do.	2,050 kc., 50 w.	Do.
Do.	New	Lamson Outfitting Co., Brooklyn, N. Y.	(E) C. P.	9,600 kc., 250 w.	Do.

Apr. 25	KTAB	The Associated Broadcasters (Inc.), San Francisco, Calif.	(B) C. P.	500 kc., 500 to 1,000 w	Granted in part.
Do.	New	Richard Preece, jr., St. Petersburg, Fla.	do	1,400 kc., 25 w	Denied.
Do.	KELW	Earl L. White, Burbank, Calif.	(B) Mod. L.	780 kc., 500 w	Do.
Apr. 30	KFOR	Howard A. Shuman, Lincoln, Nebr.	do	From 1,210 to 1,120 kc., 100 to 1,000 w. day, 500 night.	Granted.
May 1	KOH	Jay Peters (Inc.), Reno, Nev.	do	1,370 to 1,350 kc., 100 to 250 w	Denied.
May 2	KGKO	Wichita Falls Broadcast Co., Wichita Falls, Tex.	do	570 kc., 250 to 1,000 w	Do.
Do.	New	Dr. Edward H. Cunningham, San Antonio, Tex.	(B) C. P.	1,500 kc., 100 w	Do.
May 7	do	C. Merwin Dobyns, Long Beach, Calif.	(E) C. P.	2,857, 4,690 kc., 250 w	Do.
Do.		Universal Broadcasting Co., Philadelphia, Pa.	(B) C. P., high frequency.	6,000 and 9,600 kc., 500 w	Granted.
Do.		Pacific-Western Broadcasting Fed., Pasadena, Calif.	do	15,130, 9,530 kc., 15,000 w	Do.
May 8		Aviation Radio Station (Inc.) (Experimenter Publishing Co.), New York City.	(E) License	6,040, 9,550, 11,860, 15,250, 17,780, 21,460 kc., 500 w.	Do.
May 8		Harold E. Smith, Beacon, N. Y.	(F) License	Any frequency in television band, 50 w. and higher as needed.	Do.
May 9	WNBQ	Gordon P. Brown, Rochester, N. Y.	(B) Ren. L.	1,460 kc., 15 w	Denied.
Do.		The Edison Electric Illuminating Co., Boston, Mass.	(E) License	Variable	Do.
Do.	WATT	do	(B) Ren. L.	1,490 kc., 100 w	Do.
Do.	KMTR	KMTR Radio Corporation, Hollywood, Calif.	(B) Mod. L.	500–100 w., 570 kc.; full time on 570 kc., present assigned hour.	Granted in part.
Do.	WNBQ	Gordon P. Brown, Rochester, N. Y.	do	1,500 kc., 15 to 100 w	Denied.
May 14	WSSH	Tremont Temple Baptist Church, Boston, Mass.	do	1,420 to 1,360 kc., 100 to 500 w	Do.
May 15	WNJ	Radio Investment Co., Newark, N. J.	do	1,450 to 950 kc., 250 w	Do.
Do.	New	Winter Jones and Hugh H. Jones, jr., Catonsville, Md.	(B) C. P.	1,210 kc., 100 w	Do.
Do.		Radio Investment Co., Newark, N. J.	do	1,450 to 950 kc., 250 w	Do.
May 21	WEBR	Howell Broadcasting Co. (Inc.), Buffalo, N. Y.	do	550 kc., 1,000 w	Do.
			Mod. L.	1,310 to 550 kc., from 100 to 1,000 w	Do.
May 22		Intercity Radio Telegraph Co., Cleveland, Ohio.	(C) C. P.		Do.
Do.		Radio Corporation of America, New York City.	do		Granted in part.
Do.		Mackay Radio Telegraph Co., San Francisco, Calif.	do		Denied.
Do.		The Wireless Telegraph & Communication Co., Northbrook, Ill.	do		Do.
Do.		do	do		Do.
Do.		Western Radio Telegraph Co. (203, 205, 206, 207, 208 consolidated).	(C) 1 C. P., 4 licenses		Granted in part.
May 24	WHBW	D. R. Kienzle, Philadelphia, Pa.	(C) Ren. L.	1,500 kc., 100 w	Denied.
Do.	WSRO	Harry W. Fahrlander, Hamilton, Ohio.	(B) Ren. L.	1,420 kc., 100 w	Do.
Do.	WHB	Sweeney Automobile School Co., Kansas City, Mo.	do	950 kc., 500 w	Granted.
May 28	New	A. H. Nigocia, New Orleans, La.	(B) C. P.	1,420 kc., 100 w	Denied.
May 29	KGHI	Berean Bible Class, Little Rock, Ark.	do	1,500 to 620 kc., 100 to 500 w	Granted.
Do.	New	Leonard P. Brant, Klamath Falls, Oreg.	do	1,200 kc., 100 w	Denied.
Do.	KFHA	Western State College of Colorado, Gunnison, Colo.	(B) Ren. L.	1,200 kc., 50 w	Granted.
June 4	New	Mrs. Anna E. Stewart, Carterville, Mo.	(B) C. P.	1,340 kc., 50 w	Denied.
Do.	KFXF	Pikes Peak Broadcasting Co., Denver, Colo.	(B) Mod. L.	940 kc., 250 to 1,000 w	Do.
June 5		News Syndicate Co. (Inc.), New York City.	(C) License, 2 applications.		Do.
			(C) C. P. 1		Do.
June 6	New	Ralph A. Powers and Maynard Smith, Port Huron, Mich.	(B) C. P.	860 kc., 200 w	Do.
June 12	do	Hilliard Co. (Inc.), Scottsbluff, Nebr.	do	1,210 kc., 1,000 w	Do.
Do.	KTNT	Norman Baker, Muscatine, Iowa.	(B) Mod. L.	1,170 kc., from 5,000 to 10,000 or 5,000 w	Do.

Hearings held by the commission during the period October 1, 1928, to November 1, 1929—Continued

Date of hearing	Call letters	Applicant and location	Nature of application	Power and frequency	Decision (granted or denied)
1929					
June 13	WREC	WREC (Inc.), Memphis, Tenn.	(B) Mod. L.	600 kc.; 500 w night, 1 kw. day	Granted.
Do	New	The John Brown Schools, Siloam Springs, Ark.	(B) C. P.	1,140 kc., 250 w	Denied.
June 14	do	C. L. Morris, P. E. Morris, G. E. Wray, O. W. Wray, Almena, Kans.	do	1,420 kc., 50 w	Do.
Do	KGCN	The Concordia Broadcasting Co., Concordia, Kans.	(B) Ren. L.	do	Do.
Aug. 26, 27	WRUF	University of Florida, Gainesville, Fla. (heard in Florida).	(B) Mod. L.	From 1,470 to 560 kc., 5,000 w	Granted.
Sept. 3	WSIS	Sarasota Chamber of Commerce, Sarasota, Fla.	(B) Ren. L.	1,010 kc., 250 w	Denied.
Do	WSMD	Tom F. Little, Salisbury, Md.	do	1,310 kc., 100 w	Do.
Do	KGHD	Elmore-Nash Broadcasting Corporation, Missoula, Mont.	do	1,420 kc., 50 w	Do.
Sept. 4	New	Dr. F. P. Cerniglia, Monroe, La.	(B) C. P.	1,100 kc., 50 w	Do.
Do	do	Harry E. Soxman, Dunbar, Pa.	do	1,500 kc., 15 w	Do.
Do	do	Austin-Morris Co., Brownwood, Tex.	do	1,460 kc., 100 w	Do.
Sept. 5	KWK	Greater St. Louis Broadcasting Corporation, St. Louis, Mo.	(B) Mod. L.	1,350 kc., 5,000 w	Do.
Do	KCRC	Champlin Refining Co., Enid, Okla.	(B) C. P.	1,190 kc., 5,000 w	Do.
Sept. 12	New	Elgin Motor Inn (Inc.), Elgin, N. Dak.	do	1,400 kc., 25 w	Do.
Do	do	Mission Orphans' Home Mission, Dyersburg, Tenn.	do	1,210 kc., 50 w	Do.
Sept. 11	do	Norwood's Music Store, Biloxi, Miss.	do	1,310 kc., 15 w	Do.
Sept. 17	do	The Ozark Radio Corporation, Sulphur Springs, Ark.	do	1,500 kc., 50 w	Denied (order of denial set aside continued to Nov 14, 1929.)
Do	do	A. L. Smith and J. M. Hamilton, Missoula, Mont.	do	1,280 kc., 50 w	Denied.
Do	do	Portsmouth Broadcasting Co., Portsmouth, Ohio.	do	600 kc., 500 w	Do.
Do	do	Gardner-Hohlfeldt Music Co., Mitchell, S. Dak.	do	890 kc., 500 w	Do.
Sept. 19		Elgin National Watch Co., Elgin, Ill.	(E) Lic.	8,950 kc., 500 w	Granted.
Do		Public Service Electric & Gas Co., Newark, N. J.	(E) Ren. L.		Denied.
Do	New	Jesse P. Lutz, South Hampton, N. Y.	(E) C. P.	1,190 kc., 250 w	Do
Sept. 24	WTBO	Cumberland Broadcasting Co., Cumberland, Md.	(B) Mod. L.	620 kc., 500 w	Do.
Do	KGIR	Symons Broadcasting Co., Butte, Mont.	do (B) C. P.	950 kc., 500 w 950 kc., 1,000 w	Do. Do.
Sept. 25	KWSC	State College of Washington, Pullman, Wash.	do	1,100 kc., 5 kw	Granted.
Do	New	C. V. Hunter, Kennett, Mo.	do	1,050 kc., 100 w	Denied.
Oct. 1	do	Oliver L. Ayers, Springfield, Mo.	do	1,340 kc., 500 w	Do.
Oct. 1	do	Rev. Lannie W. Stewart, Carterville, Mo.	do	do	Do.
Do	do	do	(B) Lic.	do	Do.
Oct. 3	KGRC	Eugene J. Roth, San Antonio, Tex.	(B) Mod. L.	From 1,370 to 600 kc.; from 100 to 500 w. day, 250 w. night.	Do.
Oct. 15		The Chicago Daily News, Chicago, Ill.	(F) C. P.	2,140 kc., 5 kw	Granted.
Do		do	(A) C. P.	5,900 kc., 1 kw	Do.
Do		Atlantic Broadcasting Corporation, New York City.	(E) Ren. L.	6,120 kc., 5 kw	Do.
Do		do	(A) C. P.	6,120, 11,800, and 15,290 kc., 20 kw	Do.

Oct. 22		Pilot Electric Manufacturing Co., Brooklyn, N. Y.	(E) License airplane channels.	250 w	Denied.
Oct. 23	W3XB	Merril D. Beam, Haddon Heights, N. J.	(E) C. P., for change in location Norberth, Pa., to Haddon Heights, N. J.	100 w	Do.
Do	W3XB	do	(E) License variable	100 w., 36,580–2,000 kc	Do.
Do		Southern Radio Corporation, New York City	(E) C. P	23,060, 25,000, 27,500, 30,000 kc., 1 kw	Granted.
Do		Ward Leonard Electric Co., Mount Vernon, N. Y.	do	1,604, 2,398, 3,208, 4,795 kc., 250 w	Do.
Do		Doble Engineering Co., Medford, Mass.	do	1,500 kc., and 500 w	Denied.
Oct. 24		Michigan College of Mining and Technology, Houghton, Mich.	do	7,500 kc., 250 w	Granted.

Cases heard but not decided

Date of hearing	Call letters	Applicant	Power and frequency	Nature of application
1928				
Dec. 11		Northern Seed & Nursery Co., Ipswich, S. Dak	550 kc., 1,000 w	C. P. (B).
1929				
June 6	New	Edward A. and Philip P. Allen, Lynchburg, Va	1,310 kc., 100 w	Do.
Do	do	Clarke Electric Co., Danville, Va	do	Do.
June 11-12-13	WMBI	The Moody Bible Institute Radio Station, Chicago, Ill	From 1,080 to 870 kc., 5,000 w	Mod. L. (B).
June 13	WIBW	Topeka Broadcasting Association (Inc.), Topeka, Kans	From 1,300 to 680 kc.; from 2,500 day and 1,000 night to 5,000 w.	Do.
June 14	KFH	Hotel Lassen, Wichita, Kans	1,300 kc., 1,000 w	Do.
Sept. 4		Wyandotte Trans. Co., Detroit, Mich	750 w	Assignment (C).
Do		Michigan Wireless Telegraph Co., Wyandotte, Mich	do	License (C).
Sept. 10	KMBC	Midland Broadcasting Co., Kansas City, Mo	950 kc.; 2,500 w. day, 1,000 w. night	Mod. L. (B).
Sept. 11	New	Joseph E. McCormack, Gadsden, Ala	1,310 kc., 10 w	C. P. (B).
Do	do	W. J. Beard's Temple of Music, Paragould, Ark	1,200 kc., 100 w	Do.
Oct. 1	do	Ber, Killmer & Bailey, Rayne, La	1,120 kc., 150 w	Do.
Oct. 8		Wilmington Trans. Co., Wilmington, Calif	2,610 kc., 100 w	Ren. L. (C).
Do		Alaska Packers Association, San Francisco, Calif	7,600 kc., 500 w	Lic. (C).
Oct. 16	WQAO	Calvary Baptist Church, New York City	1,010 kc.; 1 kw. day, 500 w. night	Mod. L. (B).
Do	WFBR	The Baltimore Radio Show (Inc.), Baltimore, Md	1,270 kc., 1 kw.; unlimited time	Do.
Do	New	Lynchburg Radio Broadcasting Co., Lynchburg, Va	590 kc., 500 w.; unlimited time	C. P. (B).
Do	KTBR	M. E. Brown, Portland, Oreg	710 kc., 500 w.; from 1,300 kc.; limited time	Mod. L. (B)
Oct. 17	WQBS	General Broadcasting System (Inc.), New York City	From 1,180, 500 w., to 970 kc.; full time	Do.
Do	WOV	International Broadcasting Co., New York City	1,130 kc., 1 kw.; requests change from daylight to full-time operation.	Do.
Do	KFXR	Exchange Avenue Baptist Church, Oklahoma City, Okla	1,230 kc , 500 w.; unlimited time	C. P. (B).
Do	WRNY	Aviation Radio Station, New York City	970 kc., 5,000 w	Do.
Do	do	do	From 1,010 to 970 kc ; from 250 to 5,000 w	Mod. L. (B).
Oct. 29	New	Raymond C. Hammett, Talladega, Ala	1,420 kc., 100 w.; unlimited time	C. P. (B).
Do	WKBZ	K. L. Ashbacker, Ludington, Mich	1,200 kc., 100 w.; from 1,500 to 50 w	Mod. L. (B).
Do	WABY	General Broadcasting Corporation, Philadelphia, Pa	1,310 kc., 50 w	Lic. (B).
Do	do	General Broadcasting Corporation, Philadelphia, Pa. (John Magaldi, jr., to General Broadcasting Co.).	do	Assignment of License (B).
Do	do	John Magaldi, jr., Philadelphia, Pa	do	Ren. L. (B).
Do	WSSH	Tremont Temple Baptist Church, Boston, Mass	1,360 kc., 500 w	C. P. (B).
Do	WMAF	Round Hills Radio Corporation, South Dartmouth, Mass	do	Ren. Lic. (B).
Oct. 30	WFBE	Geo. M. Schott, Louis Schott, Wm. C. Schott, and Peter Miller, d/b as Parkview Hotel, Cincinnati, Ohio.	1,200 kc., 100 w.; unlimited time	Lic. (B).
Do	do	do	1,120 kc., 250 w.; unlimited time	C. P. (B).

B. PRACTICE AND PROCEDURE BEFORE THE COMMISSION

The radio act of 1927 designates four kinds of applications to be passed upon by the commission under the standard of public interest, convenience, or necessity, viz: Applications for construction permits, licenses, renewals of licenses, and modifications of license. In addition, there may be included applications for the commission's consent to assignment of construction permits and licenses.

All applications under the act must be filed with the Department of Commerce. As a matter of practice this is done through the branches of the radio division scattered over the country (divided into nine districts, in each of which a radio supervisor is located). The applications are forwarded to the radio division of the Department of Commerce at Washington which, after making records of them, turns them over to the commission.

Upon receipt by the commission each application is given a file number indicating the zone, the kind of application, and the order in which applications are filed. Thus the file number 1–M–B–111 shows that the application is one for modification of broadcasting license of a station in the first zone.

The first examination of the application is made by the license division for the purpose of finding and eliminating obvious faults or irregularities. Frequently the application will not be upon the proper form, will not be properly executed before a notary public, or questions therein will not be answered. These irregularities are made the subject of correspondence with the applicants, and corrections secured, if possible.

The engineering division next makes its examination and attaches to the file its report and recommendation. In cases where setting for hearing is recommended, it sets forth in full the facts upon which the report is made.

In this connection it may appear that the applicant requests the use of relatively low power on a frequency assigned to high-powered stations. For example, the request may be for 100 watts power on a frequency of 660 kilocycles. This frequency under the commission's General Order No. 40 is designated as a clear channel and assigned to the first zone for stations in excess of 1,000 watts power. Or a station in the first zone may apply for a clear channel assigned to the fifth zone in violation of the commission's regulations. A great many of the applications are from States or zones which already have broadcasting facilities in excess of the allocation prescribed by the Davis amendment. The foregoing presents only examples of difficulties arising with relation to the broadcast band.

The legal division of the commission next receives the application and submits its recommendations.

If setting for hearing is recommended for some legal reason, a full statement of the reasons therefor is prepared and attached to the file.

It may appear that the applicant is not a proper licensee under the provisions of the radio act, such as an alien, a corporation controlled by alien interests, a representative of a foreign government, a person or corporation found guilty of violation of the antimonopoly laws, or a person who has violated the provisions of the radio act or the regulations of the commission. The examination will also cover any matters which tend to show that the granting of the application would not be in the public interest, convenience, or necessity.

Upon recommendation of either of the last-named divisions that the application be set for hearing, the memoranda attached to the file are made the basis of a letter written by the secretary of the commission to the applicant advising him of the reasons for the recommendations, to the end that he may have every opportunity of showing to the commission why those recommendations should not be followed, or may make amendments to the application. This correspondence may result in a further reference to one of the divisions named, or, as in case of failure of the applicant to respond, submission of the application to the commission.

The secretary of the commission is charged with the duty of submitting applications for consideration of the commission. If it be satisfied that public interest, convenience, or necessity would be served thereby, the commission grants the application and orders that the formal authorization thereunder (license or construction permit) be issued.

Failing to make this finding, the commission designates the application for hearing, and a notice is sent to the applicant advising him of the commission's preliminary finding and of the proposed date for a hearing. The applicant is then to notify the commission at least 10 days before the date set whether or not a hearing is desired. Other licensees or applicants who have an interest in the matter or who would be adversely affected by the granting of the application are notified and given an opportunity to be heard and oppose the action. The commission has not only given notice to parties shown by its records to be interested but has given general notice to the public of pending applications and hearings through its press bureau. The fact that practically every application requests the use of a frequency or frequencies already in use by some other licensee makes such procedure expedient.

Should the applicant not give notice to the commission of a desire to be heard, or, having given such notice, fails to appear, an order is entered by the commission denying the application. Otherwise the matter is placed on the hearing docket.

Under present procedure, hearings are conducted before one commissioner and stenographically reported. An applicant appears, either personally or by counsel, and presents his evidence, tending to show that the requested action would be in the public interest, convenience or necessity. The burden of proof is necessarily upon him as the commission is without authority to take any action unless it is satisfied that the standard prescribed by law is met. Other stations which have been notified of the hearing have the privilege of appearing and submitting evidence in opposition to the application and are afforded the opportunity to cross-examine witnesses. Counsel for the commission is present for the purpose of bringing out by cross-examination all relevant matters which should be considered by the commission, regardless of whether such evidence is in favor of or against the applicant. He also presents to the commission any evidence of frequency deviations, violations of the law and regulations, and other matters which should enter into consideration of the application.

Affidavits of relevant facts may be submitted at a hearing under the regulations of the commission, or the case may be submitted entirely upon affidavits.

It has become a regrettable practice for broadcasting stations appearing before the commission to comb their listening public for affidavits, signers of petitions, letters, and telegrams to support their claims. In the opinion of the commission this, in most cases, results only in an encumbrance of the record without particular significance. Even a comparatively unimportant and unpopular station can, by announcements from the station and recourse to the friends of the licensee, make a formidable showing which is usually more indicative of the diligence of the broadcaster than of the popularity of the station.

The commission has followed the practice of other administrative bodies and admits testimony which it considers relevant to the issue even though such evidence might have been rejected in a court of law. When an appeal is taken to the court of appeals under section 16 of the act, an excessive record may be cut down before it is printed, by stipulation of the parties.

The transcript of the hearing is read and carefully considered by each commissioner, and thereafter the commission as a body makes its findings of facts and renders its decision, a formal order being entered thereon. Where the application is granted after hearing, the order directs that the formal authorization be issued, this being subsequently signed by the chairman for the commission. In the case of an application denied after hearing, the applicant is notified by transmitting a copy of the commission's formal order to him.

C. RULES AND REGULATIONS (GENERAL ORDERS)

The commission has from time to time adopted rules and regulations pertaining to the operation of stations, assignment of frequencies, and issuance of licenses, as well as for its own procedure and internal management. These appear in general orders [4] and minutes of the commission and include not only matter which has the character of rules and regulations but also administrative action of miscellaneous nature, such as general extensions of licenses, etc.

There is now in course of preparation a complete set of rules and regulations which will be ready for adoption by the commission some time in November. More immediate action has been delayed because of uncertainty of the continuance of the commission's administrative function, and lack of sufficient funds to cover the cost of printing and distribution.

The general orders [4] of the commission, Nos. 50 to 74, inclusive, issued from October 31, 1928, to October 11, 1929, are here included:

General Order No. 50

October 31, 1928.

Picture and television transmission for general reception by the public will be referred to herein by the commission as picture broadcasting and television broadcasting.

Picture broadcasting and television broadcasting will be permitted (but only upon written application to and formal authority from the commission) on frequencies above 1,500 kilocycles, the exact frequencies or bands of frequencies to be determined by further order of the commission.

Between the date of this order and January 1, 1929, picture broadcasting and television broadcasting will be permitted to a limited extent (but only upon

[4] General Orders Nos. 1 to 15, inclusive, were published in the commission's first annual report while General Orders Nos. 16 to 49, inclusive, were published in the Second Annual Report.

written application to and formal authority from the commission) in the broadcast band between 550 and 1,500 kilocycles, subject, however, to rigid conditions designed to prevent interference with reception from broadcasting stations. Among such conditions will be the following:

1. That the band of frequencies occupied by any such transmission shall be be not wider than 10 kilocycles; and

2. That such picture broadcasting and television broadcasting be limited to periods of not more than one hour per day at a time of the day other than between 6 p. m. and 11 p. m.

The extent to which picture broadcasting and television broadcasting in the broadcast band of frequencies will be permitted to take place after January 1, 1929, if at all, will be determined by later orders of the commission, which will depend on investigation by the commission of the results of permitting such operation with respect to interference and the popularity of such transmission with the general public, and will further depend upon the interpretation which the commission shall be advised is proper of the obligations of the United States under the International Radio Telegraph Convention of 1927, with respect to permitting anything other than telephonic transmission in the broadcast band.

General Order No. 51 [5]

October 31, 1928.

On and after January 1, 1929, no license will be issued for the operation of any radio station (other than ship stations) having a transmitter employing damped wave emissions.

All such stations now operating under authority granted by the Federal Radio Commission, and having transmitters employing damped wave emissions shall discontinue such use and shall replace such transmitters with apparatus employing continuous waves or modulated continuous wave emissions, prior to January 1, 1929. Any licensee who is unable to comply with this order within the period specified because of reasons beyond his control may, upon application and a proper showing to the commission, obtain a reasonable extension of said period.

All radio supervisors are requested to make inspections and reports where necessary to the end that the terms of this order may be strictly complied with.

General Order No. 52

November 26, 1928.

It is ordered that General Order No. 49 heretofore issued by the commission on October 26, 1928, be, and the same is hereby, amended to read as follows:

"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:

"*Provided, however,* That where a recording or electrical transcript is made exclusively for broadcasting purposes and is neither offered nor intended to be offered for sale to the public, the words "phonograph record" may be replaced by any phrase which accurately describes such transcription and which is of such a nature as not to deceive or tend to deceive the public as to the character of the reproduction broadcast. Every station taking advantage of this proviso shall keep a record of the phrases actually used by such station and shall communicate such phrases to the commission on request by the commission."

General Order No. 53

November 26, 1928.

Whenever a broadcasting station which, under its license from the commission is permitted to operate both during daytime hours and during evening hours, is, under said license or any modification thereof, permitted to use a greater amount

[5] Amended by General Order No. 70, q. v.

of power during the daytime hours than during the evening hours, the station will not be permitted to use its daytime power after the average time for sunset at the station during any particular month. In no event will such a broadcasting station be permitted to use its authorized daytime power at any time or in such manner as to cause greater heterodyne interference during the daytime than exists during evening operation from the use of the amount of power permitted for such evening operation.

This order supersedes General Order No. 10, which is hereby repealed.

General Order No. 54

December 22, 1928.

It is ordered that all existing licenses covering coastal, point-to-point, experimental, and ship radio transmitting stations, heretofore extended by the commission's General Orders Nos. 1, 3, 26, 39, and 47, 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, January 31, 1929. 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. The commission reserves the right to change the frequency assignment of any station, the license of which is affected by this order, during the extension herein provided if, in the opinion of the commission, such changes are advisable.

This order is only subject to the following exception:

(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.

General Order No. 55 [6]

December 22, 1928.

The commission, in order to carry out the provisions of the radio act of 1927, having determined that public interest, convenience, or necessity requires the allocation of certain frequencies, within the band of frequencies between 1,500 and 6,000 kilocycles, to those services and classes of stations hereinafter enumerated, hereby enters the following order.

It is ordered:

Paragraph I. That of those frequencies between 1,500 and 6,000 kilocycles, the following are hereby allocated to those services and classes of stations enumerated herein, for assignment to individual stations in conformity with this order:

(*a*) *Mobile services.*—1. Ship stations and coastal stations: The frequencies 1,504, 1,508, 1,512, 1,516, 1,520, 1,524, 1,528, 1,532, 1,536, 1,540, 1,544, 1,548, 1,552, 1,556, 1,560, 1,564, 1,568, 1,572, 1,576, 1,580, 1,584, 1,588, 1,592, 1,596, 1,660, 1,672, 1,684, 1,708, 2,320, 2,332, 2,350, 2,368, 2,380, 2,416, 2,428, 2,446, 2,452, 2,476, 2,482, 2,554, 2,566, 2,584, 2,596, 2,614, 2,626, 2,632, 2,638, 2,644, 2,668, 2,692, 2,728, 2,740, 3,076, 3,106, 3,118, 3,130, 3,142, 3,420, 3,428, 3,436, 4,116, 4,148, 4,172, 4,188, 4,196, 4,755, 4,775, 5,525, 5,555, 5,585, 5,615, 5,645, 5,675.

2. Aircraft and aeronautical stations: The frequencies 1,608, 1,612, 1,616, 1,620, 1,624, 1,628, 1,632, 1,636, 1,640, 1,644, 1,648, 1,656, 1,668, 1,676, 1,688, 2,302, 2,326, 2,344, 2,362, 2,374, 2,392, 2,506, 2,518, 2,524, 2,530, 2,536, 2,542, 2,560, 2,578, 2,590, 2,608, 2,620, 2,650, 2,662, 2,680, 2,698, 2,722, 2,734, 3,070, 3,082, 3,100, 3,112, 3,124, 3,136, 3,148, 3,452, 3,460, 3,468, 3,484, 3,492, 4,108, 4,124, 4,140, 4,164, 4,180, 4,765, 4,785, 5,510, 5,540, 5,570, 5,600, 5,630, 5,660, 5,690.

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[6] Amended by General Order No. 74, q. v.

3. Portable stations: The frequencies 1,600, 1,652, 1,664, 1,680, 1,704, 1,712.

4. Railroad rolling-stock stations and railroad harbor and tug stations: The frequencies 2,410, 2,422, 2,440, 2,458, 2,470.

(b) *Fixed services.*—1. Point to point: The frequencies 3,202, 3,208, 3,214, 3,220, 3,226, 3,238, 3,244, 3,250, 4,212, 4,220, 4,228, 4,244, 4,268, 4,276, 4,284, 4,396, 4,405, 4,415, 4,455, 4,465, 4,475, 4,485, 4,495, 4,505, 4,515, 4,535, 4,545, 4,865, 4,875, 4,885, 4,895, 4,905, 5,115, 5,125, 5,135, 5,145, 5,155, 5,165, 5,175, 5,185, 5,195, 5,205, 5,215, 5,225, 5,235, 5,245, 5,255, 5,265, 5,275, 5,285, 5,295, 5,305, 5,405, 5,415, 5,425, 5,435, 5,445, 5,455, 5,465, 5,475, 5,485, 5,720, 5,735, 5,750, 5,765, 5,780, 5,795, 5,900, 5,975, 5,990.

2. Amateur: The band of frequencies between 1,715 and 2,000 kilocycles, inclusive, and that band of frequencies between 3,500 and 4,000 kilocycles, inclusive.

3. Experimental visual broadcasting: The frequencies 2,002 to 2,300, inclusive, and 2,750 to 2,950, inclusive.

4. Experimental: The frequencies 1,604, 2,398, 3,088, 4,795.

The following frequencies allocated to fixed services, point-to-point stations, are to be assigned exclusively to stations devoted to promoting the interests of agriculture in addition to such assignments as may hereafter be made above 6,000 kilocycles.

Frequencies 3,202, 4,244, 5,485.

The following frequencies are reserved for assignment to stations rendering emergency services:

Frequencies 3,208, 3,214, 3,220, 3,226, 3,238, 3,244, 3,250.

PAR. II. No license shall be granted to any applicant for a fixed station, coastal station, or aeronautical station who is unable to satisfy the commission that he can maintain the assigned station frequency with an accuracy of 0.5 per cent or better at all time.

PAR. III. Licensees of fixed, coastal, or aeronautical stations shall obtain and use for tuning and checking the tuning of their transmitters suitable frequency-measuring equipment which shall be accurate within 0.025 per cent on the frequencies on which the transmitter is licensed to operate. Furthermore, such licensees shall, at frequent intervals, take steps to have the frequency-measuring instruments calibrated or compared with the standards made available by the Department of Commerce.

PAR. IV. Licensees must use radio transmitters, the emissions of which, by reason of actual decrement high-speed signaling modulation, spacing waves, harmonics, frequency modulation, key clicks, and mush, do not cause interference detrimental to traffic and programs being carried out on other authorized channels of communications.

GENERAL ORDER NO. 56

JANUARY 14, 1929.

From and after the date hereof and until further order of the commission, neither picture broadcasting nor television broadcasting will be permitted in the broadcast band between 550 and 1,500 kilocycles, except upon written application to and formal authority from the commission, and then only between the hours of 1 a. m., and 6 a. m., local time at the location of the transmitter. The written applications shall be on forms provided for that purpose by the commission.

For the purpose of determining whether picture broadcasting and/or television broadcasting may be permitted in the broadcast band in the future either at all or to a greater extent than above authorized, the commission has determined to hold a hearing for the presentation of evidence as to whether such broadcasting can be accommodated on a 10-kilocycle band of frequencies; whether such transmission will result in undue interference with the broadcasting of other stations; whether there is any general public interest in having such transmission take place in the broadcast band rather than in the high-frequency band, and such other questions as will bear upon the issue of whether permission of such transmission in the broadcast band will serve public interest, convenience, or necessity. This hearing will be held at the office of the commission at Washington, D. C., on February 14, 1929.

GENERAL ORDER No. 57

JANUARY 18, 1929.

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 March 1, 1929.

GENERAL ORDER No. 58

JANUARY 28, 1929.

It is ordered:

(1) That all existing licenses covering coastal, point-to-point, experimental, and ship radio-transmitting stations, heretofore extended by the commission's General Orders, Nos. 1, 3 26, 39, 47, and 54, be, and the same are hereby, further extended for a period of 45 days to terminate at 3 o'clock a. m., eastern standard time, March 16, 1929;

(2) That all licenses of these classes which have expired since December 22, 1928, and upon which renewal applications have been filed but not acted upon by the commission, be, and the same are hereby, extended from expiration date to 3 o'clock a. m., eastern standard time, March 16, 1929.

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 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. The commission reserves the right to change the frequency assignment of any station the license of which is affected by this order, during the extension herein provided if, in the opinion of the commission, such changes are advisable.

This order is subject to the following exception:

(1) It shall not apply to any existing 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.

GENERAL ORDER No. 59

FEBRUARY 16, 1929.

The Federal Radio Commission hereby further postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart, 90 days, until June 1, 1929.

GENERAL ORDER No. 60

MARCH 9, 1929.

It is ordered:

That all existing licenses covering coastal, point-to-point, and experimental radio-transmitting stations, heretofore extended by the commission's General Orders, Nos. 3, 26, 39, 47, 54, and 58 be, and the same are hereby, further extended for a period of 75 days to terminate at 3 o'clock a. m., eastern standard time, June 1, 1929.

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. The commission reserves the right to change the frequency assignment of any station, the license of which is affected by this order, during the extension herein provided if in the opinion of the commission such change is advisable.

This order shall not apply to any existing license 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 February 23, 1927); each license in such cases to be governed by its own terms and conditions.

This order shall not apply to any existing license, application for renewal of which shall not have been made to the commission prior to March 16, 1929.

This order shall not apply to any existing license, application for the renewal of which has been denied by the commission.

General Order No. 61

March 23, 1929.

It is ordered that the following regulations will govern the hours of operation of all broadcasting stations where such time of operation may be affected by daylight-saving time:

(1) Where the local time is changed from standard time to daylight-saving time at the location of all the stations sharing time on the same frequency, the hours of operation of all said stations on said frequency shall be understood to have reference to daylight-saving time and not standard time so long as day light-saving time is so observed. This provision shall govern whether the time is changed by provision of law or by the general observance of daylight-saving time by the local business community, and whether the time of operation of said stations is specified in the licenses or is mutually agreed upon between the licensees.

(2) Where the local time is not changed from standard time to daylight-saving time at the location of all the stations sharing time on the same frequency, the hours of operation of all said stations on said frequency shall be understood to have reference to standard time and not daylight-saving time, unless said licensees mutually agree upon a new schedule which shall be effective only while daylight-saving time is observed at the location of some of said stations. This provision shall be effective whether the time of operation of said stations is specified in the licenses or is mutually agreed upon between the licensees.

(3) The time of operation of all broadcasting stations which do not share time with other stations on the same frequency shall be understood to have reference to standard time whether the local time is changed as referred to herein or not, unless and until modification of such licenses with reference to hours of operation is made by the commission. This provision shall be effective where the time of operation of said stations is specifically stated in the licenses.

General Order No. 62

April 5, 1929.

It is ordered:

That in the frequencies exceeding 1,500 kilocycles per second, a channel of radio communication shall be regarded as a band of frequencies, the width of which varies according to its position in the spectrum. The width of these channels increases with the frequency according to the following table:

Frequency (kilocycles)	Channel width (kilocycles)	Frenquency (kilocycles)	Channel width (kilocycles)
1,500–2,198	4	8,210–10,980	20
2,200–3,313	6	10,990–16,405	30
3,316–4,400	8	16,420–21,960	40
4,405–5,490	10	21,980–32,780	60
5,495–8,202.5	15		

Note.—A visual broadcasting channel shall not be more than 100 kilocycles in width.

A commercial telephone channel below 3,313 kilocycles shall be regarded as 6 kilocycles in width.

A relay broadcasting channel between 6,000 and 9,600 kilocycles shall be regarded as 20 kilocycles in width.

In granting licenses, the Federal Radio Commission will specify the frequency in the center of the particular channel licensed to be used, but the licensee may occupy the center frequency and in addition such adjacent frequencies (within

the limit indicated on the above table) as may be permitted by the frequency maintenance tolerance and required by the type of emission the station may be authorized to use, all of which will be specified in the instrument of authorization, Furthermore, the licensee, upon application to the commission, may have the privilege of occupying the whole channel on condition that the emission from the station does not exceed the limits of the channel at any time, and provided that fixed stations shall maintain the constancy of any single emission of a carrier frequency to within 0.05 per cent or better at all times.

Fixed stations shall make full use of the channels that may be assigned them to the end that channels are occupied in the most effective and economical manner, and yet their limits not exceeded. The following uses are recognized and will receive encouragement: High-speed telegraphy, facsimile transmission, telephony, multiplex modulation, polyphase transmission, multiple emission on separate frequencies closely spaced.

In order that channels may be utlized to the fullest extent, licensees who have been granted two different channels for use at two or more stations will be granted the use of these same channels at any of the stations in their own system if such use will not create interference with stations of other systems.

Licensees of fixed stations who, at the expiration of the licenses, can not demonstrate that they are using a channel to the fullest capacity consistent with the average state of the radio art, may be required to either occupy a channel of lesser width or to share the channel on a part-time basis with others.

Licensees of fixed stations who have been granted the use of a channel for communications with specified points, upon application to the commission for license, may be granted the use of the same channel for communications with other points on the condition that the public interest, convenience, and necessity will be served by such a grant.

General Order No. 63

May 15, 1929.

The commission hereby further postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart, 122 days to October 1, 1929.

General Order No. 64

May 20, 1929.

It is ordered:

All licenses for experimental stations, including experimental relay broadcasting, experimental visual broadcasting, general experimental, and experimental aircraft stations, shall be issued for a period of one year.

It is further ordered:

(1) Experimental stations may be used only for experimental purposes. They are not licensed to conduct message traffic of any kind.

(2) All licensees of experimental stations shall file with the commission reports as to each such station for each quarter of the year, ending March 31, June 30, September 30, and December 31, setting forth the nature of the experiments conducted and the results thereof during the preceding period of three months. These reports shall be mailed in time to reach the commission within 15 days after the end of each quarter.

Each such report shall contain statements of—

(*a*) The specific hours of operation on each frequency during the period reported, together with a duly authenticated copy of the station log for that period.

(*b*) The general results accomplished in said period.

(*c*) The technical studies in progress at the time of filing thereof.

It is also ordered that this general order be made a part of each experimental license hereafter to be issued by the commission, and that failure to comply with this order or any provision contained herein shall be ground for the revocation of any such license.

GENERAL ORDER NO. 65

MAY 27, 1929.

It appearing that the commission has declared a recess from June 15, 1929, to September 3, 1929, for the purpose of permitting the members of the commission to visit the several zones from which they were appointed, and

It further appearing that applications (including applications for construction permits, for licenses, for renewal of licenses, and for modification of licenses) have heretofore been filed, and that similar applications will be filed during the period of said recess, and

It further appearing that certain of said applications may warrant hearing to determine whether public interest, convenience, or necessity will be served by the granting thereof, and that conditions in said zones may also warrant investigation and hearing, now, therefore,

It is ordered that members of the commission be, and they are hereby, authorized both as commissioners and examiners, to travel to, from, and within the zones from which they were appointed for the purpose of making such investigations and conducting such hearings as circumstances may warrant, with full power to taken and report testimony for the consideration of the commission, and

It is further ordered that the general counsel and any assistant he may designate for such purpose be, and they are hereby, authorized both as attorneys and examiners, to travel to, from, and within any of the several zones, for the purpose of assisting or advising members of the commission in connection with the hearings or investigations hereinabove mentioned, or for the purpose of making any investigations which may be necessary in connection with the legal work of the commission, and

It is further ordered that the chief engineer and the secretary be, and they are hereby, authorized, at the request of members of the commission or the general counsel, to designate qualified employees of the commission to assist in the hearings and investigations contemplated in this order, and

It is further ordered that members of the commission and examiners be, and they are hereby, empowered to summon witnesses, administer oaths, and compel the production of books, documents and papers, and

It is further ordered that members of the commission, the general counsel, and employees duly designated to render assistance in the hearings and investigations authorized herein, be, and they are hereby, authorized to incur expenses for travel and for stenographic and clerical assistance which are reasonably necessary to fulfill the purpose of this order, and the secretary is hereby directed to provide such transportation requests and issue such travel orders as may be required for the proper administration of this order.

GENERAL ORDER NO. 66 [7]

JUNE 10, 1929.

It is ordered, for the purpose of carrying out the provisions of section 22 of the radio act of 1927, that the following rules and regulations be, and the same are hereby, adopted and promulgated by the Federal Radio Commission.

(1) Each broadcasting station shall give absolute priority to radio communications or signals relating to ships or aircraft in distress and shall cease broadcasting upon such frequencies, and at such times, when such broadcasting may, in any way, interfere with the reception of radio distress signals or traffic relating thereto.

(2) Each broadcasting station, operating on any frequency in any location shall cease transmitting immediately upon notification by any Government or commercial marine station, for the purpose of clearing the air of interference for distress signals or distress traffic.

(3) Stations operating on 550 to 1,000 kilocycles, inclusive, and of the following powers and within the following distances from the seacoast, Great Lakes, or from any commercial or Government radio receiving station engaged in marine communication, shall keep and maintain an effective, continuous watch by a licensed operator, on the frequencies used for distress calls, during the entire period the transmitter of said station is in operation:

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[7] In process of revision.

Transmitter powers	Transmitter distances—miles
To and including 5 kilowatts	30
From 5 kilowatts to and including 10 kilowatts	45
From 10 kilowatts to and including 25 kilowatts	70
From 25 kilowatts to and including 50 kilowatts	100

(4) Each station covered by the above ruling shall cease transmitting immediately upon intercepting distress signals or distress traffic and shall remain silent until the distress traffic has been completed, or it is determined that the operation of the station will not interfere with the distress traffic.

(5) No station shall resume operation until the need for distress traffic no longer exists, or it is determined that said station will not interfere with distress traffic as it is then being routed and said station shall again discontinue if the routing of distress traffic is so changed that said station will interfere. The status of distress traffic may be ascertained from time to time by oral or wire line communication with Government and commercial stations.

(6) No two or more broadcasting stations shall maintain a joint or common watch upon frequencies used for distress calls, without first having submitted their plans to and having obtained the express authorization of the commission so to do.

(7) No broadcasting station shall utilize the watch maintained upon the frequencies used for distress calls by a commercial marine station, without first having obtained the express authorization of the commission so to do.

(8) The commission may hereafter require stations not included herein to keep an effective continuous watch.

(9) The commission may hereafter designate stations included herein to be excluded from these regulations.

General Order No. 67

It is ordered:

June 10, 1929.

SUBPŒNAS

(*a*) *By whom issued.*—Subpœnas requiring the attendance of witnesses from any place in the United States at any designated place of hearing, or designated place for taking the deposition of such witness, may be issued by any member of the commission, the secretary of the commission, or by any examiner appointed by the commission.

(*b*) *When issued.*—No subpœna will be issued at the instance of any party to a proceeding before the commission or before an examiner except upon written application therefor timely made.

Any member of the commission or examiner may issue subpœnas on his own motion when necessary.

(*c*) *Application for.*—The application for subpœnas shall state the name and address of each witness required, the time and place at which and the person before whom he is to appear.

(*d*) *Subpœnas duces tecum.*—If evidence other than oral testimony is required, such as documents or written data, the application shall set forth the specific matter to be produced and sufficient facts to indicate that the production of such matters is reasonably necessary to establish the cause of action or defense of the applicant. All applications for subpœnas duces tecum shall be verified by the applicant or his attorney. Any member of the commission or examiner may refuse to issue such subpœnas duces tecum if of the opinion that the production of such documentary or written evidence is unnecessary. The secretary of the commission may issue subpœnas duces tecum only when authorized to do so by a member of the commission or an examiner. Any member of the commission, or any examiner, may issue subpœnas duces tecum on his own motion if he shall deem necessary.

(*e*) *Service.*—The commission will not serve subpœnas, but will leave service to be procured by the party making the application. Service of subpœnas may be made by any citizen of the United States over the age of 21 years and competent to be a witness, and not a party to or in any way interested in the proceeding.

(*f*) *Proof of service.*—Proof of service may be made by affidavit.

GENERAL ORDER No. 68

JUNE 10, 1929.

It is ordered that all construction permits and licenses for relay broadcasting shall be issued on the following conditions:

(1) No station engaged in relay broadcasting shall grant authority to any radio station within the United States to rebroadcast its programs without first obtaining written consent of the commission.

(2) Stations engaged in relay broadcasting shall report at least once each quarter, to wit: March 31, June 30, September 30, December 31 (said reports to be filed within 15 days after the close of such quarter), (*a*) the stations located abroad which are regularly receiving and rebroadcasting the program originated by the licensee, (*b*) the times during which reception abroad is of sufficient intensity and quality to render rebroadcasting practicable, (*c*) the frequencies utilized abroad for reception of said programs, (*d*) the nature and extent of tests conducted abroad where relay broadcasting is carried on only for experimental purposes and not for rebroadcasting.

(3) The conditions in General Order No. 64 relating to experimental service.

GENERAL ORDER No. 69

JUNE 20, 1929.

It is ordered (1) that all existing licenses to broadcast, which by their terms expire at 3 a. m., Eastern standard time, July 31, 1929, are extended from such time until 3 a. m., Eastern standard time, on October 31, 1929, provided (*a*) that this order shall apply only to stations which shall have filed applications for such renewal with the commission, in full and proper form, on or before July 31, 1929, and (*b*) that where any change of status or condition of any station has taken place during the present license period which might be considered by the commission in determining whether the further operation thereof is in the public interest, convenience, and necessity, which change shall come to the attention of the commission after the extension of license herein provided for, the right to set the same aside is specifically reserved, and (*c*) that by special order or minute entry the commission may make this order inapplicable to any specifically named station.

(2) That all existing licenses for stations other than broadcasting stations, as well as construction permits of all classes, which expire at any time from June 15, 1929, to September 10, 1929, both inclusive, are hereby extended until 3 a. m., Eastern standard time, October 1, 1929.

GENERAL ORDER No. 70

SEPTEMBER 13, 1929.

It is ordered that General Order No. 51 be amended and enlarged to include he following language:

"At all ship stations using damped waves, the logarithmic decrement per complete oscillation in the wave trains emitted by the transmitter shall not exceed two-tenths, except when sending distress signals or signals and messages relating thereto."

GENERAL ORDER No. 71

SEPTEMBER 18, 1929.

The commission hereby further postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart, 90 days, to December 31, 1929.

GENERAL ORDER No. 72

SEPTEMBER 26, 1929.

It is ordered pending the adoption by the commission of a policy with regard to stations in the Territory of Alaska, all existing licenses and/or special authorizations covering the operation of coastal and point-to-point transmitting stations located in said territory, which, by their terms, expire September 30, 1929, are hereby extended for a period of 31 days, to expire October 31, 1929.

Provided however, 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 such station after October 31, 1929, 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 license or renewal of license, and the holder of any license or special authorization subject to this order who continues to use or operate any station during the period covered by this order shall be deemed to have consented to such condition.

GENERAL ORDER No. 73

OCTOBER 10, 1929.

It is ordered that all existing licenses and/or special authorizations covering the operation of coastal and point-to-point transmitting stations located in the Territory of Alaska, heretofore extended by the commission's General Order No. 72, are hereby extended to and will expire December 31, 1929.

Provided, however, 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 such station after December 31, 1929, 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 license or renewal of license, and the holder of any license or special authorization subject to this order who continues to use or operate any station during the period covered by this order shall be deemed to have consented to such condition.

GENERAL ORDER No. 74

OCTOBER 11, 1929.

General Order No. 55 is hereby amended to read as follows:

The commission, in order to carry out the provisions of the radio act of 1927, having determined that public interest, convenience, or necessity requires the allocation of certain frequencies, within the band of frequencies between 1,500 and 6,000 kilocycles, to those services and classes of stations hereinafter enumerated, hereby enters the following order.

It is ordered:

PARAGRAPH I.—That of those channels between 1,500 and 6,000 kilocycles, the following are hereby allocated to those services and classes of stations enumerated herein, for assignment to individual stations in conformity with this order. Each channel is specified by its center frequency.

(*a*) *Mobile services.*—1. Ship stations and/or coastal stations: 1,504,[6] 1,508,[6] 1,512,[6] 1,516, 1,520, 1,524, 1,528, 1,532, 1,536, 1,540, 1,548, 1,552, 1,556, 1,560, 1,568, 1,572, 1,576, 1,580, 1,588, 1,592, 1,660, 1,672, 1,684, 1,708, 2,320, 2,332, 2,350, 2,380, 2,428, 2,446, 2,518, 2,524, 2,530, 2,536, 2,542, 2,554, 2,560, 2,566, 2,578, 2,584, 2,590, 2,596, 2,668, 2,692, 2,728, 2,740, 3,112, 3,118, 3,124, 3,130, 3,420, 3,428, 3,436. 5,525, calling only.

2. Ship stations: 5,555, 5,615.

3. Coastal stations: 4,116, 4,148, 4,172, 4,188, 4,196, 4,755, 4,775, 5,675.

4. Mobile press stations: 5,645, east of Mississippi River; 5,585, west of Mississippi River.

5. Reserved for temporary mobile assignments only: 1,544, 1,564, 1,584, 2,368, 2,392, 2,476.

6. Portable stations: 1,600, 1,652, 1,664, 1,680, 1,704.

7. Emergency police: 1,712, 2,416, 2,452.

8. Emergency fire (marine): 1,596.

9. Reserved for special mobile services other than portable: 2,410, 2,422, 2,440, 2,458, 2,470.

10. Aircraft and/or aeronautical stations: 1,608, 1,612, 1,616, 1,620, 1,624, 1.628, 1,632, 1,636, 1,640, 1,644, 1,648, 1,656, 1,668, 1,676, 1,688, 2,302, 2,326, 2,344, 2,362, 2,374, 2,482, 2.506, 2,608, 2,614, 2,620, 2,626, 2,632, 2,638, 2,644, 2,650, 2,662, 2,680, 2,698, 2,722, 2,734, 3,070, 3,076, 3,082, 3,088, 3,100, 3,136, 3,142, 3,148, 3,452, 3,460, 3,468, 3,484, 3,492, 4,108, 4,124, 4,140, 4,164, 4,180, 4,765, 4,785, 5,510, 5,540, 5,570, 5,600, 5,630, 5,660, 5,690.

[6] To be reserved as interference guard band for broadcasting stations at all locations where the assignment to other services may result in interference with broadcasting stations.

11. Aircraft stations: 3,106, national calling frequency for all transport and itinerant airplanes.

(*b*) *Fixed services.*—1. Point-to-point (shared between United States and Canada): 3,268, 3,274, 3,280, 3,286, 3,298, 3,304, 3,310, 3,316, 3,324, 3,332.

2. Point-to-point (United States exclusive): 4,268, 4,276, 4,284, 4,396, 4,405, 4,415, 4,535, 4,545, 4,555, 4,565, 4,575, 4, 585, 4,595, 4,605, 4,615, 4,625, 4,635, 4,645, 4,655, 4,665, 4,675, 4,685, 4,695, 4,705, 4,715, 4,725, 4,735, 4,745, 4,925, 4,935, 4,945, 4,955, 4,965, 4,975, 4,985, 4,995, 5,005, 5,015, 5,025, 5,035, 5,045, 5,055, 5,065, 5,075, 5,085, 5,095, 5,105, 5,115, 5,125, 5,135, 5,145, 5,155, 5,165, 5,175, 5,185, 5,195, 5,205, 5,215, 5,225, 5,235, 5,245, 5,255, 5,265, 5,275, 5,285, 5,295, 5,305, 5,315, 5,325, 5,335, 5,345, 5,355, 5,855, 5,870, 5,885, 5,900, 5,975, 5,990.

3. General communication channels (other nations priority), provided that such use will not cause interference to services in other North American countries: 2,206, 2,212, 2,218, 2,224, 2,230, 2,236, 2,242, 2,248, 2,254, 2,260, 2,266, 2,272, 2,278, 2,284, 2,290, 2,296, 3,010, 3,016, 3,022, 3,028, 3,034, 3,040, 3,046, 3,052, 3,058, 3,196, 3,202, 3,208, 3,214, 3,220, 3,226, 4,004, 4,212, 4,220, 4,228, 4,324, 4,332, 4,340, 4,348, 4,356, 4,455, 4,465, 4,475, 4,485, 4,495, 4,505, 4,515, 4,805, 4,815, 4,825, 4,835, 4,845, 4,855, 4,865, 4,875, 4,885, 4,895, 4,905, 4,915, 5,375, 5,385, 5,395, 5,405, 5,415, 5,425, 5,435, 5,445, 5,455, 5,465, 5,475, 5,485, 5,495, 5,705, 5,720, 5,735, 5,750, 5,765, 5,780, 5,795, 5,810, 5,825, 5,840.

(*c*) *Special services.*—1. Amateur: The band of frequencies between 1,715 and 2,000 kilocycles, inclusive, and the band of frequencies between 3,504 and 4,000 kilocycles, inclusive.

2. Experimental visual broadcasting: The frequencies 2,000 to 2,200 kilocycles, inclusive, and 2,750 to 2,950 kilocycles, inclusive. The frequencies 2,200 to 2,299 kilocycles, inclusive, provided that such use will not interfere with radio services in other North American countries.

3. General experimental: 1,604, 2,398, 4,795 (assigned to general experimental stations by all North American nations), 3,256 (shared between Canada and United States).

4. The following frequencies are to be assigned exclusively to stations devoted to promoting the interests of agriculture: 3,250 (shared between Canada and the United States), 4,244, 5,365 (United States exclusive channels).

5. The following frequencies are reserved for assignment to stations rendering emergency services: 3,160, 3,166, 3,172, 3,178, 3,184 (shared between United States and Newfoundland), 3,238, 3,244 (shared between United States and Canada).

6. In order to preserve a uniform channeling system, the commission urges upon Government services the desirability of operating upon the nearest standard channel, under the terms of General Order No. 62, to the frequency assigned it by the President, and for this purpose, considers Government services to be operating upon the following frequencies: 1,692, 1,696, 1,700 (2,010 to 2,020, and 2,240 to 2,250 kilocycles shared with visual broadcasting), 2,308, 2,314, 2,338, 2,356, 2,386, 2,404, 2,434, 2,464, 2,488, 2,494, 2,500, 2,512, 2,548, 2,572, 2,602, 2,656, 2,674, 2,686, 2,704, 2,710, 2,716, 2,746 (2,885, 2,915, shared with visual broadcasting), 2,956, 2,962, 2,968, 2,974, 2,980, 2,986, 2,292, 2,998, 3,004, 3,034,[9] 3,034, 3,094, 3,154, 3,190, 3,232, 3,262, 3,292, 3,340, 3,348, 3,356, 3,364, 3,372, 3,380, 3,388, 3,396, 3,404, 3,412, 3,444, 3,476, 3,500 to 4,000, 4,012, 4,020, 4,028, 4,036, 4,044, 4,052, 4,060, 4,068, 4,076, 4,084, 4,092, 4,100, 4,132, 4,156, 4,204, 4,236, 4,252, 4,260, 4,292, 4,300, 4,308, 4,316, 4,364, 4,372, 4,380, 4,388, 4,425, 4,435, 4,445, 4,525, 5,915, 5,930. 5,945, 5,960.

PAR. II.—No license shall be granted to any applicant for a fixed station, coastal station, or aeronautical station, who is unable to satisfy the commission that he can maintain the assigned station frequency with an accuracy of 0.05 per cent or better at all times.

PAR. III.—Licensees of fixed, coastal, or aeronautical stations shall obtain and use for tuning, and checking the tuning of their transmitters, suitable frequency-measuring equipment which shall be accurate within 0.025 per cent on the frequencies on which the transmitter is licensed to operate. The frequency-measuring equipment made available by the Department of Commerce shall be considered as standard for comparing and calibrating frequency-measuring equipment.

PAR. IV.—Licensees must use radio transmitters, the omissions of which, by reason of actual decrement, high-speed signaling modulation, spacing waves,

[9] Shared between Canada and other nations. (See (*b*) 3, above.)

harmonics, frequency modulation, key clicks, and mush, do not cause interference detrimental to traffic and programs being carried out on other authorized channels of communications.

D. REVIEW OF APPLICATION FORMS

The commission has an extensive system of records in the process of development to accommodate the many classes of stations and the several kinds of applications with regard to each class. Since the radio act of 1927 provides for four kinds of applications to be passed upon by the commission and so to be granted or denied under the test of public interest, convenience, or necessity, it has been necessary to evolve a large number of application forms to cover each situation. The enumerated classes are: (1) Applications for construction permits; (2) applications for licenses; (3) applications for renewal of license; (4) applications for modification of license. To these may be added applications for the commission's consent to assignment of construction permits and licenses, and certain variations of the foregoing.

As occasion demands the present application forms are revised to include additional information. Application forms of the following classification are now in use:

Application for radio broadcasting station construction permit.—It is necessary to apply for a permit when authorization is requested for (1) construction of a new station, (2) building an existing station at a new location, (3) changing the maximum power of the transmitter which would require installation of new equipment, (4) installing new equipment which changes the character of the wave emissions.

Application for radio station construction permit (other than broadcasting).—This form is used in all other cases under the same circumstances above.

Application for modification of radio station construction permit.—This form is used in all cases where modification of a construction permit is requested. The application must be filed within sufficient time to allow the commission to take action before it expires; else an application for a new permit must be filed.

Application for consent to involuntary assignment of radio station construction permit.—This form must be filed in cases where the licensee-assignor lacks full legal capacity or where the transfer of ownership has taken place by operation of law.

Application for consent to voluntary assignment of radio station construction permit.—This is the proper form where the assigner having legal capacity to assign, does so subject to the consent of the commission.

Application for consent to involuntary assignment of radio station license.—This application is filed under the same conditions mentioned above for involuntary assignment of a permit. Moreover, it must be filed so as to be acted upon before the expiration date of the license.

Application for consent to voluntary assignment of radio-station license.—This form is used where the assignor, subject to the consent of the commission, desires to assign a license and has full legal capacity to do so.

Application for radio broadcasting station license.—This form is used subsequent to the granting of a permit and should be filled out in conformity with the terms of the permit. This form is not used for renewal of an existing station license.

Application for modification of radio-station license.—Where a modification of any of the terms of a radio-station license is desired, this application must be filed within sufficient time to be acted upon prior to the expiration date of the license.

Application for renewal of radio broadcasting station license.—This form is used when renewal of an existing broadcasting license is desired.

Application for renewal of radio-station license.—This form is used for the renewal of any existing radio-station license except broadcasting, mobile and amateur.

Application for aircraft radio-station license.—This application should be filed in applying for an original or renewal license to operate a radio station on board any type of aircraft but not for ground aeronautical stations.

Application for amateur radio-station license.—This form is used both for original and renewal licenses.

Application for radio-station license.—This form is used in applying for a license to operate any station other than broadcasting, mobile and amateur. It should be filed following the issuance of the construction permit and should be in conformity with the permit. This form is not used for the renewal of a station license.

Application for ship radio-station license.—This form is used for either where original or renewal license is desired.

Application for authorization to install automatic frequency control.—This form is filed whether such apparatus is to be installed at the time station is constructed or afterwards, and whether it is built in as a part of the transmitter or as an adjunct thereto.

Supplemental applications.—These contain information supplementing the original application and identifying any additional apparatus which may be installed.

Application for special authorization to engage in television and picture broadcasting.—This form is used by the licensee of a broadcasting station when he wishes to engage in television or picture broadcasting.

V. LITIGATION

During the past year there were 25 cases arising under the provisions of the radio act of 1927 in which the commission was interested. Of this number, 20 were appeals to the Court of Appeals of the District of Columbia.

These appeals are taken in the name of the complaining party as appellant and name the Federal Radio Commission appellee. Since this commission is really not a party to the appeal, but appears in an impartial capacity, an attempt has been made to have appeals docketed with the court under a title such In re application of John Doe, instead of John Doe *v.* Federal Radio Commission, but so far without success.

Under section 16 of the radio act of 1927, appeals originate when papers are filed in the Court of Appeals of the District of Columbia giving reasons for taking the appeal and stating the decision appealed from. After a certified copy of the "Notice and Reasons for Appeal" is served on the commission, it has 20 days in which to file the originals or certified copies of all papers and evidence presented to it upon the original and subsequent applications of the appellant and at the hearing upon said application. The commission also files its statement of facts and grounds for decision which is the statutory means of bringing before the court pertinent facts necessary for a review of the case. After these preliminaries are disposed of, the general counsel prepares for argument or other disposition of the case.

The first five cases arising under the radio act of 1927 were:

No. 4614. International Broadcasting *v.* Federal Radio Commission, filed June 15, 1927.

No. 4619. Peoples Pulpit Association *v.* Federal Radio Commission, filed July 12, 1927.

No. 4674. Harold E. Smith *v.* Federal Radio Commission, filed November 27, 1927.

No. 4828. International Quotations Company *v.* Federal Radio Commission, filed August 6, 1928, and

No. 4832. Bull Insular Lines *v.* Federal Radio Commission, filed August 14, 1928.

The first three of the foregoing were appeals to the Court of Appeals of the District of Columbia from denials by the commission of applications for modification of station licenses; the last two were appeals to that court from denials of the commission of applications for high-frequency assignments. The statements of the commission setting forth facts and grounds for decision upon which its action was based in the two last-mentioned cases, were printed in Appendix L (10) and (11) of the commission's report for 1928. All five cases were either dismissed or withdrawn by the appellants at various stages of the proceedings before decision by the court.

There were three cases instituted in the District Court of the United States for the Northern District of Illinois. Two of these, Clinton

R. White (station WCRW) *v.* Johnson, U. S. Attorney, et al, and Emil Denemark (Inc.) (station WEDC) *v.* Johnson, U. S. Attorney, et al, were suits to enjoin the United States and others from enforcing the penal provisions of the radio act on the ground of alleged unconstitutionality. The cases were heard together on motions for preliminary injunctions. Decision on these motions was rendered in favor of the Government in both cases. Some important holdings are noted in the decision. (29 F. (2d) 113.)

The regulation of radio communication is a valid exercise of the power of Congress under the commerce clause; the radio act is not invalid, in whole or in part, by reason of indefiniteness of the standard of public interest, convenience, or necessity, prescribed by the Congress for the guidance of the commission in issuing licenses; the act of February 23, 1927, is not invalid, in whole or in part, by reason of the requirement that an applicant for a license shall sign 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; the construction of plaintiffs' plant and its operation under the licenses obtained prior to the act of February 23, 1927, did not create property rights which may be asserted against the regulatory power of the United States, if that power is properly exercised; the question as to whether the commission acted correctly and with due process in its decision could not be attacked in such a manner in view of the provisions of the act for appeal from decisions of the commission to the Court of Appeals of the District of Columbia.

In the White case an appeal has been taken from the interlocutory order to the Circuit Court of Appeals of the Seventh District where the case is now pending. The court indicated in oral argument that it was inclined to certify the case to the United States Supreme Court.

The third case, United States *v.* American Bond and Mortgage Company, was a suit in the District Court of the United States, Northern District of Illinois, to enjoin threatened violation of the radio act by operation of a station without a license. Here, the commission had denied the application of this station for renewal of license. The owner of the station thereafter openly announced its intention to broadcast without a license. Suit was brought by the Attorney General of the United States to restrain this operation. The decision in this case is reported at 31 F. (2d), page 448. It holds, among other things, that regulation of radio broadcasting is a valid exercise of power under the commerce clause of the Constitution; that radio broadcasting is interstate commerce and that there is no property right in a license to broadcast as against the regulatory power of the United States.

The first station to appeal after General Order No. 32 became effective was station WTRL at Midland Park, N. J.[10] The commission denied an application for renewal of license on the ground that its operation was not in the public interest, convenience, or necessity. Station WTRL was a "local" station, using 100 watts power. In its appeal it contended that a station using 100 watts or less is not operating in interstate commerce. It is also contended that the action of the commission resulted in confiscation of property in violation of the fifth amendment, and that the commission abused its discretion and failed properly to apply the standard of public interest, convenience, or necessity. This case was argued in the Court of

[10] Extracts from the Statements of Fact and Grounds for Decision in this and other appealed cases are found at pages 31 to 43.

Appeals of the District of Columbia and a decision rendered November 4, 1929, in which the court said:

It is argued on behalf of the commission that this appeal presents a moot question because of the fact that the commission may not issue a license for a longer period than six months,[11] and that if the commission had issued the renewal license which appellant applied for, such license would long since have expired according to its own terms. It is argued that since the period for which the license might have been issued has expired, this appeal has become moot and should be dismissed. We do not agree with this contention. Such an interpretation of the act would practically nullify the right of appeal granted by Congress in such cases, for it is rarely possible for a station to secure a decision upon such an appeal within three months after the right of appeal accrues. This fact was, of course, well known to Congress when the statute was enacted. Moreover, the relief sought by an appellant for renewal is not limited to the use of a license for three months only but includes a continuing right to apply thereafter at proper times for successive renewals thereof. The statutory appeal accordingly contemplates the restoration to the appellant, if his claim be sustained, of the continuing right to make such application to the commission as he would have enjoyed had his application first been allowed. We feel justified, therefore, in entertaining the appeal. (Southern Pacific Terminal Company *v.* Interstate Commerce Commission, 219 U. S. 498.)

The appellant complains that it was not given lawful notice of the charges made against the station, nor of the time and place of the hearings to be held by the commission. This complaint is answered by the fact that appellant actually appeared by counsel at all of the hearings, and submitted evidence and otherwise participated therein.

Appellant contends that the decision of the commission is null and void for the reason as alleged that the statute requires all of the five commissioners to participate in such hearings and decisions, whereas in this case one of the commissioners failed to take any part in the proceedings. This objection is met by the fact that the absent commissioner was charged with prejudice by appellant, and thereupon retired from the hearings with appellant's express consent and approval. The remaining four commissioners were lawfully empowered to proceed with the hearings and enter a decision in the case. (See 32 Cyc. 1407, title "Quorum.") Moreover, appellant can not be heard in this court to challenge proceedings which were taken by the commission with appellant's consent. * * *

At the hearing before the commission testimony was tendered both for and against the station in the form of voluntary unverified written statements of persons not called as witnesses and also of merely verbal statements of like persons made in the presence of Government officials, all relative to the service or lack of service rendered to the public by the station. The commission ruled that such statements, whether written or oral, would not be accepted as evidence of the facts stated therein. We find no error in this ruling. On the other hand, we think that the commission has the authority, under reasonable regulations, to depart from the strict jury-trial rules of evidence which are applicable to court proceedings. (See I Wigmore on Evidence, sec. 4a.)

Appellant also contends that the commission lacked constitutional authority "to order the station off the air," and that its refusal to renew the station's license amounts to a taking of property without compensation, and without due process of law.

We can not agree with this contention. Under the commerce clause of the Constitution (art. 1, sec. 8, clause 3), Congress has power to regulate interstate commerce, and radio communication in general falls within this classification. (Whitehurst *v.* Grimes, 21 F. (2d) 787; 35 Op. Attorney General, 126; White *v.* Federal Radio Commission, 29 F. (2d) 113; United States *v.* American Bond & Mortgage Company, 31 F. (2d) 448; Davis, Law of Radio Communication, p. 29.) It may be questioned whether radio broadcasting can in any case be so restricted in practice as to be wholly intrastate in character. It is clear, however, that the broadcasting service of WTRL can not be exclusively intrastate for its location is such that its electric waves may cross State lines, and may also interfere with the reception of radio communications from other States. The present application filed by the station for a Federal broadcasting license is an implied admission of this fact.

[11] Three months.

In the radio act of 1927 (sec. 11) Congress vested the Federal Radio Commission with authority to examine the applications for station licenses, or for the renewal or modification of such licenses and to grant or refuse the same as the public interest, convenience, or necessity may require. A hearing upon notice and an appeal to this court are allowed in case of a refusal. The validity of a refusal may also finally be tried upon proper issues in other forums. The appellant, therefore, is not denied due process of law.

Moreover, under the radio act of 1927, the only property right which was acquired by appellant in the use of the ether as a medium of communication was such as was granted to it by the terms of its license and was subject to the conditions contained therein relative to power, frequency, the time for which the license was granted, and also the provisions governing the renewal thereof. It may be added that the authority of Congress to regulate radio communication as a species of interstate commerce necessarily implies the right of reasonable regulation to control in the public interest the number, the location, and activities of broadcasting stations of the country as an integral system, and such control must necessarily at times involve the right of reasonable restriction and pro tanto prohibition. (Davis, Law of Radio Communication, 71.)

Appellant also contends that the decision of the commission is contrary to the evidence, and that it is manifest from the testimony that the station WTRL, "served public interest, convenience, and necessity of Bergen County, N. J."

On this issue the burden is upon appellant, and this court should sustain the commission's findings of fact unless they are shown by the record to be manifestly against the evidence. * * * The real substantial object sought by appellant in this controversy is not to secure a renewal of the present license but a modification of its terms whereby the station will be allowed greater power and a better wave length, with a right of removal to some other location. That question, however, is not now before this court and can not be decided upon the present record. In the case actually before us we must hold that the commission was justified in its decision that a renewal of the present station's license would not serve the public interest, convenience or necessity, and its decision to that effect is affirmed with costs, including the cost of printing.

This was followed by an appeal of the General Electric Co. operating station WGY at Schenectady, N. Y. Preliminary to taking the appeal, station WGY had applied to the court of appeals for an order to stay execution of the commission's decision, and this was granted. Continuing to operate under this order, an appeal was taken from the regulation of the commission, which in effect resulted in reducing the number of hours of operation of station WGY. The court of appeals decided this case February 25, 1929, holding: (1) Granting a license with hours of operation other than those requested in the application was a denial thereof; (2) Congress has power, under the commerce clause, to provide for the reasonable regulation of the use and operation of radio stations in the United States and to establish agencies, such as the Federal Radio Commission, to give effect to that authority; (3) the commission's refusal to renew WGY's license except as modified was unreasonable and not in the public interest, convenience, or necessity; (4) another important holding in the case deals with the nature and extent of the court's jurisdiction. The commission contended that the court's jurisdiction was judicial in nature and confined to correcting arbitrary action. Although this contention was not passed upon in the opinion, it may be considered as having been overruled, since the court exercised a broad administrative review of the commission's decision; (5) the court holds incidentally that there is no property right in a license. (See 31 Fed. (2d) 630.)

The commission made application for a writ of certiorari and prohibition and/or mandamus to the Supreme Court of the United States in this case. On October 14, 1929, the writ of certiorari was granted and argument will probably be held thereon in December.

Thereafter there were 18 appeals filed in the Court of Appeals of the District of Columbia, 9 of which are now pending. The appeal of the Southwestern Sales Corporation (station KVOO) was withdrawn shortly after the commission filed its Statement of Facts and Grounds for Decision. The appeal of the Head of the Lakes Broadcasting Co. (station WEBC) was dismissed on motion of the appellant on October 7, 1929. The appeal of Norman Baker (station KTNT) was dismissed October 29, 1928, as was the appeal of Chicago Federation of Labor (station WFL, case No. 4989) on October 21, 1927.

All of these appeals present a variety of important and interesting questions. Several cases stress the fact that the application proceeds from a State which is under or over its mathematical quota of broadcasting facilities. The weight to be given to priority of one station over another still remains undetermined judicially. Other questions involve the comparative rights of a commercial station giving programs of interest to the general public and of a station representing some particular school, church, or political organization; the relevancy and materiality of a station's programs and financial standing in a controversy between several broadcasting stations; the weight to be given to letters, telegrams, petitions, and affidavits commending or condemning a station or its programs. Whether the excessive use of ordinary phonograph records, the irregularity of schedules and the use of slanderous language may be considered on application for a renewal license are also questions directly or indirectly to be decided in these appeals.

These cases may be summarized briefly as follows:

No. 4898, City of New York *v.* Federal Radio Commission (station WNYC), appeal from denial of application for modification of license. This appeal raises practically the same general questions as those in the WGY appeal. In addition, the right of a municipality to have preference over other stations because of alleged governmental functions is also in controversy. Argument for both the appellant and the commission was had on October 9, 1929, and decision of the court was rendered November 4, 1929.

In that case, the court held:

> In our opinion the interstate broadcasting of radio communications is a species of interstate commerce, and as such is subject to Federal regulation. (Whitehurst *v.* Grimes, 21 F. (2d) 787; United States *v.* American Bond & Mortgage Company, 31 F. (2d) 448; General Electric Company *v.* Federal Radio Commission, 31 F. (2d) 630; Davis, Law of Radio, 71. In the exercise of this authority Congress has imposed upon the Federal Radio Commission the duty of classifying radio stations, of assigning bands of frequency to the various classes of stations and for each individual station, and of determining the power which each station shall use and the time during which it may operate. (Section 4 (a) and (e), radio act of 1927.) It is manifest that in the performance of this duty the commission must at times limit the operation of some of the stations in the public interest. The appellant's rights, like those of other stations, are made subject to this authority by the statute, and also by the express terms of the license.
>
> Appellant contends that the commission lacks authority to prohibit the full-time operation of station WNYC because appellant is a municipal corporation and the operation of the station is a governmental function.
>
> This contention can not be sustained. It is true that appellant is a municipal corporation, but in the operation of its radio station it exercises private, not governmental, powers, and accordingly is not acting as a municipal corporation but as a corporate legal individual. Vilas *v.* Manile, 220 U. S. 345, 346; 43 C. J. 182, 183. Moreover, even if station WNYC is partly used for governmental purposes, the use is, nevertheless, subject to the regulatory control exercised over the national broadcasting system which is vested by statute in the Federal

Radio Commission. (Brennan *v.* Titusville, 153, U. S. 269; Illinois Central Railroad Company *v.* Illinois, 163 U. S. 142; Atlantic Coast Line *v.* Wharton, 207 U. S. 328; Kansas City Southern Railway Company *v.* Kaw Valley Drainage District, 233 U. S. 75.)

Appellant contends that the order appealed from is arbitrary and unreasonable, and that the rules and procedure of the commission pursuant to which the order was made are likewise arbitrary and unreasonable, and in violation of the Federal radio act. We shall not undertake herein to discuss the voluminous testimony which was heard by the commission. We content ourselves with saying that in our opinion the decision in question is sustained by the evidence and is reasonable and just. The commission found that under the revised allocation of stations it was impracticable to grant the application of station WNYC for full operating time without the complete elimination of station WMCA. The latter station serves the same public as the former, and has won the public esteem by the high character of its service. It is believed that the stations may without substantial prejudice severally continue their public service under the present arrangement.

We find furthermore that the procedure pursued by the commission in hearing appellant's application was fully authorized by the statute and are also convinced that the record sufficiently covers the issue herein, and that no additional testimony need be heard.

Appellant presents other complaints against the decision of the commission, and we have considered them. But upon consideration of the entire record we are convinced that the decision should be, and it is, affirmed with costs.

No. 4899, C. L. Carrell *v.* Federal Radio Commission was an appeal from denial of application for renewal of station licenses. In this appeal the validity of General Order No. 30, abolishing portable broadcasting stations, was questioned. Applicant appealed on the ground that the action of the commission results in confiscation of property contrary to the provisions of the fifth amendment and on further ground that the commission failed in its administrative duty to provide for portables in determining its allocation of broadcasting stations. It further alleged a failure on the part of the commission to apply properly the standard of public interest, convenience, or necessity. The court gave its decision in this case on November 4, 1929, holding, in part, as follows:

It may be stated at once that no complaint is made as to the conduct of appellant in the operation of the stations now in question. The ruling of the commission relates to all portable stations alike and this appeal challenges the authority of the commission to make and enforce its rule against the licensing of portable broadcasting stations as a class.

It is contended on behalf of the commission that the licensing of portable broadcasting stations is not in the public interest, convenience, or necessity; that the Davis amendment to the radio act of 1927 (45 Stat. 373) contemplates fixed allocation of broadcasting stations, and its mandate can not be carried out if roving transmitters are allowed to operate; that under the allocation of the stations as at present established the operation of migratory transmitters would result in harmful interference; that the difficulties of supervision of portable stations rendered it against public interest to license them; and that to permit portable broadcasting stations to rove at will over a portion of the country on any one broadcasting channel would deprive the public of the service of that channel to its full capacity.

We think that the commission acted within its authority when dealing with portable stations as a class, under the provisions of section 4 of the radio act of 1927. * * *

We think also that the objections urged against the licensing of portable stations as a class are fully sustained by the evidence. Moreover, it is within common knowledge that if portable transmitters were licensed to rove over the country at the will of the licensee, great inconvenience would result because of interference with established stations, and the difficulty of supervising the broadcasting service as a whole would be greatly increased. It is obvious that these inconveniences need not be incurred at the present state of the art since adequate service may be expected from stations having fixed allocations, and the development of broadcasting in this country has tended exclusively toward localized stations.

No. 4900, Great Lakes Broadcasting Company *v.* Federal Radio Commission (station WENR); No. 4901, Wilbur Glenn Boliva *v.* Federal Radio Commission (station WCBD); No. 4902, Agricultural Broadcasting Company *v.* Federal Radio Commission (station WLS). These three appeals are from decisions of the commission denying applications for modification of licenses, the pleading in each case setting forth that the applicant has been deprived of property rights and the violation of the fifth amendment by action of the commission; also that the commission's action is unreasonable and arbitrary. These stations all applied for time on the same frequency and the commission was for the first time faced with a proper occasion for committing to written form the broad underlying principles which, in its opinion, must control its decision on controversies arising between broadcasting stations in their competition for favorable assignments on the limited number of channels available. This the commission attempted to do in its Statement of Facts and Grounds for Decision, filed with the Court of Appeals quoted from above on pages 32 to 35. Briefs were filed and oral argument had October 8, 1929.

No. 4925, Richmond Development Corporation *v.* Federal Radio Commission (Station WRBC) was an appeal from a decision denying, on rehearing, an application for a third extension of a construction permit authorizing the Richmond Development Corporation to construct a station at Roanoke, Va. In this appeal the validity of a 2-to-2 decision was attacked. The commission contended that its tie vote was one to determine whether it would reconsider and rescind its former action, and that to reconsider and rescind would be affirmative action requiring a majority vote of the commission; that since the vote was a tie the application to rescind its former action failed. Appellant contended that the commission's tie vote was one which attempted to deny its application for a third extension of its construction permit. Another question involved in this appeal was whether the causes of delay in completing the construction of applicant's station within the time set forth in the construction permit were within the appellant's control. The court rendered a decision in this case on November 4, 1929.

The opinion holds:

> We are convinced by a review of the record that it was the duty of the commission to grant the application. The evidence, without substantial contradiction, discloses that the appellant had acted not only in good fatih but also with diligence in its efforts to construct the station within the time allowed by the permit, and that the completion thereof was prevented by causes not under its control.
>
> If appellant is denied the privilege of completing the station it will suffer a heavy loss in consequence. On the other hand, it can not be contended that the public interests have suffered any loss or prejudice by reason of the delay in the completion of the station; and if allowed to proceed with the construction appellant agrees "to make every human effort to push it through to the earliest possible completion." Furthermore, in our opinion, the record disclosed no cause or circumstance arising or first coming to the knowledge of the commission since the granting of the permit which would make the operation of the station against the public interest. It is manifest that the opposition to appellant's application is largely based upon the claim that when the construction permit was first granted there already was an efficient broadcasting station in Roanoke, and that there was no public need for another station; also that the erection of a second station in Roanoke would tend to deprive other cities in Virginia of their just and equal rights in broadcasting. This argument, however, is answered by the fact that

all these conditions were well known to the commission and must have been considered by that body when it granted the construction permit and the extensions thereof. Consequently, they do not constitute a "cause or circumstance arising or first coming to the knowledge of the licensing authority since the granting of the permit." With reference to the alleged injustice which may result to other cities from the operation of this station, if completed, it may be noted that prior to the date of appellant's permit the competing Roanoke station was not using all of its time and when the commission made an allocation on September 1, 1928, it provided that the two stations should share time. This allocation was rescinded when it came to the attention of the commission that appellant's station had not been completed within the prescribed time. But it does not appear that such allocation can not be made without injustice to other cities, if the station should hereafter be completed.

It is therefore, the decision of this court that the appellant was, on September 1, 1928, and still is, entitled to an extension of time reasonably sufficient to enable it to complete the construction of the broadcasting station in question. The decision appealed from is reversed and this cause is remanded to the Federal Radio Commission to carry the present decision into effect.

No. 4972, Chicago Federation of Labor *v.* Federal Radio Commission (station WCFL) is an appeal from the denial of an application for modification of license. Besides the questions raised in other cases this appeal raises the question whether it is in the public interest, convenience, or necessity to give a cleared channel to an organization, body, or association to broadcast social doctrines of the owners.

No. 4976, Head-of-the-Lakes Broadcasting Company *v.* Federal Radio Commission (station WEBC) was an appeal from a denial of an application for modification of station license. It was dismissed on motion of appellant.

No. 5003, Southwestern Sales Corporation *v.* Federal Radio Commission (station KVOO) was an appeal from a denial of an application for modification of station license. This appeal has been voluntarily withdrawn by the appellant.

No. 5004, Norman Baker *v.* Federal Radio Commission (station KTNT) was an appeal from a denial of an application for modification of station license. It was dismissed on motion of appellant.

Two of the remaining eight appeals are by private corporations from the commission's denial of applications for licenses to use short-wave frequencies for private point-to-point communication. These are No. 4984, By-Products Coal Company *v.* Federal Radio Commission, and No. 4985, J. P. Burton Coal Company *v.* Federal Radio Commission, and involve the question of the application of the standard of public interest, convenience, or necessity to private communications companies. A motion to dismiss these two appeals has been filed by the commission on the ground that they were not taken within the time allowed by section 16 of the radio act of 1927.

The remaining six appeals are by communication companies seeking short-wave assignments for public point to point communication. These are: No. 4987, Intercity Radiotelegraph Company *v.* Federal Radio Commission; No. 4988, Wireless Telegraph and Communication Company *v.* Federal Radio Commission; Chicago Federation of Labor *v.* Federal Radio Commission (dismissed); No. 4990, Radio Corporation of America *v.* Federal Radio Commission; No. 4991, Mackay Radio and Telegraph Company *v.* Federal Radio Commission; No. 5005, Universal Service Wireless Company *v.* Federal Radio Commission. These appeals involve such questions as the following:

Whether an established communications company has rights superior to those of a newcomer in the assignment of additional channels; to what extent the policy of establishing competition in point to point communication must be followed; whether press messages are entitled to special recognition over the ordinary commercial messages to the extent of reserving channels for the press; what effect is to be given the fact that available channels are all disposed of, and many incidental questions involving the financial resources and technical equipment of appellants.[12]

A petition for a "stay order" has been filed in these cases, appellants relying on the decisions of the court in the WGY case and, which, if issued as requested, would effectually prevent use of any of the channels pending final judgment by the court. Motions to dismiss these petitions have been filed by the commission on the theory that the court of appeals is without jurisdiction to issue such a writ.

In addition to the foregoing, two suits have been instituted in the Supreme Court of the District of Columbia. Both were injunction proceedings. The first, San Angelo Broadcasting Company *v.* I. E. Robinson, E. O. Sykes, Sam Pickard, H. A. Lafount, and O. H. Caldwell, constituting the Federal Radio Commission, Equity No. 29000, was dismissed by plaintiff without prejudice. The second was National Radio Press Association *v.* Federal Radio Commission, and the individual commissioners, Equity No. 94524. In this case Judge Bailey denied the application for an injunction and rendered the following opinion:

> The commission has reserved 20 frequencies for general press service for intercontinental use, without allotting any particular frequency to anyone. Apart from any other question I do not think that the plaintiff is a "press" association, despite its name, nor do I think that the commission is under any obligation to reopen its hearings whenever a corporation, which has just come into existence, applies to it for that purpose.
>
> The allocations to be made by the commission are for a year only; the parties have a right to appeal from any erroneous action of that body, no irreparable injury will be done to the plaintiff that would justify the court in interfering with the action of the commission.
>
> The application for a temporary injunction will be denied.

[12] Extended quotations from the commission's statements in these cases are found at pp. 31 to 43.

VI. MISCELLANEOUS

A.-INTERNATIONAL PROBLEMS

There are already many interesting questions of an international nature raised in the field of radio communication. While several treaties and conferences have dealt with this subject, none have been of very great significance until the signing of the most recent general treaty which resulted from the Washington conference of 1927.

The United States was a signatory to this treaty. No attempt was made therein to allocate channels to the various nations of the world. It was confined merely to an obligation to avoid interference and divided up the entire spectrum of frequencies into bands to be devoted to the various kinds of service.

Negotiations were next entered into with the North American governments concerning the use of frequencies in the so-called continental band (between 1,500 and 6,000 kilocycles). As a result of these negotiations a conference was held at Ottawa, Canada, beginning January 21, 1929, and an arrangement was made allocating the short-wave channels on the North American Continent. The governments thereby agreed not to assign to stations within their respective jurisdictions any general communication channels that may be allocated to other governments unless it could be accomplished without causing interference. Each government, however, retained the right to assign such channels to any radio station within its jurisdiction upon the sole condition that no interference with any service of another country will result therefrom.

At present there is only an informal "gentlemen's agreement" between the United States and Canada covering the broadcast band, discussed elsewhere in this report.

The representatives of European nations met for the consideration of their problems in the broadcast and continental high-frequency bands at Prague in April, 1929. This meeting was also attended by representatives of the United States who were present merely as observers. The result of this conference was an assignment of frequencies to European broadcasting stations known as the Prague plan which became effective on June 30, 1929.

The American delegation spoke of the encouragement given to amateurs in the United States and explained its reasons for opposing the extension of broadcasting to high frequencies where there would be encroachment on amateur radio operation. This problem, together with many others, was presented to the International Radio Consulting Committee at The Hague with the prospect of having a solution worked out for presentation to the conference.

The first meeting of the International Technical Consulting Committee on Radio Communication was held at The Hague September 18 to October 2, 1929. The official United States delegation of tech-

nical experts was headed by Maj. Gen. Charles McK. Saltzman, a member of the Federal Radio Commission. Numerous proposals were submitted to the conference for the improvement of international radio conditions and in each instance the action taken was satisfactory to the United States. The American delegation achieved signal success in its efforts to fix standards of engineering practice in the use of wave lengths having international effect. The action of the conference with respect to proposed restrictions limiting the activities of amateurs was of great interest to the United States because of the large number of amateurs in this country. It is very gratifying to report that the status of amateurs in the United States would not be changed by any recommendations of the conference. The final report of the American delegation showing the results of the conference will probably not be available before the end of this year.

The consideration and solution of the international problems of radio is of primary importance to all nations of the world. Until they are solved the internal regulations of these countries can not achieve a status of satisfactory stability. The United States having acquired an acknowledged leadership among the family of nations in matters of radio communication and being far in advance of other nations in the use of radio, must undoubtedly play a prominent part in the satisfactory settlement of these problems.

B. SUMMARY AND DISPOSITION OF APPLICATIONS RECEIVED (YEAR ENDING JULY 1, 1929)

Applications received	Total			Granted without hearing			Heard by commission			Denied after hearing or applicant's default			Granted after hearing		
	Construction permits	Licenses	Renewals [1]	Construction permits	Licenses	Renewals [1]	Construction permits	Licenses	Renewals [1]	Construction permits	Licenses	Renewals [1]	Construction permits	Licenses	Renewals [1]
FIXED SERVICE															
Broadcasting [2]	601	601	1,894	312	231	1,860	47	52	145	240	78	39	6	16	108
Point to point (domestic)	204	193	18	146	166	13	215	22	16	144	38	22	171	5	3
Point to point (international)	131	18	92	45	89	105	137	16	1	137	16	0	0	0	1
MOBILE SERVICE															
Ships		1,426	824		1,426	598		0	0		0	0		0	0
Marine relay	0	9	0	0	9	0	0	0	0	0	0	0	0	0	0
Airplanes		78	1		84	0		0	0		0	0		0	0
Aeronautical	89	54	0	44	48	0	35	3	1	36	0	0	35	3	0
Special [3]		22	0		22	0		0	0		0	0		0	1
Portable (including geophysical)	67	105	8	15	84	23	90	16	0	3	2	0	89	14	0
Coastal	36	44	10	28	65	11	6	6	2	2	8	0	4	2	2
Fire and police	7	8	3	5	14	1	1	0	0	0	0	0	1	0	0
Press	47	22	0	0	2	2	73	0	0	57	1	0	16	0	0
EXPERIMENTAL SERVICE															
General	72	86	27	44	131	17	37	1	3	36	5	1	9	0	2
Visual	32	23	3	16	15	5	4	2	1	33	1	3	1	2	1
Relay	16	3	3	9	12	3	11	5	1	18	5	2	6	1	1
Airplane		29	5		17	4		1	0		0	0		1	0
Aeronautical	6	6	0	4	4	1	0	0	0	0	0	0	0	0	0
Broadcasting	0	4	0	0	0	2	0	0	0	0	0	0	0	0	0
Grand total	1,308	2,731	2,888	668	2,419	2,645	656	124	170	701	154	67	338	44	119
Final grand total	6,927			5,732			950			922			501		

[1] Renewals include modifications and voluntary or involuntary assignments of license.
[2] Renewal applications for broadcasting licenses are received every 90 days. All other services are licensed for 1 year.
[3] Temporary authority to operate in connection with special events of local or national interest.

C. COMPARISON OF LICENSE, RENEWALS, AND CONSTRUCTION PERMITS ISSUED FOR YEARS ENDING JULY 1 1928 AND JULY 1, 1929

Classification	1928			1929			Increase, 1929			Decrease, 1929		
	Licenses [1]	Renewals	Construction permits	Licenses [1]	Renewals	Construction permits	Licenses [1]	Renewals	Construction permits	Licenses [1]	Renewals	Construction permits
FIXED SERVICE												
Broadcasting [2]	499	2,082	220	247	1,968	318	0	0	98	252	114	0
Point to point (domestic)	118	0	72	171	16	316	53	16	244	0	0	0
Point to point (international)	59	0	38	89	106	45	40	106	7	0	0	0
MOBILE SERVICE												
Ships	577	0	----------	1,426	598	----------	849	598	----------	0	0	----------
Marine relay	0	0	0	9	0	0	9	0	0	0	0	0
Airplanes	5	0	----------	84	0	----------	79	0	----------	0	0	----------
Aeronautical	0	0	0	51	1	79	51	1	79	0	0	0
Special [3]	11	0	7	22	0	0	11	0	0	0	0	7
Portable (including geophysical)	5	0	5	98	23	104	93	23	99	0	0	0
Coastal	23	0	18	67	13	32	44	13	14	0	0	0
Fire and police	0	0	2	14	1	6	14	1	4	0	0	0
Press	1	0	17	2	2	16	1	2	0	0	0	1
EXPERIMENTAL SERVICE												
General	101	0	34	131	19	53	30	19	19	0	0	0
Visual	0	0	0	17	7	17	17	7	17	0	0	0
Relay	0	0	0	13	4	15	13	4	15	0	0	0
Airplane	3	0	----------	18	4	----------	15	4	----------	0	0	0
Aeronautical	0	0	0	4	1	4	4	1	4	0	0	0
Broadcasting	4	0	0	0	2	0	0	2	0	4	0	0
Grand total	1,406	2,082	413	2,463	2,765	1,005	1,323	797	600	256	114	8
Final grand total	3,901			6,233			2,720			378		

[1] Licenses include modifications and voluntary or involuntary assignments of license.
[2] Renewal applications for broadcasting licenses are received every 90 days. All other services are licensed for 1 year.
[3] Temporary authority to operate in connection with special events of local or national interest.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929 [13]

PUBLIC POINT TO POINT—TRANSOCEANIC

Licensee or permittee	Location	Call letters	Remarks
American Telephone & Telegraph Co.	Ocean Township (Whale Pond Road, N. J.)	WLO	Construction permit.
Do	Deal, Lawrence Township, N. J.	WMI	Licensed.
Do	Ocean Township (Whale Pond Road, N. J.).	WNC	Construction permit.
Mackay Radio & Telegraph Co	Near Palo Alto, Calif. (Santa Clara County).	KNW	Licensed.
American Telephone & Telegraph Co.	Lawrenceville, N. J	WND	Do.
Do	Rocky Point, N. Y	WNL	Do.
Robert Dollar Co	Guam	KDC	Construction permit.
Do	Musselrock, Calif	KGQ	Do.
Do	Seattle, Wash	KGR	Do.
Do	Honolulu, Island of Oahu, Hawaii.	KGS	Do.
Do	Los Angeles, Calif	KGX	Do.
Do	New York City, N. Y	WGA	Do.
Mackay Radio & Telegraph Co	Near Palo Alto, Calif. (Santa Clara County).	KNK	Licensed.
Do	Near Honolulu, Oahu Island, Hawaii.	KNN	Do.
Do	Guam	KTA	Construction permit.
Do	Midway, Midway Island	KTF	Do.
Do	Sayville, N. Y	WML	Licensed.
Press Wireless (Inc.)	Thirty-first and Diamond Streets, San Francisco, Calif.	KOQ	Construction permit.
Do	Little Neck, Long Island, N. Y.	WJN	Do.
Do	San Francisco, Calif	KOP	Do.
Do	Los Angeles, Calif	KOS	Do.
Do	do	KPG	Do.
Do	Chicago, Ill	WJA	Do.
Do	do	WJC	Do.
Do	Near Milwaukee, Wis	WJF	Do.
Do	Philadelphia, Pa	WJG	Do.
Do	Upper Newton Falls, Newton, Mass.	WJK	Do.
Do	Washington, D. C	WJM	Do.
Do	Little Neck, Long Island, N. Y.	WJO	Do.
Do	do	WJP	Do.
Do	do	WJQ	Do.
Do	do	WJS	Do.
Do	do	WJU	Do.
R. C. A. Communications (Inc.)	Point Reyes, Calif	KDU	Licensed.
Do	Bolinas, Calif	KEB	Do.
Do	do	KEE	Do.
Do	do	KEI	Do.
Do	do	KEJ	Do.
Do	do	KEL	Do.
Do	do	KEM	Do.
Do	do	KEN	Do.
Do	Hahuku, Hawaii	KEQ	Do.
Do	Bolinas, Calif	KER	Do.
Do	do	KES	Do.
Do	do	KET	Do.
Do	do	KEZ	Do.
Do	Territory of Hawaii, Kahuku	KGI	Do.
Do	do	KIE	Do.
Do	Kahuku, Hawaii	KIO	Do.
Do	do	KKH	Do.
Do	Bolinas, Calif	KKL	Do.
Do	Kahuku, Hawaii	KKP	Do.
Do	Bolinas, Calif	KKQ	Do.
Do	do	KKR	Do.
Do	do	KKW	Do.
Do	do	KKZ	Do.
Do	do	KLL	Do.
Do	do	KMM	Do.
Do	do	KQG	Do.
Do	Kahuku, Hawaii	KQH	Construction permit.
Do	Bolinas, Calif	KQJ	Licensed.
Do	do	KQR	Do.
Do	do	KQZ	Do.
Do	Kahuku, Hawaii	KRO	Do.
Do	Bolinas, Calif	KSS	Do.
Do	do	KUN	Do.
Do	do	KWE	Do.

[13] This list is not an index to stations now in operation, but is a record of all authorizations in the fields indicated which have been issued, during the reporting period, by the commission.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

PUBLIC POINT TO POINT—TRANSOCEANIC—Continued

Licensee or permittee	Location	Call letters	Remarks
R. C. A. Communications (Inc.)	Rocky Point, N. Y.	WAJ	Licensed.
Do	New Brunswick, N. J.	WAZ	Do.
Do	Rocky Point, N. Y.	WBU	Do.
Do	Tuckerton, N. J.	WCI	Do.
Do	Rocky Point, N. Y.	WDS	Do.
Do	do	WEA	Do.
Do	do	WEB	Do.
Do	do	WEC	Do.
Do	do	WED	Do.
Do	do	WEE	Do.
Do	do	WEF	Do.
Do	do	WEG	Do.
Do	do	WEJ	Do.
Do	do	WEL	Do.
Do	do	WEM	Do.
Do	do	WEN	Do.
Do	do	WEO	Do.
Do	do	WER	Do.
Do	do	WES	Do.
Do	do	WET	Do.
Do	do	WEV	Do.
Do	do	WEX	Do.
Do	do	WEZ	Do.
Do	do	WFX	Do.
Do	Tuckerton, N. J.	WGG	Do.
Do	San Juan, P. R.	WGT	Do.
Do	do	WGU	Do.
Do	do	WGX	Construction permit.
Do	do	WGZ	Licensed.
Do	Rocky Point, N. Y.	WHR	Do.
Do	New Brunswick, N. J.	WII	Do.
Do	Rocky Point, N. Y.	WIK	Do.
Do	do	WIR	Do.
Do	do	WIY	Do.
Do	New Brunswick, N. J.	WIZ	Do.
Do	San Juan, P. R.	WJT	Do.
Do	Rocky Point, N. Y.	WKC	Do.
Do	do	WKD	Do.
Do	do	WKJ	Do.
Do	do	WKL	Do.
Do	do	WKM	Do.
Do	do	WKO	Do.
Do	do	WKP	Do.
Do	do	WKQ	Do.
Do	do	WKU	Do.
Do	do	WKW	Do.
Do	do	WLL	Do.
Do	do	WPE	Do.
Do	do	WQA	Do.
Do	do	WQB	Do.
Do	do	WQC	Do.
Do	do	WQD	Do.
Do	do	WQE	Do.
Do	do	WQF	Do.
Do	do	WQG	Do.
Do	do	WQH	Do.
Do	do	WQI	Do.
Do	do	WQJ	Do.
Do	do	WQK	Do.
Do	do	WQL	Do.
Do	do	WQN	Do.
Do	do	WQO	Do.
Do	do	WQP	Do.
Do	do	WQQ	Do.
Do	do	WQR	Do.
Do	do	WQS	Do.
Do	do	WQT	Do.
Do	do	WQU	Do.
Do	do	WQV	Do.
Do	do	WQW	Do.
Do	do	WQX	Do.
Do	do	WQY	Do.
Do	San Juan, P. R.	WQZ	Construction permit.
Do	Marion, Mass.	WRQ	Licensed.
Do	New Brunswick, N. J.	WRT	Do.
Do	Marion, Mass.	WSO	Do
Do	Rocky Point, N. Y.	WSS	Do.
Do	do	WTT	Do.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

PUBLIC POINT TO POINT—TRANSOCEANIC—Continued

Licensee or permittee	Location	Call letters	Remarks
Radio Corporation of America	Coram Hill, N. Y	WQL	Licensed.[1]
Southern Radio Corporation	Linden, N. J	WMU	Do.
Tropical Radio Telegraph Co	Hialeah, Fla	WAX	Do.
Do	Boston, Mass	WBF	Do.
Do	Mobile, Ala	WNN	Do.
Do	New Orleans, La	WNU	Do.
U. S. Liberia Radio Corporation	Akron, Ohio	WTF	Do.

PUBLIC POINT TO POINT—DOMESTIC

Alaska Pacific Salmon Corporation	Drier Bay, Alaska	KTT	Licensed.
Do	Evans Bay, Alaska	KUR	Do.
Alaska-Portland Packers Association	Daly, Alaska	KDJ	Do.
Do	Warren, Alaska	KHU	Do.
Alitak Fish Co	Zachar Bay, Alaska	KFX	Do.
Do	Lazy Bay, Alaska	KPS	Do.
Alpena Marine Radio Service	Alpena, Mich	WGI	Do.
Annette Island Packing Co	Annette Island, Alaska	KFA	Do.
Joseph T. Bauer	Chichagof, Alaska	KWW	Do.
Baranoff Packing Co	Red Bluff Bay, Alaska	KSX	Do.[1]
Chichagof Mining Co	Chichagof, Alaska	KRX	Do.[1]
Chilkat Oil Co	Katalla, Alaska	KSC	Do.
City of Seattle, harbor department	Seattle, Wash	KPE	Do.[1]
Columbia Rivers Packers Association.	Lake Bay, Alaska	KZC	Do.
Far North Fisheries (Inc.)	Hydaburg, Alaska	KGIP	Do.
Florida Radio Telegraph Co	Poinciana, Fla	WFV	Do.[1]
Do	Miami, Fla	WRB	Do.[1]
Karl Hansen	Port Alexander, Alaska	KPR	Do.
Intercity Radio Telegraph Co	Buffalo, N. Y	WAM	Do.
Do	Columbus, Ohio	WCL	Do.
Do	Detroit, Mich	WDI	Do.
Do	Chicago, Ill	WFL	Do.
Do	Duluth, Minn	WME	Do.
Do	Cleveland, Ohio	WTK	Do.
Do	do	WTL	Do.
Katmai Packing Co. (Inc.)	Uzinki, Alaska	KZU	Do.
Kennecott Copper Corporation	Latouche, Alaska	KIM	Do.
Killam, T. H	Port Graham, Alaska	KFQ	Do.[1]
Killisnoo Fisheries (Inc.)	Killisnoo, Alaska	KQU	Do.
Kodiak Island Fishing & Packing Co. (Inc.).	Uganik Bay, Alaska	KLP	Do.
Libby, McNeill & Libby	Libbyville, Alaska	KMT	Do.
Lipke, Adam W	Seldovia, Alaska	KEA	Do.
Mackinac Radio Service	Mackinac Island, Mich	WIIQ	Do.
Michigan Limestone & Chemical Co.	Rogers City, Mich	WLC	Do.
Mackay Radio & Telegraph Co	Hillsboro, Oreg	KGH	Do.
Do	Palo Alto, Calif	KWT	Do.
Do	Clearwater, Calif	KNR	Do.
Do	Sayville, N. Y	WKI	Do.
Mutual Telephone Co	Wailuku, Island of Maui	KHL	Do.
Do	Lihue, Hawaii	KHM	Do.
Do	Lanai, Hawaii	KHN	Construction permit.
Do	Kaunakakai, island of Molokai.	KHO	Licensed.
Do	Hilo, Hawaii	KLN	Do.
Do	Wahiawa, Hawaii	KHK	Do.[1]
Do	Honolulu, Hawaii	KOG	Do.
Nakat Packing Co	Union Bay, Alaska	KON	Do.
Do	Waterfall, Alaska	KZN	Do.
Do	Hidden Inlet Cannery, Alaska	KQL	Do.
Do	Nakeen Cannery, Alaska	KJI	Do.
New England Fish Co	Chatham Cannery, Alaska	KGIN	Do.
Do	Steamboat Bay, Alaska	KUU	Do.
Norfolk-Cape Charles Radio Telegraph Co.	Cape Charles, Va	WEP	Do.[1]
Pacific American Fisheries	Excursion Inlet, Alaska	KGIS	Do.
Do	King Cove, Alaska	KJK	Do.
Do	Point Moller, Alaska	KWR	Do.
Do	Ikatan, Alaska	KXW	Do.
Pere Marquette Railway Co	Ludington, Mich	WLD	Do.
Peril Straits Packing Co	Todd, Alaska	KFP	Do.
Port Walter Herring & Packing Co	Big Port Walter, Alaska	KPV	Do.
Porto Rico Telephone Co	Ponce, P. R	WJF	Do.[1]

[1] Term has expired and station not now operating.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

PUBLIC POINT TO POINT—DOMESTIC—Continued

Licensee or permittee	Location	Call letters	Remarks
C. Reiss Coal Co	Sheboygan, Wis	WSK	Licensed.
R. C. A. Communications (Inc.)	Rocky Point, N. Y	WQM	Do.[1]
R. P. Slayton	Pinecrest, Fla	WRP	Do.[1]
South Porto Rico Sugar Co	Ensenada. P. R	WPR	Do.
Tropical Radio Telegraph Co	Burrwood, La	WBW	Do.[1]
Do	Fort Morgan, Ala	WIO	Do.
Union Fish Co	Pirate Cove, Alaska	KOX	Do.[1]
Universal Wireless Communications Co. (Inc.).	Akron, N. Y	WNDF	Construction permit.
Do	Albany, N. Y		Do.
Do	Amarillo, Tex		Do.
Do	Athol, Mass		Do.
Do	Atlanta, Ga		Do.
Do	Atlantic City, N. J		Do.
Do	Augusta, Ga		Do.
Do	Austin, Tex		Do.
Do	Augusta, Me		Do.
Do	Bakersfield, Calif		Do.
Do	Baltimore, Md		Do.
Do	Billings, Mont		Do.
Do	Birmingham, Ala		Do.
Do	Boise, Idaho		Do.
Do	Brunswick, Ohio	WNDC	Do.
Do	do	WNDB	Do.
Do	Burlington, Va		Do.
Do	Butte, Mont		Do.
Do	Carson City, Nev		Do.
Do	Cedar Rapids, Iowa		Do.
Do	Charleston. W. Va		Do.
Do	Charleston, S. C		Do.
Do	Chattanooga Tenn		Do.
Do	Cheyenne, Wyo		Do.
Do	Columbus, Ohio	WNDM	Do.
Do	Concord, N. H		Do.
Do	Dallas, Tex		Do.
Do	Dayton, Ohio	WNDI	Do.
Do	Denver, Colo		Do.
Do	Duluth, Minn		Do.
Do	Elko, Nev		Do.
Do	Fargo, N. Dak		Do.
Do	Fresno, Calif		Do.
Do	Galveston, Tex		Do.
Do	Grand Forks, N. Dak		Do.
Do	Harrisburg, Pa		Do.
Do	Hartford, Conn		Do.
Do	Helena, Mont		Do.
Do	Houston, Tex		Do.
Do	Indianapolis, Ind		Do.
Do	Jackson, Miss		Do.
Do	Jacksonville, Fla		Do.
Do	Jefferson City, Mo		Do.
Do	Kansas City, Mo		Do.
Do	La Crosse, Wis		Do.
Do	Lincoln, Nebr		Do.
Do	Little Rock, Ark		Do.
Do	Los Angeles, Calif		Do.
Do	Louisville, Ky		Do.
Do	Madison, Wis		Do.
Do	Medford, Oreg		Do.
Do	Memphis, Tenn		Do.
Do	Miami, Fla		Do.
Do	Milford, Ohio	WNDD	Do.
Do	Milwaukee, Wis	WNDL	Do.
Do	Minneapolis, Minn		Do.
Do	Mobile, Ala		Do.
Do	Moline, Ill		Do.
Do	Montpelier, Vt		Do.
Do	Muskegon, Mich		Do.
Do	Nashville, Tenn		Do.
Do	New Brunswick, N. J		Do.
Do	New Haven, Conn		Do.
Do	New Orleans, La		Do.
Do	Norfolk, Va		Do.
Do	North Platte, Nebr		Do.
Do	Oklahoma City, Okla		Do.

[1] Term has expired and station not now operating.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

PUBLIC POINT TO POINT—DOMESTIC—Continued

Licensee or permittee	Location	Call letters	Remarks
Universal Wireless Communications Co. (Inc.)	Omaha, Nebr		Construction permit.
Do	Palm Beach, Fla		Do.
Do	Peoria, Ill	WNDJ	Do.
Do	Philadelphia, Pa		Do.
Do	Phoenix, Ariz		Do.
Do	Pierre, S. Dak		Do.
Do	Pittsburgh, Pa		Do.
Do	Pocatello, Idaho		Do.
Do	Ponca City, Okla		Do.
Do	Portland, Me		Do.
Do	Portland, Oreg		Do.
Do	Rock Springs, Wyo		Do.
Do	Sacramento, Calif		Do.
Do	Salt Lake City, Utah		Do.
Do	San Angelo, Tex		Do.
Do	San Antonio, Tex		Do.
Do	San Francisco, Calif		Do.
Do	Santa Fe, N. Mex		Do.
Do	Sault Ste. Marie, Mich		Do.
Do	Savannah, Ga		Do.
Do	Schenectady, N. Y		Do.
Do	Seattle, Wash		Do.
Do	Shreveport, La		Do.
Do	South Lyon, Mich	WNDE	Do.
Do	Spartanburg, S. C		Do.
Do	Spokane, Wash		Do.
Do	Springfield, Ill	WNDK	Do.
Do	Springfield, Mass		Do.
Do	Springfield, Ohio		Do.
Do	St. Louis, Mo		Do.
Do	Trenton, N. J		Do.
Do	Tampa, Fla		Do.
Do	Taunton, Mass	WNDH	Do.
Do	do	WNDG	Do.
Do	Tucson, Ariz		Do.
Do	Utica, N. Y		Do.
Do	Waco, Tex		Do.
Do	Walla Walla, Wash		Do.
Do	Washington, D. C		Do.
Do	Wichita, Kans		Do.
Do	Wilmington, Del		Do.
Do	Winston-Salem, N. C		Do.
Do	Youngstown, Ohio		Do.
Do	Scobeyville, N. J	WKDA	Licensed.
Do	Plainfield, Ill	WKDE	Do.
The Warehouse Co	Port Hobron, Alaska	KGL	Do.
The Wireless Telegraph & Communication Co.	Northbrook, Ill	WHW	Do.[1]

POINT TO POINT—PRIVATE

Aleutian Livestock Co	Nelsmoor, Alaska	KGIY	Construction permit.[2]
Do	Unalaska, Alaska	KGIV	Do.
Do	Umnak, Alaska	KGIU	Do.
Alaska Consolidated Canneries (Inc.)	Chomly, Alaska	KDP	Licensed.
Do	Pybus Bay, Alaska	KFC	Do.
Do	Quadra, Alaska	KHD	Do.
Do	Tenakee, Alaska	KOU	Do.
Do	Yes Bay, Alaska	KRU	Do.
Alaska Packers Association	Moored vessel in Koggiung River, Alaska.	KDR	Do.
Do	Alameda, Calif	KFU	Do.[1]
Do	Uyak, Alaska	KHA	Do.
Do	Kvichak, Alaska	KHB	Do.
Do	Chignik, Alaska	KHC	Do.
Do	Snag Point, Alaska	KHF	Do.
Do	Clarks Point, Alaska	KHG	Do.
Do	Naknek, Alaska	KHT	Do.
Do	Loring, Alaska	KRI	Do.
Do	Naknek, Alaska	KTZ	Do.[1]
Do	Koggiung River, Alaska	KUB	Do.
Do	Bacheroff, Alaska	KUD	Do.
Do	Pilot Point, Alaska	KUL	Do.

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D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

POINT TO POINT—PRIVATE—Continued

Licensee or permittee	Location	Call letters	Remarks
Alaska Packers Association	Koggiung River, Alaska (Kvichak).	KVQ	Licensed.
Do	Karluk, Alaska	KYK	Do.
Do	Alitak, Alaska	KYL	Do.
Alaska Pacific Salmon Corporation	Port Althrop, Alaska	KLW	Do.
Do	Cape Chacon, Alaska	KFN	Do.
Do	Rose Inlet, Alaska	KJC	Do.
Alaska Salmon Co	Nushagak, Alaska	KZV	Do.
Ann Arbor Railroad Co	Manistique, Mich	WMX	Do.
Do	Manitowoc, Wis	WMW	Do.
Do	Frankfort, Mich	WFK	Do.
Do	Menominee, Mich	WDM	Do.
Bethleham Shipbuilding Corporation	Quincy, Mass	WPC	Do.
Baranof Packing Co	Red Bluff Bay, Alaska	KXS	Do.[1]
J. P. Burton Coal Co	Cleveland, Ohio	WLI	Do.[1]
By-Products Coal Co	Bypro, Ky	WLG	Do.[1]
Bristol Bay Packing Co	Kvichak, Alaska	KYM	Do.
Buchan and Heinen Packing Co	Point Armstrong, Alaska	KHH	Do.
Byrd Antartic Expedition	Portable	WFA	Do.[1]
Do	do	WFD	Do.[1]
Do	do	KFK	Do.[1]
Do	do	WFE	Do.[1]
Carter Publications (Inc.)	Fort Worth, Tex	KMB	Do.[1]
Caw Packing Co	Rasberry Island, Alaska	KMQ	Do.[1]
City of Los Angeles, Calif	Independence, Calif	KQS	Do.[1]
City of New York, Department of Plant and Structure.	New York City	WKDX	Construction permit.[2]
City of Seattle Light Department	Cedar Falls, Wash	KFR	Do.
City of Seattle, Harbor Department	Seattle, Wash	KPE	Do.[1]
City of Seattle Light Department	do	KVW	Do.
City of Seattle Lighting Department.	Rockport, Wash	WJE	Do.
Columbia River Packers Association (Inc.).	Nushagak, Alaska	KLJ	Do.
Do	Chignik, Alaska	KNP	Do.
Commonwealth Edison Co	Chicago, Ill	WOF	Do.
W. M. Cook	Siginaka Island, Alaska	KXD	Do.[1]
Crosley Radio Corporation	Harrison, Ohio	WDJ	Do.[1]
Dallas News and Dallas Journal	Dallas, Tex	KFB	Do.[1]
Department of Water and Power	Los Angeles, Calif	KQT	Do.[1]
The Detroit Edison Co	Detroit, Mich	WBM	Construction permit.[2]
Do	Marysville, Mich	WPV	Do.[2]
Do	Ypsilanti, Mich	WRH	Do.[2]
Everett Packing Co	Herendeen Bay, Alaska	KHE	Licensed.
First Troop Philadelphia City Cavalry.	Philadelphia, Pa	WDH	Do.[1]
Florida Power & Light Co	Bradenton, Fla	WNE	Do.
Do	Lakeland, Fla	WNF	Do.
Do	West Palm Beach, Fla	WNG	Do.
Do	Miami, Fla	WNH	Do.
Do	Lake City, Fla	WNM	Do.
Do	Palatka, Fla	WNP	Do.
Do	Fort Lauderdale, Fla	WNQ	Do.
Do	Punta Gorda, Fla	WNS	Do.
Do	Sanford, Fla	WNT	Do.
Do	St. Augustine, Fla	WNV	Do.
Do	Daytona Beach, Fla	WNX	Do.
Do	Fort Pierce, Fla	WNZ	Do.
Florida Radio Telegraph Co	Miami, Fla	WRB	Do.[1]
Do	Poinciana, Fla	WFV	Do.[1]
Ford Motor Co	Dearborn, Mich	WAV	Do.
Do	do	WBO	Do.[1]
Do	L'Anse, Mich	WCT	Do.[1]
Federal-State Marketing Service	San Diego, Calif	KGJA	Construction permit.[2]
Do	Indio, Calif	KGJB	Do.[2]
Do	Lodi, Calif	KGJC	Do.[2]
Do	Santa Rosa, Calif	KGJD	Do.[2]
Do	Santa Maria, Calif	KGJE	Do.[2]
Do	Modesto, Calif	KGJG	Do.[2]
Do	Marysville, Calif	KGJH	Do.[2]
Do	Fresno, Calif	KGJI	Do.[2]
Do	Salinas, Calif	KRB	Licensed.
Do	Sebastopol, Calif	KRD	Do.
Do	San Francisco, Calif	KRG	Do.
Do	San Jose, Calif	KRH	Do.
Do	Sacramento, Calif	KRJ	Do.

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D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

POINT TO POINT—PRIVATE—Continued

Licensee or permittee	Location	Call letters	Remarks
Federal-State Marketing Service	Los Angeles, Calif.	KRM	Licensed.
Do	Brawley, El Centro, Calif.	KRN	Do.
P. E. Harris & Co	False Pass, Alaska	KJL	Do.
Do	Hawk Inlet, Alaska	KPD	Do.
Headquarters Troop One-hundred and Fourth Cavalry, Pennsylvania National Guard.	Harrisburg, Pa	WKB	Do.[1]
Hawaiian Pineapple Co. (Ltd.)	Kaumapalapu, Hawaii	KRQ	Do.[1]
Do	Honolulu, Hawaii	KYB	Do.[1]
Hemrich Packing Co. (Inc.)	Kukah Bay, Alaska	KJP	Do.[1]
Huron Transportation Co	Alpena, Mich.	WNO	Do.
Independent Wireless Telegraphing Co.	Zachar Bay, Alaska	KFX	Do.
Indiana Electric Corporation	Indianapolis, Ind	WMDH	Construction permit.
Do	Terre Haute, Ind	WMDM	Do.
Inland Waterways Corporation	Minneapolis, Minn	KQP	Licensed.
Do	Memphis, Tenn	WPI	Do.
International News Service (Inc.)	New York City	WJD	Do.[1]
Inland Waterways Corporation	Birmingport, Ala	WPM	Do.[1]
Lincoln L. Jackson	Seattle, Wash.	KPA	Do.[1]
Kreeten Co	Johnswood, Mich	WMF	Do.
W. W. Kathan	Cheboygan, Mich	WPJ	Do.
Libby, McNeil & Libby	Yakutat, Alaska	KKA	Do.
Do	Egegik, Alaska	KMF	Do.
Do	Ekuk, Alaska	KMG	Do.
Do	Lockanok, Alaska	KML	Do.
Do	Nushagak, Alaska	KNO	Do.
Do	Tally Scow, Alaska	KTQ	Do.
Do	Taku Harbor, Alaska	KVG	Do.
Do	Koggiung, Alaska	KVV	Do.
Do	Kenai, Alaska	KYZ	Do.
G. E. Maddox	Mary Island, Alaska	KJJ	Do.
Marland Pipe Line Co	Panhandle, Tex.	KEH	Do.
Do	Ponca City, Okla.	KFE	Do.
C. A. McCue	Boca De Quadra, Alaska	KZS	Do.
Michigan Limestone & Chemical Co.	Rogers City, Mich.	WLC	Do.
Minaret Mines Co.	Sierras, Calif.	KGKI	Construction permit.[2]
Do	Anaheim, Calif.	KGKJ	Do.
Nakat Packing Corporation	Heceta Island, Alaska	KGG	Linseed.[1]
New England Fish Co	Steamboat Bay, Alaska	KUU	Do.[1]
New York Alaska Gold Dredging Co.	Bear Creek, Alaska	KUY	Do.
Northwestern Electric Co	Underwood, Wash.	KFL	Do.
Do	Portland, Oreg.	KLB	Do.
Northwestern Fisheries Co	Dundas, Alaska	KEY	Do.
Do	Uyak, Alaska	KHV	Do.
Do	Chignik, Alaska	KJB	Do.
Do	Kenni, Alaska	KLD	Do.
Do	Kasaan, Alaska	KMC	Do.
Do	Nushagak, Alaska	KNJ	Do.
Do	Naknek, Alaska	KOM	Do.
Do	Quadra, Alaska	KOR	Do.
Do	Hunters Bay, Alaska	KQI	Do.
Do	Shakan, Alaska	KVN	Do.
Northern States Power Co.	Minneapolis, Minn.	WLP	Do.
Do	St. Croix Falls, Wis.	WPL	Do.
Pacific American Fisheries	Pillar Bay, Alaska	KYV	Do.
Penna Power & Light Co	Frackville, Pa.	WBI	Do.
Do	Hazleton, Pa.	WCJ	Do.
Do	Allentown, Pa.	WHC	Do.
Do	Williamsport, Pa.	WPH	Do.
Pennsylvania Railroad	Altoona, Pa.	WHL	Do.
Penna Power & Light Co	Willsonville, Pa.	WLF	Do.[1]
Pere Marquette Railway Co	Ludington, Mich.	WLD	Do.
The Philadelphia Electric Co.	Philadelphia, Pa.	WJV	Do.
Phillips Petroleum Co	Bartlesville, Okla.	KJM	Do.
Do	Borger, Tex.	KJS	Do.
Do	Breckenridge, Tex.	KSU	Do.
Port Walter Herring & Packing Co.	Saginaw Bay, Alaska	KFJ	Do.
Potomac Edison Co	Williamsport, Md.	WHF	Do.
Do	Cumberland, Md.	WKZ	Do.
Potomac Electric Power Co	Washington, D. C.	WJH	Do.
Do	Benning, Washington, D. C.	WJX	Do.
Public Service Electric & Gas Co.	Jersey City, N. J.	WHU	Do.
Do	Newark, N. J.	WHV	Do.
Pan American Airways (Inc.)	San Juan, P. R.	WMDU	Construction permit.
Russell Reed	Portable	KGV	Licensed.[1]

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D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

POINT TO POINT—PRIVATE—Continued

Licensee or permittee	Location	Call letters	Remarks
Radio Victor Corporation of America.	Madison Square Garden, New York City.	WODD	Licensed.[1]
Radio Salmon Canning Co	Naknek, Alaska	KMK	Do.
Do	Ugashik, Alaska	KMU	Do.
Do	S. S. Hyades (moored), Alaska.	KPB	Do.
Do	M. S. Mount Baker (moored), Alaska.	KYD	Do.
Radiomarine Corporation of America.	Aberdeen, Wash	KZE	Do.[1]
San Juan Fishing & Packing Co	Uganik, Alaska	KVF	Do.
Sebastian Stuart Fish Co	Tyee, Alaska	KSR	Do.
Skelly Oil Co	Skelly Camp, Tex	KIH	Do.
Do	Eldorado, Kans	WAH	Do.
Do	Tulsa, Okla	WEH	Do.
R. P. Slayton	Pinecrest, Fla	WRP	Do.[1]
Snug Harbor Packing Co	Snug Harbor, Alaska	KVC	Do.
Starr-Collinson Packing Co	Prince of Wales Island, Alaska.	KGIT	Do.
State of California, Division of Forestry.	Portable	KGKN	Construction permit.
Do	do	KGKP	Do.
Sunny Point Packing Co	Kake, Alaska	KGP	Licensed.
Do	Funter, Alaska	KXK	Do.
Superior Packing Co	Tenakee, Alaska	KFD	Do.
Susquehanna Power Co	Darlington, Md	WSY	Do.
Tropical Radio Telegraph Co	Fort Morgan, Ala	WIO	Do.
Texas Pipe Line Co	McCamey, Tex	KSZ	Do.
Do	Kingsmill, Tex	KYI	Do.
Do	Wichita Falls, Tex	KYU	Do.
United States Alaska Packing Co	Point Herbert, Alaska	KOV	Do.
U. S. Shipping Board Merchant Fleet Corporation.	Mobile, Ala	WPK	Do.[1]
The Warehouse Co	Point Hobron, Alaska	KGL	Do.
Do	Akutan, Alaska	KMW	Do.
West Penn Power Co	Charleroi, Pa	WBV	Do.
Do	Cheat Haven, W. Va	WHH	Construction permit.[2]
Do	Butler, Pa	WHJ	Do.[2]
Do	Connellsville, Pa	WOB	Licensed.
Do	Springdale, Pa	WOY	Do.
Wyandotte Transportation Co	Wyandotte, Mich	WCV	Do.[1]
Whitworth Fisheries (Inc.)	Point Warde, Alaska	KLH	Do.[1]
Westinghouse Electric & Manufacturing Co.	East Pittsburgh, Pa	WKA	Do.[1]
Do	Springfield, Mass	WBZ	Do.[1]
Do	Newark, N. J	WAQ	Do.[1]

MOBILE SERVICE—COASTAL

American Tug Boat Co	Everett, Wash	KFT	Licensed.
Ann Arbor Railroad Co	Manistique, Mich	WMX	Do.
Do	Manitowoc, Wis	WMW	Do.
Do	Frankfort, Mich	WFK	Do.
Do	Menominee, Mich	WDM	Do.
Annette Island Packing Co	Annette Island, Alaska	KFA	Do.
American Telephone & Telegraph Co.	Near Deal, N. J	WOO	Do.
Bureau of Insular Telegraph	Munoz Rivera, Vieques, P. R.	WQW	Do.
Do	Ceiba, P. R	WKK	Do.
Chilkat Oil Co	Katalla, Alaska	KSC	Do.
City of Seattle, harbor department	Seattle, Wash	KPE	Do.
Commercial Pacific Cable Co	Midway Island, Pacific Ocean.	KYN	Do.[1]
Coos Bay Wireless Telegraph Co	North Bend, Oreg	KGN	Do.
Robert Dollar Co	Guam	KDC	Construction permit.
Do	Portland, Oreg	KKB	Do.
Do	Seattle, Wash	KSA	Do.
Do	Los Angeles, Calif	KSM	Do.
Do	San Francisco, Calif	KTK	Do.
Do	Honolulu, Island of Oahu, Hawaii.	KYG	Do.
Do	Hunts Point, New York City, N. Y.	WPN	Do.
Elwood Exploration Co	Santa Barbara, Calif	KGJY	Do.
Carol G. Fisher Co	Miami Beach, Fla	WFU	Licensed.[2]
Ford Motor Co	Fordson, Mich	WMD	Do.
Gulf Radio Service	Tampa, Fla	WPD	Do.

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D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE—COASTAL—Continued

Licensee or permittee	Location	Call letters	Remarks
Karl Hansen	Port Alexander, Alaska	KPR	Licensed.[1]
The Harbor Tug & Barge Co	Alameda, Calif	KLR	Do.
Do	San Francisco, Calif	KGKH	Construction permit.[2]
Humble Oil & Refining Co	Baytown, Tex	KJV	Licensed.
Howard P. Hardesty	Highland Park, Mich	WBC	Do.[1]
Inland Waterways Corporation, Mississippi Warrior Service.	Birmingport, Ala	WPM	Do.
Do	Mobile, Ala	WPP	Do.
Illinois Radio Corporation of America	South Chicago, Ill	WGO	Do.
The Intercity Radio Telegraph Co	Buffalo, N. Y	WAM	Do.
Do	Ishpeming, Mich	WAN	Do.
Do	Detroit, Mich	WDI	Do.
Do	Chicago, Ill	WFL	Do.
Do	do	WFL	Do.
Do	Duluth, Minn	WME	Do.
Do	Cleveland, Ohio	WTK	Do.
Kennecott Copper Corporation	Latouche, Alaska	KIM	Do.
Libby, McNeill & Libby	Libbyville, Alaska	KMT	Do.
Adam W. Lipke	Seldovia, Territory of Alaska	KEA	Do.
Mackinac Radio Service	Mackinac Island, Mich	WHQ	Do.
Magnolia Petroleum Co	Beaumont, Tex	WOD	Do.
Marine Products (Inc.)	Reedville, Va	WRX	Do.[1]
Merchants Exchange (Inc.)	Portland, Oreg	KPK	Do.
Mackay Radio & Telegraph Co	Hillsboro, Oreg	KEK	Do.
Do	Near Palo Alto, Calif	KFS	Do.
Do	Clearwater, Calif	KOK	Do.
Do	Near Bar Harbor, Me	WAG	Construction permit.
Mackay Radio & Telegraph Co	North West Palm Beach, Fla	WMR	Do.
Do	New York City, N. Y	WSF	Licensed.
Do	Sayville, N. Y	WSL	Do.
Michigan Limestone & Chemical Co	Rogers City, Mich	WLC	Do.
Mutual Telephone Co	Wahiawa, Territory of Hawaii	KHK	Do.
Pacific American Fisheries	King Cove, Alaska	KJK	Do.
Do	Port Moller, Alaska	KWR	Do.
Do	Ikatan, Alaska	KXW	Do.
Pacific Coast Cement Co	Dall Island, Alaska	KSJ	Do.[1]
Pere Marquette Railway Co	Ludington, Mich	WLD	Do.
Radio Corporation of America, Ohio Co.	Buffalo, N. Y	WBL	Do.
Do	West Dover, Ohio	WCY	Do.
Do	Duluth, Minn	WRL	Do.
Radiomarine Corporation of America	Bolinas, Calif	KPH	Do.
Do	Torrance, Calif	KSE	Do.
Do	Marion, Mass	WCC	Do.
Do	Galveston, Tex	WGV	Do.
Do	Baltimore, Md	WMH	Do.
Do	Brooklyn, N. Y	WNY	Do.
Do	Palm Beach, Fla	WOE	Do.
Do	Port Arthur, Tex	WPA	Do.
Do	New London, Conn	WSA	Do.
Do	Tuckerton, N. J	WSC	Do.
Do	East Moriches, Long Island, N. Y.	WSH	Do.
The C. Reiss Coal Co	Sheboygan, Wis	WSK	Do.
San Francisco Bar Pilots Association	San Francisco, Calif	KGJJ	Construction permit.
South Porto Rico Sugar Co	Ensenada, P. R	WPR	Licensed.
Tidewater Wireless Telegraph Co	Philadelphia, Pa	WNW	Do.
Tropical Radio Telegraph Co	Hialeah, Fla	WAX	Do.
Do	Boston, Mass	WBF	Do.
Do	Fort Morgan, Ala	WIO	Do.
Do	Mobile, Ala	WNN	Do.
Do	New Orleans, La	WNU	Do.
Twin Harbor Stevedoring & Tug Co	Hoquiam, Wash	KJQ	Do.[1]
United States Shipping Board Emergency Fleet Corporation.	Fort Eustis Pier, Va	WPF	Do.
The Warehouse Co	Port Hobron, Territory of Alaska.	KGL	Do.
Do	Akutan, Territory of Alaska	KMW	Do.

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D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE-MARINE RELAY

Licensee or permittee	Location	Call letters	Remarks
Illinois Radio Corporation of America.	Chicago, Ill	WGO	Licensed.
Intercity Radio Telegraph Co	Buffalo, N. Y	WAM	Do.
Do	Ishpeming, Mich	WAN	Do.
Do	Detroit, Mich	WDI	Do.
Do	Duluth, Minn	WME	Do.
Do	Cleveland, Ohio	WTK	Do.
R. C. A. Communications (Inc.)	Rocky Point, N. Y	WQM	Do.
Radio Corporation of America, Ohio Co.	Buffalo, N. Y	WBL	Do.
Do	Duluth, Minn	WRL	Do.
Radiomarine Corporation of America	Port Arthur, Tex	WPA	Do.
Tropical Radio Telegraph Co	Mobile, Ala	WNN	Do.
Do	New Orleans, La	WNU	Do.

MOBILE SERVICE-PRESS

New York Times Co	New York City	WHD	Licensed.
Examiner Printing Co	San Francisco, Calif	KUP	Do.

MOBILE SERVICE—AERONAUTICAL

Boeing Air Transport (Inc.)	Portland, Oreg	KEG	Construction permit.[2]
Do	Burbank, Calif	KEU	Do.[2]
Do	Sacramento, Calif	KFM	Licensed.
Do	Oakland, Calif	KFO	Do.
Do	Medford, Oreg	KGE	Do.
Do	do	KGE	Construction permit.
Do	Fresno, Calif	KGT	Licensed.
Do	Tacoma, Wash	KGKW	Construction permit.
Do	Fresno, Calif	KGT	Do.
Do	Reno, Nev	KJE	Do.[2]
Do	Elko, Nev	KKO	Do.[2]
Do	Omaha, Nebr	KMP	Do.[2]
Do	North Platte, Nebr	KMR	Do.[2]
Do	Cheyenne, Wyo	KOE	Do.[2]
Do	Rock Springs, Wyo	KQC	Do.[2]
Do	Salt Lake City, Utah	KQD	Do.[2]
Do	Des Moines, Iowa	KQM	Do.[2]
Do	Iowa City, Iowa	KQQ	Do.[2]
Do	Bakersfield, Calif	KQX	Licensed.
Do	Cedar Rapids, Iowa	KRA	Construction permit.[2]
Do	Lincoln, Nebr	KRF	Do.[2]
Do	Redding, Calif	KTU	Do.[2]
Do	Portland, Oreg	KVO	Do.[2]
Do	Seattle, Wash	KZJ	Do.[2]
Do	Chicago, Ill	WBQ	Do.[2]
Egyptian Transportation System (Inc.)	Marion, Ill	WEU	Do.
Ford Motor Co	Dearborn, Mich	WFO	Licensed.
Do	Lansing, Ill	WCQ	Do.
Maddux Air Lines (Inc.)	Phoenix, Ariz	KGJR	Construction permit.[2]
Do	San Diego, Calif	KGJS	Do.[2]
Do	San Bruno, Calif	KGJT	Do.[2]
Do	El Paso, Tex	KGJU	Do.[2]
Do	Los Angeles, Calif	KGJV	Do.[2]
Monterey Peninsula Airport	Monterey County, Calif	KGKV	Do.[2]
New York Air Terminals (Inc.)	Jackson Heights, N. Y	WODJ	Do.[2]
Pacific Air Transport	Los Angeles, Calif	KFU	Licensed.
Pan American Airways (Inc.)	Brownsville, Tex	KGJW	Do.
Do	Miami, Fla	WKDL	Construction permit.[2]
Santa Maria Air Lines (Inc.)	Santa Maria, Calif	KGKD	Do.[2]
Transcontinental Air Transport (Inc.)	Albuquerque, N. Mex	KSI	Licensed.
Do	Gallup, N. Mex	KSP	Construction permit.[2]
Do	Clovis, N. Mex	KST	Licensed.
Do	Winslow, Ariz	KSV	Do.
Do	Kingman, Ariz	KSX	Do.
Do	Waynoka, Okla	KSY	Do.
Do	Columbus, Ohio	WHG	Do.
Do	Indianapolis, Ind	WHM	Do.

[2] Time has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE—AERONAUTICAL—Continued

Licensee or permittee	Location	Call letters	Remarks
Universal Aviation Corporation	Garden City, Kans.	KGKQ	Construction permit.
Western Air Express (Inc.)	Oakland, Calif.	KGSB	Licensed.
Do	Albuquerque, N. Mex.	KGSD	Do.
Do	Amarillo, Tex.	KGSE	Do.
Do	Dodge City, Kans.	KGSH	Do.
Do	Phoenix, Ariz.	KGSI	Do.
Do	Seligman, Ariz.	KGSL	Construction permit.[2]
Do	El Paso, Tex.	KGSM	Licensed.
Do	Denver, Colo.	KGSP	Do.
Do	Pueblo, Colo.	KGSR	Do.
Do	San Diego, Calif.	KGSX	Do.
Do	Holbrook, Ariz.	KGTA	Do.
Do	Wichita, Kans.	KGTD	Do.
Do	Kansas City, Mo.	KGTG	Do.
Do	Salt Lake City, Utah.	KGTH	Do.
Do	Los Angeles, Calif.	KGTI	Do.
Do	Las Vegas, Nev.	KGTJ	Do.
Do	Kingman, Ariz.	KGTL	Do.
Do	Avalon, Calif.	KGTM	Do.
Do	Williams, Ariz.	KGSA	Construction permit.[2]
Do	Oklahoma City, Okla.	KGSC	Do.[2]
Do	Tucson, Ariz.	KGSF	Do.[2]
Do	Flagstaff, Ariz.	KGSG	Do.[2]
Do	Austin, Tex.	KGSJ	Do.[2]
Do	Dallas, Tex.	KGSK	Do.[2]
Do	Fort Worth, Tex.	KGSN	Do.[2]
Do	Houston, Tex.	KGSO	Do.[2]
Do	Marfa, Tex.	KGSQ	Do.[2]
Do	San Antonio, Tex.	KGSS	Do.[2]
Do	St. Louis, Mo.	KGST	Do.[2]
Do	Sweetwater, Tex.	KGSU	Do.[2]
Do	Wichita Falls, Tex.	KGSV	Do.[2]
Do	Muskogee, Okla.	KGSW	Do.[2]
Do	Barstow, Calif.	KGSY	Do.[2]
Do	Ashfork, Ariz.	KGSZ	Do.[2]
Do	Gallup, N. Mex.	KGTB	Do.[2]
Do	Clovis, N. Mex.	KGTC	Do.[2]
Do	Needles, Calif.	KGTE	Do.[2]
Do	Winslow, Ariz.	KGTF	Do.[2]
Do	S. F. Municipal Airport, Calif.	KGTK	Do.[2]
Do	Chicago, Ill.	WMDA	Do.[2]

MOBILE SERVICE—AIRPLANE

American International Airways (Inc.).	Airplane	KHEA	Licensed.[1]
Boeing Air Transport (Inc.)	do	KHAF	Do.[1]
Do	do	KHBA	Do.[1]
Do	do	KHBB	Do.[1]
Do	do	KHBC	Do.[1]
Do	do	KHBD	Do.
Do	do	KHBE	Do.
Do	do	KHBF	Do.
Do	do	KHBG	Do.
Do	do	KHBH	Do.
Do	do	KHBI	Do.
Do	do	KHBJ	Do.
Do	do	KHBK	Do.
Do	do	KHBL	Do.
Do	do	KHBM	Do.
Do	do	KHBN	Do.
Do	do	KHBO	Do.
Do	do	KHBP	Do.
Do	do	KHBQ	Do.
Do	do	KHBR	Do.[1]
Do	do	KHBS	Do.[1]
Do	do	KHBT	Do.[1]
Do	do	KHBU	Do.[1]
Do	do	KHBV	Do.[1]
Commander Richard E. Byrd	do	WFB	Do.[1]
Do	do	WFC	Do.[1]
Do	do	WFF	Do.[1]

[1] Term has expired and station not now operating.
[2] Term has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE—AIRPLANE—Continued

Licensee or permittee	Location	Call letters	Remarks
R. N. Cheminant	Airplane	W10XN	Licensed.
Chicago Daily News (Inc.)	do	KHEH	Do.
Curtiss Aeroplane Export Corporation.	do	KHEN	Do.
Curtis Flying Service (Inc.)	do	KHEB	Do.
Do	do	KHGA	Do.
Do	do	KHGB	Do.
B. Ellson	do	KDY	Do.[1]
Do	do	KDZ	Do.[1]
R. H. Jackson, jr	do	KHEP	Do.
H. G. McCarroll	do	KHAS	Do.[1]
New York, Rio & Buenos Aires Line (Inc.).	do	KHED	Do.
Irving Niles	do	KIK	Do.
Joseph M. Patterson	do	KHAL	Do.
Pan American Airways (Inc.)	do	KHAM	Do.
Do	do	KHFG	Do.
Do	do	KHAA	Do.
Do	do	KHAB	Do.
Do	do	KHAC	Do.
Do	do	KHAD	Do.
Do	do	KHAE	Do.
Do	do	KHAH	Do.
Do	do	KHAK	Do.
Do	do	KHAO	Do.
Do	do	KHAP	Do.
Do	do	KHAQ	Do.
Do	do	KHAR	Do.
Do	do	KHAS	Do.
Do	do	KHAT	Do.
Do	do	KHAU	Do.
Do	do	KHAV	Do.
Do	do	KHAW	Do.
Do	do	KHAX	Do.
Do	do	KHFA	Do.
Do	do	KHFB	Do.
Do	do	KHFC	Do.
Do	do	KHFD	Do.
Do	do	KHFE	Do.
Do	do	KHFF	Do.
Do	do	KHFH	Do.
Do	do	KHFI	Do.
Do	do	KHFJ	Do.
Do	do	KHFK	Do.
Do	do	KHFL	Do.
Do	do	KHFN	Do.
Radio Engineer Laboratories	do	KHAK	Do.[1]
Radiomarine Corporation of America	do	KHAY	Do.
Do	do	KHEC	Do.
Do	do	KHEI	Do.
Do	do	KHRC	Do.
Cesare Sabelli	do	KHAT	Do.[1]
Slate Aircraft Corporation	do	KHEF	Do.
Standard Oil Co. of California	do	KHAZ	Do.
The Tribune Co	do	KHEJ	Do.[1]
Transcontinental Air Transport (Inc.).	do	KHDA	Do.
Do	do	KHDB	Do.
Do	do	KHDC	Do.
Do	do	KHDD	Do.
Do	do	KHDE	Do.
Do	do	KHDF	Do.
Do	do	KHDG	Do.
Do	do	KHDH	Do.
Do	do	KHDI	Do.
Do	do	KHDJ	Do.
Do	do	KHDK	Do.
Do	do	KHDL	Do.
Do	do	KHDM	Do.
Do	do	KHDN	Do.
Do	do	KHDO	Do.
Do	do	KHDP	Do.
Do	do	KHDQ	Do.
Do	do	KHDR	Do.
Do	do	KHDS	Do.
Do	do	KHDT	Do.

[1] Term has expired and station not now operating.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE—AIRPLANE—Continued

Licensee or permittee	Location	Call letters	Remarks
Universal Aviation Corporation	Airplane	KHEM	Licensed.
James Walter Warner	do	KHEE	Do.
Western Air Express (Inc.)	do	KHAG	Do.
Do	do	KHAI	Do.
Do	do	KHAJ	Do.
Do	do	KHCA	Do.
Do	do	KHCB	Do.
Do	do	KHCC	Do.
Do	do	KHCD	Do.
Do	do	KHCE	Do.
Do	do	KHCF	Do.
Do	do	KHCG	Do.
Do	do	KHCH	Do.
Do	do	KHCI	Do.
Do	do	KHCJ	Do.
Do	do	KHCK	Do.

MOBILE SERVICE—GEOPHYSICAL

F. S. Chapman	Portable	KDD	Construction permit.[1]
Do	do	KDE	Do.[1]
Do	do	KDL	Do.[1]
Do	do	WGC	Do.[1]
Geophysical Exploration Co	do	KJN	Licensed.
Do	do	KJO	Do.
Do	do	KJT	Do.
Do	do	KJW	Do.
Do	do	KJY	Do.
Geophysical Research Corporation	do	KDH	Do.
Do	do	KDV	Do.
Do	do	KDX	Do.
Do	do	KGJL	Do.
Do	do	KGJM	Do.
Do	do	KGJN	Do.
Do	do	KGJO	Do.
Do	do	KGJP	Do.
Do	do	KGJQ	Do.
Do	do	KGKR	Construction permit.
Do	do	KGKS	Do.
Do	do	KGKT	Do.
Do	do	KGKU	Do.
Do	do	KHP	Licensed.
Do	do	KHS	Do.
Do	do	KHW	Do.
Do	do	KHZ	Do.
Do	do	KIB	Do.
Do	do	KIC	Do.
Do	do	KIJ	Do.
Do	do	KKD	Do.
Do	do	KKF	Do.
Do	do	KKU	Do.
Do	do	KKV	Do.
Do	do	KKX	Do.
Do	do	KKY	Do.
Do	do	KNL	Do.
Do	do	KNM	Do.
Do	do	KNQ	Do.
Do	do	KNS	Do.
Do	do	KNT	Do.
Do	do	KNU	Do.
Do	do	KNY	Do.
Do	do	KNZ	Do.
Do	do	KOD	Do.
Do	do	KOF	Do.
Do	do	KOI	Do.
Do	do	KOT	Do.
Do	do	KSB	Do.
Do	do	WFG	Do.
Do	do	WFH	Do.
Do	do	WFJ	Do.
Do	do	WFM	Do.
Do	do	WFN	Do.
Do	Portable	WFP	Do.
Do	do	WFQ	Do.

[1] Time has expired within which to complete construction

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE—GEOPHYSICAL—Continued

Licensee or permittee	Location	Call letters	Remarks
Geophysical Research Corporation	Portable	WFR	Licensed.
Do	do	WFS	Do.
Do	do	WFY	Do.
Do	do	WFZ	Do.
Do	do	WGB	Do.
Humble Oil & Refining Co	do	KFF	Do.
Do	do	KFG	Do.
Do	do	KFY	Do.
Do	do	KGZ	Do.
Do	do	KJA	Do.
Do	do	KJD	Do.
Do	do	KLA	Do.
Do	do	KLE	Do.
Do	do	KLG	Do.
Do	do	KLI	Do.
Do	do	KLT	Do.
Do	do	KLY	Do.
Do	do	KMD	Do.
Do	do	KMI	Do.
Do	do	KMS	Do.
Do	do	KMX	Do.
Do	do	KMY	Do.
Do	do	KMZ	Do.
Interstate Geophysical Exploration Co.	do	KOZ	Do.
Do	do	KPF	Do.
Do	do	KPL	Do.
Do	do	KPT	Do.
Do	do	KPU	Do.
Do	do	KRR	Do.
Do	do	KRS	Do.
Do	do	KRT	Do.
Do	do	KRV	Do.
Do	do	KRW	Do.
Do	do	KRZ	Do.
Do	do	WCS	Do.
Marland Refining Co	do	KJZ	Do.
Do	Ponca City, Okla	KSF	Do.
Do	Portable	WCU	Do.
McCollum Exploration Co	do	KGKE	Construction permit.
Sun Oil Co	do	WCM	Do.[1]
Do	do	WCN	Do.[1]
Do	do	WCO	Do.[1]
Do	do	WCP	Do.[1]
Do	do	WCR	Do.[1]
The Texas Co	do	KJG	Licensed.
Do	do	KNB	Do.
Do	do	KNC	Do.
Do	do	KND	Do.
Do	do	KNE	Do.
Do	do	KNF	Do.
Do	do	WBB	Do.
Do	do	WBD	Do.
Do	do	WBE	Do.
Do	do	WBG	Do.
Do	do	WBH	Do.
Do	do	WBK	Do.
Do	do	WBN	Do.
Do	do	WBS	Do.
Do	do	WBX	Do.
Do	do	WCA	Do.
Do	do	WCB	Do.
Do	do	WCD	Do.
Do	do	WCH	Do.
Wireless Service Corporation	do	KGJZ	Construction permit.[1]

MOBILE SERVICE—POLICE AND FIRE

Berkeley Police Department	Berkeley, Calif	KSW	Construction permit.[1]
Board of fire commissioners, Baltimore, Md.	Baltimore, Md	WEQ	Licensed.
Boston Fire Department	Boston, Mass	WEY	Do.
Bureau of police (department of public safety, city of Philadelphia).	Philadelphia, Pa	WPDP	Construction permit.
City of Beaumont, Tex	Beaumont, Tex	KGKM	Do.

[1] Time has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

MOBILE SERVICE—POLICE AND FIRE—Continued

Licensee or permittee	Location	Call letters	Remarks
City of Buffalo, N. Y., department of police.	Buffalo, N. Y.	WMJ	Construction permit.[2]
City of Chicago, police department	Chicago, Ill.	WPDB	Do.
Do	do	WPDC	Do.
Do	do	WPDD	Do.
City of Cincinnati	Cincinnati, Ohio	WKDU	Do.
City of Cleveland	Cleveland, Ohio	WRBH	Do.
City of Dallas, police and fire signal department.		KVP	Licensed.
City of Indianapolis, police department.	Indianapolis, Ind.	WMDZ	Construction permit.
City of Miami, police department	Miami, Fla.	WNDA	Do.
City of New York, police department	New York, N. Y.	WPY	Licensed.
City of Seattle, fire department	Seattle, Wash.	KYF	Do.
Commonwealth of Massachusetts, department of public safety, division of State police.	Framingham, Mass.	WMP	Do.
Highland Park Police	Highland Park, Mich.	WMO	Do.
Detroit Fire Department	Detroit, Mich.	WKDT	Construction permit.[2]
Detroit Police Department	Belle Isle, Mich.	WCK	Licensed.
Pasadena Police Department	Pasadena, Calif.	KGJX	Construction permit.
Pennsylvania State Police	Harrisburg, Pa.	WBA	Licensed.
Pennsylvania State Police, Commonwealth of Pennsylvania.	Butler, Pa.	WBR	Do.
Do	Wyoming, Pa.	WDX	Do.
Do	Greensburg, Pa.	WJL	Do.
Do	West Reading, Pa.	WMB	Do.
Police department, city of Tulare	Tulare, Calif.	WPDA	Construction permit.
Seattle Police Department and Seattle Fire Department.	Seattle, Wash.	KGPA	Do.

MOBILE—SPECIALS

L. Bamberger & Co	New York, N. Y.	W2XAQ	Licensed.[1]
Chicago Police Department	Chicago, Ill.	W9XAJ	Do.[1]
Crosley Radio Corporation	Airplane	W8XAA	Do.[1]
H. P. Drey	Columbus, Ohio	WCAH	Do.[1]
Examiner Printing Co	Aboard press yacht Ambassador.	W6XZ	Do.[1]
Gimbel Bros. (Inc.)	Airplane	W2XBZ	Do.[1]
National Battery Broadcasting Co	do		Do.[1]
National Broadcasting Co. (Inc.)	do	W2XBF	Do.[1]
WYAY (Inc.)	do	W8XH	Do.[1]

GENERAL EXPERIMENTAL

Anderson, Clayton & Co	Houston, Tex.	W5XJ	Construction permit.[2]
Earle C. Anthony (Inc.)	Portable	W6XY	Licensed.[1]
American Telephone & Telegraph Co.	do	W1XR	Do.
Do	Rocky Point, N. Y.	W2XA	Do.
Do	Washington, D. C.	W3XT	Do.
Baltimore Radio Show (Inc.)	Baltimore, Md.	W3XE	Do.
Merrill D. Beam	Narberth, Pa.	W3XB	Construction permit.
Bell Telephone Laboratories (Inc.)	Portable	W2XAA	Licensed.
Gerald M. Best	Piedmont, Calif.	W6XAO	Do.
Joseph G. Branch	Chicago, Ill.	W9XAD	Construction permit.[2]
C. F. Burgess Laboratories	Madison, Wis.	W9XH	Licensed.
Bell Telephone Laboratories (Inc.)	Portable	W2XAV	Do.
Do	New York City, N. Y.	W2XB	Do.
Do	Ocean Township, N. J.	W2XG	Do.
Do	Deal, N. J.	W2XJ	Do.
Do	Cliffwood, N. J.	W2XF	Do.
Do	Whippany, N. J.	W3XN	Do.
Do	Portable	W6XQ	Do.
Do	Airplane	W7XAA	Do.
R. N. Cheminant	Los Angeles, Calif.	W6XBC	Construction permit.[2]
Allen D. Cardwell Manufacturing Corporation.	Brooklyn, N. Y.	W2XCE	Licensed.
Ceco Manufacturing Co. (Inc.)	Providence, R. I.	W1XAC	Do.[1]
Frank B. Chambers	Philadelphia, Pa.	W3XC	Do.
Corwin C. Chapman	Palo Alto, Calif.	W6XAY	Do.

[1] Term has expired and station not now operating.
[2] Time has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

GENERAL EXPERIMENTAL—Continued

Licensee or permittee	Location	Call letters	Remarks
The Chicago Daily News (Inc.)	Addison, Ill.	W9XAP	Construction permit.
Clark University	Worcester, Mass.	W1XZ	Licensed.
Cleveland Vacuum Tube Works	Cleveland, Ohio	W8XD	Do.
Colonial Air Transport (Inc.)	Boston, Mass.	W1XE	Construction permit.[2]
Do	Hartford, Conn.	W1XF	Do.[2]
Colorado School of Mines	Portable	W9XE	Do.[2]
Continental Broadcasting Corporation.	Alexandria, Va.	W3XD	Do.[2]
Do	Fredericksburg, Va.	W3XF	Do.[2]
Do	do	W3XG	Do.[2]
Do	Richmond, Va.	W3XH	Do.[2]
Howard C. Crossett	Wianno, Mass.	W1XA	Licensed.
De Forest Radio Co.	Passaic, N. J.	W2XCD	Do.
Fred Louis Dewey	Los Angeles, Calif.	W6XL	Do.[1]
Laurence E. Dutton	Miami Beach, Fla.	W4XQ	Do.
Do	Culver, Ind.	W9XB	Do.
The Robert Dollar Co.	Portable	K6XAK	Construction permit.[2]
The Electro-Spray Corporation	North Wenatchee, Wash.	W7XAS	Licensed.[1]
Do	North Cashmere, Wash.	W7XAT	Do.[1]
Elgin National Watch Co.	Elgin, Ill.	W9XAM	Do.
Dr. Willis Eugene Everette	San Rafael, Calif.	W6XAC	Do.[1]
Dean Farran	Portable	W6XAP	Do.
Federal Telegraph Co.	Newark, N. J.	W2XCG	Construction permit.
Do	Halfmoon Bay, Pacific Ocean	W6XAQ	Licensed.
Do	Palo Alto, Calif.	W6XV	Do.
Reginald A. Fessenden	Chestnut Hill, Mass.	W1XS	Do.
Robert Anton Fleiss	Portable	W2XAY	Construction permit.[2]
Edmund Thomas Flewelling	Dayton, Ohio.	W8XAG	Licensed.
Fox Film Corporation	Beverly Hills, Calif.	W6XAH	Construction permit.[2]
Galt Technical Junior College for Aeronautics.	Galt, Calif.	W6XBX	Do.
General Electric Co.	Portable	W6XAX	Licensed.[1]
General Radio Co.	Cambridge, Mass.	W1XO	Do.
David Grimes	Grasmere, N. Y.	W2XCB	Construction permit.[2]
Do	New York City, N. Y.	W2XCC	Do.[2]
Daniel Guggenheim Fund for the Promotion of Aeronautics.	Garden City, N. Y.	W2XBG	Do.
General Electric Co.	South Schenectady, N. Y.	W2XAC	Licensed.
Do	do	W2XAH	Do.
Do	do	W2XAK	Do.
Do	do	W2XAW	Do.
Do	do	W2XAZ	Do.
Do	do	W2XH	Do.
Do	Schenectady, N. Y.	W2XI	Licensed.[1]
Do	South Schenectady, N. Y.	W2XK	Do.
Do	do	W2XO	Do.
Do	Oakland, Calif.	W6XN	Do.
John Hays Hammond, jr.	Gloucester, Mass.	W1XI	Do.
Francis Edward Handy	Hartford, Conn.	W1XL	Do.
Lorenze A. Hansen and Carlton H. Kohler.	Robbinsdale, Minn.	W9XAE	Do.[1]
Harvard University-Cruft Laboratory.	Cambridge, Mass.	W1XJ	Do.
Ralph M. Heintz	Portable	W6XBB	Do.[1]
Herbert Hoover, jr., and Frederick E. Terman.	do	W6XH	Do.
Gleason W. Kenrick	Philadelphia, Pa.	W3XS	Do.
Lemert Engineering Corporation	Catalina Terminal, Calif.	W6XAE	Construction permit.
Mackay Radio & Telegraph Co.	Sayville, N. Y.	W2XBL	Licensed.[1]
Do	do	W2XCM	Do.[1]
Massachusetts Institute of Technology.	Cambridge, Mass.	W1XM	Do.
D. B. McGown	Portable	W6XD	Construction permit.[2]
Michigan College of Mining and Technology.	Houghton, Mich.	W9XAW	Do.
Montana State College	Bozeman, Mont.	W7XB	Licensed.
Morkum-Kleinschmidt Corporation	Chicago, Ill.	W9XO	Do.
Mackay Radio & Telegraph Co.	Palo Alto, Calif.	W6XAU	Do.[1]
Do	Portable	W6XBK	Do.
Mutual Telephone Co.	Honolulu, Hawaii	W6XP	Do.
Nightingale Radios (Inc.)	Portable	W6XR	Do.[1]
Louis Gerard Pacent	Winfield, Long Island, N. Y.	W2XP	Do.
Pacific Coast Crystal Laboratory	San Diego, Calif.	W6XJ	Construction permit.[2]
The Pennsylvania State College, department of electric engineering.	State College, Pa.	W8XE	Licensed.
Petroleum Telephone Co.	Oil City, Pa.	W8XBD	Do.[1]

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[2] Time has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

GENERAL EXPERIMENTAL—Continued

Licensee or permittee	Location	Call letters	Remarks
Pilot Electric Manufacturing Co. (Inc.).	Yorktown Heights, N. Y	W2XCF	Construction permit.[2]
Albert B. Pitts	Rantoul, Ill	W9XK	Licensed.
Radio Air Service Corporation	Cleveland, Ohio	W8XF	Do.
Radio Engineering Laboratories	Long Island City, N. Y	W2XV	Do.
Radio Pictures (Inc.)	New York City, N. Y	W2XR	Do.
The Radiore Co	Portable	W6XAB	Do.
John L. Reinartz	South Manchester, Conn	W1XAM	Do.
J. Harris Rogers	Hyattsville, Md	W3XR	Do.
Round Hills Radio Corporation	Portable	W1XAN	Do.
Do	Dartmouth, Mass	W1XV	Do.
R. C. A. Communications (Inc.)	Marion, Mass	W1XC	Do.
Do	New Brunswick, N. J	W2XAM	Do.
Do	Rocky Point, N. Y	W2XAS	Do.
Do	do	W2XBI	Do.
Do	Portable	W2XCQ	Do.
Do	Tuckerton, N. J	W2XD	Do.
Do	Rocky Point, N. Y	W2XS	Do.
Do	do	W2XT	Do.
Do	Bound Brook, N. J	W3XL	Do.
Do	Bolinas, Calif	W6XI	Do.
Do	Kahuku, Hawaii	W6XO	Do.
Do	Honolulu, Island of Oahu, Hawaii.	K6XS	Do.
Do	Lahaina, Island of Maui	K6XX	Do.
Do	Chicago, Ill	W9XAK	Do.
Radio Corporation of America	Yonkers, N. Y	W2XAB	Do.
Do	do	W2XAJ	Do.
Do	Brooklyn, N. Y	W2XBB	Do.
Do	New York City, N. Y	W2XCI	Do.
Do	Bronx, N. Y	W2XN	Do.
Do	New York City, N. Y	W2XW	Do.
Radiomarine Corporation of America.	Seattle, Wash	W7XE	Do.
Southern Pacific Co	Oakland, Calif	W6XZ	Construction permit.[2]
Southern Radio Corporation	Linden, N. J	W2XCY	Do.
George W. Sterling	Baltimore, Md	W3XI	Licensed.
Rev. Lannie W. Stewart	Carterville, Mo	W9XV	Do.
Stromberg-Carlson Telephone Manufacturing Co.	Rochester, N. Y	W8XAC	Do.
The Travelers Broadcasting Service Corporation.	Hartford, Conn	W1XG	Do.
Trustees of Tufts College	Medford, Mass	W1XAW	Do.
Tropical Radio Telegraph Co	Boston, Mass	W1XT	Do.
Do	Hialeah, Fla	W4XG	Do.
Do	New Orleans, La	W5XH	Do.
University of California	Berkeley, Calif	W6XM	Do.
University of Minnesota	Minneapolis, Minn	W9XI	Do.
Department of Electrical Engineering, University of North Dakota.	Grand Forks, N. Dak	W9XJ	Do.
Universal Wireless Commercial Co. (Inc.).	New York City, N. Y	W2XCT	Construction permit.[2]
Do	Portable	W3XU	Licensed.
Do	Salt Lake City, Utah	W6XA	Construction permit.[2]
Do	San Francisco, Calif	W6XZ	Do.[2]
Do	Buffalo, N. Y	W8XH	Do.[2]
Do	Chicago, Ill	W9XM	Do.[2]
Do	Portable	W10XA	Licensed.
Do	do	W10XB	Do.
Do	do	W10XC	Do.
Do	do	W10XD	Do.
Do	do	W10XE	Do.
G. H. Vincent	Utica, Mich	W8XB	Do.
Walter Charles Von Brandt	Jersey City, N. J	W2XBY	Construction permit.
Edward F. Walter	Los Angeles, Calif	W6XAV	Do.[2]
Ward Leonard Electric Co	Mount Vernon, N. Y	W2XBF	Do.
Warner Bros. Pictures (Inc.)	Portable	W6XBR	Licensed.[1]
Washburn Crosby Co	Anoka, Minn	W9XL	Do.
John E. Waters	Portable	W6XE	Do.[1]
Charles L. Watson and Ralph C. Gray.	San Francisco, Calif	W6XT	Construction permit.[1]
John M. Wells (for American Optical Co.)	Southbridge, Mass	W1XAX	Licensed.[1]
Wesleyan University	Middletown, Conn	W1XN	Do.
Western State College of Colorado	Gunnison, Colo	W9XD	Do.

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[2] Time has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

GENERAL EXPERIMENTAL—Continued

Licensee or permittee	Location	Call letters	Remarks
Westinghouse Electric & Manufacturing Co.	Newark, N. J	W2XAI	Licensed.
Do	East Pittsburgh, Pa	W8XI	Do.
Do	do	W8XP	Do.
Do	do	W8XS	Do.
Do	Chicago, Ill	W9XY	Do.
West Virginia University	Portable	W8XAW	Construction permit.
Wired Radio (Inc.)	Newark, N. J	W2XCU	Do.

EXPERIMENTAL—VISUAL BROADCASTING

Aero Products (Inc.)	Chicago, Ill	W9XAG	Construction permit.[1]
Chicago Federation of Labor	do	W9XAA	Licensed.[1]
Freed-Eisemann Radio Corporation	Allwood, N. J	W2XCP	Construction permit.
General Industries Co	Somerville, Mass	W1XB	Do.
Great Lakes Broadcasting Co	Downers Grove, Ill	W9XR	Licensed.[2]
General Electric Co	Schenectady, N. Y	W2XCW	Do.[1]
Jenkins Television Corporation	Jersey City, N. J	W2XCR	Do.
Do	Washington, D. C	W3XK	Do.
Do	Airplane	W10XU	Do.
Wilbur Jerman	Portland, Oreg	W7XAO	Do.
The Lexington Air Stations	Lexington, Mass	W1XAY	Do.
William Justice Lee	Winter Park, Fla	W4XE	Do.[1]
Ben S. McGlashan	Los Angeles, Calif	W6XAM	Construction permit.[2]
Nelson Bros. Bond & Mortgage Co.	Chicago, Ill	W9XAO	Licensed.
Pilot Electric Manufacturing Co. (Inc.).	Brooklyn, N. Y	W2XCL	Do.
RCA Communications (Inc.)	Bound Brook, N. J	W3XL	Do.
Radio Corporation of America	Portable	W2XBS	Do.
Do	do	W2XBV	Do.
Do	Near New York City, N. Y	W2XCO	Construction permit.
Do	Portable	W3XAK	Licensed.
Radio Pictures (Inc.)	New York City, N. Y	W2XR	Do.
Shortwave and Television Laboratory (Inc.).	Boston, Mass	W1XAV	Construction permit.
Harold E. Smith	Near Beacon, N. Y	W2XBU	Licensed.
University of Iowa	Iowa City, Iowa	W9XAZ	Do.[1]
W. A. A. M. (Inc.), Isiah R. Nelson, president.	Newark, N. J	W2XBA	Do.
Westinghouse Electric & Manufacturing Co.	Springfield, Mass	W1XAE	Do.[1]
Do	East Pittsburgh, Pa	W8XAV	Do.[1]
W. R. E. C. (Inc.)	Whitehaven, Tenn	W4XA	Do.[1]

EXPERIMENTAL—RELAY BROADCASTING

Atlantic Broadcasting Corporation	Crossbay Boulevard, Long Island, near Jamaica, N. Y.	W2XE	Licensed.
Aviation Radio Station (Inc.)	Coytesville, N. Y	W2XAL	Do.
L. Bamberger & Co	Kearny, N. J	W2XCX	Construction permit.[2]
Baruchrome Corporation	Portable	W2XBR	Licensed.
The Chicago Daily News (Inc.)	Addison, Ill	W9XAQ	Construction permit.
Chicago Federation of Labor	Chicago, Ill	W9XAA	Do.
The Crosley Radio Corporation	Harrison, Ohio	W8XAL	Licensed.[1]
Great Lakes Radio Broadcasting Co.	North Downers Grove, Ill	W9XF	Do.
General Electric Co	South Schenectady, N. Y	W2XAD	Do.
Do	do	W2XAF	Do.
Mona Motor Oil Co	Council Bluffs, Iowa	W9XU	Do.[1]
Pacific-Western Broadcasting Federation.	North Westminster, Calif	W6XAL	Construction permit.
RCA Communications (Inc.)	Bound Brook, N. J	W3XAL	Licensed.
Universal Broadcasting Co	North Bustleton, Pa	W3XAU	Construction permit.
Westinghouse Electric & Manufacturing Co.	East Springfield, Mass	W1XAZ	Do.
Do	East Pittsburgh, Pa	W8XK	Licensed.[1]

[1] Term has expired and station not now operating.
[2] Time has expired within which to complete construction.

D. List of licenses and permits (exclusive of broadcasting, ship or amateur) arranged by services, that have been authorized from July 1, 1928, to November 1, 1929—Continued

EXPERIMENTAL—AIRPLANE

Licensee or permittee	Location	Call letters	Remarks
Aircraft Radio Corporation	Airplane	W10XI	Licensed.
American Aeronautical Corporation	do	W10XG	Do.
Bell Telephone Laboratories (Inc.)	do	W2XBX	Do.[1]
Do	do	W7XAA	Do.
The Chicago Daily News (Inc.)	do	W10XF	Do.
Colonial Air Transport (Inc.)	do	W10XQ	Do.
Do	do	W10XS	Do.
Lieut. James H. Doolittle	do	W10XH	Do.[1]
Ford Motor Co	do	W8XA	Do.
C. Francis Jenkins	do	W10XZ	Do.
Morton B. Kahn	do	W2XCA	Do.
National Air Transport (Inc.)	do	W10XJ	Do.
Packard Motor Car Co	do	W8XC	Do.
Pilot Electric Manufacturing Co. (Inc.).	do	W2XBQ	Do.
Radio Corporation of America	do	W4XN	Do.[1]
Do	do	W2XBZ	Do.[1]
Radio Engineering Laboratories	do	W10XO	Do.
Do	do	W10XP	Do.
Roosevelt Field (Inc.)	On a parachute	W10XT	Do.
Do	Airplane	W10XV	Do.
Radio Corporation of America	do	W4XM	Do.[1]
Do	do	W4XP	Do.[1]
Do	do	W10XW	Do.
Radiomarine Corporation of America	do	W10XL	Do.
Sky Lines (Inc.)	do	W2XAQ	Do.
William Deaderick Van Dyke	do	W10XR	Do.

EXPERIMENTAL—AERONAUTICAL

Aircraft Radio Corporation	Boonton, N. J.	W3XW	Licensed.
American Aeronautical Corporation	Port Washington, N. Y.	W2XCS	Do.
Boeing Air Transport (Inc.)	Portable	W10XM	Construction permit.
Do	do	W10XX	Do.
Do	do	W10XY	Do.
The Chicago Daily News (Inc.)	Addison Township, Ill.	W9XAL	Do.
General Electric Co	Schenectady, N. Y.	W2XCH	Licensed.
Roosevelt Field (Inc.)	Mineola, N. Y.	W2XCV	Construction permit.
Radio Corporation of America, Ohio Co.	West Dover, Ohio	W8XJ	Do.

EXPERIMENTAL—BROADCASTING

General Electric Co	South Schenectady, N. Y.	W2XAG	Licensed.
Do	Portable	W6XG	Do.
Do	Denver, Colo.	W9XA	Do.
Oregonian Publishing Co	Portable	W7XA	Do.
Fisher's Blend Station (Inc.)	do	W7XAR	Do.

[1] Term has expired and station not now operating.

List of radio station construction permits that have been authorized by the commission for domestic communication but not yet issued

Permittee	Location	Permittee	Location
R. C. A. Communications (Inc.).	New York, N. Y.	Western Radio Telegraph Co.	Tulsa, Okla.
Do	Chicago, Ill.	Do	Eldorado, Kans.
Do	San Francisco, Calif.	Do	Skellytown, Tex.
Do	New Orleans, La.	Do	Bartlesville, Okla.
Do	Seattle, Wash.	Do	Borger, Tex.
Do	Los Angeles, Calif.	Do	Breckenridge, Tex.
Do	Denver, Colo.	Do	Kingsmill, Tex.
Do	Cincinnati, Ohio.	Do	Burkburnett, Tex.
Do	Detroit, Mich.	Do	McCamey, Tex.
Do	Kansas City, Mo.	Do	Ponca City, Okla.
Do	Cleveland, Ohio.	Do	Jal, N. Mex.
Do	St. Louis, Mo.	Do	Crane, Tex.
		Do	Wink, Tex.
		Press Wireless (Inc.)	Indefinite.[1]

[1] The number of cities to be served by the domestic press communications service is not yet ascertained 20 frequencies (2 per cent channe ls) have been reserved for this service.

E. OUTSTANDING BROADCAST STATION AUTHORIZATIONS

The following list shows the outstanding licenses in the broadcast band as of November 9, 1929:

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WAAF	Chicago, Ill	Drovers Journal Publishing Co		500	920	D.
WAAM	Newark, N. J	W. A. A. M. (Inc.)	WGCP, WODA	1 kw 2 kw	1,250	LS.
WAAT	Jersey City, N. J	Bremer Broadcasting Corporation		300	1,070	(1).
WAAW	Omaha, Nebr	Omaha Grain Exchange		500	660	D.
WABC, WBOQ	West of Cross Bay Boulevard, Queens County, N. Y. C. P. to move and increase power to 50 kilowatts, LP. S.=New York City.	Atlantic Broadcasting Corporation.		5 kw	860	
WABI	Bangor, Me	First Universalist Church of Bangor		100	1,200	
WABO, WHEC. (See WHEC-WABO.)						
WABZ	New Orleans, La	Coliseum Place Baptist Church	WJBW	100	1,200	
WADC	Akron, Ohio. C. P. to move to Talmadge, Ohio.	Allen T. Simmons		1 kw	1,320	
WAGM	Royal Oak, Mich	Robert L. Miller (½ time)		50	1,310	
WAIU	Columbus, Ohio	American Insurance Union		500	640	LT.
WAPI	Birmingham, Ala	Alabama Polytechnic Institute, University of Alabama, and Alabama College.	KVOO	5 kw	1,140	
WASH	Grand Rapids Township, Mich.	WASH Broadcasting Corporation	WOOD	500	1,270	
WBAA	West Lafayette, Ind	Purdue University	WCMA, WKBF	500	1,400	C. P. only.
WBAK	Harrisburg, Pa	Pennsylvania State Police, Commonwealth of Pennsylvania.	WHP, WCAH	500	1,430	
WBAL	Glen Morris, Md S.=Baltimore, Md.	Consolidated Gas, Electric Light & Power Co. of Baltimore.	WTIC	10 kw	1,060	
WBAP	Forth Worth, Tex	Carter Publications (Inc.)	WFAA	50 kw	800	LP.
WBAX	Wilkes-Barre, Pa. C. P. issued to move to Bear Creek Township.	John H. Stenger, jr	WJBU	100	1,210	

D.=Daytime. See General Order No. 41.
LS.=Power until local sunset.
LT.=Limited time. See General Order No. 48.
LP.=Limited power. See General Order No. 42.
C. P.=Construction permit authorized.
S.=Where main studio location differs from transmitter same is shown below transmitter location.

[1]Day till 6 p. m., but not after sunset at Cleveland, Ohio.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WBBC	Brooklyn, N. Y.	Brooklyn Broadcasting Corporation	WSGH, WSDA, WCGU, WLTH	500	1,400	
WBBL	Richmond, Va.	Grace Covenant Presbyterian Church		100	1,370	
WBBM, WJBT	Glenview, Ill. S.=Chicago, Ill.	Atlass Co. (Inc.)	KFAB	25 kw	770	
WBBR	Rossville, N. Y.	Peoples Pulpit Association	WHAZ, WHAP, WEVD	1 kw	1,300	
WBBY	Charleston, S. C.	Washington Light Infantry		75	1,200	
WBBZ	Ponca City, Okla.	C. L. Carrell		100	1,200	
WBCM	Hampton Township, Mich. S.=Bay City, Mich.	James E. Davidson		500	1,410	
WBIS, WNAC. (See WNAC, WBIS.)						
WBMS	Fort Lee, N. J.	WBMS Broadcasting Corporation	WNJ, WKBO, WIBS	250	1,450	
WBNY	New York, N. Y.	Baruchrome Corporation	WCDA, WKBQ, WMSG	250	1,350	
WBOQ, WABC. (See WABC, WBOQ.)						
WBOW	Terre Haute, Ind.	Banks of Wabash (Inc.)		100	1,310	
WBRC	Birmingham, Ala.	Birmingham Broadcasting Co. (Inc.)		500	930	
WBRE	Wilkes-Barre, Pa.	Louis G. Baltimore		1 kw		LS.
WBRL	Tilton, N. H.	Booth Radio Laboratories (Inc.)		100	1,310	
WBSO	Wellesley Hills, Mass. C. P. issued to move to Needham, Mass., and increase power to 500 watts.	Babson's Statistical Organization (Inc.)		500	1,430	
				250	920	D.
WBT	Charlotte, N. C.	Station WBT (Inc.)		5 kw	1,080	
WBZ	East Springfield, Mass. S.=Springfield, Mass.	Westinghouse Electric & Manufacturing Co.	WBZA	15 kw	990	
WBZA	Boston, Mass.	do	WBZ	500	990	
WCAC	Storrs, Conn.	Connecticut Agricultural College (½ time)		250	600	
WCAD	Canton, N. Y.	St. Lawrence University		500	1,220	D.
WCAE	Pittsburgh, Pa.	Kaufman & Baer Co. (Inc.)		500	1,220	
WCAH	Columbus, Ohio	Commercial Radio Service Co.	WHP, WBAK	500	1,430	
WCAJ	Lincoln, Nebr.	Nebraska Wesleyan University	WOW	500	590	
WCAL	Northfield, Minn.	St. Olaf College	KFMX, WRHM, WLB	1 kw	1,250	
WCAM	Camden, N. J.	City of Camden	WOAX, WCAP	500	1,280	
WCAO	Baltimore, Md.	Monumental Radio (Inc.)		250	600	
WCAP	Asbury Park, N. J.	Radio Industries Broadcast Co.	WCAM, WOAX	500	1,280	
WCAT	Rapid City, S. Dak.	South Dakota State School of Mines		100	1,200	
WCAU	Byberry, Pa. S.=Philadelphia, Pa.	Universal Broadcasting Co.		10 kw	1,170	
WCAX	Burlington, Vt.	University of Vermont	WNBX	100	1,200	
WCAZ	Carthage, Ill.	Carthage College		50	1,070	D.
WCBA	Allentown, Pa.	B. Bryan Musselman	WSAN	250	1,440	
WCBD	Zion, Ill.	Wilbur Glenn Voliva	WMBI	5 kw	1,080	LT.

WCBM	Baltimore, Md. C. P. issued to increase power to 250 watts; LS.	Baltimore Broadcasting Corporation		100	1,370	
WCBS	Springfield, Ill	Charles H. Messter and Harold L. Dewing	WTAX	100	1,210	
WCCO	Anoka, Minn. S.=Minneapolis, Minn.	Northwestern Broadcasting (Inc.)		7½ kw	810	
WCDA	Cliffside Park, N. J. S.=New York City, N. Y.	Italian Educational Broadcasting Co. (Inc.)	WBNY, WKBQ, WMSG	250	1,350	
WCFL	Chicago, Ill	Chicago Federation of Labor		1½ kw	970	LT.
WCGU	Coney Island, N. Y.	U. S. Broadcasting Corporation	WSGH, WSDA, WLTH, WBBCO.	500	1,400	
WCKY	Crescent Springs, Ky. S.=Covington, Ky.	L. B. Wilson (Inc.)	WSOA, WJAZ, WORD	5 kw	1,480	
WCLO	Kenosha, Wis.	C. E. Whitmore		100	1,200	
WCLS	Joliet, Ill.	WCLS (Inc.)	WEHS, WKBB, WKBI, WHFC.	100	1,310	
WCMA	Culver, Ind.	Culver Military Academy	WBAA, WKBF	500	1,400	
WCOA	Pensacola, Fla.	City of Pensacola, Fla.		500	1,120	
WCOC	Meridian, Miss.	H. B. Holmes, sr., and H. B. Holmes, jr., doing business as Crystal Oil Co.		500	880	
WCOD (formerly WPRC)	Harrisburg, Pa.	Norman R. Hoffman	WKJC	1 kw		LS.
WCOH	Greenville, N. Y. S.=Yonkers, N. Y.	Westchester Broadcasting Corporation	WJBI, WGBB, WINR	100	1,200	
WCRW	Chicago, Ill.	Clinton R. White	WSBC, WEDC	100	1,210	
WCSH	Portland, Me.	Congress Square Hotel Co.		500	940	
WCSO	Springfield, Ohio	Wittenberg College	WFJC	500	1,450	
WDAE	Tampa, Fla.	Tampa Publishing Co.	WDBO	1 kw	620	
WDAF	Kansas City, Mo.	Kansas City Star Co.	WOQ	1 kw	610	
WDAG	Amarillo, Tex.	National Radio & Broadcasting Corporation	KGRS	250	1,410	
WDAH	El Paso, Tex.	Trinity Methodist Church	KTSM	100	1,310	
WDAY	West Fargo, N. Dak.	WDAY (Inc.)	WEBC	1 kw	1,280	
WDBJ	Roanoke, Va.	Richardson-Wayland Electrical Corporation		250	930	
WDBO	Orlando, Fla.	Rollins College (Inc.)	WDAE	500		LS.
WDEL	Wilmington, Del.	WDEL (Inc.)		1 kw	620	
WDGY	Minneapolis, Minn.	Dr. Geo. W. Young	WHDI	250	1,120	
WDOD	Chattanooga, Tenn.	Chattanooga Radio Co. (Inc.)		350		LS.
WDRC	New Haven, Conn.	Doolittle Radio Corporation		1 kw	1,180	LT.
WDSU	New Orleans, La.	Joseph H. Uhalt		1 kw	1,280	
WDWF, WLSI	Cranston, R. I. S.=Providence, R. I.	Dutee W. Flint and The Lincoln Studios (Inc.)	WPAW	2½ kw		LS.
WDZ	Tuscola, Ill.	James L. Bush		500	1,330	
WEAF	Bellmore, N. Y. S.=New York, N. Y.	National Broadcasting Co. (Inc.)		1 kw	1,250	
WEAI	Ithaca, N. Y.	Cornell University		100	1,210	
WEAN	Providence, R. I.	The Shepard Co.		100	1,070	D.
				50 kw	660	LP.
				500	1,270	D.
				250	780	
				500		LS.

D.=Daytime. See General Order No. 41.
LS.=Power until local sunset.

LT.=Limited time. See General Order No. 48.
LP.=Limited power. See General Order No. 42.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WEAO	Columbus, Ohio	Ohio State University	WKBN	750	570	
WEAR	Cleveland, Ohio	WTAM and WEAR (Inc.)	WTBM	1 kw	1,070	
WEBC	Superior, Wis. S.=Duluth, Minn.	Head of the Lakes Broadcasting Co	WDAY	1 kw	1,280	
WEBE	Cambridge, Ohio	Roy W. Waller		100	1,210	
WEBQ	Harrisburg, Ill	First Trust & Savings Bank of Harrisburg	KFVS	100	1,210	
WEBR	Buffalo, N. Y	Howell Broadcasting Co. (Inc.)		100	1,310	
				200		LS.
WEBW	Beloit, Wis	Beloit College		350	600	D.
WEDC	Chicago, Ill	Emil Denemark (Inc.)	WCRW, WSBC	100	1,210	
WEDH	Erie, Pa	Erie Dispatch Herald Broadcasting Corporation		30	1,420	
WEEI	Weymouth, Mass. S.=Boston, Mass.	Edison Electric Illuminating Co. of Boston		1 kw	590	
WEHC	Emory, Va	Emory and Henry College		100	1,370	
WEHS	Evanston, Ill	Victor C. Carlson	WCLS, WKBB, WKBI, WHFC	100	1,310	
WELK	Philadelphia, Pa	Howard R. Miller		100	1,370	
WEMC	Berrien Springs, Mich	Emmanuel Missionary College		1 kw	590	D.
WENR, WBCN	Chicago, Ill	Great Lakes Broadcasting Co	WLS	50 kw	870	LP.
WEVD	Forest Hills, N. Y. S.=New York City.	Debs Memorial Radio Fund (Inc.)	WBBR, WHAP, WHAZ	500	1,300	
WEW	St. Louis, Mo	St. Louis University		1 kw	760	D.
WFAA	Dallas, Tex. C. P. issued to increase power to 50 kilowatts; LP.	The Dallas News & Dallas Journal (A. H. Belo Corporation).	WBAP	10 kw	800	
WFAN	Philadelphia, Pa	Keystone Broadcasting Co	WIP	500	610	
WFBC	Knoxville, Tenn	First Baptist Church		50	1,200	
WFBG	Altoona, Pa	Wm. F. Gable Co	WJAC	100	1,310	
WFBJ	Collegeville, Minn	St. John's University		100	1,370	
WFBL	Syracuse, N. Y	The Onondaga Co	WMAK	750	900	
WFBM	Indianapolis, Ind	Indianapolis Power & Light Co	WSBT	1 kw	1,230	
WFBR	Baltimore, Md	Baltimore Radio Show (Inc.)		250	1,270	
WFDF	Flint, Mich	Frank D. Fallain		100	1,310	
WFI	Philadelphia, Pa	Strawbridge & Clothier	WLIT	500	560	
WFIW	Hopkinsville, Ky	The Acme Mills (Inc.)		1 kw	940	
WFJC	Akron, Ohio	W. F. Jones Broadcasting (Inc.)	WCSO	500	1,450	
WFKD	Wissinoming, Pa. S.=Philadelphia, Pa.	Foulkrod Radio Engineering Co	WNAT, WABY	50	1,310	
WFLA, WSUN	Clearwater, Fla	Clearwater Chamber of Commerce and St. Petersburg Chamber of Commerce.		1 kw	900	
				2½ kw		LS.
WGAL	Lancaster, Pa	Lancaster Electric Supply & Construction Co	WRAW	15	1,310	
WGBB	Freeport, N. Y	Harry H. Carman	WJBI, WINR, WCOH	100	1,210	

WGBC	Memphis, Tenn.	First Baptist Church	WNBR	500	1,430	
WGBF	Evansville, Ind.	Evansville on the Air (Inc.)	WOS, KFRU	500	630	
WGBI	Scranton, Pa.	Scranton Broadcasters (Inc.)	WQAN	250	880	
WGBS	Astoria, Long Island, N. Y. S.=New York City.	General Broadcasting System (Inc.)		500	1,180	LT.
WGCM	Gulfport, Miss.	Great Southern Land Co. (Inc.)		100	1,210	
WGCP	Newark, N. J.	May Radio Broadcast Corporation	WODA, WAAM	250	1,250	
WGES	Chicago, Ill.	Oak Leaves Broadcasting Station (Inc.)	WJKS	500	1,360	
WGH	Newport News, Va.	Virginia Broadcasting Co. (Inc.)		100	1,310	
WGHP	Fraser, Mich. S.=Detroit, Mich.	American Broadcasting Corporation of Ohio. C. P. issued to move and increase power to 1 kilowatt.		750	1,240	
WGL	Fort Wayne, Ind.	Fred C. Zieg (Allen Wayne Co.)		100	1,370	
WGMS, WLB. (See WLB, WGMS.)						
WGN, WLIB	Elgin, Ill. S.=Chicago, Ill.	The Tribune Co.		25 kw	720	
WGR	Amherst, N. Y. S.=Buffalo, N. Y.	Radio Station WGR (Inc.)		1 kw	550	
WGST	Atlanta, Ga.	Georgia School of Technology	WMAZ	250	890	
WGY	South Schenectady, N. Y.	General Electric Co.		50 kw	790	
WHA	Madison, Wis.	University of Wisconsin		750	940	D.
WHAD	Milwaukee, Wis.	Marquette University	WISN	250	1,120	
WHAM	Victor Township, N. Y. S.=Rochester, N. Y.	Stromberg-Carlson Telephone Manufacturing Co.		5 kw	1,150	
WHAP	Carlstadt, N. J. S.=New York City.	Defenders of Truth Society (Inc.)	WBBR, WEVD, WHAZ	1 kw	1,300	
WHAS	Jeffersontown, Ky. S.=Louisville, Ky.	The Courier-Journal Co. and The Louisville Times Co.		10 kw	820	
WHAZ	Troy, N. Y.	Rensselaer Polytechnic Institute	WBBR, WAHP, WEVD	500	1,300	
WHB	Kansas City, Mo.	Sweeney Automobile School Co.	KMBC	500	950	
WHBC	Canton, Ohio.	St. John's Catholic Church (Sundays)	WNBO	10	1,200	
WHBD	Mount Orab, Ohio.	F. P. Moler		100	1,370	
WHBF	Rock Island, Ill.	Beardsley Specialty Co.		100	1,210	
WHBL	Sheboygan, Wis.	Press Publishing Co. and C. L. Carrell	KFLV	500	1,410	
WHBQ	Memphis, Tenn.	Broadcasting Station WHBQ (Inc.)		100	1,370	
WHBU	Anderson, Ind.	Citizens Bank		100	1,210	
WHBY	West De Pere, Wis. S.=Green Bay, Wis.	St. Norbert College (Sunday 10 to 11 a. m. and 5 to 6 p. m. Daily 12 noon to 1 p. m. and 6 to 8 p. m.)		100	1,200	LT.
WHDF	Calumet, Mich.	Upper Michigan Broadcasting Co.		100	1,370	
WHDH	Gloucester, Mass.	Matheson Radio Co. (Inc.)		1 kw	830	D.
WHDI	Minneapolis, Minn.	William Hood Dunwoody Industrial Institute	WDGY	500	1,180	LT.
WHEC, WABO	Rochester, N. Y.	Hickson Elec. Co. (Inc.)	WOKO	500	1,440	
WHFC	Cicero, Ill.	Triangle Broadcasters	WCLS, WKBB, WKBI, WEHS	100	1,310	
WHIS	Bluefield, W. Va.	Daily Telegraph Printing Co.		100	1,420	

D.=Daytime. See General Order No. 41.
LS.=Power until local sunset.
LT.=Limited time. See General Order No. 48.
LP.=Limited power. See General Order No. 42.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WHK	Cleveland, Ohio. C. P. to move to Independence, Ohio.	Radio Air Service Corporation		1 kw	1,390	
WHN	New York, N. Y.	Marcus Loew Booking Agency	WRNY, WQAO-WPAP	250	1,010	
WHO	Des Moines, Iowa	Bankers Life Co	WOC	5 kw	1,000	
WHP	Lemoyne, Pa.	Pennsylvania Broadcasting Co. (W. S. McCachren, president).	WBAK, WCAH	500	1,430	
WIAS	S. = Harrisburg, Pa. Ottumwa, Iowa	Morris W. & James P. Poling, doing business as Poling Electric Co.		100	1,420	
WIBA	Madison, Wis.	The Capital Times Co		100	1,210	
WIBG	Elkins Park, Pa.	St. Pauls Protestant Episcopal Church		50	930	D.
WIBM	Jackson, Mich.	C. L. Carrell	WJBK	100	1,370	
WIBO	Desplaines, Ill.	Nelson Bros. Bond & Mortgage Co	WPCC, WNAX	1 kw	570	
	S. = Chicago, Ill.			1½ kw		LS.
WIBR	Steubenville, Ohio	George W. Robinson	WQBZ	50	1,420	
WIBS	Jersey City, N. J.	New Jersey Broadcasting Corporation	WBMS, WNJ, WKBO	250	1,450	
WIBU	Poynette, Wis.	Wm. C. Forrest		100	1,310	
WIBW	Near Topeka, Kans.	Topeka Broadcasting Association (Inc.)	KFH	1 kw	1,300	
				2½ kw		LS.
WIBX	Utica, N. Y.	WIBX (Inc.)		100	1,200	
				300		LS.
WICC	Easton, Conn.	Bridgeport Broadcasting Station (Inc.)		500	1,190	D.
	S. = Bridgeport, Conn.					
WIL	St. Louis, Mo.	Missouri Broadcasting Corporation	KFWF, WMAY	100	1,200	
				250		LS.
WILL	Urbana, Ill.	University of Illinois	KFNF, KUSD	250	890	
				500		LS.
WILM	Wilmington, Del.	Delaware Broadcasting Co. (Inc.)		100	1,420	
WIOD, WMBF	Miami Beach, Fla.	Webb Jay & Jesse H. Jay, doing business as Isle of Dreams Broadcasting Co.		1 kw	560	
WIP	Philadelphia, Pa.	Gimbel Bros. (Inc.)	WFAN	500	610	
WISN	Milwaukee, Wis.	Evening Wisconsin Co	WHAD	250	1,120	
WJAC (formerly WHBP)	Johnstown, Pa.	Johnstown Automobile Co	WFBG	100	1,310	
WJAD	Waco, Tex.	Frank P. Jackson	KSAT	1 kw	1,240	
WJAG	Norfolk, Nebr.	Norfolk Daily News		1 kw	1,060	LT.
WJAK	Marion, Ind.	Marion Broadcast Co	WLBC	50	1,310	
WJAR	Providence, R. I.	The Outlet Co		250	890	
				400		LS
WJAS	North Fayette Township, Pa.	Pittsburgh Radio Supply House		1 kw	1,290	
	S. = Pittsburgh, Pa.					
WJAX	Jacksonville, Fla.	City of Jacksonville		1 kw	1,260	
WJAY	Cleveland, Ohio.	Cleveland Radio Broadcasting Corporation		500	620	D.
WJAZ	Mount Prospect, Ill.	Zenith Radio Corporation	WSOA, WORD, WCKY	5 kw	1,480	
	S. = Chicago, Ill.					

WJBC	La Salle, Ill	Hummer Furniture Co	WJBL	100	1,200	
WJBI	Red Bank, N. J	Robert S. Johnson	WGBR, WINR, WCOH	100	1,210	
WJBK	Ypsilanti, Mich	James F. Hopkins	WIBM	50	1,370	
WJBL	Decatur, Ill	Wm. Gushard Dry Goods Co	WJBC	100	1,200	
WJBO	New Orleans, La	Valdemar Jensen		100	1,370	
WJBT, WBBM. (See WBBM, WJBT.)						
WJBU	Lewisburg, Pa	Bucknell University	WBAX	100	1,210	
WJBW	New Orleans, La	C. Carlson	WABZ	30	1,200	
WJBY	Gadsden, Ala	Chas. J. Black		50	1,210	
				500 kw	1,270	
WJDX	Jackson, Miss	Lamar Life Insurance Co. (C. P. only)		1 kw		LS.
WJJD	Mooseheart, Ill	Supreme Lodge of the World, Loyal Order of Moose.		20 kw	1,130	LT.
WJKS	Gary, Ind	Johnson-Kennedy Radio Corporation	WGES	500	1,360	
				1¼ kw		LS.
WJR	Sylvan Lake Village, Mich. S. = Detroit, Mich.	WJR The Goodwill Station (Inc.)		5 kw	750	
WJSV	Mount Vernon Hills, Va	Independent Publishing Co		10 kw	1,460	
WJW (formerly WLBV)	Mansfield, Ohio	John F. Weimer, owner Mansfield Broadcasting Association.		100	1,210	
WJZ	Bound Brook, N. J. S. = New York City, N. Y.	Radio Corporation of America		30 kw	760	LP.
WKAQ	San Juan, P. R	Radio Corporation of Porto Rico		500	890	
WKAR	E. Lansing, Mich	Michigan State College		1 kw	1,040	D.
WKAV	Laconia, N. H	Laconia Radio Club		100	1,310	
WKBB	Joliet, Ill	J. Sanders and Ben Sanders, doing business as Sanders Bros.	WEHS, WCLS, WKBI, WHFC	100	1,310	
WKBC	Birmingham, Ala	R. B. Broyles, doing business as R. B. Broyles Furniture Co.		100	1,310	
WKBF	Indianapolis, Ind	Indianapolis Broadcasting (Inc.)	WBAA, WCMA	500	1,400	
WKBH	La Crosse, Wis	Jos. Callaway, doing business as Callaway Music Co.	KSO	1 kw	1,380	
WKBI	Chicago, Ill	Fred L. Schoenwolf	WCLS, WKBB, WHFC, WEHS	50	1,310	
WKBN	Youngstown, Ohio	Warren P. Williamson, jr	WEAO	500	570	
WKBO	Jersey City, N. J	Camith Corporation	WBMS, WNJ, WIBS	250	1,450	
WKBP	Battle Creek, Mich	Enquirer-News Co		50	1,420	
WKBQ	New York, N. Y	Standard Cahill Co. (Inc.)	WBNY, WMSG, WCDA	250	1,350	
WKBS	Galesburg, Ill	Permil N. Nelson		100	1,310	
WKBV	Connersville, Ind	Wm. O. Knox, doing business as Knox Battery & Electric Co.		100	1,500	
				150		LS.
WKBW	Amherst, N. Y. S. = Buffalo, N. Y.	Churchill Evangelistic Association (Inc.)		5 kw	1,470	
WKBZ	Ludington, Mich	K. L. Ashbacker		50	1,500	
WKEN	Grand Island, N. Y. S. = Buffalo, N. Y.	Radio Station WKEN (Inc.)		1 kw	1,040	LT.
WKJC	Lancaster, Pa	Kirk Johnson & Co	WCOD	100	1,200	
WKRC	Cincinnati, Ohio	J. S. Boyd		500	550	

D. = Daytime. See General Order No. 41.
LS. = Power until local sunset.
LT. = Limited time. See General Order No. 48.
LP. = Limited power. See General Order No. 42.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WKY	Oklahoma City, Okla.	WKY Radiophone Co.		1 kw	900	
WLAC	Nashville, Tenn.	Life & Casualty Insurance Co. of Tennessee.	WTNT	5 kw	1,490	
WLAP	Louisville, Ky.	American Broadcasting Corporation of Kentucky.		30	1,200	
WLB, WGMS	Minneapolis, Minn. (Call WGMS used by WCCO when broadcasting over WLB.)	University of Minnesota	WCAL, KFMX, WRHM	500	1,250	
WLBC	Muncie, Ind.	Donald A. Burton	WJAK	50	1,310	
WLBF	Kansas City, Kans.	Everett L. Dillard		100	1,420	
WLBG	Ettrick, Va. S.=Petersburg, Va.	Robert Allen Gamble		250		LS.
WLBL	Stevens Point, Wis.	Wisconsin Department of Markets		2 kw	900	D.
WLBW	Oil City, Pa.	Radio-Wire Program Corporation of America.		500	1,260	
WLBX	Long Island City, N. Y.	John N. Brahy	WCLB, WWRL, WMBQ	100	1,500	
WLBZ	Bangor, Me.	Maine Broadcasting Co. (Inc.)		500	620	
WLCI	Ithaca, N. Y.	Lutheran Association of Ithaca, N. Y.		50	1,210	
WLEX	Lexington, Mass.	Carl S. Wheeler, doing business as the Lexington Air Stations.	WMAF	500	1,360	
WLEY	do	do	WSSH	100	1,420	
				250		LS.
WLIB, WGN. (See WGN, WLIB.)						
WLIT	Philadelphia, Pa.	Lit Bros.	WFI	500	560	
WLOE	Chelsea, Mass. S.=Boston, Mass.	Boston Broadcasting Co.	WMES	100	1,500	
				250		LS.
WLS	Crete, Ill. S.=Chicago, Ill.	Agricultural Broadcasting Co. C. P. issued to increase power to 50 kilowatts; LP.	WENR, WBCN	5 kw	870	
WLSI, WDWF. (See WDWF, WLSL)						
WLTH	Brooklyn, N. Y.	Voice of Brooklyn (Inc.)	WCGU, WSGH, WSDA, WBBC	500	1,400	
WLW	Mason, Ohio S.=Cincinnati.	Crosley Radio Corporation		50 kw	700	LP.
WLWL	Kearny, N. J. S.=New York City.	Missionary Society of St. Paul the Apostle	WPG	5 kw	1,100	
WMAC	Cazenovia, N. Y.	Clive B. Meredith	WSYR	250	570	
WMAK	Martinsville, N. Y. S.=Buffalo, N. Y.	WMAK Broadcasting System (Inc.)	WFBL	750	900	
WMAL	Washington, D. C.	M. A. Leese		250	630	
				500		LS.
WMAN	Columbus, Ohio	W. E. Heskett		50	1,210	

WMAQ	Addison, Ill. S.=Chicago, Ill.	Chicago Daily News (Inc.)		5 kw	670	
WMAY	St. Louis, Mo.	Kingshighway Presbyterian Church	KFWF, WIL	100	1,200	
				250		LS.
WMAZ	Macon, Ga.	Macon Junior Chamber of Commerce	WGST	250	890	
				500		LS.
WMBA	Newport, R. I.	Leroy Joseph Beebe		100	1,500	
WMBC	Detroit, Mich. C. P. issued to increase power to 250; LS.	Michigan Broadcasting Co. (Inc.)		100	1,420	
WMBD	Peoria Heights, Ill.	E. M. Kahler (owner Peoria Heights Radio Laboratory)	WTAD	500	1,440	
				1 kw		LS.
WMBF, WIOD. (See WIOD, WMBF.)						
WMBG	Richmond, Va.	Havens & Martin (Inc.)		100	1,210	
WMBH	Joplin, Mo.	Edwin Dudley Aber		100	1,420	
				250		LS.
WMBI	Addison, Ill. S.=Chicago.	The Moody Bible Institute Radio Station	WCBD	5 kw	1,080	LT.
WMBO	Auburn, N. Y.	Radio Service Laboratories		100	1,370	
WMBQ	Brooklyn, N. Y.	Paul J. Gollhofer	WCLB, WWRL, WLBX	100	1,500	
WMBR	Tampa, Fla.	F. J. Reynolds		100	1,210	
WMC	Memphis, Tenn. (C. P. issued to move to Bartlett, Tenn.)	Memphis Commercial Appeal (Inc.)		500	780	
				1 kw		LS.
WMCA	Hoboken, N. J. S.=New York City, N. Y.	Knickerbocker Broadcasting Co. (Inc.)	WNYC	500	570	
WMES	Boston, Mass.	Massachusetts Education Society	WLOE	50	1,500	
WMMN	Fairmont W. Va.	Holt-Rowe Novelty Co.		250	890	
				500		LS.
WMPC	Lapeer, Mich.	First Methodist Protestant Church of Lapeer		100	1,500	
WMRJ	Jamaica, N. Y.	Peter J. Prinz	WPOE, WHPP	10	1,420	
WMSG	New York, N. Y.	Madison Square Garden Broadcast Corporation	WBNY, WCDA, WKBQ	250	1,350	
WMT	Waterloo, Iowa.	Waterloo Broadcasting Co.		250	600	
WNAC, WBIS	Quincy, Mass. S.=Boston, Mass.	Shepard Norwell Co. (Trade name The Shepard Stores.)		1 kw	1,230	
WNAD	Norman, Okla.	University of Oklahoma	KGGF	500	1,010	
WNAT	Philadelphia, Pa.	Albert A. Walker	WFKD, WABY	100	1,310	
WNAX	Yankton, S. Dak.	Gurney Seed & Nursery Co.	WIBO, WPCC	1 kw	570	
WNBF	Binghamton, N. Y.	Howitt-Wood Radio Co. (Inc.)		50	1,500	
WNBH	New Bedford, Mass.	Irving Vermilya, doing business as New Bedford Broadcasting Co.		100	1,310	
WNBJ	Knoxville, Tenn.	Lonsdale Baptist Church		50	1,310	
WNBO	Washington, Pa.	John Brownlee Spriggs	WHBC Sundays	100	1,200	
WNBR	Memphis, Tenn.	John Ulrich	WGBC	500	1,430	
WNBW	Carbondale, Pa.	G. F. Schiessler & M. E. Stephens, doing business as Home Cut Glass & China Co.		10	1,200	
WNBX	Springfield, Vt.	First Congregational Church Corporation	WCAX	10	1,200	
WNBZ	Saranac Lake, N. Y.	Earl J. Smith & William Mace, doing business as Smith & Mace.		50	1,290	D.

D.=Daytime. See General Order No. 41.
LS.=Power until local sunset.

LT.=Limited time. See General Order No. 48.
LP.=Limited power. See General Order No. 42.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WNJ	Newark, N. J.	Radio Investment Co.	WBMS, WIBS, WKBO	250	1,450	
WNOX	Knoxville, Tenn. (C. P. issued to increase power to 2 kilowatts; LS.)	Sterchi Bros.		1 kw	560	
WNRC	Greensboro, N. C.	Wayne M. Nelson		250	1,440	
WNYC	New York, N. Y.	City of New York, department of plant and structures.	WMCA	500	570	
WOAI	San Antonio, Tex. (C. P. issued to increase power to 50 kilowatts, LP.)	Southern Equipment Co.		5 kw	1,190	
WOAN	Lawrenceburg, Tenn.	James D. Vaughan	WREC	500	600	
WOAX	Trenton, N. J.	Franklyn J. Wolff	WCAM, WCAP	500	1,280	
WOBT	Union City, Tenn.	A. F. Tittsworth, trading as Tittsworth Radio & Music Shop.		100, 250	1,310	LS.
WOBU	Near Charleston	Charleston Radio Broadcasting Co.	WSAZ	250	580	
WOC	Davenport, Iowa	Palmer School of Chiropractic	WHO	5 kw	1,000	
WOCL	Jamestown, N. Y.	A. E. Newton		25	1,210	
WODA	Paterson, N. J.	Richard E. O'Dea	WGCP, WAAM	1 kw	1,250	
WODX	Springhill, Ala. S. = Mobile, Ala.	Scott Helt, trustee, Mobile Broadcasting Corporation. (C. P. only.)	WSFA	500	1,410	
WOI	Ames, Iowa	Iowa State College of Agricultural and Mechanical Arts.	KFEQ	5 kw	560	D.
WOKO	Mount Beacon, N. Y. S. = Poughkeepsie, N. Y.	H. E. Smith & R. M. Curtis, doing business as Hudson Valley Broadcasting Co.	WHEC, WABO	500	1,440	
WOL	Washington, D. C.	American Broadcasting Co.		100	1,310	
WOMT	Manitowoc, Wis.	Francis M. Kadow		100	1,210	
WOOD	Furnwood, Mich. S. = Grand Rapids, Mich.	Walter B. Stiles (Inc.)	WASH	500	1,270	
WOPI	Bristol, Tenn.	Wilson Radiophone Service Co.		100	1,500	
WOQ	Kansas City, Mo.	Unity School of Christianity	WDAF	1 kw	610	
WOR	Kearny, N. J. S. = Newark, N. J.	L. Bamberger & Co.		5 kw	710	
WORC (formerly WKBE).	Auburn, Mass. S. = Worcester, Mass.	Alfred Frank Kleindienst	WEPS	100	1,200	
WORD	Batavia, Ill. S. = Chicago, Ill.	People's Pulpit Association	WJAZ, WSOA, WCKY	5 kw	1,480	
WOS	Jefferson City, Mo.	Missouri State Marketing Bureau	WGBF, KFRU	500 1 kw	630	LS.
WOV	Secaucus, N. J. S. = New York City.	International Broadcasting Corporation		1 kw	1,130	D. to 6 p. m.
WOW	Omaha, Nebr.	Woodmen of the World Life Insurance Association.	WCAJ	1 kw	590	
WOWO	Fort Wayne, Ind.	Main Auto Supply Co.	WWVA	10 kw	1,160	

WPAP, WQAO. (See WQAO, WPAP.)						
WPAW	Pawtucket, R. I.	Shartenberg & Robinson Co.	WDWF, WLSI	100	1,210	
WPCC	Chicago, Ill.	North Shore Congregational Church	WIBO, WNAX	500	570	
WPCH	Hoboken, N. J. S.=New York City.	Eastern Broadcasters (Inc.)		500	810	D.
WPEN (formerly WPSW).	Philadelphia, Pa.	Wm. Penn Broadcasting Co.		100	1,500	
				250		LS.
WPG	Atlantic City, N. J.	Municipality of Atlantic City	WLWL	5 kw	1,100	
WPOE	Patchogue, N. Y.	Nassau Broadcasting Corporation	WHPP, WMRJ	30	1,420	
				100		LS.
WPOR, WTAR. (See WTAR, WPOR.)						
WPSC	State College, Pa.	Pennsylvania State College		500	1,230	D.
WPTF	Raleigh, N. C.	Durham Life Insurance Co.		1 kw	680	LT.
WQAM	Miami, Fla.	Miami Broadcasting Co.		1 kw	1,240	
WQAN	Scranton, Pa.	E. J. Lynett, proprietor, The Scranton Times	WGBI	250	880	
WQAQ, WPAP	Cliffside, N. J. S.=New York City, N. Y.	Calvary Baptist Church	WHN, WRNY	250	1,010	
WQBC	Utica, Miss.	Utica Chamber of Commerce (Inc.)		300	1,360	
WQBZ	Weirton, W. Va.	J. H. Thompson	WIBR	60	1,420	
WRAF	La Porte, Ind.	The Radio Club (Inc.)	WWAE	100	1,200	
WRAK	Erie, Pa.	Clarence R. Cummins		50	1,370	
WRAW	Reading, Pa.	Horace D. Good, trading as Avenue Radio & Electric Shop.	WGAI	100	1,310	
WRAX	Philadelphia, Pa.	Berachah Church (Inc.)		250	1,020	D.
WRBI	Tifton, Ga.	Chas. A. & Milton U. Kent, doing business as Kent's Furniture & Music Store.	Half time	20	1,310	
WRBJ	Hattiesburg, Miss.	Woodruff Furniture Co. (Inc.)		10	1,500	
WRBL	Columbus, Ga.	David Parmer		50	1,200	
WRBQ	Greenville, Miss.	J. Pat. Scully		100	1,210	
WRBT	Wilmington, N. C.	Wilmington Radio Association		100	1,370	
WRBU	Gastonia, N. C.	A. J. Kirby Music Co. (A. J. Kirby, owner)		100	1,210	
WRC	Washington, D. C.	Radio Corporation of America		500	950	
WREC	Whitehaven, Tenn. S.=Memphis, Tenn.	WREC (Inc.)	WOAN	500	600	
				1 kw		LS.
WREN	Lawrence, Kans.	Jenny Wren Co.	KFKU	1 kw	1,220	
WRHM	Fridley, Minn. S.=Minneapolis, Minn.	Rosedale Hospital Co. (Inc.)	WCAL, KFMX, WLB	1 kw	1,250	
WRJN	Racine, Wis.	Racine Broadcasting Corporation		100	1,370	
WRK	Hamilton, Ohio.	S. W. Doron & John C. Slade, doing business as Hamilton Radio Service.		100	1,310	
WRNY	Coytesville, N. J. S.=New York City, N. Y.	Aviation Radio Station (Inc.)	WQAO, WPAP, WHN	250	1,010	
WRR	Dallas, Tex.	City of Dallas, Tex.		500	1,280	
WRUF	Gainesville, Fla.	University of Florida		5 kw	1,470	
WRVA	Mechanicsville, Va. S.=Richmond, Va.	Larus & Bro. Co. (Inc.)		5 kw	1,110	
WSAI	Mason, Ohio. S.=Cincinnati, Ohio	Crosley Radio Corporation, lessee		500	1,330	

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LT.=Limited time. See General Order No. 48.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
WSAJ	Grove City, Pa	Grove City College		100	1,310	
WSAN	Allentown, Pa	Allentown Call Pub. Co. (Inc.)	WCBA	250	1,440	
WSAR	Fall River, Mass	Doughty & Welsh Electric Co. (Inc.)		250	1,450	
WSAZ	Huntington, W. Va	WSAZ (Inc.)	WOBU	250	580	
WSB	Atlanta, Ga. (C. P. issued to increase power to 5 kilowatts.)	Atlanta Journal Co		1 kw	740	
WSBC	Chicago, Ill	World Battery Co. (Inc.)	WEDC, WCRW	100	1,210	
WSBT	South Bend, Ind	South Bend Tribune	WFBM	500	1,230	
WSDA, WSGH. (See WSGH, WSDA.)						
WSFA	Montgomery, Ala	Howard E. Pill and S. G. Persons, doing business as Montgomery Broadcasting Co. (C. P. only).	WODX	500	1,410	
WSGH, WSDA	Brooklyn, N. Y	Abraham Hass and Salvatore D. Angelo, doing business as Amateur Radio Specialty Co.	WCGU, WLTH, WBBC	500	1,400	
WSIX	Springfield, Tenn	Jack M. and Lewis R. Draughton, doing business as 638 Tire & Vulcanizing Co.		100	1,210	
WSJS (formerly WJDZ)	Winston-Salem, N. C	Winston-Salem Journal Co. (C. P. only)		100	1,310	
WSM	Nashville, Tenn	National Life & Accident Insurance Co		5 kw	650	
WSMB	New Orleans, La	Saenger Theatres (Inc.) & Maison Blanche Co.		500	1,320	
WSMK	Dayton, Ohio	Stanley M. Krohn, jr	KQV	200	1,380	
WSOA	Deerfield, Ill S.=Chicago, Ill.	Radiophone Broadcasting Corporation	WJAZ, WORD, WCKY	5 kw	1,480	
WSPD	Toledo, Ohio	Toledo Broadcasting Co		500	1,340	
				1 kw		LS.
WSSH	Boston, Mass	Tremont Temple Baptist Church	WLEY	100	1,420	
				250		LS.
WSUI	Iowa City, Iowa	State University of Iowa	KSAC	500	580	
WSUN, WFLA. (See WFLA, WSUN.)						
WSVS	Buffalo, N. Y	Seneca Vocational High School (Elmer S. Pierce, principal).		50	1,370	
WSYR	Syracuse, N. Y	Clive B. Meredith	WMAC	250	570	
WTAD	Quincy, Ill	Illinois Stock Medicine Broadcasting Corporation.	WMBD	500	1,440	
WTAG	Worcester, Mass	Worcester Telegram Publishing Co. (Inc.)		250	580	
WTAM	Brecksville Village, Ohio S.=Cleveland, Ohio.	WTAM & WEAR (Inc.)	WEAR	50 kw	1,070	LP.
WTAQ	Township of Washington, Wisconsin. S.=Eau Claire, Wis.	Gillette Rubber Co	KSCJ	1 kw	1,330	
WTAR, WPOR	Norfolk, Va	WTAR Radio Corporation	½ time	500	780	

WTAW	College Station, Tex	Agricultural & Mechanical College of Texas	KUT	500	1,120	
WTAX	Streator, Ill	Williams Hardware Co	WCBS	50	1,210	
WTBO	Cumberland, Md	Associated Broadcasting Corporation		50	1,420	
WTFI	Toccoa, Ga	Toccoa Falls Institute		250	1,450	
WTIC	Avon, Conn. S.=Hartford, Conn.	Travelers Broadcasting Service	WBAL	50 kw	1,060	LP.
WTMJ	Brookfield, Wis. S.=Milwaukee, Wis.	The Journal Co. (Milwaukee Journal)		1 kw	620	
				2½ kw		LS.
WTNT (formerly WBAW).	Nashville, Tenn	Tennessee Publishing Co	WLAC	5 kw	1,490	
WTOC	Savannah, Ga	Chamber of Commerce of Savannah		500	1,260	
WWAE	Hammond, Ind	Hammond-Calumet Broadcasting Corporation	WRAF	100	1,200	
WWJ	Detroit, Mich	The Evening News Association (Inc.)		1 kw	920	
WWL	New Orleans, La	Loyola University (KWKH)		5 kw	850	
WWNC	Asheville, N. C	Citizen's Broadcasting Co. (Inc.)		1 kw	570	
WWRL	Woodside, N. Y	Long Island Broadcasting Corporation	WMBQ, WLBX, WCLB	100	1,500	
WWVA	Wheeling, W. Va	West Virginia Broadcasting Corporation	WOWO	5 kw	1,160	
KCRC	Enid, Okla	Champlin Refining Co	KGFG	100	1,370	
				250		LS.
KDB	Santa Barbara, Calif	Santa Barbara Broadcasting Co		100	1,500	
KDFN	Casper, Wyo	Donald Lewis Hathaway (C. P. only)		100	1,210	
KDKA	Wilkins Township, Pa. (C. P. issued to move near Saxonburg, Pa.) S.=Pittsburgh, Pa.	Westinghouse Electric & Manufacturing Co		50 kw	980	LP.
KDLR	Devils Lake, N. Dak	Bert Wick & Harold Serumgard (Radio Electric Co.).		100	1,210	
KDYL	Salt Lake City, Utah	Intermountain Broadcasting Corporation		1 kw	1,290	
KECA (formerly KPLA)	Los Angeles, Calif	Pacific Radio Development Co		1 kw	1,000	LT.
KEJK	Beverly Hills, Calif	R. S. Macmillan		500	1,170	LT.
KELW	Burbank, Calif	Earl L. White	KTM	500	780	
KEX	Portland, Oreg	Western Broadcast Co	KOB	5 kw	1,180	
KFAB	Lincoln, Nebr	Nebraska Buick Automobile Co	WBBM, WJBT	5 kw	770	
KFBB	Great Falls, Mont	Buttrey Broadcast (Inc.)	KGIR	500	1,360	
KFBK	Sacramento, Calif	James McClatchy Co		100	1,310	
KFBL	Everett, Wash	Otto Leese & Robert Leese, doing business as Leese Bros.	KVL	50	1,370	
KFDM	Beaumont, Tex. (C. P. issued to increase power to 1 kilowatt, LS.)	Magnolia Petroleum Co		500	560	
KFDY	Brookings, S. Dak	South Dakota State College	KFYR	500	550	
				1 kw		LS.
KFEL	Denver, Colo	Eugene P. O'Fallon (Inc.)	KFXF	250	940	
KFEQ	St. Joseph, Mo	Scroggin & Co. Bank	WOI	2½ kw	560	D.
KFGQ	Boone, Iowa	Boone Biblical College	KWCR, KFJY	100	1,310	
KFH	Wichita, Kans. (C. P. issued for 1 kilowatt.)	Radio Station KFH Co	WIBW	500	1,300	
KFHA	Gunnison, Colo	Western State College of Colorado		50	1,200	
KFI	Los Angeles, Calif	Earl C. Anthony (Inc.)		5 kw	640	
KFIF	Portland, Oreg	Benson Polytechnic School	KXL	100	1,420	

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E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
KFIO	Spokane, Wash	Spokane Broadcasting Corporation		100	1,230	D.
KFIZ	Fond du Lac, Wis	The Reporter Printing Co		100	1,420	
KFJB	Marshalltown, Iowa	Marshall Electric Co. (Inc.)		100	1,200	
KFJF	Oklahoma City, Okla	National Radio Manufacturing Co		5 kw	1,470	
KFJI	Astoria, Oreg	KFJI Broadcasters (Inc.)		100	1,370	
KFJM	Grand Forks, N. Dak	University of North Dakota		100	1,370	
KFJR	Portland, Oreg	Ashley C. Dixon, trading as Ashley C. Dixon & Son.	KTBR	500	1,300	
KFJY	Fort Dodge, Iowa	C. S. Tunwall	KFGQ, KWCR	100	1,310	
KFJZ	Fort Worth, Tex	H. C. Meacham		100	1,370	
KFKA	Greeley, Colo	Colorado State Teachers College	KPOF	500	880	
				1 kw		LS.
KFKB	Milford, Kans	John R. Brinkley		5 kw	1,050	LT.
KFKU	Lawrence, Kans	University of Kansas	WREN	1 kw	1,220	
KFKX-KYW. (See KYW, KFKX.)						
KFLV	Rockford, Ill	A. T. Frykman	WHBL	500	1,410	
KFLX	Galveston, Tex	George Roy Clough		100	1,370	
KFMX	Northfield, Minn	Carleton College	WCAL, WRHM, WLB	1 kw	1,250	
KFNF	Shenandoah, Iowa	Henry Field Seed Co	WILL, KUSD	500	890	
				1 kw		LS.
KFOR	Lincoln, Nebr	Howard A. Shuman		100	1,210	
				250		LS.
KFOX	Long Beach, Calif	Nicholas & Warriner (Inc.)		1 kw	1,250	
KFPL	Dublin, Tex. (C. P. issued to increase power to 100 watts.)	C. C. Baxter		15	1,310	
KFPM	Greenville, Tex	Dave Ablowich, trading as the New Furniture Co.		15	1,310	
KFPW	Siloam Springs, Ark	Rev. Lannie W. Stewart		50	1,340	D.
KFPY	Spokane, Wash	Symons Broadcasting Co	KMO	500	1,340	
KFQA, KMOX. (See KMOX, KFQA.)						
KFQD	Anchorage, Alaska	Anchorage Radio Club		100	1,230	
KFQU	Holy City, Calif	W. E. Riker	KGGC	100	1,420	
KFQW	Seattle, Wash	KFQW (Inc.)		100	1,420	
KFQZ	Hollywood, Calif. S=Los Angeles, Calif.	Taft Radio & Broadcasting Co. (Inc.)		250	860	LT.
KFRC	San Francisco, Calif	Don Lee (Inc.)		1 kw	610	
KFRU	Columbia, Mo	Stephens College	WOS, WGBF	500	630	
KFSD	San Diego, Calif	Airfan Radio Corporation		500	600	
				1 kw		LS.
KFSG	Los Angeles, Calif	Echo Park Evangelical Association	KMIC	500	1,120	
KFUL	Galveston, Tex	Will H. Ford	KTSA	500	1,290	

KFUM	Colorado Springs, Colo	W. D. Corley		1 kw	1,270	
KFUO	Clayton, Mo	Evangelical Lutheran Synod of Missouri, Ohio, and other States, Rev. R. Kretzschmar, chairman, board of control of Concordia, Seminary.	KSD	500	550	
				1 kw		LS.
KFUP	Denver, Colo	Fitzsimons General Hospital, U. S. Army	KFXJ	100	1,310	
KFVD	Culver City, Calif	Los Angeles Broadcasting Co		250	710	LT.
KFVS	Cape Girardeau, Mo	Oscar C. Hirsch, trading as Hirsch Battery & Radio Co.	WEBQ	100	1,210	
KFWB	Hollywood, Calif	Warner Bros. Broadcasting Corporation	KPSN	1 kw	950	
KFWF	St. Louis, Mo	St. Louis Truth Center (Inc.)	WMAY, WIL	100	1,200	
KFWI	San Francisco, Calif	Radio Entertainments (Inc.)	KFWM	500	930	
KFWM	Richmond, Calif	Oakland Educational Society	KFWI	500	930	
				1 kw		LS.
KFXD	Jerome, Idaho	Frank E. Hurt, trading as Service Radio Co		50	1,420	
KFXF	Denver, Colo	Pikes Peak Broadcasting Co. (Inc.)	KFEL	250	940	
KFXJ	Edgewater, Colo	R. G. Howell	KFUP	50	1,310	
KFXM (formerly KFWC)	San Bernadino, Calif	J. C. & E. W. Lee (Lee Bros. Broadcasting Co.)	KPPC	100	1,200	
KFXR	Oklahoma City, Okla	Exchange Avenue Baptist Church		100	1,310	
KFXY	Flagstaff, Ariz	Mary M. Costigan		100	1,420	
KFYO	Abilene, Tex	T. E. Kirksey, trading as Kirksey Bros		100	1,420	
				250		LS.
KFYR	Bismarck, N. Dak	Hoskins-Meyer	KFDY	500	550	
KGA	Spokane, Wash	Ralph A. Horr, receiver for Northwest Radio Service Co.		5 kw	1,470	
KGAR	Tucson, Ariz	Tucson Motor Service Co		100	1,370	
KGB	San Diego, Calif	Pickwick Broadcasting Corporation		250	1,360	
KGBU	Ketchikan, Alaska	Alaska Radio & Service Co. (Inc.)		500	900	
KGBX	St. Joseph, Mo	Foster-Hall Tire Co	KWKC	100	1,370	
KGBZ	York, Nebr	Dr. George R. Miller	KMA	500	930	
				1 kw		LS.
KGCA	Decorah, Iowa	Chas. W. Greenley	KWLC	50	1,270	D.
KGCI	San Antonio, Tex	Sam Liberto, trading as Liberto Radio Sales Co.	KGRC	100	1,370	
KGCR	Watertown, S. Dak	Cutler's Radio Broadcasting Service (Inc.)		100	1,210	
KGCU	Mandan, N. Dak	Mandan Radio Association		100	1,200	
KGCX	Wolf Point, Mont	First State Bank of Vida	½ time	100	1,310	
				250		LS.
KGDA	Dell Rapids, S. Dak	J. R. Nelson, trading as Home Auto Co		50	1,370	
KGDE	Fergus Falls, Minn	Chas. L. Jaren (Jaren Drug Co.)		50	1,200	
KGDM	Stockton, Calif	E. F. Peffer		50	1,100	D.
KGDY	Oldham, S. Dak	J. Albert Loesch and Geo. W. Wright		15	1,200	
KGEF	Los Angeles, Calif	Trinity Methodist Church South	KTBI	1 kw	1,300	
KGEK	Yuma, Colo	Elmer G. Beehler, trading as Beehler Electrical Equipment Co.	KGEW	50	1,200	
KGER	Long Beach, Calif	C. Merwin Dobyns		100	1,370	
KGEW	Fort Morgan, Colo	City of Fort Morgan	KGEK	100	1,200	
KGEZ	Kalispell, Mont	Kalispell Chamber of Commerce		100	1,310	
KGFF	Alva, Okla	D. R. Wallace, owner KGFF Broadcasting Co		100	1,420	
KGFG	Oklahoma City, Okla	Faith Tabernacle Association (Inc.)	KCRC	100	1,370	
KGFI	Corpus Christi, Tex	Eagle Broadcasting Co. (Inc.)		100	1,500	
KGFJ	Los Angeles, Calif	Ben S. McGlashan		100	1,420	

D.=Daytime. See General Order No. 41.
LS.=Power until local sunset.

LT.=Limited time. See General Order No. 48.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
KGFK	Hallock, Minn.	R. W. Lautzenheiser and O. R. Mitchell, doing business as Lautzenheiser & Mitchell.		50	1,200	
KGFL	Raton, N. Mex.	Lamont A. Hubbard and T. F. Murphy, doing business as Hubbard & Murphy.		50	1,370	
KGFW	Ravenna, Nebr. (C. P. to increase power to 100 watts.)	Otto F. Sothman and Roy H. McConnell		50	1,310	
KGFX	Pierre, S. Dak.	Dana McNeil		200	580	D.
KGGC	San Francisco, Calif.	The Golden Gate Broadcasting Co.	KFQU	50	1,420	
KGGF	Picher, Okla.	D. L. Connell, M. D.	WNAD	500	1,010	
KGGM	Albuquerque, N. Mex.	New Mexico Broadcasting Co.		250	1,230	
				500		LS.
KGHF	Pueblo, Colo. (C. P. to increase power to 500 watts; LS.).	Curtis P. Ritchie and Joe E. Finch		250	1,320	
KGHI	Little Rock, Ark.	Berean Bible Class, First Baptist Church		100	1,200	
KGHL	Billings, Mont.	Northwestern Auto Supply Co. (Inc.)		500	950	
KGHX	Richmond, Tex.	Fort Bend County School Board		50	1,500	
KGIQ	Twin Falls, Idaho.	Radio Broadcasting Corporation	KID	250	1,320	
KGIR	Butte, Mont.	Symons Broadcasting Co.	KFBB	250	1,360	
KGIW	Trinidad, Colo.	Trinidad Creamery Co. (Inc.)		100	1,420	
KGIX	Las Vegas, Nev.	J. M. Heaton. (C. P. only)		100	1,420	
KGJF	Little Rock, Ark.	First Church of the Nazarene		250	890	
KGKB	Brownwood, Tex.	E. M., C. T., and E. E. Wilson, doing business as Eagle Publishing Co.		100	1,500	
KGKL	San Angelo, Tex.	KGKL (Inc.)		100	1,370	
KGKO	Wichita Falls, Tex.	Wichita Falls Broadcasting Co.		250	570	
				500		LS.
KGKX	Sandpoint, Idaho. (C. P. to increase power to 100 watts.)	C. E. Twiss and F. H. McCann		15	1,420	
KGO	Oakland, Calif.	General Electric Co.		7½ kw.	790	
KGRC	San Antonio, Tex.	Eugene J. Roth	KGCI	100	1,370	
KGRS	Amarillo, Tex.	E. B. Gish (Gish Radio Service)	WDAG	1 kw.	1,410	
KGU	Honolulu, Hawaii. (C. P. to increase power to 1 kilowatt.)	Marion A. Mulrony and Advertiser Publishing Co. (Ltd.).		500	940	
KGW	Portland, Oreg.	Oregonian Publishing Co.		1 kw.	620	
KGY	Lacey, Wash.	St. Martins College		10	1,200	
				50		LS.
KHJ	Los Angeles, Calif.	Don Lee (Inc.)		1 kw.	900	
KHQ	Spokane, Wash. (C. P. to increase power to 2 kilowatts, LS.)	Louis Wasmer (Inc.)		1 kw.	590	
KICK	Red Oak, Iowa.	Red Oak Radio Corporation		100	1,420	

KID	Idaho Falls, Idaho	Jack W. Duckworth	KGIQ	250	1,320	
KIDO	Boise, Idaho	Frank L. Hill and C. G. Phillips, doing business as Boise Broadcast Station.		1 kw	1,250	
KIT	Yakima, Wash	Carl E. Haymond		50	1,370	
KJBS	San Francisco, Calif	Julius Brunton & Sons Co		100	1,070	D.
KJR	Seattle, Wash	Ralph A. Horr, receiver for Northwest Radio Service Co.		5 kw	970	
KLCN	Blytheville, Ark	Charles Leo Lintzenich		50	1,290	D.
KLO	Ogden, Utah	Peery Building Co		100	1,370	
				200		LS.
KLPM	Minot, N. Dak	E. C. Reineke		100	1,420	
KLRA	Little Rock, Ark	Arkansas Broadcasting Co	KUOA	1 kw	1,390	
KLS	Oakland, Calif	E. N. and S. W. Warner, doing business as Warner Bros.		250	1,440	D.
KLX	do	The Tribune Publishing Co		500	880	
KLZ	Denver, Colo	Reynolds Radio Co. (Inc.)		1 kw	560	
KMA	Shenandoah, Iowa	May Seed & Nursery Co	KGBZ	500	930	
				1 kw		LS.
KMBC	Independence, Mo. S.=Kansas City, Mo.	Midland Broadcasting Co. (Inc.)	WHB	1 kw	950	
				2½ kw		LS.
KMED	Medford, Oreg	Mrs. W. J. Virgin		50	1,310	
KMIC	Inglewood, Calif	Dalton's (Inc.)	KFSG	500	1,120	
KMJ	Fresno, Calif	James McClatchy Co		100	1,210	
KMMJ	Clay Center, Nebr	The M. M. Johnson Co		1 kw	740	LT.
KMO	Tacoma, Wash	KMO (Inc.)	KFPY	500	1,340	
KMOX, KFQA	Kirkwood, Mo. S.=St. Louis, Mo.	Voice of St. Louis (Inc.). C. P. to move and increase power to 50 kilowatts, LP.		5 kw	1,090	
KMTR	Hollywood, Calif	KMTR Radio Corporation		500	570	
KNX	Los Angeles, Calif. S.=Hollywood, Calif.	Western Broadcast Co. C. P. to increase power to 50 kilowatts, LP.		5 kw	1,050	
KOA	Denver, Colo	General Electric Co		12½ kw	830	
KOAC	Corvallis, Oreg	Oregon State Agricultural College		1 kw	550	
KOB	State College, N. Mex	New Mexico College of Agricultural and Mechanical Arts. C. P. to increase power to 20 kilowatts.	KEX	10 kw	1,180	
KOCW	Chickasha, Okla	Oklahoma College for Women		250	1,400	
				500		LS.
KOH	Reno, Nev	Jay Peters (Inc.)		100	1,370	
KOIL	Council Bluffs, Iowa	Mona Motor Oil Co		1 kw	1,260	
KOIN	Sylvan, Oreg. S.=Portland, Oreg.	KOIN (Inc.)		1 kw	940	
KOL	Seattle, Wash	Seattle Broadcasting Co. (Inc.)	KTW	1 kw	1,270	
KOMO	do	Fisher's Blend Station (Inc.)		1 kw	920	
KOOS	Marshfield, Oreg	H. H. Hanseth		50	1,370	
KORE	Eugene, Oreg	Frank L. Hill & C. G. Phillips, doing business as Eugene Broadcast Station.		100	1,420	
KOY	Phoenix, Ariz	Nielson Radio Supply Co		500	1,390	
KPCB	Seattle, Wash. C. P. to move locally and increase power to 100 watts.	Wescoast Broadcasting Co	KPQ	50	1,210	

D.=Daytime. See General Order No. 41.
LS.=Power until local sunset.

LT.=Limited time. See General Order No. 48.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
KPJM	Prescott, Ariz.	A. P. Miller and Geo. R. Klahn, doing business as Miller & Klahn.		100	1,500	
KPO	San Francisco, Calif.	Hale Bros. Stores (Inc.), and the Chronicle Publishing Co.		5 kw	680	
KPOF	Denver, Colo.	Pillar of Fire (Inc.)	KFKA	500	880	
KPPC	Pasadena, Calif.	Pasadena Presbyterian Church	KFXM	50	1,200	
KPQ	Seattle, Wash. C. P. to move to Wenatchee, Wash.; power, 50 watts.	Wescoast Broadcasting Co.	KPCB	100	1,210	
KPRC	Sugarland, Tex. S.=Houston, Tex.	Houston Printing Co.		1 kw	920	
KPSN	Pasadena, Calif.	Pasadena Star-News Publishing Co.	KFWB	2½ kw		LS.
KPWF	Westminster, Calif.	Pacific-Western Broadcasting Federation (C. P. only).		1 kw 5 to 10 kw	950 1,490	
KQV	Pittsburgh, Pa.	Doubleday-Hill Electric Co.	WSMK	500	1,380	
KQW	San Jose, Calif.	First Baptist Church		500	1,010	
KRE	Berkeley, Calif.	First Congregational Church of Berkeley	KZM	100	1,370	
KREP (formerly KFAD)	Phoenix, Ariz. C. P. to move locally and increase power to 1 kilowatt; LS.	KAR Broadcasting Co.		500	620	
KRGV	Harlingen, Tex.	Valley Radio-Electric Corporation	KWWG	500	1,260	
KRLD	Dallas, Tex.	KRLD Radio Corporation	KTHS	10 kw	1,040	
KRMD	Shreveport, La.	Robert M. Dean	KTSL	50	1,310	
KRSC	Seattle, Wash.	Radio Sales Corporation		50	1,120	D.
KSAC	Manhattan, Kans.	Kansas State Agricultural College	WSUI	500 1 kw	580	LS.
KSAT (formerly KTAT)	Birdsville, Tex. S.=Fort Worth, Tex.	Texas Air Transport Broadcast Co.	WJAD	1 kw	1,240	
KSCJ	Sioux City, Iowa.	Perkins Bros. Co. (publishes the Sioux City Journal).	WTAQ	1 kw	1,330	
KSD	St. Louis, Mo.	Pulitzer Publishing Co.	KFUO	500	550	
KSEI	Pocatello, Idaho.	KSEI Broadcasting Association (Inc.)		250	900	
KSL	Salt Lake City, Utah.	Radio Service Corporation of Utah		5 kw	1,130	
KSMR	Santa Maria, Calif.	Santa Maria Valley Railroad Co.		100	1,200	
KSO	Clarinda, Iowa.	Berry Seed Co.	WKBH	500	1,380	
KSOO	Sioux Falls, S. Dak.	Sioux Falls Broadcast Association (Inc.)		2 kw	1,110	LT.
KSTP	Westcott, Minn. S.=St. Paul, Minn.	National Battery Broadcasting Co.		10 kw	1,460	
KTAB	Oakland, Calif.	Associated Broadcasters		1 kw	560	
KTAP	San Antonio, Tex.	Alamo Broadcasting Co.		100	1,420	
KTBI	Los Angeles, Calif.	Bible Institute of Los Angeles	KGEF	750	1,300	
KTBR	Portland, Oreg.	M. E. Brown	KFJR	500	1,300	
KTBS	Shreveport, La.	S. R. Elliott and A. C. Steere		1 kw	1,450	

KTHS	Hot Springs National Park, Ark.	Hot Springs Chamber of Commerce	KRLD	10 kw	1,040	
KTM	Santa Monica, Calif. (C. P. issued to move locally and increase power to 1 kilowatt; LS.) S. = Los Angeles, Calif.	Pickwick Broadcasting Corporation	KELW	500	780	
KTNT	Muscatine, Iowa	Norman Baker		5 kw	1,170	LT.
KTSA	San Antonio, Tex	Lone Star Broadcast Co. (Inc.)	KFUL	1 kw	1,290	
				2 kw		LS.
KTSL	Cedar Grove, La. S. = Shreveport, La.	Houseman Sheet Metal Works (Inc.)	KRMD	100	1,310	
KTSM	El Paso, Tex	W. S. Bledsoe and W. T. Blackwell	WDAH	100	1,310	
KTUE	Houston, Tex. (C. P. issued to increase power to 100 watts.)	William John Uhalt (Uhalt Electric)		5	1,420	
KTW	Seattle, Wash	First Presbyterian Church	KOL	1 kw	1,270	
KUJ	Longview, Wash. (C. P. issued to increase power to 100 watts, sharing with KVEP.)	Columbia Broadcasting Co. (Inc.)		10	1,500	
KUOA	Fayetteville, Ark	University of Arkansas	KLRA	1 kw	1,390	
KUSD	Vermilion, S. Dak	University of South Dakota	KFNF, WILL	500	890	
				750		LS.
KUT	Austin, Tex	M. A. English, D. W. English, and W. G. Stacy, doing business as KUT Broadcasting Co.	WTAW	500	1,120	
KVEP (formerly KWBS)	Portland, Oreg	Schaeffer Radio Co		15	1,500	
KVI	Des Moines, Wash. S. = Tacoma, Wash.	Puget Sound Broadcasting Co. (Inc.)		1 kw	760	LT.
KVL	Seattle, Wash	Arthur C. Dailey	KFBL	100	1,370	
KVOA	Tucson, Ariz	Robert M. Riculfi		500	1,260	D.
KVOO	Tulsa, Okla	Southwestern Sales Corporation	WAPI	5 kw	1,140	
KVOS	Bellingham, Wash	KVOS (Inc.)		100	1,200	
KWCR	Cedar Rapids, Iowa	Harry F. Paar	KFJY, KFGQ	100	1,310	
KWEA	Shreveport, La	William E. Antony		100	1,210	
KWG	Stockton, Calif	Portable Wireless Telegraph Co. (Inc.)		100	1,200	
KWJJ	Portland, Oreg	Wilbur Jerman		500	1,060	LT.
KWK	St. Louis, Mo	Greater St. Louis Broadcasting Corporation		1 kw	1,350	
KWKC	Kansas City, Mo	Wilson Duncan, trading as Wilson Duncan Broadcasting Co.	KGBX	100	1,370	
KWKH	Kennonwood, La	W. K. Henderson	WWL	10 kw	850	
KWLC	Decorah, Iowa	Luther College	KGCA	100	1,270	D.
KWSC	Pullman, Wash	State College of Washington	½ time	500	1,390	
KWWG	Brownsville, Tex	Chamber of Commerce, City of Brownsville	KRGV	500	1,260	
KXA	Seattle, Wash	American Radio Telephone Co		500	570	
KXL	Portland, Oreg	KXL Broadcasters (Inc.)	KFIF	100	1,420	
KXO	El Centro, Calif	E. R. Irey and F. M. Bowles		100	1,200	
KXRO	Aberdeen, Wash	KXRO (Inc.)		75	1,310	

D. = Daytime. See General Order No. 41.
LS. = Power until local sunset.
LT. = Limited time. See General Order No. 48.

E. Outstanding broadcast station authorizations—Continued

Call letters	Transmitter location	Licensee	Shares with—	Power	Kilocycles	Time and power limitations
KYW, KFKX	Chicago, Ill. C. P. issued to move to Bloomingdale Township and increase power to 10 kilowatts.	Westinghouse Electric & Manufacturing Co.	KYWA	5 kw	1,020	
KYWA	Chicago, Ill.	do	KYW, KFKX	500	1,020	

Respectfully submitted.

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

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FOURTH ANNUAL REPORT

of the

FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

For the Fiscal Year 1930

▼

COMMISSIONERS

C. McK. SALTZMAN, *Chairman*

EUGENE O. SYKES, *Vice Chairman*

IRA E. ROBINSON HAROLD A. LAFOUNT

WILLIAM D. L. STARBUCK

JAMES W. BALDWIN, *Secretary*



UNITED STATES

GOVERNMENT PRINTING OFFICE

WASHINGTON : 1930

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FOURTH ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION

FEDERAL RADIO COMMISSION,
Washington, D. C., December 1, 1930.

To the Senate and House of Representatives of the United States of America in Congress assembled:

Herewith is submitted the Fourth Annual Report of the Federal Radio Commission covering the fiscal year ending June 30, 1930.

PERMANENCY

From the creation of the Federal Radio Commission pursuant to the act approved February 23, 1927, until December 18, 1929, the commission existed as a temporary body with a date set from time to time when it would transfer its administrative duties to the Department of Commerce and become an appellate body with curtailed responsibilities. This temporary existence naturally imposed certain restrictions on the procurement of personnel, on the formation of plans and policies for the future and in other operations of the commission.

The establishment of the commission as a permanent body by the act approved December 18, 1929, removes the limitation referred to and places on that body full responsibility for the future development and upbuilding of excellent radio service for the country. The work being accomplished indicates that the commission appreciates this responsibility and will bring about the desired results gradually and effectively without violence to worthy services now existing.

The demand for frequencies for broadcasting, marine, "point-to-point," aviation, experimental, and many other purposes being already greater than the supply available, the future responsibilities of the permanent commission includes a demand for creative work through the development of plans and policies whereby a better and more extensive use may be made of the limited number of frequencies available.

PERSONNEL

The terms of all commissioners expiring February 23, 1930, the following commissioners were reappointed for the term of years shown below:

	Years
Maj. Gen. C. McK. Saltzman	6
Harold A. Lafount	5
William D. L. Starbuck	4
Eugene O. Sykes	3
Ira E. Robinson	2

On February 28, 1930, the following organization was effected by the commission:

Chairman	Maj. Gen. C. McK. Saltzman.
Vice chairman	Eugene O. Sykes.

A vacancy was created in the office of secretary of the commission by the unexpected resignation of Mr. Carl Butman, who had filled that position since November 2, 1927. The commission selected as the new secretary Mr. James W. Baldwin, then chief clerk of the Department of Justice.

The resignation on December 15, 1929, of the general counsel of the commission, Mr. Bethuel M. Webster, jr., caused a vacancy in that office, which was filled by the selection of Col. Thad H. Brown, then general counsel of the Federal Power Commission.

The act establishing the commission as a permanent body created the office of chief engineer. The commission selected for this office Dr. C. B. Jolliffe, then an official of the Bureau of Standards.

REORGANIZATION

The three divisions of the office through which practically all routine business passes, the license, legal, and engineering divisions, have, during the period covered by this report, been carefully reorganized with a view to a more speedy and efficient handling of routine business. During the year 8,543 applications for new services, for modification of existing services, or for the issue of licenses, were handled by these divisions, and 7,655 licenses and permits were issued. The records show that the average time elapsing between the receipt of applications and the final action on the same has been greatly reduced. The indications are that this time will be still further reduced, commencing September 1 of this year.

OFFICE REMOVAL

During the preceding year, the commission was located in the Interior Department Building. The commission realizes the inconvenience experienced by the department in allotting to the commission much valuable office space which was needed by the department. The commission desires to express its appreciation to the department for the many courtesies extended to the commission by the department while housed in its building. It was apparent, however, for many months, that the commission had outgrown its offices. The limited space available made it necessary in some cases for offices of one division to be widely separated and on different floors, this condition presenting difficulties in administration, and producing consequent delays. On July 8, 1930, the commission moved to the National Press Building, Fourteenth and F Streets NW., where additional space was obtained. This change can only result in more speedy administration and increased efficiency.

RADIOTELEPHONY

During the year the outstanding development in radiotelephony was the inauguration of a dependable radiotelephone service with the steamship *Leviathan* at sea connected through the land telephone sys-

tem whereby a person at any telephone station in the United States or Europe could speak to a person on that ship at sea. This remarkable radiotelephone achievement, developed by American genius, marks the beginning of a service which is being extended to many other ships.

Since 1927 a regular dependable trans-Atlantic radiotelephone service has been established for conversations between the United States and Europe. Recently, a similar service was opened between the United States and South America. Due to the success of the trans-Atlantic service, demands have been made upon the Federal Radio Commission for additional frequencies in order to give more reliable and additional service between the United States and Europe.

Due to the fact that marine radiotelephone services did not exist when the International Radiotelegraph Conference prepared the convention of 1927, and due to the lack of coordination in the assignment of frequencies suitable for such services, the Radio Commission has found itself greatly embarrassed in providing frequencies for this new radiotelephone use. To provide frequencies, the commission has, with the cooperation of Government departments and commercial operating agencies in this country, endeavored to prepare a new plan for the use of frequencies for maritime purposes which would not only provide for the continuance of existing services, but make available frequencies for these telephone services. This will result not only in providing space for telephone service, but also in a better organization of all maritime radio services.

AVIATION

The rapid growth of aviation in the United States has developed many trying problems for the commission. In its endeavor to assist in making aviation safer and more useful to the public, the commission has grappled with a difficult problem of providing adequate radio facilities for this rapidly growing service from the very limited number of useful frequencies available for this purpose. Many air transport companies are equipping aircraft with receivers to make use of the radio aids to navigation provided by the Department of Commerce and with equipment for 2-way communication between aircraft and ground. To make the most economical use of the few frequencies available, the commission, after a conference with representatives of the air transport companies, has prepared a new plan for the control of aviation communication.

INTERNATIONAL AVIATION RADIO-FREQUENCIES

For the purpose of enabling closer cooperation and the prevention of interference in aviation radio, a Canadian and United States delegation met informally in New York on April 10, 1930, and agreed upon recommendations which have since been adopted by both countries.

STATE QUOTAS

The amendment to the radio act of 1927, approved March 28, 1928, and generally referred to as the Davis amendment, requires that the Radio Commission "* * * shall as nearly as possible

make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave lengths, and of station power to each of said five zones * * * and shall make a fair and equitable allocation of licenses, wave lengths, time of operation, and station power to each of the States * * * within each zone according to population."

The demand from the various States for additional radio facilities is constantly increasing, while the number of frequencies available for this purpose remains fixed. This increasing demand from States for additional facilities has rendered it imperative that the commission establish just and proper standards for computing the value of facilities assigned to the various States.

On June 17, 1930, the commission adopted, after much study and discussion, General Order No. 92, specifying a unit value for radio broadcasting stations of various types, power, etc., by means of which units the value of the stations assigned to each State could be determined and thereby guide the commission in making "a fair and equitable allocation of licenses, wave lengths, time of operation, and station power to each of the States." Further details concerning this order and the equitable division of radio broadcasting facilities within the United States is set forth in the report of the chief engineer hereto appended.

INTERNATIONAL RELATIONS

The international radio convention and regulations are of the utmost concern to users of radio facilities in the United States. The assignment of frequencies to various classes of services and the rules, limitations, and restrictions on their use are necessarily based on the international convention and regulations. All users of radio, whether for communication, aviation, marine, experimental, or other purposes are therefore vitally interested in the results accomplished by international communication conferences. Existing conditions are based on the convention adopted by the International Radiotelegraph Conference of Washington of 1927. The next conference will take place in 1932 at Madrid.

The first meeting of the international technical consulting committee on radio communications authorized by the International Radiotelegraph Conference of 1927 took place at The Hague last fall. This meeting was attended by three official representatives from the Federal Radio Commission and, in addition to other official representation, by a large number of representatives from radio operating agencies in the United States. The results of the deliberations at The Hague were favorable to the United States.

A second meeting of the international technical consulting committee on radio communications will take place at Copenhagen in 1931. Many problems of vital interest to the users of radio in the United States will be considered at that meeting. The work at Copenhagen will have a direct bearing on the work to be done at the International Radiotelegraph Conference at Madrid in 1932.

In connection with the preparations for the above mentioned international conferences so vital to all radio services in this country, the Federal Radio Commission is desirous of making every effort to ascertain the needs and views of radio licensees and of extending all

possible assistance and cooperation to the Department of State under whose jurisdiction all operations pertaining to international communication are so efficiently conducted.

COOPERATION

The Radio Commission desires to express its appreciation of the assistance received during the past year from the radio division, the aeronautics branch and the Bureau of Standards, Department of Commerce, the Department of State, the War Department, Navy Department, and the Coast Guard, Treasury Department. The cooperation of these agencies has facilitated the work of the commission in many instances.

CODE OF PRACTICE AND PROCEDURE—EXAMINERS

While the work of the legal division and the major legal developments of the fiscal year have been rather fully considered in the part of this report devoted to that subject, certain of these are believed to be of special importance. On June 25, 1930, the commission adopted a code of practice and procedure governing the conduct of hearings before it. On the same date the commission made provisions for the appointment of one chief examiner and two attorney examiners who will conduct the hearings in all but exceptional cases. These two provisions are so closely associated and interrelated, not only as to date of enactment but as to cause and probable effect, that they will be considered together.

From the date of its organization the commission has been confronted with procedural difficulties which are not only very real but are not common to any other board or commission. Radio was in a period of transition, passing from the experimental stage to that of commercial adaptation. Certain provisions of the radio act had not been construed by courts of last resort, and there was not only a lack of precedent upon which to build but also an absence of even an apt analogy. In short, the commission was beset on every hand with new and novel problems such as would be expected to arise in the administration of a law only recently enacted which had for its purpose the regulation of a business which, while it already directly affected a relatively large part of the entire public, was in a state of rapid development. It was necessary, under the circumstances, to make certain compromises and to rely to a large degree upon the not too satisfactory system of trial and error.

With no tried and established system of procedure, the commission did not feel justified in delegating the authority to conduct hearings to its subordinates, even though it was manifest at the outset that the commission could not actually conduct all hearings required to be held by it and give full and sufficient consideration to other important problems.

The experiences of the past three and one-half years have, however, been such as to lead to the adoption during the year of a codified system of practice and procedure and to make possible the conduct of hearings by examiners, provided for by the original act, but only recently appointed.

While no extravagant claims are made for the system of procedure thereby established, and it is fully recognized that the period of trial and error is not at an end, it is confidently believed and expected that beneficial results will be attained and that a step has been taken which, if followed by proper cooperation on the part of persons having business with the commission, will inure to the benefit of all and to a more effective administration of the provisions of the act.

AMENDMENT TO SECTION 16, RADIO ACT OF 1927

An event of equal or paramount importance was the passage by Congress during the fiscal year and the approval by the President on July 1, 1930, of an amendment to the appellate provisions (sec. 16) of the radio act of 1927. The need for such an amendment, although generally recognized for some time, had only recently been of great practical importance.

EXPERIMENTATION IN HIGH FREQUENCIES

The International Radio Conference of 1927 assigned bands of frequencies between 10 and 23,000 kilocycles to the use of the various radio services then existing. The channels between these limits thus became the supply of useful working frequencies for the entire world. Above 23,000 there exists a wide band of very high frequencies whose characteristics and usefulness are not definitely known and which offers a fruitful field for experimentation. The Radio Commission has constantly endeavored to encourage experimentation in this field in the hope of enlarging the number of useful channels in the world's supply. Several agencies have been granted licenses for experiment stations in this band in order that they may determine the conditions under which it may be used.

RECOMMENDATIONS

1. It is recommended that the Federal Radio Commission be authorized to compel the painting and illumination of radio towers, if, in its judgment, such towers constitute a menace to air navigation.

2. It is recommended that the Virgin Islands, Porto Rico, Alaska, and the Hawaiian Islands be not included in zones, as now provided under the provisions of the Davis amendment, and that their quotas of radio facilities be separate and independent of the facilities alloted to continental United States.

3. It is recommended that authority be given the commission to suspend a radio license for a period of not to exceed 30 days for infractions of the law, regulations, or orders. Under the existing law, the only corrective measure possible to the commission is the complete revocation of the license or the refusal to renew the same. Many of the infractions of the law, regulations, or orders do not warrant a complete revocation of the license, but do warrant corrective measures of less rigor.

The reports to this commission of the secretary, the general counsel, and the chief engineer are appended.

Respectfully submitted.

C. McK. Saltzman. *Chairman.*

REPORT OF THE SECRETARY

JAMES W. BALDWIN

(Carl H. Butman served as secretary until May 1, 1930)

GENERAL

Consistent with the establishment of the commission as a permanent body there were created appropriate divisions and sections to which were allocated the administrative duties of the commission. New methods and policies were adopted to displace those employed during the temporary existence of the commission and with a view to possible future growth.

LICENSE DIVISION

This division was reorganized for the purpose of better administration.

There were received in this division 8,543 applications, as compared with 6,927 during the previous year; and there were issued 7,655 instruments of authority, as compared with 6,233 during last year.

Hearing notices, indicating the place and date of hearings, were mailed to 826 applicants.

To protect the rights of citizens of the United States in the use of frequencies assigned to them by the commission there were prepared separate lists, (*a*) fixed land and special, (*b*) aircraft, (*c*) portable, and (*d*) broadcasting, for registration at the International Bureau of the Telegraph Union at Berne, Switzerland; and weekly supplements thereto will follow as of course.

MAIL AND FILES

One of the newly created divisions is that of mail and files. This division has been assigned the responsibility of coordinating, consolidating, indexing, and classifying the files which have accumulated since the commission was created.

FINANCES

There was appropriated for the year ending June 30, 1930, $295,440. This sum is accounted for as follows:

Appropriated	$295,440
Expended:	
For personal services	255,674
For supplies and materials	3,475
For communication service	1,444
For travel expense	4,370
For printing and binding	22,524
For special and miscellaneous expenses	101
For equipment	7,796
Unobligated balance	3,456
Total	295,440

The general orders enacted and promulgated during the fiscal year related to a diversity of subjects. These orders and the subjects to which they relate may be briefly tabulated as follows:

70. Amending and enlarging provisions of General Order 51, which provided for the discontinuance of use of apparatus employing damped wave emissions.
71. Extending General Order 43, which provided for the limitation of chain broadcasting, to December 31, 1929.
72. Alaska licenses, etc., covering coastal and point-to-point transmitting stations extending to October 31, 1929.
73. Extending all licenses under General Order 72 to December 31, 1929. General Order 72 provided that Alaska licenses, etc., covering coastal and point-to-point transmitting stations be extended to October 31, 1929.
74. Amending General Order 55 affecting band of frequency between 1,500 and 6,000 kilocycles.
75. Violation of radio laws and regulations.
76. Amending General Order 24 to clarify amateur situation.
77. Installation of frequency control apparatus upon written authorization of commission.
78. Use of phonograph records and electrical transcriptions.
79. Rules and regulations governing issuance of construction permits, licenses, renewals of licenses and modifications of licenses, point-to-point or coastal service in Territory of Alaska.
80. Extending licenses of Alaska stations.
81. Rescinding General Orders 43 to 46 in reference to chain broadcasting.
82. Issuing of licenses to stations employing time wave emissions (conditions).
83. Alaskan licenses covering coastal and point-to-point transmitting stations. (See General Orders 72, 73, and 80.)
84. Rescinding General Orders 24 and 76, which refer to amateur stations, and adopting "Revised Amateur Regulations."
85. Amending General Order 74 to provide for emergency police radio service. General Order 74 affected band of frequency between 1,500 and 6,000 kilocycles.
86. Amending General Order 74, which affected band of frequency between 1,500 and 6,000 kilocycles, providing for emergency service for power companies.
87. Reallocation of frequencies in the case of certain clear channel stations for the purpose of reducing cross-talk interference.
88. Repeal of General Order 62 and the establishment of new channel separation in frequencies above 1,500 kilocycles.
89. Filing of applications.
90. Stations and operator's license to be posted.
91. Power and methods for determining operating power of broadcast transmitters.
92. Values of radio broadcasting stations fixed in units and quotas fixed.
93. Practice and procedure before the Federal Radio Commission.
94. Regulations governing aeronautical and aircraft stations.

The text of these general orders follows:

GENERAL ORDER No. 70

SEPTEMBER 13, 1929.

It is ordered that General Order No. 51 be amended and enlarged to include the following language:

"At all ship stations using damped waves, the logarithmic decrement per complete oscillation in the wave trains emitted by the transmitter shall not exceed two-tenths, except when sending distress signals or signals and messages relating thereto."

GENERAL ORDER No. 71

SEPTEMBER 18, 1929.

The commission hereby further postpones the effective date of General Order No. 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart, 90 days, to December 31, 1929.

GENERAL ORDER No. 72

SEPTEMBER 26, 1929.

It is ordered: Pending the adoption by the commission of a policy with regard to stations in the Territory of Alaska, all existing licenses and/or special authorizations covering the operation of coastal and point-to-point transmitting stations located in said Territory, which, by their terms, expire September 30, 1929, are hereby extended for a period of 31 days, to expire October 31, 1929.

Provided, however, 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 such station after October 31, 1929, 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 license or renewal of license, and the holder of any license or special authorization subject to this order who continues to use or operate any station during the period covered by this order shall be deemed to have consented to such condition.

GENERAL ORDER No. 73

OCTOBER 10, 1929

It is ordered that all existing licenses and/or special authorizations covering the operation of coastal and point-to-point transmitting stations located in the Territory of Alaska, heretofore extended by the commission's General Order No. 72, are hereby extended to and will expire December 31, 1929.

Provided, however, 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 such station after December 31, 1929, 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 license or renewal of license, and the holder of any license or special authorization subject to this order who continues to use or operate any station during the period covered by this order shall be deemed to have consented to such condition.

GENERAL ORDER No. 74

OCTOBER 11, 1929.

General Order No. 55 is hereby amended to read as follows:

"The commission, in order to carry out the provisions of the radio act of 1927, having determined that public interest, convenience, or necessity requires the allocation of certain frequencies, within the band of frequencies between 1,500 and 6,000 kilocycles, to those services and classes of stations hereinafter enumerated, hereby enters the following order:

"It is ordered:

"PARAGRAPH I. That of those channels between 1,500 and 6,000 kilocycles, the following are hereby allocated to those services and classes of stations enumerated herein, for assignment to individual stations in conformity with this order. Each channel is specified by its center frequency.

"(*a*) Mobile services.

"1. Ship stations and/or coastal stations:

1,504,[1] 1,508,[1] 1,512,[1] 1,516, 1,520, 1,524, 1,528, 1,532, 1,536, 1,540, 1,548, 1,552, 1,556, 1,560, 1,568, 1,572, 1,576, 1,580, 1,588, 1,592, 1,660, 1,672, 1,684, 1,708, 2,320, 2,332, 2,350, 2,380, 2,428, 2,446, 2,518, 2,524, 2,530, 2,536, 2,542, 2,554, 2,560, 2,566, 2,578, 2,584, 2,590, 2,596, 2,668, 2,692, 2,728, 2,740, 3,112, 3,118, 3,124, 3,130, 3,420, 3,428, 3,436, 5,525 (calling only).

"2. Ship stations:

5,555, 5,615.

"3. Coastal stations:

4,116, 4,148, 4,172, 4,188, 4,196, 4,755, 4,775, 5,675.

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[1] To be reserved as interference guard band for broadcasting stations at all locations where the assignment to other services may result in interference with broadcasting stations.

"4. Mobile press stations:
5,645, east of Mississippi River.
5,585, west of Mississippi River.
"5. Reserved for temporary mobile assignments only:
1,544, 1,564, 1,584, 2,368, 2,392, 2,476.
"6. Portable stations:
1,600, 1,652, 1,664, 1,680, 1,704.
"7. Emergency police:
1,712, 2,416, 2,452.
"8. Emergency fire (marine):
1,596.
"9. Reserved for special mobile services other than portable:
2,410, 2,422, 2,440, 2,458, 2,470.
"10. Aircraft and/or aeronautical stations:
1,608, 1,612, 1,616, 1,620, 1,624, 1,628, 1,632, 1,636, 1,640, 1,644, 1,648, 1,656, 1,668, 1,676, 1,688, 2,302, 2,326, 2,344, 2,362, 2,374, 2,482, 2,506, 2,608, 2,614, 2,620, 2,626, 2,632, 2,638, 2,644, 2,650, 2,662, 2,680, 2,698, 2,722, 2,734, 3,070, 3,076, 3,082, 3,088, 3,100, 3,136, 3,142, 3,148, 3,452, 3,460, 3,468, 3,484, 3,492, 4,108, 4,124, 4,140, 4,164, 4,180, 4,765, 4,785, 5,510, 5,540, 5,570, 5,600, 5,630, 5,660, 5,690.
"11. Aircraft stations:
3,106, national calling frequency for all transport and itinerant airplanes.
"(*b*) Fixed services.
"1. Point-to-point (shared between United States and Canada):
3,268, 3,274, 3,280, 3,286, 3,298, 3,304, 3,310, 3,316, 3,324, 3,332.
"2. Point-to-point (United States exclusive):
4,268, 4,276, 4,284, 4,396, 4,405, 4,415, 4,535, 4,545, 4,555, 4,565, 4,575, 4,585, 4,595, 4,605, 4,615, 4,625, 4,635, 4,645, 4,655, 4,665, 4,675, 4,685, 4,695, 4,705, 4,715, 4,725, 4,735, 4,745, 4,925 4,935, 4,945, 4,955, 4,965, 4,975, 4,985, 4,995, 5,005, 5,015, 5,025, 5,035, 5,045, 5,055, 5,065, 5,075, 5,085, 5,095, 5,105, 5,115, 5,125, 5,135, 5,145, 5,155, 5,165, 5,175, 5,185, 5,195, 5,205, 5,215, 5,225, 5,235, 5,245, 5,255, 5,265, 5,275, 5,285, 5,295, 5,305, 5,315, 5,325, 5,335, 5,345, 5,355, 5,855, 5,870, 5,885, 5,900, 5,975, 5,990.
"3. General communication channels (other nations priority), provided that such use will not cause interference to services in other North American countries:
2,206, 2,212, 2,218, 2,224, 2,230, 2,236, 2,242, 2,248, 2,254, 2,260, 2,266, 2,272, 2,278, 2,284, 2,290, 2,296, 3,010, 3,016, 3,022, 3,028, 3,034, 3,040, 3,046, 3,052, 3,058, 3,196, 3,202, 3,208, 3,214, 3,220, 3,226, 4,004, 4,212, 4,220, 4,228, 4,324, 4,332, 4,340, 4,348, 4,356, 4,455, 4,465, 4,475, 4,485, 4,495, 4,505, 4,515, 4,805, 4,815, 4,825, 4,835, 4,845, 4,855, 4,865, 4,875, 4,885, 4,895, 4,905, 4,915, 5,375, 5,385, 5,395, 5,405, 5,415, 5,425, 5,435, 5,445, 5,455, 5,465, 5,475, 5,485, 5,495, 5,705, 5,720, 5,735, 5,750, 5,765, 5,780, 5,795, 5,810, 5,825, 5,840.
"(*c*) Special services.
"1. Amateur:
The band of frequencies between 1,715 and 2,000 kilocycles, inclusive, and the band of frequencies between 3,504 and 4,000 kilocycles, inclusive.
"2. Experimental visual broadcasting:
The frequencies 2,000 to 2,200 kilocycles, inclusive. and 2,750 to 2,950 kilocycles, inclusive.
The frequencies 2,200 to 2,299 kilocycles, inclusive, provided that such use will not interfere with radio services in other North American countries.
"3. General experimental:
1,604, 2,398, 4,795 (assigned to general experimental stations by all North American nations).
3256 (shared between Canada and United States).
"4. The following frequencies are to be assigned exclusively to stations devoted to promoting the interests of agriculture:
3,250 (shared between Canada and the United States).
4.244, 5,365 (United States exclusive channels).

"5. The following frequencies are reserved for assignment to stations rendering emergency services:

3,160, 3,166, 3,172, 3,178, 3,184 (shared between United States and Newfoundland).

3,238, 3,244 (shared between United States and Canada).

"6. In order to preserve a uniform channeling system, the commission urges upon Government services the desirability of operating upon the nearest standard channel, under the terms of General Order No. 62, to the frequency assigned it by the President, and for this purpose considers Government services to be operating upon the following frequencies:

1,692, 1,696, 1,700 (2,010 to 2,020 and 2,240 to 2,250 kilocycles shared with visual broadcasting), 2,308, 2,314, 2,338, 2,356, 2,386, 2,404, 2,434, 2,464, 2,488, 2,494, 2,500, 2,512, 2,548, 2,572, 2,602, 2,656, 2,674, 2,686, 2,704, 2,710, 2,716, 2,746, (2,885, 2,915 shared with visual broadcasting), 2,956, 2,962, 2,968, 2,974, 2,980, 2,986, 2,992, 2,998, 3 004, 3,034,[2] 3,064, 3,094, 3,154, 3,190, 3,232, 3,262, 3,292, 3,340, 3,348, 3,356, 3,364, 3,372, 3,380, 3,388, 3,396, 3,404, 3,412, 3,444, 3,476, 3,500 to 4,000, 4,012, 4,020, 4,028, 4,036, 4,044, 4,052, 4,060, 4,068, 4,076, 4,084, 4,092, 4,100, 4,132, 4,156, 4,204, 4,236, 4,252, 4,260, 4,292, 4,300, 4,308, 4,316, 4,364, 4,372, 4,380, 4,388, 4,425, 4,435, 4,445, 4,525, 5,915, 5,930, 5,945, 5,960.

"PAR. II. No license shall be granted to any applicant for a fixed station, coastal station, or aeronautical station who is unable to satisfy the commission that he can maintain the assigned station frequency with an accuracy of 0.05 per cent or better at all times.

"PAR. III. Licensees of fixed, coastal, or aeronautical stations shall obtain and use for tuning and checking the tuning of their transmitters suitable frequency-measuring equipment which shall be accurate within 0.025 per cent on the frequencies on which the transmitter is licensed to operate. The frequency-measuring equipment made available by the Department of Commerce shall be considered as standard for comparing and calibrating frequency-measuring equipment.

"PAR. IV. Licensees must use radio transmitters, the emissions of which, by reason of actual decrement, high-speed signaling modulation, spacing waves, harmonics, frequency modulation, key clicks, and mush, do not cause interference detrimental to traffic and programs being carried out on other authorized channels of communications."

GENERAL ORDER NO. 75

OCTOBER 30, 1929.

1. Every licensee operating a radio station under a license from the Federal Radio Commission who receives a notification from a Department of Commerce supervisor or inspector regarding any violation of the Federal laws in force, or any violation of the orders or regulations of the Federal Radio Commission, or any violation of the terms and conditions of the station license shall within three days of receipt of such notice send a written reply in triplicate to the supervisor or inspector from whom the notification was received.

2. The answer to each notice shall be complete in itself and shall not be abbreviated in the least by reference to any other communications or answers to previous notifications that the licensee may have received and answered.

3. If the notification relates to some violation that may be due to the physical or electrical characteristics of the transmitting apparatus the answer to the inspector shall state fully what steps, if any, are being taken to prevent future violations; and if any new apparatus is to be installed the date such apparatus was ordered shall be given, the name of manufacturer, and promised date of delivery.

4. If the notification of violation relates to some violation caused by lack of attention or improper operation of transmitter, the name and license number of operator in charge shall be given.

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[2] Shared between Canada and other nations. (See (b) 3, above.)

GENERAL ORDER No. 76

NOVEMBER 6, 1929.

It is ordered that General Order No. 24 be, and the same is hereby, amended to read as follows:

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

"'Any 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.

"Amateur radio telephone apparatus will be licensed for operation only in the following bands:

Kilocycles	Meters
60,000 to 56,000	5.00 to 5.36
14,300 to 14,100	84.50 to 85.70
3,550 to 3,500	150.00 to 175.00
2,000 to 1,715	

"Provided, however, that operation in the band of 14,300 to 14,100 kilocycles will be permitted only by operators holding extra first-class operator's licenses or, lacking such licenses, by operators who in their applications for station licenses show special technical qualification and ability to operate within the limits prescribed herein."

GENERAL ORDER No. 77

NOVEMBER 8, 1929.

It is ordered that in order to regulate the kind of apparatus to be used with respect to its external effects and to reduce interference between stations, any automatic frequency control apparatus, the purpose of which is to maintain the frequency of a radio transmitter upon the frequency assigned by the commission, or within the maximum tolerance therefrom allowed by the commission, shall be installed only upon receipt of, and in accordance with, written authorization from the commission.

Such authorization shall be applied for upon the form specifically provided by the commission for that purpose, and such form shall be executed and submitted in the same manner as other applications for authorizations from the commission.

GENERAL ORDER No. 78

DECEMBER 5, 1929.

It is ordered that General Order No. 52 be, and the same is hereby amended to read as follows:

"1. *Ordinary phonograph records, mechanical piano players, etc.*—All broadcasting stations shall announce clearly and distinctly the character of all mechanical reproductions broadcast by them, the announcement to immediately precede the broadcasting of each record. In such announcements each talking machine, phonograph, or graphophone record used, whatever its character, shall be described by the use of the exact words: 'This is a talking machine record,' or 'This as a phonograph record,' or 'This is a graphophone record'; each player-piano selection used shall be described as played by "mechanical piano player"; every other mechanical reproduction shall be similarly described by the term generally understood and used by the public and meaning such mechanical reproduction.

"2. *Exclusive transcriptions for broadcast purposes.*—Where a recording or transcript is made exclusively for broadcasting purposes and is neither offered nor intended to be offered for sale to the public, each such recording shall be immediately preceded and followed by the following statement: 'This program is an electrical transcription made exclusively for broadcast purposes.'

"Broadcasting stations shall not use such records, transcriptions, or piano-player rolls when the length of the rendition thereof exceeds 15 minutes unless provision is made for the announcement of the station call letters, which must be given, together with the statement above set forth, at least once every 15 minutes."

GENERAL ORDER No. 79

DECEMBER 20, 1929.

It is ordered that the following provisions be, and the same are hereby, adopted and promulgated as the rules and regulations of the Federal Radio Commission governing the issuance of construction permits, licenses, renewals of licenses, and modifications of licenses, with respect to stations engaged in or intending to be used in point-to-point or coastal service in the Territory of Alaska or its territorial waters.

1. The rules and regulations adopted by the commission on October 25, 1929, and recorded in the minutes of that date are hereby repealed.

2. Non-Government stations licensed pursuant to this general order shall provide adequate service at all times without discrimination for the general public.

3. Applications for construction permits or licenses for the construction or operation of non-Government stations shall be filed in triplicate in accordance with the radio act of 1927, upon forms furnished by the commission, with the supervisor of radio at Seattle, Wash., and shall be routed to the Federal Radio Commission as follows:

(*a*) Said supervisor shall send the applications to the "officer in charge, Washington-Alaska Military Cable and Telegraph System (W. A. M. C. A. T. S.). This officer shall recommend by indorsement the type of equipment, frequencies, etc., necessary for efficient operation with the Alaska system."

(*b*) Said officer shall then forward such applications to the office of the Chief Signal Officer of the United States Army. This officer will either approve or amend the recommendation of the officer in charge W. A. M. C. A. T. S.

(*c*) The Chief Signal Officer shall then send such applications to the chief of the radio division, Department of Commerce, who shall make the usual record in such cases and forward such applications to the Federal Radio Commission for final action.

4. Construction permits, licenses, and all formal notices shall be forwarded to the applicant or licensee in the reverse order of the procedure set out in section 3 hereof.

5. All licensees using transmitters employing damped-wave emissions shall change such equipment to transmitters employing continuous waves or modulated continuous waves at the earliest practicable date. In no case will the commission, after May 31, 1931, issue construction permits or licenses or renewal or modifications of licenses with respect to any transmitter employing damped-wave emissions.

6. (*a*) The following frequencies and types of emissions are hereby designated for point-to-point communication between Government and non-Government stations in Alaska, provided, however, that stations now equipped with damped-wave transmitters may continue the use of such transmitters only subject to the conditions of section 5 hereof:

172 kilocycles, A1, A2.[1]
178 kilocycles, A1, A2.
182 kilocycles, A1, A2.
183 kilocycles, A1, A2.
186 kilocycles, A1, A2.
187 kilocycles, A1, A2.[1]
188 kilocycles, A1, A2.
189 kilocycles, A1, A2.
192 kilocycles, A1, A2.[1]
193 kilocycles, A1, A2.
212 kilocycles, A1, A2.[1]
217 kilocycles, A1, A2.[1]
219 kilocycles, A1, A2.[1]
220 kilocycles, A1, A2.[1]
222 kilocycles, A1, A2.[1]
225 kilocycles, A1, A2.[1]
227 kilocycles, A1, A2.[1]
246 kilocycles, A1, A2.
252 kilocycles, A1, A2.
256 kilocycles, A1, A2.
262 kilocycles, A1, A2.
268 kilocycles, A1, A2.
272 kilocycles, A1, A2.[1]
274 kilocycles, A1, A2.

[1] Government frequencies.

and subject to the further provision that the commission will not approve the assignment of Government frequencies for the use of non-Government stations unless the Chief Signal Officer has approved the applications therefor.

(*b*) The following frequencies and types of emission are hereby designated for short-distance point-to-point communication between non-Government stations, provided that the maximum power on such frequencies shall not exceed 100 watts and upon the condition that no interference will result to other services.

3,160 kilocycles, A1, A2, A3.
3,166 kilocycles, A1, A2, A3.
3,172 kilocycles, A1, A2, A3.
3,178 kilocycles, A1, A2, A3.
3,184 kilocycles, A1, A2, A3.

(*c*) The following frequencies and types of emission are hereby designated for the use of stations engaged in ship-to-shore or coastal communications, provided the maximum power on such frequencies shall not exceed 200 watts:

1,540 kilocycles, A1, A2, A3.	500 A1, A2.	B Calling and distress.
1,592 kilocycles, A1, A2, A3.	425 A1, A2.	B Working.
1,660 kilocycles, A1, A2, A3.	460 A1, A2.	Working.
1,708 kilocycles, A1, A2, A3.		
2,320 kilocycles, A1, A2, A3.		
2,428 kilocycles, A1, A2, A3.		
2,560 kilocycles, A1, A2, A3.		

and subject to the condition that after May 31, 1931, type B emissions shall not be employed.

GENERAL ORDER No. 80

DECEMBER 20, 1929.

It is ordered that all existing licenses and special authorizations covering the operation of coastal and point-to-point transmitting stations located in the Territory of Alaska, heretofore extended by the commission's General Orders No. 72 and No. 73, are hereby extended to and will expire March 31, 1930.

Provided, however, 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 such station after March 31, 1930, serves or will serve public interest, convenience, or necessity, or that public interest, convenience, or necessity will be served by the granting of any application for license or renewal of license, and the holder of any license or special authorization subject to this order who continues to use or operate any station during the period covered by this order shall be deemed to have consented to such conditions.

It is further ordered that no construction permit, license, or renewal or modification of license be granted unless subsequent to the issuance hereof an application therefor has been made pursuant to the radio act of 1927 and in accordance with the provisions of General Order No. 79 of the commission.

GENERAL ORDER No. 81

DECEMBER 20, 1929.

In order to assure the uninterrupted broadcasting of high-class chain programs for the benefit of the general public;

In order to afford adequate time to the Federal Radio Commission and full opportunity to investigate and determine whether chain programs are being unnecessarily duplicated, and to enable said commission to determine what progress has been and is being made toward the successful operation of two or more stations on the same frequency in synchronism, either by wire connection or otherwise;

To afford the Federal Radio Commission opportunity to determine whether chain broadcasting may be successfully carried on in the future with a more economic use of frequencies than now employed, it is

Ordered that General Order No. 43 of the Federal Radio Commission, adopted at a meeting of said commission on September 8, 1928, which had as its purpose the regulation of chain broadcasting and placed definite limitations on

stations which might engage in chain broadcasting, and General Order No. 46 of the Federal Radio Commission, adopted by said commission on October 5, 1928, as an amendment to General Order No. 43 aforesaid, be and said General Orders Nos. 43 and 46 of the Federal Radio Commission are hereby rescinded and repealed.

GENERAL ORDER No. 82

JANUARY 3, 1930.

It is ordered:

1. No license will be issued hereafter for the operation of any radio station using, or proposing to use, transmitting apparatus employing damped-wave emissions except under the following conditions:

(*a*) When such apparatus was installed on board a ship prior to January 1, 1930, in such cases licenses will be issued for the operation of damped-wave transmitters on the following frequencies only:

375 kilocycles.
410 kilocycles.
425 kilocycles.
454 kilocycles.
500 kilocycles.

(*b*) Licenses may be issued authorizing the operation of damped-wave transmitting apparatus in Alaska and its territorial waters provided such damped-wave transmitting apparatus was installed prior to January 1, 1930, and upon the condition that the operation of such damped-wave transmitting apparatus will cause no interference with any other radio service. In the issuing of licenses authorizing the use of damped wave transmitting apparatus for other than mobile stations the commission will in no case authorize the use of such apparatus subsequent to May 31, 1931, and in no case will the commission, after May 31, 1931, issue construction permits, licenses, or renewals, or modifications of licenses with respect to transmitting apparatus employing damped-wave emissions and located in the Territory of Alaska.

GENERAL ORDER No. 83

JANUARY 25, 1930.

It is ordered that all existing licenses and special authorizations covering the operation of coastal and point-to-point transmitting stations located in the Territory of Alaska, heretofore extended by the Federal Radio Commission's General Orders Nos. 72, 73, and 80, are hereby extended to, and will expire on, January 25, 1931.

Provided, however, 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 such station after January 25, 1931, serves or will serve public interest, convenience, or necessity, or that public interest, convenience, or necessity will be served by the granting of any application for license or renewal of license; and the holder of any license or special authorization subject to this order who continues to use or operate any station during the period covered by this order shall be deemed to have consented to such conditions.

It is further ordered that with regard to stations affected by this order no construction permit, license, or renewal or modification of license shall be granted unless, subsequent to the issuance hereof, an application therefor has been made pursuant to the radio act of 1927 and in accordance with the provisions of General Order No. 79 of the commission.

GENERAL ORDER No. 84

APRIL 4, 1930.

It is ordered:

1. That General Orders Nos. 24 and 76 be, and they are hereby, repealed.

2. That the revised regulations incorporated in the minutes of this date, entitled "Revised Amateur Regulations," are hereby adopted and shall be effective on and after April 5, 1930.

REVISED AMATEUR REGULATIONS

APRIL 4, 1930.

Under the provisions of section 4 of the radio act of 1927, as amended, the Federal Radio Commission establishes the following regulations for amateur radio stations:

SECTION 1. *Definitions.*—As used in these regulations:

(*a*) An amateur is a person interested in radio technique solely with a personal aim and without pecuniary interest.

(*b*) An amateur operator is a person holding a valid license from the Secretary of Commerce as a radio operator who is authorized under the regulations of the Secretary of Commerce to operate amateur radio stations.

(*c*) An amateur station is all the apparatus controlled from one location used for amateur radio communication.[4]

(*d*) Amateur radio communication is radio communication between amateur radio stations by telegraph, telephone, facsimile, or television solely with a personal aim and without pecuniary interest.

(*e*) A fixed station is a station permanently located.

(*f*) A mobile station is a station permanently located upon a mobile unit and ordinarily used while in motion.

(*g*) A portable station is a station so constructed that it may conveniently be moved about from place to place for communication and is in fact so moved about from time to time, but not ordinarily used while in motion.

SEC. 2. *Classification of amateur stations.*—The public interest, convenience, and necessity will be served by the operation of amateur stations. Save as restricted by and subject to the provisions of treaty, law, or regulations of the commission and with the exception of individual cases where the public interest, convenience, or necessity requires otherwise, all applications from amateurs for amateur-station licenses will be granted.

SEC. 3. *Prescription of the nature of service to be rendered.*—(*a*) For the present, amateur mobile stations will not be licensed.

(*b*) Amateur stations are to communicate only with similar stations. In emergencies or for testing purposes they may communicate with commercial or Government stations. They may also communicate with mobile craft and expeditions which do not have general public-service licenses and which may have difficulty in establishing communication with commercial or Government stations.

(*c*) Amateur stations shall not broadcast news, music, lectures, sermons, or any form of entertainment to the general public.

(*d*) Amateur stations shall not transmit or receive messages for hire nor engage in communication for material compensation, direct or indirect, paid or promised.

(*e*) Except as otherwise herein provided, amateur radio stations shall be used only for amateur radio communication, as defined in section 1, paragraph (*d*) above.

SEC. 4. *Assignment of bands of frequencies.*

(*a*) The following bands of frequencies are assigned exclusively to amateur stations:

1,715 to 2,000 kilocycles.	28,000 to 30,000 kilocycles.
3,500 to 4.000 kilocycles.	56,000 to 60,000 kilocycles.
7,000 to 7,300 kilocycles.	400,000 to 401,000 kilocycles.
14,000 to 14,400 kilocycles.	

(*b*) All bands of frequencies so assigned may be used for continuous wave telegraphy.

(*c*) The following bands of frequencies may also be used for radio telephony:

1,715 to 2.000 kilocycles.
3,500 to 3,550 kilocycles.
56,000 to 60.000 kilocycles.

(*d*) Upon application, amateurs who hold operators' licenses from the Secretary of Commerce of the extra first-class amateur grade, or higher, or who show special technical qualifications, satisfactory to the licensing authority, will also be licensed for radio telephony in the band of frequencies:

14,100 to 14,300 kilocycles.

[4] As a matter of licensing procedure in all cases of remotely controlled transmitters, the location of the station shall be assumed to be that of the control point, save that, where such control point is more than 5 miles from the radiating antenna, the location shall be assumed to be that of the radiating antenna.

(*e*) The following bands of frequencies may also be used for television, facsimile, and picture transmission:

1,715 to 2,000 kilocycles.
56,000 to 60,000 kilocycles.

(*f*) Licenses to individual amateur stations shall permit the use of all frequencies within the service bands above assigned which the licensee may be entitled to use and shall not specify individual frequencies.

SEC. 5. *Location.*—An amateur radio station shall not be located upon premises controlled by an alien.

SEC. 6. *Regulations concerning the kind of apparatus to be used, with reference to its external effects.*—(*a*) Amateur stations shall not use apparatus transmitting damped waves.

(*b*) The frequency of the waves emitted by amateur stations must be as constant and as free from harmonics as the state of the art permits. For this purpose they must use circuits loosely coupled to the radiating system or devices that will produce equivalent effects to minimize keying impacts and harmonics. Conductive coupling to the radiating antenna, even though loose, is not permitted, but this restriction does not apply against the employment of transmission-line feeder systems to Hertzian antennas.

(*c*) Amateur stations must use adequately filtered direct-current power supply or arrangements that produce equivalent effects to minimize frequency modulation and prevent the emission of broad signals.[5]

(*d*) Amateur stations are authorized to use a maximum power input into the last stage of a transmitter of 1 kilowatt.

SEC. 7. *Regulations deemed necessary to prevent interference.*—(*a*) In the event that the operation of an amateur station causes general interference with broadcast reception in receiving apparatus of modern design, that amateur station shall not operate during the hours from 8 o'clock p. m. to 10.30 p. m., and on Sundays from 10.30 a. m. until 1 p. m., local time, upon such frequency or frequencies as cause such interference.

(*b*) An amateur station shall transmit its assigned call at the end of each transmission, but in any event at least once during each 15 minutes of operation.

SEC. 8. *Other regulations.*—(*a*) Amateur station licenses shall be issued only to persons who are amateurs, as defined in section 1, paragraph (*a*) above.

(*b*) Amateur station licenses shall be issued only to persons who are amateur operators, as defined in section 1, paragraph (*b*) above; provided, however, that if an applicant is not such an operator, an amateur station license shall be issued him upon the presentation of affirmative evidence that the station, when licensed, will be operated by an amateur operator.

(*c*) Amateur station licenses shall not be issued to corporations or associations; provided, however, that in the case of a bona fide amateur radio society, a license may be issued to an authorized official of such society as trustee therefor.

(*d*) The licensee of a portable station shall give advance notice to the supervisor of radio in the district where application was made for said portable station license, of all locations in which the station will be operated.

(*e*) The licensee of an amateur station shall keep an accurate log of station operation, in which shall be recorded the time of each transmission, the station called, the input power to the last stage of the transmitter, and the frequency band used.

SEC. 9. *Administration.*—For the purpose of administering these regulations and under the findings of public interest, convenience, and necessity herein made, all ministerial and routine duties in connection with the licensing of amateur radio stations will be performed by the radio division of the Department of Commerce. That division will issue, on behalf of and in the name of the commission, all licenses the applications for which disclose no question involving discretion and which require no determination of controverted questions of fact. All applications tendering such questions shall be referred by the radio division to the commission.

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[5] The use of unrectified alternating-current power supply will be considered satisfactory in the amplifier stages of oscillator-amplifier transmitter so arranged that variations in plate voltage can not affect the frequency of the oscillator.

GENERAL ORDER No. 85

APRIL 8, 1930.

It is ordered:

1. That General Order 74 be amended so as to provide for emergency police radio service as hereinafter set forth.

2. *Definition.*—Emergency police radio service is the broadcasting of emergency communications from central police headquarters to squad cars or other mobile units.

To whom licenses will be issued.—Licenses for emergency police radio service will be authorized only for municipally controlled stations.

Assignment of frequencies.—The following frequencies are designated for emergency police service:

1,712, 2,410, 2,416, 2,422, 2,440, 2,452, 2,458, and 2,470 kilocycles.

No specific frequency will be assigned for the exclusive use of any licensee. One frequency may be shared by a number of municipalities in the same geographical area.

Prerequisites to authorization.—Construction permits and licenses will be granted on condition:

(1) That the station be operated only for the purpose of transmitting dispatches of an emergency nature to squad cars or other mobile units; provided, however, that the frequency may be used for the transmission of test messages not to exceed two minutes in each half-hour period; and further, that before testing, the station shall make certain that no interference will result to reception in other locations.

(2) That a survey has been completed to determine the most suitable location from which the lowest possible power with highest percentage of modulation will afford coverage over the desired service area; provided, however, that in no case will the commission authorize an amount of power in excess of that shown in the subjoined table of the following paragraph, or a modulating capacity of transmitter less than 85 per cent on peaks. Furthermore, no transmitter will be permitted to operate unless the applicant can show that the carrier frequency will be kept within 0.025 per cent of the assigned frequency by automatic frequency control.

Power.—The maximum amount of power to be assigned for the use of stations will be based on the latest Census Bureau population figures for cities or State subdivisions in accordance with the following table:

Population	Power (watts)	Population	Power (watts)
Under 100,000	50	400,000 to 500,000	250
100,000 to 200,000	100	500,000 to 600,000	300
200,000 to 300,000	150	600,000 to 700,000	400
300,000 to 400,000	200	Over 700,000	500

In the event that the amount of power allocated above is insufficient to afford reliable coverage over the desired service area, the commission will, upon proper showing being made, authorize the use of additional transmitters of duplicate power.

GENERAL ORDER No. 86

APRIL 8, 1930.

It is ordered:

1. That General Order 74 be amended in so far as it provides for emergency service for power companies.

2. (*a*) That emergency radio service for power companies is service providing for emergency radio communication between power company stations when all forms of wire communication fail.

(*b*) That the frequency 3,184 kilocycles with maximum power of 500 watts, type A–1 (CW) emission be authorized for use by power companies for the purpose of handling dispatches of an emergency nature during times when such traffic can not be otherwise delivered because of the breakdown of established means of communication.

(*c*) That the frequency may be used for testing purposes not to exceed 10 minutes per day, provided, however, that before testing, the station shall ascertain that the frequency is clear and that no interference will result to other stations or services.

3. That all licenses heretofore issued to power companies for emergency service be so modified as to conform with this general order.

GENERAL ORDER No. 87

APRIL 7, 1930.

It is ordered that, effective 3 a. m. Eastern Standard Time, April 30, 1930, General Order No. 40, dated August 30, 1928, be, and the same is hereby, amended to read as follows:

"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 herein below 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 Radio Telegraph 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 sta-

tions, 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 1,160 kilocycles.
Second zone: 700, 750, 820, 980, 1,020, 1,080, 1,140, and 1,150 kilocycles.
Third zone: 650, 740, 800, 850, 1040, 1,070, 1,130, and 1,190 kilocycles.
Fourth zone: 670, 720, 770, 810, 870, 1,000, 1,110, and 1,180 kilocycles.
Fifth zone: 640, 680, 790, 830, 970, 1,050, 1,090, and 1,170 kilocycles.

"(*b*) The following frequencies are allocated each for use by not less than two zones, with broadcasting stations in these 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 connecting 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 April 30, 1930, 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."

GENERAL ORDER NO. 88

APRIL 14, 1930.

It is ordered that General Order No. 62 is hereby repealed.

That in the frequencies exceeding 1,500 kilocycles per second, a channel of radio communication shall be regarded as a band of frequencies, the width of which varies according to its position in the spectrum. The width of these channels increases with the frequency according to the following table:

Frequency (kilocycles)	Channel width (kilocycles)	Frequency (kilocycles)	Channel width (kilocycles)
1,500 to 2,198	4	8,210 to 10,980	20
2,200 to 3,313	6	10,990 to 16,405	30
3,316 to 4,400	8	16,420 to 21,960	40
4,405 to 5,490	10	21,980 to 32,780	60
5,495 to 8,202.5	15		

NOTE.—A visual broadcasting channel shall not be more than 100 kilocycles in width. A commercial telephone channel below 3,313 kilocycles shall be re-

garded as 6 kilocycles in width. A relay broadcasting channel between 6,000 and 9,600 kilocycles shall be regarded as 20 kilocycles in width.

In granting licenses, the Federal Radio Commission will specify the frequency in the center of the particular channel licensed to be used, but the licensee may occupy the center frequency and in addition such adjacent frequencies (within the limit indicated on the above table) as may be permitted by the frequency maintenance tolerance and required by the type of emission the station may be authorized to use, all of which will be specified in the instrument of authorization.

Licensees of fixed stations who have been granted the use of a channel for communications with specified points, upon application to the commission for licenses may be granted the use of the same channel for communications with other points on the condition that the public interest, convenience, and necessity will be served by such a grant.

From and after the adoption of this general order no licenses or renewals thereof for operation in the frequencies hereinabove named shall be granted for a longer period than December 31, 1930.

MAY 20, 1930.

Inclosed herewith is a copy of General Order No. 89, promulgated by the Federal Radio Commission and effective May 1, 1930.

Your attention is particularly directed to paragraph 2 of this general order and you are hereby advised that full compliance with these provisions will be insisted upon by the commission.

Proper application blanks may be secured from the supervisor of the district in which your station is located. The responsibility for obtaining the proper application blank and its accomplishment will rest entirely upon the applicant.

Existing regulations require that application must be forwarded through the office of the supervisor of the district in which your station is located.

GENERAL ORDER No. 89

APRIL 21, 1930.

It is ordered, effective May 1, 1930:

1. All applications for renewal of license must be filed so as to be received at the offices of the supervisor of radio in charge of the district in which the station is located at least 30 days prior to the expiration date of the license sought to be renewed.

2. That in no case where an applicant fails to meet the foregoing requirements shall any temporary extension of license be granted pending action of the commission upon the application for renewal of license. And in any case where the applicant has failed to meet the foregoing requirements, and no action is taken by the commission on the application for renewal of license before the expiration date of the license sought to be renewed, the licensee shall cease operating in accordance with the terms of said license.

GENERAL ORDER No. 90

MAY 19, 1930.

It is ordered that every station license shall be posted by the licensee in a conspicuous place in the room in which the transmitter is located, and the license of every station operator shall be posted in a conspicuous place in the room occupied by said station operator while on duty.

GENERAL ORDER No. 91

[Specifying and limiting the maximum rated power of broadcast transmitters which may be installed hereafter and specifying methods for determining the operating power of broadcast transmitters of various types]

MAY 23, 1930.

MAXIMUM ALLOWABLE RATED CARRIER POWER

It is ordered:

SECTION 1. That the maximum rated carrier power of all broadcast transmitters to be installed after this date shall be determined by the authorized

power as given in Table 1 of this section. The maximum carrier power rating shall be determined as provided in section 2 of this general order.

TABLE I

Authorized power (watts)	Maximum carrier power allowed to be installed (watts)
(a)	
5 to 100	100
250 (day)	250
(b)	
250 to 1,000	1,000
2,500 to 5,000	5,000
(c)	
The maximum power to be installed in stations with an authorized power of over 5,000 watts shall be the same as the auathorized power.	

Applicants requesting power from 5 to 50 watts, or from 250 to 500 watts, inclusive, may be allowed to install transmitters of the same maximum carrier power as the authorized power.

SEC. 2. The maximum power of all broadcasting transmitters shall be determined by the installed vacuum tube capacity of the oscillator or radio frequency power amplifier which supplies power to the antenna.

Transmitters employing high-level modulation shall be rated as the same maximum carrier power as the total installed tube power capacity of the stage which supplies power to the antenna. The maximum carrier power of transmitters employing low-level modulation shall be rated as one-fourth the installed tube power capacity of the stage which supplies power to the antenna. (If this does not give an even number, the nearest even figure shall be used.)

The power capacity of all standard tubes commonly used in broadcasting transmitters with a power of 50 watts or above as oscillators, or class 3 or class C amplifiers, is fixed and approved as set out in Table II, hereafter set out in this section. Any tube of a power rating or type number not listed in Table II may be specified on an application to the commission, provided the manufacturer's maximum rating and operating constants as oscillator or class C amplifier are definitely shown in such application, subject to approval by the commission.

TABLE II

Power rating (watts)	De Forest	R. C. A. radiotron	Western Electric
50	503-A-511-545	UV203-A-UV-211-UV845	211-A to E, 242-A, 248-A.
75	552-560	UX852-UX860	
250	504-A	UV204-A	212-A to E, 241-A.
350		UV849	
500	500-561	UV861	
1,000		UV851-UV206	
2,000			243-A.
5,000	520-B		228-A.
10,000		UV207-UV848-UV863-UV854	220-B, 240-A.
15,000			236-A.
35,000			232-A.
100,000		UV862	

SEC. 3. No licensee shall increase the number of vacuum tubes or change to vacuum tubes of higher rating in the oscillator or radio-frequency power amplifier which supplies power to the antenna, or change the system of modulation without the authority of the commission therefor.

DETERMINATION OF OPERATING POWER

SEC. 4. The operating carrier power of broadcasting transmitters shall be determined by the antenna input power either by (a) direct measurement or

(*b*) by indirect measurement by means of the plate input power of the oscillator or last stage radio power amplifier which supplies power to the antenna.

(*a*) The antenna input power by direct measurement is the square of the antenna current times the antenna resistance at the place where the current is measured and at the operating frequency. The direct measurement of the antenna input power will be accepted as operating power, provided the data on the antenna resistance measurements are submitted under oath, giving detailed description of the method used and data taken. The antenna current shall be measured by an ammeter of accepted accuracy and subject to such verification as the commission may determine.

Any licensee from whom the commission accepts antenna input power by direct measurement as the operating power, shall not make any changes in the antenna system without the authority of the commission.

(*b*) The antenna input power shall be determined by indirect measurement from the plate input power by multiplying plate voltage by the plate current of the oscillator or last stage radio power amplifier which supplies power to the antenna and by the proper percentage given in Table III or IV in accordance with the power and system of modulation used.

The operating power of transmitters employing high-level modulation shall be determined from the plate input in accordance with Table III.

TABLE III

Maximum carrier power of transmitter (watts)	The power output shall be considered to be this percentage of plate input
5 to 100	50
250 to 1,000	60
2,500 to 50,000	65

The operating power of transmitters employing low-level modulation in terms of plate input and maximum percentage of modulation of the antenna current without over 5 per cent second and third harmonics shall be determined in accordance with Table IV. No distinction will be recognized between transmitters of different power or between transmitters of greater maximum carrier power than the operating power.

TABLE IV

Maximum percentage of modulation	The exact output shall be this per cent of the plate input
100 to 80	33⅓
75 to 50	40

SEC. 5. Operating power rating based on field intensity measurements may be accepted in lieu of antenna imput power, provided a sufficient number of measurements are taken to insure accuracy and a theoretical analysis of the antenna is submitted, indicating horizontal and vertical distribution of the radiation. This data must be submitted to the commission for such verification as it may consider necessary. Any licensee from whom the commission accepts operating power based on field intensity measurements shall not make any changes in the antenna system without the authority of the commission therefor.

SEC. 6. All transmitters shall be equipped with indicating instruments of accepted accuracy which will give the values of the antenna current, voltage supplied to the plate circuit of the oscillator or power amplifier stage which supplies power to the antenna, and the total direct current flowing in the plate circuit of the oscillator or power amplifier stage which supplies power to the antenna.

GENERAL ORDER No. 92

JUNE 17, 1930.

Whereas the act of Congress approved March 28, 1928, entitled "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," provides and declares that "The people of all the zones established by section 2 of this act (radio act of 1927) are entitled to equality of radio broadcasting service, both of transmission and of reception"; and

Whereas said act approved March 28, 1928, above referred to, also provides and requires that "in order to provide said equality 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"; and

Whereas it was the intent and purpose of Congress to secure an equal distribution of radio broadcasting service, both of transmission and of reception between the five zones aforesaid; and

Whereas it is necessary, in order to make and maintain such equal allocation between said five zones and fairly and equitably between the States within each of the zones, that the commission determine the value of stations of various classes or of various powers in effecting such allocation; and

Whereas the commission has sought and obtained the best advice and information available and has given much time to an intensive study to such values of stations of various powers; and

Whereas the commission, through its engineers and from studies made by the commission, has considered all the elements required by Congress to be considered, and has allowed the paramount intent and purpose of the act of March 28, 1928, above referred to, to control, i. e., "that the people of all the zones * * * are entitled to equality of radio broadcasting service, both of transmission and of reception"; and

Whereas it has been found that, according to the broadcasting service rendered to the people of each zone and of the States within each zone by stations of various classes, both of transmission and of reception, each class of station is of the following value in units, to wit:

Classes of stations

(A) FOR FULL-TIME STATIONS

	Value in units
(1) Stations of a power of 5 kilowatts or more, 1 station only operating on the channel at night	5
(2) Stations of a power of 5 kilowatts or more, 2 stations operating simultaneously on a common frequency and separated by 2,000 miles or more	4
(3) Stations of a power of 5 kilowatts or more, 2 or more stations operating on a common frequency and stations separated by less than 2,000 miles	2
(4) Stations of a power of 1 kilowatt, 2 or more stations operating simultaneously on a common frequency	1
(5) Stations with 500-watt power with more than 2 stations operating simultaneously on a common frequency	.6
(6) Stations with 250-watt power with more than 2 stations operating simultaneously on a common frequency	.4
(7) Stations with 100-watt power or less with 2 or more stations per zone operating simultaneously on a common frequency	.2

(B) DAY STATIONS

(1) Stations of a power of 5 kilowatts operating during daylight hours only simultaneously with stations of class A (1), above	1.5
(2) Stations of a power of 2.5 kilowatts operating during daylight hours only	.75
(3) Stations of a power of 1 kilowatt operating during daylight hours only	.5
(4) 500, 250, or 100 watt stations operating during daylight hours only, one-half values given for corresponding full-time stations above.	

(C) FULL-TIME STATIONS HAVING EXCESS DAY POWER

All stations shall have their values in units based on one-half the units for full-time stations of same power as the stations have at night plus the value in units for a day station of the same power as the station has in daytime, as follows:

1 kilowatt night, 2½ kilowatts day, equal	1.25
500 watts night, 1 kilowatt day, equal	.8
250 watts night, 500 watts day, equal	.5
100 watts night, 250 watts day, equal	.3

(D) LIMITED-TIME STATIONS

For stations of more than 5 kilowatts the value of units will be the same for all powers. The units will be based on 5 units. The units for each station will therefore be 2.5 for day operation plus 2.5 times hours used between 6 p. m. and 12 p. m., local time, divided by 12.

Stations over 5 kilowatts operating—

1 night hour	2.7
2 night hours	2.9
3 night hours	3.1

For stations of 5 kilowatts the basis shall be 1.5 units for day operation, the same as a 5-kilowatt day station given above, plus 2.5 units times hours used between 6 p. m. and 12 p. m., local time, divided by 12.

Station of 5 kilowatts operating—

1 night hours	1.7
2 night hours	1.9
3 night hours	2.1

For stations operating with power of 1 kilowatt, 500 and 250 watts, the value in units shall be the same as for a day station plus the value in units of day station times number of night hours used between 6 p. m. and 12 p. m., local time, dividing by 12.

1,000-watt stations operating—

1 night hour	.54
2 night hours	.58
3 night hours	.62

500-watt stations operating—

1 night hour	.32
2 night hours	.35
3 night hours	.38

250-watt stations operating—

1 night hour	.22
2 night hours	.23
3 night hours	.26

For stations dividing time on the same frequency the value assigned will be in proportion to the time assigned.

It is, therefore, ordered that the values of radiobroadcasting stations of the various classes, powers, and time of operation be, and they are hereby, fixed in units as above set forth; and

It is further ordered that each of the five zones created by section 2 of the radio act of 1927 shall each have broadcasting stations the total value in units of which shall be equal and shall be fairly and equitably distributed among and allocated to the States within each of said zones in proportion to the population each of said States bears to the population of the zone, and that the quota of broadcasting facilities to which each State is entitled shall be determined and fixed as herein provided and in accordance with values in units for various classes of stations above set out.

GENERAL ORDER No. 93

JUNE 25, 1930.

It is ordered that the following rules and regulations pertaining to practice and procedure before the commission be, and the same are hereby, adopted.

It is further ordered that all general orders or parts thereof and all rules and regulations in conflict therewith be, and the same are hereby, repealed.

It is further ordered that this general order be effective on September 1, 1930.

PRACTICE AND PROCEDURE BEFORE THE FEDERAL RADIO COMMISSION

SUBTITLE A.—GENERAL

SECTION 1. *Office of the commission.*—The principal office of the commission shall be located at Washington, D. C. Except for Sundays and legal holidays throughout the year and except for Saturdays after 1 o'clock p. m. during the period from June 1 to October 1 (both inclusive), the office will be open every day from 9 a. m. to 4.30 p. m.

SEC. 2. *Meetings of the commission.*—All meetings of the commission, unless otherwise determined by a majority of its members, shall be held at the principal office of the commission. The commission will, however, meet at another place if so determined by a majority of its members and may, by one or more of its members, or by such examiner or other employee as it may designate, hold hearings, conduct investigations, and prosecute any inquiry necessary to its duties at any other place.

SEC. 3. *Secretary to sign instruments of authorization and orders.*—All instruments of authorization granted by the commission and all orders issued by it shall, unless otherwise specifically provided by order of the commission, be signed by the secretary in the name of the commission.

SEC. 4. *Official record.*—The official record of any action of the commission, other than in connection with or as the result of hearings on applications or revocation proceedings, shall be the minutes of such session, kept by and in the custody of the secretary. The official record of any action by the commission made in connection with or as the result of any such a hearing, shall be the order of the commission entered and filed in the appropriate hearing docket file. Such official records shall be subject to inspection at the office of the secretary during business hours.

SEC. 5. *Files.*—The files of the commission shall not be open to inspection by the public except as follows:

(*a*) Hearing docket files shall be open to inspection by anyone.

(*b*) Copies of current permits, licenses, and other instruments of authorization shall be open to inspection by anyone having a legitimate interest therein.

(*c*) Applications shall be open to inspection by the applicant himself or by any parties interested in the granting or denial of said applications.

SEC. 6. *Seal.*—The seal of the commission shall be affixed to all permits, licenses, and other instruments of authorization granted, and all orders issued by the commission.

SEC. 7. *Certified copies.*—A copy of any instrument or authorization granted by the commission, or of an order issued by the commission, or of any public record of the commission, will be certified to by the secretary of the commission under its seal. Any cost that may be necessary in preparing such copy shall be prepaid by the person requesting it.

SEC. 8. *Official reporter.*—The commission will designate from time to time an official reporter for the taking down and transcribing of its proceedings. No transcript of the testimony taken or argument had at any hearing held by the commission will be furnished to any party or to any other person by the commission; such transcript must be obtained directly from the official reporter.

SEC. 9. *Copies.*—Where, under these regulations, any document is permitted or required to be filed in connection with any hearing, it shall be necessary to file the same in duplicate unless otherwise expressly provided.

SEC. 10. *Additional time to parties in certain cases.*—Where, under these regulations, any limitation is made as to the time within which any document is required to be filed, or any other procedural step is required to be taken in connection with any hearing, parties who are residents of the fifth zone shall have an additional period of five days and parties who reside beyond the confines of the continental United States shall have an additional period of 20 days within which to file such document or take such other procedural step.

SEC. 11. *Attorneys.*—Any party to a proceeding before the commission may appear and be heard in person, by agent with power of attorney, or by attorney at law. All attorneys at law appearing must conform to the standard of ethical conduct required of practitioners before the courts of the United States.

SUBTITLE B.—ACTION ON APPLICATIONS

SECTION 1. *Applications returned without action.*—Any application which is not filed in accordance with the commission's regulations or, if properly filed,

does not comply with the regulations with respect to the form used, manner of execution, completeness of answer to questions, or any other information required will not be entered on the records of the commission or considered by the commission. Each such application shall be returned to the applicant by the secretary of the commission together with a brief statement of the respect in which the application is defective.

SEC. 2. *Refiling of applications.*—Upon the return of any such defective application, as provided in section 1, the applicant may either (*a*) correct the defective application and refile the same, or (*b*) if it is nevertheless believed to be sufficient, he may refile it without correction.

SEC. 3. *Applications denied without hearing.*—In the event that any defective application returned to the applicant is refiled without correction, as provided for in subdivision (*b*) of section 2, or where it appears from the face of any application or from any documents accompanying it that the instrument of authorization in question is one which may not be granted by the commission, or that the applicant is not eligible to receive such instrument under the laws or treaties of the United States, or under the terms of these regulations, the commission may deny such application without hearing and the secretary shall promptly mail a written notice of such denial to the applicant setting forth a brief statement of the reasons for such action.

SEC. 4. *Hearings granted where interpretation of law, treaty, or regulation involved.*—In any case enumerated in section 3, where the proper interpretation or application of the laws or treaties of the United States, or the proper interpretation or application, or the validity of the regulations of the commission is involved, the applicant may, by written request filed with the secretary, not later than 15 days from the date of mailing of the notice of denial by the secretary, have his application entered on the hearing docket and obtain a hearing with respect to such question or questions. The applicant shall in such written request specify the respects in which it is believed that the law or treaties or regulations have been wrongly interpreted or applied, or that the regulation is invalid, and the hearing will be limited to the issues thus presented. The time and place of hearing shall be fixed in the same manner as other applications designated for hearing and, pending such hearing, the effective date of the commission's denial shall be postponed to the date of the commission's decision after hearing. The commission may, after hearing or default, again deny the application or may, after hearing, set aside its previous denial thereof and proceed to consider the application on its merits in the same manner as other applications.

SEC. 5. *Applications granted without hearing.*—The commission will grant an application in whole or in part without hearing on the merits if it does not fall within any of the cases covered by sections 1 and 3 of this subtitle, or if it has been determined to be proper after a hearing pursuant to section 4 and in addition thereto it appears conclusively to the commission from the face of such application, from documents submitted therewith and from such other information as the commission may have—

(*a*) That the granting of such application either in whole or in part would serve public interest, convenience, and necessity, and

(*b*) That the granting of such application either in whole or in part would not aggrieve or adversely affect the interest of any person, firm, company, or corporation holding a permit, license, or other instrument of authorization from the commission, or having an application therefor pending before the commission.

In any case where the application is for a license or for a modification of license, pursuant to a construction permit previously granted by the commission, such license or modification of license will be granted without hearing if it appears conclusively to the commission that all the terms, conditions, and obligations set forth in the application for construction permit and in the permit have been fully met and that no causes or circumstances have arisen since the granting of such permit which would make the granting of said license or modification of license against public interest.

SEC. 6. *Hearings in cases where applications are granted in part.*—Where any application is granted by the commission in part or with any privileges, terms, or conditions other than those requested pursuant to section 5 and without a hearing thereon, the action of the commission shall be considered as the granting of such application unless the applicant shall, within 15 days of the date of mailing by the secretary of his written notice of such action, file with the commission a written request for a hearing with respect to the part or with

respect to the privileges, terms, or conditions not granted. The request for hearing shall be accompanied by a statement in writing of the facts which the applicant expects to prove upon such hearing. Upon the receipt of such request and statement in proper form, the application will be set for hearing in the same manner as other applications are set for hearing and the applicant and other parties in interest notified thereof. Within a period of 10 days from the receipt of such notice of hearing the applicant shall deliver or mail a copy of the statement of facts to be proved by it to all other parties notified of the hearing and shall file with the commission an affidavit stating that this requirement has been met. The evidence to be offered by any applicant upon such hearing shall be limited to the matter contained in the applicant's written statement of facts to be proved by it. Pending such hearing the effective date of the commission's action with respect to such application shall be postponed to the date of the commission's decision after hearing.

SEC. 7. *All other applications designated for hearing.*—In cases where the application is or has, pursuant to section 4 hereof, been determined to be proper upon its face but the commission is unable to determine without a hearing on the merits—

(*a*) That the granting of such application either in whole or in part would serve public interest, convenience, or necessity.

(*b*) That the granting of such application either in whole or in part would not aggrieve or adversely affect the interest of any person, firm, company, or corporation holding a permit, license, or other instrument of authorization from the commission, or having an application therefor pending before the commmission—

the commission will designate the same for hearing and the following procedure will govern:

(1) The secretary shall forthwith mail a written notice to the applicant setting forth the action of the commission (together with such statement of the commission's reasons therefor as shall be appropriate to the nature of the application), the time and place for hearing and a list of the other parties notified thereof.

(2) In order to avail himself of the opportunity to be heard, the applicant shall, within 20 days of the mailing of the notice by the secretary, file with the commission a written appearance consisting of a statement of his desire to be heard, together with a statement in writing of the facts which he expects to prove at such hearing and an affidavit showing that a copy of such written statement has been served upon or mailed to all other parties notified of the hearing.

(3) In case no appearance or statement in writing of the facts to be proved upon such hearing is filed by the applicant within the time so specified (or any extension thereof as the commission may grant upon proper showing), the applicant will be defaulted and the application denied without a hearing and the secretary shall so notify the other parties to the hearing.

(4) In case the appearance and statement in writing of the facts to be proved is duly and seasonably filed, the application will be entered upon the hearing docket.

(5) If at the date set for hearing, either originally or as a result of continuances, the applicant does not appear, a default will be entered and the commission will deny the application.

(6) After a hearing has been held in accordance with the foregoing, the commission may grant the application, deny it, or grant it in part, or deny it in part.

(7) A partial denial of any application after hearing thereon shall be considered as a denial of the application.

SEC. 8. *Repetition of applications.*—Where an applicant has more than one application pending for essentially the same instrument of authorization, with respect to the character of station, type of service, and the territory sought to be served, the commission shall determine which of such applications shall be first considered by it. Where an applicant has been afforded an opportunity to be heard with respect to a particular application and the commission has, after hearing or default, denied the application, the commission will not consider or designate for hearing another application by the same applicant, or for his successor or assignee, until after the lapse of periods of time as follows:

(*a*) Where the second application is for exactly or substantially the same instrument of authorization with respect to the privileges, terms, and conditions

requested, and the territory sought to be served, a period of 12 months must elapse from and after the date of the commission's denial of the first application.

(*b*) Where the second application is for the same kind of instrument of authorization, with respect to type of service and the territory sought to be served, a period of six months must elapse from and after the date of the commission's denial of the first application.

Provided, however, that the foregoing provisions shall have no application where, since the commission's denial of the first application, there has been a material change in the facilities available for designation to the particular service sought to be established in the territory sought to be served.

SEC. 9. *Applications pending appeal from decisions of the commission.*—Where an appeal has been taken from the action of the commission in denying a particular application, the commission will not consider or designate for hearing another application for the same kind of instrument of authorization, with respect to the type of service and territory sought to be served, filed by the same applicant, his successor or assignee, until the final disposition of such appeal, provided, however, that where, pursuant to section 7 of subtitle B, an application is granted in part and denied in part and the applicant desires to utilize the partial grant and to contest the partial denial, any such applicant shall be permitted during the pendency of such appeal, and without prejudice thereto, to file such application or applications as shall be necessary or requisite to the utilization, extension, or renewal, but not for a modification of the instrument in the particulars theretofore denied, and the commission will consider and dispose of these applications.

SEC. 10. *Application involving conflicting claims, etc.*—In fixing dates for hearings the Secretary will, so far as possible, endeavor to fix the same date for hearings on all related matters which involve the same applicant and for hearings on all applications which by reason of the privileges, terms, or conditions requested present conflicting claims.

SEC. 11. *Depositions.*—In exceptional cases the commission may, either on its own motion or on written request by a party setting forth the facts which he expects to prove and the causes or reasons for the taking thereof, issue an order directing the time, place, and manner in which the testimony of a witness shall be taken by deposition. Such order shall be served upon all parties to the proceeding in which the deposition is to be used, and such deposition, when not otherwise directed, shall be taken, transcribed, and executed in the usual manner before any officer having power to administer oaths. The time within which any such deposition shall be filed with the commission shall be fixed in the order directing the taking thereof.

SEC. 12. *Witnesses and subpœnas.*—Subpœnas may be issued by the commission or any member thereof or by an examiner appointed by the commission to compel the attendance of any witness at any hearing or at the taking of any deposition, or to compel the production of any document. Service of any such subpœna may be made by any United States marshal or by his deputy or by any citizen of the United States competent to be a witness. If service is made by a United States marshal or by his deputy, his service shall be evidenced by his return thereon; if made by any other person by his affidavit stating the manner in which service was made, which affidavit shall be attached to and returned with the original subpœna. Witnesses who attend any hearing or the taking of any deposition in answer to a subpœna are entitled to and shall receive the same fees and mileage as are paid for like services in the courts of the United States, such sum to be paid by the party at whose instance the testimony is taken.

SEC. 13. *Opening and closing.*—In each formal hearing held on an application for an instrument of authorization, the applicant shall have the opening and closing of the evidence and argument, if any. In each formal hearing held on an order of revocation the commission shall have the opening and closing. In cases where the foregoing rules are inapplicable under the issues to be presented, the commission or the person conducting the hearing may fix the order of procedure.

SEC. 14. *Amendments.*—Where no prejudice results to other parties, a party will be permitted to amend his application, answer, or other pleading at any time prior to the conclusion of hearing provided, however, that no amendment of an application for an instrument of authorization as to the frequency, power, hours of operation, equipment, location of station, or points of communication in case of stations (other than broadcasting) will be permitted unless such

amendment is filed with the commission not later than 20 days before the hearing date. In all cases where an amendment is made to any application contrary to the foregoing provisions, such amendment shall have the effect or setting aside the assignment for hearing and any such application so amended shall be treated in all respects as an application originally filed. In any case where an application is amended in the particulars above enumerated the secretary shall notify all parties affected thereby.

SUBTITLE C.—REVOCATION PROCEEDINGS

SECTION 1.—*Revocation proceedings and the conduct thereof.*—Revocation proceedings under section 14 of the radio act shall me governed by the following procedure:

(*a*) Such proceedings shall in all cases be initiated by an order of revocation served upon or mailed by the commission to the holder of the license in question directing h'm to appear upon a date certain not less than 30 days after receipt of such notice and show cause why such order of revocation should not be made effective. This order of revocation shall be accompanied by a written statement of the cause for such proposed revocation.

(*b*) Either the respondent or any person in interest who would be aggrieved by any such revocation will be accorded an opportunity to appear and be heard in opposition to such order if, prior to the hearing date therein fixed, such respondent or other person shall deliver to the commission a written application therefor.

(*c*) Upon the filing of any such application the order of revocation shall stand suspended until the conclusion of the hearing herein provided for and the decision of the commission thereon; and the commission will forthwith fix the date for hearing and shall immediately mail a written notice of the time and place for such hearing to respondent and to all parties known to be interested in such license. The date fixed for hearing shall not be earlier than 30 days from the mailing of the notice thereof as herein provided.

(*d*) Not later than 20 days after date of mailing of the notices of hearing respondent shall file with the commission an answer executed and sworn to by a person having knowledge of the facts, in which answer the allegations of the statement of cause for revocation shall be specifically and in detail denied or explained as the case may be. Any person other than the respondent may likewise file an answer within the same time and upon the same terms and conditions. Evidence to be introduced upon such hearing will be limited to the issues formed by the commission's statement of cause for revocation and the answers filed thereto, and in case no such answer is filed within the period herein fixed or such extension thereof as the commission may allow, an order of default will be entered, no hearing will be held, and an absolute order of revocation will be issued forthwith.

(*e*) After hearing has been held in accordance with the foregoing, the commission may affirm or revoke such order of revocation.

SUBTITLE D.—FORMAL HEARINGS AND THE CONDUCT THEREOF

SECTION 1. *Parties to hearings.*—All persons who are permitted to be heard in support of any application made by them shall be referred to as "applicants." All persons who are permitted to be heard in opposition to any application or licensees against whom revocation proceedings are instituted shall be referred to as "respondents." All persons, firms, companies, or corporations holding permits, licenses, or other instruments of authorization from the commission, or who have applications pending before the commission who would be aggrieved, or whose interests would be adversely affected by the granting of any application designated for hearing, shall constitute proper parties respondent and shall be notified of any such hearing.

SEC. 2. *Commission a party.*—The commission, represented by its general counsel or such assistants as he may designate, shall be a party to every formal hearing to the extent that in its judgment such participation is necessary to carry out the intent of the laws and treaties of the United States and of these regulations.

SEC. 3. *Intervention.*—Any governmental department or officer, any person, firm, company, or corporation, or any State or political subdivision thereof may, at any time, more than 10 days prior to the date of any hearing, file with the commission a petition to intervene therein in support of or in opposition to any

application designated for hearing. If the petition discloses a substantial interest in the subject matter of the hearing, the commission will grant the same and permit the petitioner to be heard at such hearing subject to regulations hereinafter imposed.

SEC. 4. *Taking of testimony and argument.*—In case of any formal hearing herein provided for the testimony may be taken before a quorum of the commission, before less than a quorum of the commission, or before any examiner appointed by the commission in the discretion of the commission, as follows:

(*a*) In the event that the testimony is taken before the commission it may be followed by oral argument by the parties or by the filing of briefs, or both, at the discretion of the commission, and the case shall thereafter be decided by the commission on the basis of the testimony heard and the proceedings had.

(*b*) In the event that the testimony is taken before less than a quorum of the commission or before an examiner, the testimony, duly transcribed, shall be reported back to the commission by the person or persons conducting such hearing, together with a written report containing recommendations as to the decision to be made thereon, and the facts and grounds upon which such recommendation is based. A copy of such report shall be mailed by the commission to each party participating in the hearing, and such party or parties shall have the right, providing the same is exercised within a period of 15 days from the mailing of such report, to file exceptions to said report. Such exceptions shall point out with particularity the alleged error in said report and shall contain specific reference to the page or pages of the transcript of hearing or report referred to. In case any party filing an exception to a report desires oral argument thereon, he shall accompany the exceptions with a written request for such argument before a quorum of the commission and shall file therewith an affidavit stating that a copy of such exceptions and request for oral argument has been mailed to or served upon every other party participating in the hearing. Upon receipt of such request and affidavit, the commission may in its discretion fix a time for such oral argument to be held at its office in Washington, D. C., and give adequate notice to all parties participating in the hearing or it may consider and decide such matter without argument.

SEC. 5. *Continuances.*—Continuances of date of hearing, extensions of time for filing documents required to be filed, or for the taking of any other step in connection with any hearing, may be granted for reasons such as are usually considered sufficient for analogous continuances and extensions in the courts of the United States, providing, however, that request for such shall be made in writing setting forth the reasons therefor, and the additional time required, and provided, further, that such requests shall be made at a time and in such manner as to avoid unnecessary hardship or expense to other parties to the proceeding.

SEC. 6. *Briefs.*—Whenever consent is given to the filing of any briefs in connection with any hearing, 10 copies shall be filed with the commission within 20 days from the date on which hearing of testimony is concluded unless upon an affirmative showing the commission fixes a longer period. Each other party shall have 10 days from the filing of such brief within which to file an answer brief to any brief filed by such party. At or prior to the date fixed for filing any brief, the party filing the same shall serve or mail at least one copy thereof to every other party to the proceeding and no briefs will be accepted or considered by the commission unless accompanied by an affidavit to the effect that this requirement has been met.

SEC. 7. *Documents to be typewritten or printed.*—All pleadings, briefs, or other documents filed in connection with any hearing shall be printed or typewritten with such type and on such quality of paper as shall be easily legible. The commission reserves the right to refuse to receive or consider any document that does not meet this requirement.

SEC. 8. *Evidence.*—Except as hereinafter stated, the rules of evidence governing civil proceedings in the courts of the United States shall govern formal hearings before the commission, any commissioner or examiner, provided, however, that the commission reserves the right to relax such rules in any case where in its judgment the ends of justice will be better served by so doing.

(*a*) In any hearing on an application for an instrument of authorization the following records of the commission shall be considered as a part of the record

without special request or offer by any party unless otherwise stated in the transcript:

(1) A list of all stations, together with their authorized power, frequency, and hours of operation, licensed in the band of frequencies [4] in which authorization to operate is sought;

(2) A list of all applications pending at the date of said hearing with respect to any station seeking to operate in said band; [4]

(3) Such of the commission's published rules, regulations, and general orders as have to do with the band of frequencies in question and with the services permitted in such band.[4]

(*b*) Copies of reports of any governmental department or agency made by an employee thereof in the course of his duties in so far as they are material shall be admissible in evidence without further authentication than a statement from the proper custodian of any such record or from the person compiling the same that the copy in question is a true copy of such record and that the record is what it purports to be.

(*c*) Where relevant and material matter offered in evidence is embraced in a document containing other matter not material or relevant and not intended to be put in evidence, such document will not be received, but the party offering the same shall present to opposing counsel and to the commission the original document together with true copies of such material and relevant matter taken therefrom as it is desired to introduce. Upon presentation of such matter in proper form it may be received in evidence and become a part of the record, provided, however, that opposing counsel shall be afforded an opportunity to introduce in evidence, in like manner, other portions of such document if found to be material and relevant.

(*d*) Except as herein otherwise expressly provided, no document or exhibit or a part thereof shall be received as or admitted in evidence unless the offer in evidence is accompanied by a tender of the original and a full, true, and correct copy or a full, true, and correct copy of such document or exhibit in duplicate.

(*e*) Except as herein expressly stated, unsworn documents and oral declarations will not be received in evidence.

(*f*) The introduction of merely cumulative evidence shall be avoided and the commission reserves the right to limit the number of witnesses that may be heard in behalf of a party on any issue.

(*g*) Any party desiring to present his case in whole or in part by affidavit may do so by adhering to the following procedure:

(1) Affidavits must be limited to material facts personally known to affiants and must not contain expressions of opinion, argument, or conclusions;

(2) Only the affidavits of parties and their respective agents and employees will be received;

(3) Copies of all affidavits intended to be used in any hearing must be served upon or mailed to the commission and all parties notified of the hearing not less than 15 days prior to the hearing date and no affidavits will be received or considered by the commission unless accompanied by a further affidavit by the party, his agent or attorney, stating that this requirement has been met;

(4) Any party to a hearing may, upon the receipt of a copy of an affidavit from any other party, as provided in the foregoing subparagraph (3), prepare and file counteraffidavits which shall be limited in their scope to an explanation or denial of the facts alleged in the affidavits to which they relate.

SUBTITLE E.—INFORMAL HEARINGS AND THE CONDUCT THEREOF

SECTION 1. *Method of obtaining and procedure.*—The commission may, upon petition by any person or upon its own motion, hold such informal hearings as it may deem necessary from time to time in connection with the investigation of any matter which it has power to investigate under the law, or for the purpose of obtaining information necessary or helpful in the determination of its policies, the carrying out of its duties, or the formulation or amendment

[4] "Band" or "band of frequencies" as used herein shall be taken as referring to the major bands, namely, low (10 to 100 kilocycles), medium (100 to 550 kilocycles), broadcast (550 to 1,500 kilocycles), medium high (1,500 to 6,000 kilocycles), high (6,000 to 30,000 kilocycles), and very high (above 30,000 kilocycles).

of its rules and regulations. For such purposes, it may summon witnesses and require the production of testimony as in formal hearings, but the procedure to be followed shall be informal and such as in the opinion of the commission will best serve the purposes of such hearing.

SUBTITLE F.—PREPARATION OF RECORD ON APPEAL

SECTION 1. *Preparation and stipulation by general counsel.*—Where an appeal is taken from a decision of the commission to the Court of Appeals of the District of Columbia or to a district court in the United States, the record required to be filed in such court by section 16 of the radio act of 1927 shall be prepared under the supervision of the general counsel of the commission and shall be certified by the secretary of the commission. The general counsel shall have power to stipulate with the appellant to such extent as may be necessary to omit unnecessary matter from the record, provided that the interests of neither the commission nor of any other party to the record is adversely affected by such omission.

SEC. 2. *Stipulation between parties.*—Where the case has been in its essential nature a controversy between two or more parties and no interest of the commission or of the public is involved, the general counsel will observe and give effect to any stipulation entered into between the parties as to what matters shall or shall not be included in the record.

SUBTITLE G.—GENERAL ORDERS

SECTION 1. *Scope, promulgation, and effective date.*—Such action by the commission as affects a large number of persons and does not arise out of a formal hearing, such as the enactment of further regulations or as an amendment to these regulations, shall be taken by general order which shall be promptly promulgated by the secretary, shall be numbered serially, and shall bear both the date of adoption and the effective date.

GENERAL ORDER No. 94

JUNE 26, 1930.

It is ordered that:

1. Upon proper application of any companies or agencies maintaining, or proposing to maintain, aeronautical stations, if the commission is satisfied that the particular applicant is qualified and that the issuance of the license or licenses in question would serve public interest, convenience, or necessity, frequencies will be designated solely for use by all of said stations which comprise a continuous series of stations, or chain, along a particular airway.

2. Aeronautical stations licensed pursuant to this plan will provide adequate service, without discrimination, for all and any aircraft of whatever nature. In the interest of economy in the use of frequencies, to coordinate the radio facilities and secure the maximum flexibility, it is required that, where the service provided by a chain is regularly used, as distinguished from casual, incidental, or emergency use, the owners of the aircraft which use such chain or chains shall cooperate among themselves as to the operation, maintenance, and liability of the stations; provided, however, that nothing herein shall impose upon the commission any authority or responsibility whatever with reference to the private business or transactions of any licensee.

3 All frequencies assigned for aviation purposes shall be designated in three classes, as follows:

(*a*) Frequencies used by aeronautical or aircraft stations on a chain or chains for communication purposes either between aeronautical stations and aircraft or between aeronautical stations.

(*b*) Frequencies used for distress, calling, and aids to navigation.

(*c*) Experimental frequencies will include all frequencies assigned for aviation purposes other than those set forth in (*a*) and (*b*). All such experimental frequencies may be changed by the commission during the term of the license without advance notice or hearing, and all licenses shall take these experimental frequencies subject to this express condition.

4. The distress, calling, and navigational frequencies shall be assigned as follows:

278 kilocycles. Calling and working frequency from all ground stations to itinerant aircraft. Power not to exceed 15 watts. Required for all ground stations.

333 kilocycles. International air calling frequency to be used only for international flights. Primarily not for assignment in the United States.

375 kilocycles. Radio compass.

500 kilocycles. International calling and distress frequency for ships and aircraft over the seas.

3,106 kilocycles. National calling and working frequency for all itinerant aircraft. May also be assigned to transport aircraft in addition to chain frequencies.

5,525, 11,050, and 16,580 kilocycles. Primarily for coastal stations and ships. May also be assigned to aircraft only for the purpose of calling a coastal station or ship when aircraft is in flight over the sea.

393, 400, 414, 420, and 457 kilocycles. For aircraft and stations on chains desiring to use intermediate frequencies except where interference may be caused with other services.

414 and 457 kilocycles. Working frequencies for aircraft on sea flights desiring intermediate frequencies. Those desiring high frequencies may use the frequencies designated for maritime calling and working.

5. The frequencies 12,180 and 12,210 kilocycles, designated by the President as reserved for Government experimental stations but available for assignment to commercial companies subject to recall by the Government upon six months' notice, are made available on such temporary basis for aeronautical point-to-point communications on chains during daylight hours only; provided, however, that applicants desiring the use of such frequencies can show, by reason of distance to be covered, that such frequencies are necessary.

6. Frequencies licensed for use by aeronautical stations shall not be used for point-to-point service except--

(*a*) Where frequencies are allocated to a chain and cooperatively used as described in paragraph 2, a point-to-point service will be licensed upon application on frequencies to be designated, provided that the use of such service shall be open to all of the cooperative participants upon an equal basis and then only to the extent of the actual aviation needs of the users.

(*b*) That at all times the licensee of point-to-point service shall be required to transmit, without charge or discrimination, emergency messages for the general public which involve the safety of life or property.

7. In no event shall the use of any frequency by a licensee extend to commercial correspondence or to paid or toll messages in the sense in which these terms are generally understood and accepted.

8. The chains shall be established as indicated upon a map to be maintained by the commission, and this map shall show (1) the location of all aeronautical stations, (2) all navigational aids, (3) the frequencies allocated by the commission, and (4) as nearly as possible all proposed chains (following, connecting with, or independent of existing chains).

9. The initial chains shall be established as indicated upon this map in colored lines, the colors having the following designations:

BLUE CHAIN

From Kansas City, Kans.
Through Wichita, Kans.
Amarillo, Tex.
Albuquerque, N. Mex.
Holbrook, Ariz.
Flagstaff, Ariz.
Kingman, Ariz.
Barstow, Calif.
To Los Angeles, Calif.

From Los Angeles—
Through San Diego, Calif.
El Centro, Calif.
To Phoenix, Ariz.

From Los Angeles, Calif.
To San Francisco, Calif.

BLUE CHAIN—continued

From San Francisco, Calif.
Through Redding, Calif.
Montague, Calif.
Medford, Oreg.
Portland, Oreg.
To Seattle, Wash.

From Dallas, Tex.
Through Fort Worth, Tex.
Midland, Tex.
Abilene, Tex.
El Paso, Tex.
Douglas, Ariz.
Tucson, Ariz.
Phoenix, Ariz.
To Los Angeles, Calif.

From Los Angeles, Calif.
Through Barstow, Calif.
Las Vegas, Nev.
To Salt Lake City, Utah.

From Cheyenne, Wyo.
Through Denver, Colo.
Pueblo, Colo.
Trinidad, Colo.
Santa Fe, N. Mex.
Albuquerque, N. Mex.
To El Paso, Tex.

From Pueblo, Colo.
Through Amarillo, Tex.
Wichita Falls, ex.
To Dallas, Tex.

From Amarillo, Tex.
Through Oklahoma City, Okla.
To Tulsa, Okla.

BROWN CHAIN

From Boston, Mass.
Through Hartford, Conn.
To New York City.

From New York City.
Through Albany, N. Y.
To Montreal, Canada.

From Albany, N. Y.
Through Buffalo, N. Y. (cross Lake Ontario).
Cleveland, Ohio.
Bryan, Ohio.
Chicago, Ill.
Kansas City, Kans.
To Omaha, Nebr.

From Chicago, Ill.
Through Indianapolis, Ind.
To Cincinnati, Ohio.

From Chicago, Ill.
Through Springfield, Ill.
St. Louis, Mo.
To Kansas City, Mo.

From St. Louis, Mo.
Through Covington, Ky.
To Nashville, Tenn.

From Kansas City, Mo.
Through Tulsa, Okla.
Fort Worth, Tex.
Dallas, Tex.
Big Springs, Tex.
To El Paso, Tex.

From Chicago, Ill.
Through Terre Haute, Ind.
Nashville, Tenn.
Chattanooga, Tenn.
Atlanta, Ga.
Birmingham, Ala.
Mobile, Ala.
New Orleans, La.
Beaumont, Tex.
Houston, Tex.
Waco, Tex.
To Fort Worth, Tex.

From Waco, Tex.
Through San Antonio, Tex.
To Brownsville, Tex.

From Washington, D. C.
Through Pittsburgh, Pa.
Cleveland, Ohio.
Columbus, Ohio.
Dayton, Ohio.
Cincinnati, Ohio.
To Louisville, Ky.

From Chicago, Ill.
Through La Crosse, Wis.
St. Paul, Minn.
Minneapolis, Minn.
Fargo, N. Dak.
To Canada.

GREEN CHAIN

From Trenton, N. J.
Through Philadelphia, Pa.
Washington, D. C.
Richmond, Va.
Greensboro, N. C.
Spartanburg, S. C.
Atlanta, Ga.
Jacksonville, Fla.
To Miami, Fla.
Tampa, Fla.

From Newark, N. J.
Through Scranton, Pa.
Cleveland, Ohio.
To Bryan, Ohio.
Chicago, Ill.

From Columbus, Ohio.
Through Indianapolis, Ind.
St. Louis, Mo.
Kansas City, Mo.
Wichita, Kans.
Amarillo, Tex.
Clovis, N. Mex.
Albuquerque, N. Mex.
Winslow, Ariz.
Flagstaff, Ariz.
Seligman, Ariz.
Kingman, Ariz.
Barstow, Calif.
To Los Angeles, Calif.

From Los Angeles, Calif.
To San Diego, Calif.

From Los Angeles, Calif.
To San Francisco, Calif.

From Chicago, Ill.
Through Dixon, Ill.
St. Joseph, Mo.
To Kansas City, Mo.

From Wichita, Kans.
Through Oklahoma City, Okla.
Tulsa, Okla.
Ardmore, Okla.
To Fort Worth, Tex.

RED CHAIN

From Cleveland, Ohio.
Through Detroit, Mich.
Kalamazoo, Mich.
Chicago, Ill.
Iowa City, Iowa.
Cedar Rapids, Iowa.
Des Moines, Iowa.
Council Bluffs, Iowa.
Lincoln, Nebr.
North Platte, Nebr.
Cheyenne, Wyo.
Rock Springs, Wyo.
Salt Lake City, Utah.
Helena, Mont.
To Great Falls, Mont.

From Salt Lake City, Utah.
Through Elko, Nev.
Reno, Nev.
Sacramento, Calif.
To San Francisco, Calif.

From Los Angeles, Calif.
Through Bakersfield, Calif.
Fresno, Calif.
To San Francisco, Calif.

From San Francisco, Calif.
Through Redding, Calif.
Medford, Oreg.
Portland, Oreg.
Tacoma, Wash.
To Seattle, Wash.

From Portland, Oreg.
Through Baker, Oreg.
Pasco, Oreg.
To Spokane, Wash.

From Salt Lake City, Utah.
Through Boise, Idaho.
To Pasco, Oreg.

YELLOW CHAIN

From New York, N. Y.
To Washington, D. C.

From New York, N. Y.
Through Atlantic City, N. J.
Norfolk, Va.
Wilmington, N. C.
Charleston, S. C.
Savannah, Ga.
Jacksonville, Fla.
Miami, Fla.
To Key West, Fla.

From Miami, Fla.
Through San Juan, P. R.
St. Thomas, Virgin Islands.
To Habana, Cuba.

From Brownsville, Tex.
To Mexico.

10. Frequencies are designated for use on the chains as follows:

Brown chain, 5,600 and 3,484.	Red chain, 5,660 and 3,172.
Blue chain, 3,070, 3,088, 3,460, 6,350, 8,015 (day only), and 12,180 (day only).	Yellow chain, 8,015 (day only), 5,690, 2,662, and 3,070.
Green chain, 2,344 and 3,468.	

11. In all cases herein where the word "day" occurs in connection with a specific frequency, such use of the word "day" shall be construed to mean that period of time included between 2 hours after local sunrise and 2 hours before local sunset. If, for any reason, it is impossible to shift from a day to a night frequency at the exact time required, such shift in frequency shall be made at the earliest possible moment and, with respect to any aircraft, under no circumstances shall the use of a day frequency be continued at night after such aircraft has once landed at one of the regular airports along its route, following the time when such shift is required to be made.

12. No aeronautical station will be licensed to use more than 1 kilowatt power on frequencies of 1,500 kilocycles and above.

13. All aeronautical stations will maintain a watch on such frequencies and for such periods of time as the Assistant Secretary for Aeronautics of the Department of Commerce may designate.

14. For the purpose of the foregoing, two types of aircraft are defined:

(*a*) Transport aircraft—those commercially transporting persons and/or property and operating regularly on fixed routes.

(*b*) Intinerant aircraft—all those other than transport or Government aircraft.

15. An aeronautical station shall be defined as one being capable of giving—

(1) Ground-to-aircraft communication.

(2) Point-to-point communication (provided frequencies have been designated for this service pursuant to par. (*a*) of sec. 6).

(3) Distress, calling, and navigational service.

16. Licenses, both of aeronautical and aircraft stations, shall install equipment of such construction and efficiency as will assure the service which the station is intended to give.

17. All licenses, whether aircraft or aeronautical, shall be posted at all times in a conspicuous place in the station so licensed. The license of every station operator shall be available for inspection at all times while he is on duty.

18. This order is, and shall be, construed as a regulation of the commission, violation of which will be cause for revocation of license as provided by the act of 1927, as amended.

It is further ordered that all general orders or parts thereof and all rules and regulations in conflict herewith be, and the same are hereby, repealed.

REPORT OF THE GENERAL COUNSEL

THAD H. BROWN

(Bethuel M. Webster served as general counsel until December 15, 1929)

I. PERSONNEL AND ORGANIZATION

The increase in the work of the commission during the fiscal year ending July 1, 1930, was accompanied by a corresponding increase in the work of the legal division. This was caused by greater volume of work of the sort summarized in previous annual reports as well as the creation of new duties and the presentation of entirely new and novel problems arising out of the continued efforts of the commission to more effectively administer the provisions of the act. This increase in the volume and kind of work has not only called for an increased personnel but has required a reorganization of the legal division into sections with more clearly defined duties and responsibilities and with correspondingly greater opportunities for specialization.

The legal division as reorganized by the general counsel is divided for the purpose of administration into three principal sections, each under the immediate supervision of an assistant general counsel who is in turn directly responsible to the general counsel.

1. THE GENERAL COUNSEL'S OFFICE

The general counsel personally handles or personally assigns all court matters of the commission, including briefs, records on appeal, and the like, as well as the presentation of all matters in court. It is the office of the general counsel to examine, pass upon, and approve or reject all matters emanating from various sections of the legal division and for this purpose all correspondence or other documents emanating from any of said sections or subsections is prepared for his signature. It is likewise the duty of the general counsel or some one designated by him to perform certain important administrative duties in connection with the handling of interdepartmental affairs and to interview representatives of the public and parties having matters pending before the commission. A great deal of the time of the general counsel is consumed in this manner.

2. ADMINISTRATIVE SECTION

This section has been divided into the following subsections whose respective duties are classified substantially as follows:

(*a*) *Application and form subsection.*—This subsection is responsible for the preparation and revision of forms of application and authorization and such other forms relating to the administrative

or routine work of the commission as the legal division is called upon to prepare, revise, or approve. It maintains a complete file of such forms which is at all times made available to the commission and other commission personnel properly interested. All applications for licenses and authorization involving legal questions are referred to this subsection where they are examined and the recommendation of the legal division with respect thereto is made.

(*b*) *Complaint and investigation subsection.*—This subsection has charge of all complaints referred to the commission with reference to licenses and applicants. It maintains a file of such matters, correlates the same, and sees that all papers and documents in connection with such complaints are in proper form and available to the commission and others properly interested. It maintains a permanent complaint and investigation record showing the name of the licensee or applicant complained of, the nature and date of the complaint, and by whom made, together with all other necessary or proper information with respect thereto. Such cases as are of sufficient merit or importance to require immediate or further action are referred through the general counsel for commission action and when the commission orders any matter to be referred to any other governmental department or agency, this subsection is responsible for transferring such matter and all documents and information with respect thereto and forms the liaison between the commission and such other governmental department or agency. The chief investigator is also under the supervision of this subsection which cooperates with the radio division of the Department of Commerce in all such matters.

3. Hearing and Record Section

This section is responsible for all questions arising upon the record made in formal hearings conducted by the commission, the commissioners, or examiners. The head of this section or some one designated by him attends all such hearings and advises with the person or persons conducting the hearings as to the status of the matter being heard and the rights of all proper parties to the record or in interest, compliance with the rules and regulations of the commission, the admissibility of evidence, and such other questions of like character as may arise. The representative of this section cross-examines witnesses on behalf of the commission and presents evidence in its behalf, avoiding at all times the advocacy of the claims of individual parties except in so far as to sustain the position of the commission. This section is responsible for the preparation of the commission's cases for hearing and for this purpose confers and advises with the commission, other divisions of the commission personnel, representatives of other governmental departments and agencies, and all others properly interested or possessed of information necessary for the preparation of the commission's case. It is the duty of this section to collect, correlate, and file all exhibits and other matter proper and necessary to be incorporated into the record on appeal under section 16 of the radio act or in any way essential to other litigation in which the commission may be involved as a result of any hearing.

4. Research and Drafting Section

It is the duty of this section to maintain a file of the "Opinions of the general counsel" and to draft, correlate, and index all such new opinions. It has prepared and maintains a file of all legal memoranda prepared in the legal division which is correlated and made available in proper form to all members of the legal division and other commission personnel properly interested. Under the direction of the commission it prepares all proposed rules and regulations, general orders, minutes, and the like; and receives, collects, and appraises suggestions and material for the preparation or amendment of all documents heretofore referred to. This section collects all available foreign laws and treaties with respect to regulation of radio communication, all reports of national or international conventions, and is charged with the gathering, correlation, and tabulation of material and legal data in the preparation of the annual report as well as all proposed legislative amendments, when so requested. This section also has charge of maintaining the library of the commission and keeping the same up to date, and, except when otherwise specifically directed by the general counsel, briefs in all cases in which the commission is a party are prepared under the supervision of this section.

II. WORK OF THE FISCAL YEAR

1. Formal Hearings on Applications

During the past year 8,543 applications for various instruments of authorization were received by the commission. In 944 cases the commission was unable to determine without a hearing that such applications should be granted and they were scheduled for hearing. Under the practice then in effect applicants were notified of the fact that an application had been designated for hearing and were given an opportunity to be heard provided the commission received a seasonable notice to that effect. Three hundred and twenty-three cases were placed on the calendar for hearing upon receipt of notices that the respective applicants desired hearings.[1] Thirty-two applications were denied by default at hearing date; 240 formal hearings were actually held; 159 applications were denied after hearing; and 77 applications were granted after hearing.[2] Following the decision of the commission in 36 cases appeals were taken to the Court of Appeals of the District of Columbia. Of the 240 cases heard during the fiscal year only 3 were undecided during that period.

Pursuant to commission practice in such matters, each application received by the commission was examined and passed upon (except identical renewals in certain cases) by the legal division prior to commission action thereon. In all cases set for hearing notices and documents were sent to the applicants and others who were or might be affected by any decision rendered in the matter, and in all cases which actually reached the hearing stage the cases were

[1] The balance of the applications scheduled for hearing were denied on failure of applicants to reply to hearing notice, dismissed at request of applicants, or continued for hearing during the fiscal year 1931.

[2] The docket cases not accounted for were reconsidered and granted before hearing date, dismissed at request of applicant, or continued.

prepared for hearing by the legal division, and one or more members of the division attended the hearings, examined and cross-examined witnesses, and presented the commission or public side of the controversy.

2. Informal Hearings and General Orders

During this period the legal division assisted the commission in the preparation of 24 general orders or regulations of general application. In certain cases these general orders were enacted and promulgated as a result of informal hearings held by the commission for the purpose of obtaining information and the views of representatives of the parties to be affected. In such cases representatives of the legal division attended and assisted the commission in the conduct of such hearings.

3. Formal and Informal Opinions

During this period the legal division prepared and submitted to the commission a number of opinions on questions involving the interpretation and application of the radio act. These opinions were for the most part informal and are contained in intradepartmental memoranda and correspondence and as such are not made available to the public except on special request therefor. They were, however, correlated and indexed by the division and are available for future use.

4. Statement of Facts and Grounds for Decision

The commission is required under the terms of section 16 of the radio act of 1927, as amended, to prepare and file in the appropriate court a "full statement in writing of the facts and grounds for its decision as found and given by it" in all cases where an appeal is taken from the commission's decision.[3] The legal division has assisted the commission in the preparation of such statements in each of the 36 cases in which appeals have been taken during the fiscal year last past. In compliance with the statutory mandate these statements have included a résumé and summary of the pertinent and salient facts as well as a statement and consideration of legal questions involved, if any.

While no arrangement has yet been made for the regular publication of these statements, the commission has caused a sufficient number of copies to be prepared so that they are available to interested parties upon request. Cases in which statements have been prepared and filed during the period herein reported are as follows:

No. 5003. Southwestern Sales Corporation, July 10, 1929.
No. 5004. Norman Baker, July 10, 1929.
No. 5005. Universal Service Wireless (Inc.), July 10, 1929.
No. 5090. Isle of Dreams Broadcasting Co., November 7, 1929.
No. 5092. Triangle Broadcasters, November 11, 1929.
No. 5093. Victor C. Carlson, November 11, 1929.
No. 5094. Fred L. Schoenwolf, November 11, 1929.

[3] This section was amended on the 1st day of July, 1930, in other respects, but this provision of the original act remains unchanged.

No. 5095. The Journal Co., November 11, 1929.
No. 5104. Westinghouse Electric & Manufacturing Co., November 19, 1929.
No. 5105. Westinghouse Electric & Manufacturing Co., November 19, 1929.
No. 5112. Northwest Broadcasting System (Inc.), December 12, 1929.
No. 5117. WMAK Broadcasting Station (Inc.), December 21, 1929.
No. 5118. Wilmington Transportation Co., December 24, 1929.
No. 5125. The Onondago Co., January 9, 1930.
No. 5126. Arthur Faske, January 9, 1930.
No. 5141. Havens & Martin (Inc.), February 6, 1930.
No. 5150. Westinghouse Electric & Manufacturing Co., February 19, 1930.
No. 5149. W. O. Ansley, jr., February 19, 1930.
No. 5151. John Ulrich, February 20, 1930.
No. 5158. Rev. Lannie W. Stewart, March 3, 1930.
No. 5163. The Journal Co., March 11, 1930.
No. 5190. The Courier-Journal Co. and the Louisville Times Co., April 23, 1930.
No. 5196. General Broadcasting System (Inc.), April 25, 1930.
No. 5192. Westinghouse Electric & Manufacturing Co., April 25, 1930.
No. 5207. American Fisherman's Protective Association, May 10, 1930.
No. 5204. Missouri Broadcasting Corporation and C. W. Benson, May 13, 1930.
No. 5208. J. E. Bennett Music Co., May 10, 1930.
No. 5225. Jay Peters (Inc.), June 2, 1930.
No. 5227. Shortwave & Television Laboratory (Inc.), June 4, 1930.
No. 5228. William B. Schaeffer, June 5, 1930.
No. 5240. KFKB Broadcasting Association (Inc.), June 16, 1930.
No. 5245. Carl S. Wheeler (Lexington Air Stations), June 17, 1930.
No. 5253. Marquette University, June 26, 1930.
No. 5264. Horace D. Good, June 27, 1930.
No. 5257. The Ann Arbor Railroad Co., June 28, 1930.
No. 5256. Pere Marquette Railway Co., June 28, 1930.

5. Pending Litigation

The termination of the fiscal year finds a greater number of cases to which the commission is a party pending in the courts. In all there were 31 such cases. While the preparation and trial of cases to which the commission is a party has consumed a great deal of the time of this division and has been largely responsible for the required increase and reorganization of its personnel, such a condition is quite natural in view of the relatively unsettled condition of this branch of the law and the holding of the Supreme Court of the United States in the case of Federal Radio Commission *v.* General Electric Co. et al.[4] (281 U. S. 464; 74 L. ed. 969.)

The following summary will serve to briefly identify the cases in court, the principal issues involved, and their status:

I. COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 4987. Intercity Radio Telegraph Co. *v.* F. R. C.
No. 4988. Wireless Telegraph & Communications Co. *v.* F. R. C.
No. 4990. R. C. A. Communications (Inc.) *v.* F. R. C.
No. 4991. Mackay Radio & Telegraph Co. *v.* F. R. C.

These appeals all relate to a controversy arising out of certain decisions of the Federal Radio Commission refusing to authorize the issuance of station licenses and construction permits for point-to-point communication within the United States. The principal issues involved in these appeals are: Whether the Court of Appeals of the District of Columbia can pass on rights of parties not before

[4] In this case the jurisdiction of the Court of Appeals was declared to be that of an administrative tribunal. (See p. 50, post.)

it; and what consideration and weight (if any) ought to be given to priority of existing stations in the communication field carrying on (*a*) the same service as that applied for by later applicants, or (*b*) a different service; priority in the matter of the filing of applications; and the application of the standard of "public interest, convenience, and necessity" to public point-to-point communication.

All parties to these appeals have filed briefs and plaintiffs will file reply briefs by August 15. Oral argument will be presented to the Court of Appeals of the District of Columbia early in the fall term.

No. 5095. The Journal Co., a corporation, *v.* F. R. C. (station WTMJ).

This is an appeal from an order of the commission granting a license to the applicant, but by him claimed not to be in accordance with the terms of his applications because licenses were granted other applicants whose operation is alleged to have reduced appellant's "service area." The primary questions are whether the act permits an appeal from a decision of the commission in so far as said decision may reduce the service area of appellant's broadcasting station, and whether a hearing is necessary when the commission puts other stations on the same frequency as existing stations.

Nos. 5104, 5105, and 5150, Westinghouse Electric & Manufacturing Co. *v.* F. R. C.

These appeals grew out of certain action of the commission relating to applications of appellant for renewal of licenses for its broadcasting stations KYW, KFKX, and KYA, located at Chicago, Ill. The renewal licenses contained language to the effect that they were issued with the specific understanding that the cleared channel of frequency of 1,020 kilocycles had been allocated for use by stations in the second zone created by section 2 of the radio act of 1927, and they were issued for a temporary period of 90 days and would not be renewed provided application therefor was made for the use of 1,020 kilocycles by a proper applicant within the second zone. It is contended by appellant that this provision in the licenses constitutes a denial of its applications. The commission moved to dismiss on the ground that there was no denial of appellant's applications and the use of 1,020 kilocycles by it originally was temporary and known to be so by appellant. The principal issue presented is whether the decisions of the commission are ones from which an appeal may be taken under section 16 of the act. Briefs are due by both parties early in the fall and these appeals will be argued orally before the Court of Appeals at the next term of court.

No. 5141. Havens and Martin *v.* F. R. C.

This is an appeal from an order of the commission denying an application for a construction permit seeking an increase in power with a regional frequency assignment for station WGBM at Richmond, Va. The issues include an interpretation of "public interest, convenience, and necessity" as used in the radio act of 1927, and the Davis amendment to the radio act of 1927. The record in this appeal has been filed, and briefs will be forthcoming by both parties in the early fall. Oral argument may be reached the next term of court.

No. 5149. W. O. Ansley, jr., *v.* F. R. C.

This is an appeal from an order of the commission denying an application for a construction permit to build a station in the city of Abilene, Tex. The questions raised by this appeal are mostly questions of fact relating to the service Texas is getting and probable interference if the application of appellant were granted. An interpretation of the statutory stand and of "public interest, convenience, and necessity" as applied to the particular facts of that case is also involved. The quota figures promulgated by the commission under the provisions of the amendatory act of March 28, 1928, are challenged in this appeal as well as certain procedure of the commission. The record has been printed in this appeal and appellant's brief is due shortly.

No. 5190. The Courier-Journal Co. and the Louisville-Times Co. *v.* F. R. C.

This appeal arises by virtue of a change in the frequency assignment of station WHAS pursuant to a clear channel shift undertaken by the commission's General Order No. 87, and subsequent amendments thereto, to alleviate cross-talk interference which was promulgated by virtue of section 4 (*f*) of the radio act of 1927, as amended. It is contended by appellant that General Order No. 87 is not a reasonable exercise of the powers of the commission, and that the action of the commission taken pursuant thereto affecting a change of the frequency on which station WHAS was licensed to operate, constitutes an appealable decision of the commission. The commission contends that General Order No. 87, as amended, is a valid exercise of its regulatory powers affecting all stations of a particular class so that its action taken pursuant thereto changing the frequency assignment of station WHAS does not constitute an appealable decision of the commission under section 16 of the radio act of 1927, as amended. The record in this case has not yet been printed.

No. 5163. The Journal Co. *v.* F. R. C.

This is an appeal from an order of the commission denying appellant's application for modification of station license (WTMJ). This station is at Milwaukee, Wis., and had been operating on the frequency of 620 kilocycles with a power output of 1 kilowatt and an additional 1½ kilowatts for experimental purposes. Its application, the denial of which gave rise to these proceedings, requested an increase in power to 5,000 watts. The Journal Co. attacks General Order No. 40 of the commission by their appeal and propose in place of the 10 kilocycles separation of stations adhered to by that order, a plan for 50 clear channels or frequencies with a 10-kilocycle separation, and a 7½-kilocycle separation for all others. The record has been printed in this appeal and appellant's brief is due in the near future.

No. 5192. Westinghouse Electric & Manufacturing Co. *v.* F. R. C.

This appeal, unlike the other three former Westinghouse appeals, grew out of the clear-channel shift made by the commission pursuant to General Order No. 87, as amended. It raises various issues, including virtually the same questions as those in the Courier-Journal Co. and the Louisville Times Co. appeal. The record in this appeal is not yet printed.

No. 5196. General Broadcasting Co. *v.* F. R. C.

This appeal is taken from an order of the commission denying appellant's application for renewal of station license (WGBS) for the use of the frequency of 600 kilocycles; power output 500 watts (day), 250 watts (night); limited time. The station had been given the use of this frequency temporarily and experimentally because it was only 30 kilocycles away from another station operating in the same geographical area of metropolitan New York, this being less than the separation generally accepted by the leading engineers of the country for satisfactory service. The principal issue is one of fact; viz, whether interference resulted by reason of the operation of station WGBS only on 600 kilocycles, only 30 kilocycles away from stations WMCA and WNYC, all in New York City. The application of the amendatory act, approved March 28, 1928, is also in question. The record has not yet been printed in this case, but is due early in the fall.

No. 5204. Missouri Broadcasting Corporation and C. W. Benson *v.* F. R. C.

This is an appeal from an order of the commission denying the application of the Missouri Broadcasting Station for a construction permit seeking the use of the frequency of 1,350 kilocycles for station WIL with a power output of 1,000 watts. Besides the issue of fact, viz, whether the evidence of comparative showing of public interest of the stations involved in this appeal support the commission's decision, there is this question of law: Is proof of improper use of facilities by a licensee sufficient to entitle any other applicant to the use thereof, without further proof of its serving public interest, convenience, and necessity? The record in this case has not yet been printed.

No. 5207. American Fisherman's Protective Association *v.* F. R. C.

This is an appeal from an order of the commission denying an application for a construction permit to erect a transmitter for private shore to ship communication. No new question of law is presented, the sole issue being whether it is in the public interest, convenience, or necessity to grant the application applied for. The record in this case has not yet been printed.

No. 5208. J. E. Bennett Music Co. *v.* F. R. C.

This is an appeal from an order of the commission denying a construction permit to erect a station at Cordell, Okla., for the use of 1,360 kilocycles with a power output of 100 watts. No question of law is involved in this appeal. The only questions of fact arising herein relate to interference and whether the commission's finding that public interest would not be served by the granting of the appellant's application is supported by the evidence. The record in this case has not yet been printed.

No. 5227. Shortwave & Television Laboratory (Inc.) *v.* F. R. C.

This appeal arose as a result of the commission's denial of appellant's application for a construction permit to build a station at Boston, Mass., for the use of the frequency of 1,370 kilocycles with a power output of 100 watts (night) and 250 watts (day). The principal issue is one of fact, viz, whether the evidence supported the

commission's finding that public interest would not be served by granting the application applied for. Commission procedure is questioned by this appeal also. The record has not yet been printed.

No. 5228. William B. Schaeffer, doing business as Schaeffer Radio Co., *v.* F. R. C.

The commission denied the application of appellant for renewal of its station (KVEP) license to operate at Portland, Oreg., on the frequency 1,490 kilocycles, unlimited time of operation with a power output of 15 watts. This appeal raises squarely these questions: What is obscene and indecent language as contemplated by the act and can the commission indirectly censor station programs for "indecent and obscene" language? The record in this case is not yet printed.

No. 5240. KFKB Broadcasting Association (Inc.) *v.* F. R. C.

Like the foregoing appeal, this arose out of a denial of an application to renew the station's license. This appeal raises the question: How far can the commission go in its indirect censorship of programs, determining what is or is not in the public interest? The record in this case has not yet been printed.

No. 5245. Carl S. Wheeler, doing business as Lexington Air Stations, *v.* F. R. C.

This is an appeal from an order of the commission denying an application for a construction permit seeking to move station WLEX from Lexington to Worcester, Mass. The issues in this appeal are chiefly an issue of fact, viz, whether the granting of the application is in the public interest; an issue of law, viz, can the commission accept a showing of service in the public interest from parties other than the licensee?

No. 5264. Horace D. Good, trading as the Avenue Radio and Electric Shop, *v.* F. R. C.

The commission denied the appellant's application for a construction permit and from this order an appeal was taken. Appellant attacks certain procedure of the commission in his appeal, but the principal issue is one of fact, viz, whether the granting of the application would serve public interest. The record in this appeal has not yet been designated.

No. 5253. Marquette University, a corporation (Station WHAD) *v.* F. R. C.

This is an appeal from an order of the commission denying appellant's application for modification of its station license. The issues involved in this appeal include the application of the so-called Davis amendment to the radio act of 1927, approved March 28, 1928, and the legislative standard of public interest. The commission's statement and record have not yet been filed.

No. 5256. Pere Marquette Railway Co. *v.* F. R. C.
No. 5257. Ann Arbor Railroad Co. *v.* F. R. C.

These appeals arose by reason of orders of the commission denying renewal applications for commercial point-to-point and coastal service. They involve the question of whether it is in the public interest to grant the applications made herein to parties not engaged

primarily in a general communications business. The commission's "Statement of fact and grounds for decision" has not yet been filed.

II. UNITED STATES DISTRICT COURT OF CONNECTICUT

No. 2064. Bridgeport Broadcasting Station (Inc.) *v.* F. R. C.

This appeal was taken from a decision of the Federal Radio Commission which, appellant contends, had the effect of revoking its station license. It raises the questions whether the action of the commission taken pursuant to stay orders issued by the Court of Appeals of the District of Columbia constitutes a "revocation" of the station license of appellant within the meaning of section 16 of the radio act of 1927, as amended, and whether the Court of Appeals of the District of Columbia has power to issue a "stay order" in a matter over which it does not have appellate jurisdiction under the radio act of 1927, as amended.

The commission's statement of facts and record have been filed and a temporary restraining order granted by the court. The General Broadcasting Co. has been allowed to intervene, and its motion to dismiss the appeal and dissolve the temporary restraining order has not been acted upon by the court as yet.

III. SUPREME COURT OF THE DISTRICT OF COLUMBIA

Equity No. 51439. The Baltimore Radio Show (Inc.), a Corporation, et al. *v.* F. R. C.

This is a suit for an injunction against the commission to enjoin it from allowing the Baltimore Broadcasting Co. to operate its station (WCBN) upon a frequency of 60 kilocycles away from that upon which appellant operates its station (WFBR). Plaintiff's contention is that the operation of station WFBR, located geographically so close to station WCBN, 60 kilocycles apart, will cause a reduction of its service area. It raises a question of fact, first, as to whether the action complained of does affect a reduction of plaintiff's station's service area, and second, a question of law: Does a license to operate a station on a given frequency with a given power output entitle the station to a "service area" to the limit of such facilities?

Equity No. 51325. Stromberg-Carlson Telephone Manufacturing Co., a Corporation, *v.* F. R. C.

This is a suit for an injunction growing out of the commission's General Order No. 87 and subsequent amendments to enjoin the commission from changing the frequency assignment of the plaintiff's radio broadcasting station (WHAM) and to restrain and enjoin the commission from assigning any other radio station to the frequency used or to be used by plaintiff's radio station (WHAM).

The Supreme Court of the District of Columbia granted plaintiff's motion for preliminary injunction, and the commission appealed from this order granting the same on the ground that the court's order placed the burden of proof in showing why the changes made by the commission's General Order No. 87 should not be made on the commission, contrary to the provisions of the radio act of 1927.

The validity of the commission's General Order No. 87 and amendments thereto is in issue as well as certain other commission procedure.

The record will be certified to the Court of Appeals of the District of Columbia in the near future.

IV. UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF ILLINOIS

The Agricultural Broadcasting Co. has filed a suit for injunction against the individual commissioners as the Federal Radio Commission and the Great Lakes Broadcasting Co. to restrain the commission from enforcing against it the order of the court of appeals reducing the time of operation of its station WLS from 5/7 to 1/2. The validity of the order of the Court of Appeals of the District of Columbia is in question, and also whether or not there is a property right in a license as between two individual stations which may be protected by injunction.

The commission will move to dismiss on the grounds of lack of jurisdiction over any of the commissioners.

V. SUPREME COURT OF THE UNITED STATES

American Bond & Mortgage Co. *v.* F. R. C.

This appeal was taken to the circuit court of appeals from a decree entered by the District Court for the Northern District of Illinois, perpetually enjoining the American Bond & Mortgage Co. from operating its broadcasting station (WMBB–WOK) in Chicago on a frequency of 1,190 kilocycles with a power output of 5,000 watts.

The following questions are certified to the Supreme Court:

Question 1. Did a corporation which, prior to the enactment of the radio act of 1927, applied for and obtained successive licenses from the Secretary of Commerce authorizing such corporation to broadcast with a specified transmitter, and which acquired and owned the necessary apparatus, the building in which the apparatus was housed, and the land whereon the same was located, and continuously broadcast therewith to an audience interested in its radio programs, have or acquire thereby a property right within the meaning of the word "property" as used in the fifth amendment to the Constitution of the United States?

(*a*) In the continuance of broadcasting by such corporation as a business or occupation?

(*b*) In the continued use of such apparatus, building, and land for similar broadcasting purposes?

Question 2. Does a corporation, which, subsequent to the enactment of the radio act of 1927, expended substantial sums in replacing old apparatus with new after obtaining a construction permit from the Federal Radio Commission and thereafter used the new apparatus under licenses issued by the Federal Radio Commission and continuously broadcast therewith to an audience interested in its radio programs, have or acquire thereby a property right within the meaning of the word "property" as used in the fifth amendment to the Constitution of the United States?

(*a*) In the continuance of such broadcasting as a business or occupation?

(*b*) In the continued use of such apparatus, building, and land for similar broadcasting purposes?

Question 3. If by virtue of the answers to questions 1 and/or 2, it appears that such a corporation had or acquired such property rights, is such a corporation deprived of property without due process of law, or without just compensa-

tion contrary to the provisions of the fifth amendment to the Constitution of the United States by virtue of the waiver required by the joint resolution of Congress of December 8, 1926, or the waiver referred to in the last paragraph of section 5, or the condition required to be contained in all licenses of subparagraph (*a*) of section 11 of the radio act of 1927, as amended?

Question 4. If by virtue of the answers to questions 1 and/or 2, it appears that after February 23, 1927, such a corporation had or acquired such a property right, is the radio act of 1927, as amended, valid as against the claim that it authorizes or requires the Federal Radio Commission, in acting upon an application for renewal of license by said person, to deprive such person of such property without due process of law, in that the only standards provided by the act for the guidance of the commission in acting upon such applications are that of "public interest, convenience, or necessity" and that set forth in section 5 of the amendatory act of March 28, 1928, and in that the act fails to require that the commission, prior to proceeding to a hearing or decision on such application, shall specify in what respect it deems or has failed to find that the granting of such application would not serve public interest, convenience, or necessity, contrary to the provisions of the fifth amendment to the Constitution of the United States?

Question 5. If by virtue of the answers to questions 1 and/or 2, it appears that after February 23, 1927, such a corporation had or acquired such a property right, is the act of March 28, 1928, amending the radio act of 1927 (commonly known as the Davis amendment) valid as against the claim that it authorizes or requires the Federal Radio Commission, in acting upon an application for renewal of license to deprive such person of such property without due process of law or to take private property for public use without just compensation, contrary to the provisions of the fifth amendment to the Constitution of the United States?

Question 6. If by virtue of the answers to questions 1 and/or 2, it appears that after February 23, 1927, such a corporation had or acquired such a property right, is the radio act of 1927, as amended, valid as against the claim that it authorizes or requires the Federal Radio Commission in its actions on an application for renewal of license by a person such as is described in question 2 to take property for public use without just compensation, by denying such application, contrary to the provisions of the fifth amendment to the Constitution of the United States?

The case of Clinton R. White *v.* George E. Q. Johnson, which was filed in the United States District Court for the Northern District of Illinois, arose by reason of the attempt of Clinton R. White, the owner of radio station WCRW at Chicago, to compel the commission to renew his license to operate on 1,340 kilocycles, with 500 watts power. An interlocutory injunction was sought to enjoin the commission from enforcing the penal provisions of sections 32 and 33 of the radio act of 1927 against Mr. White, either for violation of the provisions of the act or for violation of the order of the commission. The court denied the application for injunction, and upon appeal to the circuit court of appeals for the seventh circuit the following questions were certified to the Supreme Court of the United States:

1. Did a person who, prior to the enactment of the radio act of 1927, applied for and was granted successive licenses by the Secretary of Commerce for the operation of a broadcasting station, and who owned and continuously operated such broadcasting station, whereby it developed a following of listeners and advertisers which constituted a going business, have or acquire thereby property in the continued operation of such station, with power appropriate to continue the operation of said business, within the meaning of the word "property" as used in the fifth amendment to the Constitution of the United States?

2. If the answer to question 1 is in the affirmative, is the joint resolution of Congress of December 8, 1926, valid as against the claim that, by virtue of the waiver it requires, it works a deprivation of such property without due process of law or a taking of private property for public use without just compensation?

3. If the answer to question 1 is in the affirmative, is the radio act of 1927, as amended, valid as against the claim that, by virtue of the waiver required in the last paragraph of section 5 and by virtue of the condition required to be contained in all licenses by subparagraph (a) of section 11, it works a deprivation of such property without due process of law or a taking of private property for public use without just compensation?

4. If the answer to question 1 is in the affirmative, is the radio act of 1927, as amended, valid as against the claim that it authorizes or requires the Federal Radio Commission, in its action on an application for renewal of license by a person such as is described in question 1, to take private property for public use without just compensation, either by denying such application or granting it on such terms as virtually to destroy a going broadcasting business of such person?

5. If the answer to question 1 is in the affirmative, is the radio act of 1927, as amended, valid as against the claim that it authorizes or requires the Federal Radio Commission, in acting upon an application for renewal of license by said person, to deprive such person of such property without due process of law, in that the only standards provided by the act for the guidance of the commission is acting upon such applications are that of "public interest, convenience, or necessity" and that set forth in section 5 of the amendatory act of March 28, 1928, and in that the act fails to require that the commission, prior to proceeding to a hearing or decision on such application, shall specify in what respect it deems or has failed to find that the granting of such application would not serve public interest, convenience, or necessity?

III. DEVELOPMENTS OF THE FISCAL YEAR

I. Court Decisions

While the decisions rendered by the courts in cases wherein the commission was a party were not numerous, certain of these are destined to have a more or less permanent effect on the law of radio and are entitled to special consideration.

THE WGY CASES

The first and probably best-known decision of the court of appeals is that rendered in the case of General Electric Co. and the People of the State of New York *v.* Federal Radio Commission, usually called the WGY case and reported in 31 F. (2d) 630. In this case the commission had failed to renew the license of WGY in all particulars, and an appeal was taken on the theory that an application which was granted WGY in part constituted a refusal of which the court might take cognizance under section 6 of the radio act of 1927. The court of appeals upheld this contention by reviewing and revising the decision of the commission in an administrative rather than a judicial capacity. It refrained, however, from passing on any question of property rights, although the power of Congress to deal with the subject matter by appropriate legislation was specifically recognized.

A petition for a writ of certiorari was thereupon filed in the Supreme Court and was granted on October 14, 1929. However, at the time of oral argument in January, 1930, the Supreme Court indicated from the bench that it had no jurisdiction over the cause inasmuch as the court of appeals was the final authority under the then existing appellate provision. The court on May 19, 1930, rendered a written opinion in which it was clearly enunciated that

the court of appeals, under the radio act of 1927, is an administrative tribunal and the Supreme Court has no appellate jurisdiction to review its determinations on writ of certiorari.

THE TECHNICAL RADIO LABORATORY CASE

In the next case decided by the court of appeals, Technical Radio Laboratory *v.* Federal Radio Commission (36 F. (2d) 111), the question of property rights in the use of the ether was squarely presented to the court and it was held that "the authority of Congress to regulate radio communication as a species of interstate commerce necessarily implies the right of reasonable regulation to control in the public interest the number, location, and activities of the broadcasting stations of the country as an integral system, and such control must necessarily at times involve the right of reasonable restriction and protanto prohibition." On the question of the weight to be attached to the commission's decision the court declared that "the burden is upon appellant and this court should sustain the commission's findings of fact unless they are shown by the record to be manifestly against the evidence."

THE CARRELL CASE

The legislative power of the commission to make rules of general application, entailing limitation of private property rights was sustained in the case of Carrell *v.* Federal Radio Commission (36 F. (2) 117). The order from which the appeal was taken put an end to the licensing of all portable broadcasting stations. By declaring for its validity the court defined, within broad limits, the regulatory authority of the commission.

THE WNYC CASE

Constitutional questions, involving property rights and the due-process clause, were again raised and determined in the commission's favor in the case of City of New York *v.* Federal Radio Commission (36 F. (2d) 115). The court further held that in operating a municipal station the city of New York is acting not in its governmental capacity but in its corporate proprietary capacity, and, irrespective of whether its activity is governmental or merely corporate, it is subject to regulation by the commission. A petition for a writ of certiorari was filed with the Supreme Court and this was denied on the same theory as the court had already determined in the WGY case, supra.

THE CHICAGO CASES (WLS, WENR, AND WCBA)

The commission's practice under General Order No. 40 was very seriously contested in a group of cases decided together by the court of appeals, namely, Great Lakes Broadcasting Company *v.* Federal Radio Commission, Wilbur Glenn Voliva *v.* Federal Radio Commission, Agricultural Broadcasting Company *v.* Federal Radio Commission (37 F. (2d) 993). In none of the cases did the court examine

into the procedural difficulties but proceeded simply to consider in its administrative capacity the relative merits of the three stations involved. The result of the decision was to give one of the stations, Great Lakes Broadcasting Co., a little more operating time at the expense of station WLS, owned by the Agricultural Broadcasting Co. The commission's decision was otherwise upheld with respect to the other stations. The importance of this decision is further enhanced by the fact that it sustained the general reallocation of broadcasting stations effected November 11, 1928.

Shortly after the rendition of the court's opinion in the above case station WLS applied to the Supreme Court for a writ of certiorari to review the action of the court of appeals. but this was denied by the court in a memorandum decision. The same station thereupon filed a bill of complaint in the United States Court for the Northern District of Illinois, eastern division, seeking to restrain the Great Lakes Broadcasting Co. and the Federal Radio Commission from interfering with its operation on the theory that the validity of the order of the court of appeals may be collaterally attacked in a constitutional court exercising judicial functions. A motion to dismiss the case as to the defendant members of the Radio Commission, because of the court's lack of jurisdiction and failure to serve process upon the commissioners, has been filed; and it is expected that the cause will proceed, if at all, only as to the Great Lakes Broadcasting Co.

THE RICHMOND DEVELOPMENT CASE

In the case of Richmond Development Corporation *v.* Federal Radio Commission (35 F. (2d) 883), the court reversed the commission's decision denying an application for extension of a construction permit. The applicant had expended a substantial sum on construction of its station in reliance on the commission's action, and this to the court seemed to justify granting the application.

THE CHICAGO FEDERATION OF LABOR CASE

In the case of Chicago Federation of Labor *v.* Federal Radio Commission (decided May 5, 1930, and not yet officially reported) the court declared that meritorious stations should not be deprived of privileges merely to make room for another station inasmuch as such an attitude would greatly impair the cause of independent broadcasting. The additional question of the propriety of the commission's procedure in requiring an applicant to designate in its application a single frequency upon which it may be heard was determined in the commission's favor.

THE UNIVERSAL SERVICE WIRELESS CASE

In Universal Service Wireless Company *v.* Federal Radio Commission (41 F. (2d) 113) an appeal was taken from a decision of the commission denying an application for point-to-point press communication facilities on the ground that the frequencies set aside for press service had already been assigned to one public utility corporation to serve all the press agencies. The court was not called upon to

determine this question in its decision but rather decided the case on the procedural ground that the appeal did not come within the appellate provisions of section 16 of the radio act, and, therefore, it could not assume jurisdiction.

2. The Amendment to Section 16

Although Public Law No. 494 was not approved by the President until July 1, 1930, it had passed both Houses of Congress prior to the end of the fiscal year and should be considered as one of the important legal developments of that period.

While this or similar amendments to the radio act of 1927 had from time to time been suggested by various parties and had been incorporated into various bills pending in Congress, the immediate necessity for such legislation was made apparent by the decision of the Supreme Court in the case of Federal Radio Commission *v.* General Electric Co. et al. (See p. 50, ante.)

3. Active Complaint and Investigation Work in Conjunction With the Department of Commerce

The past year has shown a marked development in the attempt of the commission to curb illegal operation of radio stations. The legal division has been instrumental in building up a complaint section which is beginning to function in splendid shape and is having a wholesome effect upon all licensees. This has been made possible only through the reorganization and increase in the personnel of the division and through a very splendid cooperation on the part of the radio division of the Department of Commerce. The legal division is keeping an accurate check upon any and all violations by all stations of any of the provisions of the radio act and of the regulations of the commission. This check has included deviation from assigned frequencies, use of excess power, use of indecent and obscene language, and the like. The reports are sent in by the various supervisors' offices and are compiled by the commission. These matters are then brought to the attention of the commission in passing upon applications for renewal of licenses of the respective stations.

It is surprising to learn that over 100 stations have violated the act or commission regulations in some particular during the past six months' period. Most of these violations are immediately corrected by the station and those that continue to violate are refused a renewal of license and their applications set down for hearing. During the past license period, ending April 30, 1930, 16 stations were set for hearing and two stations were refused renewal of their licenses.

Another important work of the legal division has been the matter of checking unauthorized broadcasting stations. This information comes to the commission from various private sources and also from the supervisors of the radio division. This information is compiled by the commission and forwarded to the Department of Justice for prosecution. During the past year over 50 violations of this nature have been reported to the commission and 10 have been forwarded to the Department of Justice.

The first conviction under the radio act for operating a broadcasting station without a license was had in the United States District Court at St. Louis, Mo., and the defendant, William Fellowes, was found guilty of operating a broadcasting station without a license and sentenced to one year and a day in jail. He was later deported.

4. Codified Rules of Practice and Procedure

While the commission has at various times since its organization enacted and promulgated various rules and regulations governing practice and procedure and attempts at codification have been made, it was not successful in achieving this result until June 25, 1930. The causes for this delay have been chiefly two in number. In the first place, the commission itself was not established in its present form upon a permanent basis until December 18, 1929, it being originally intended that it should act after a time as a purely appellant body. In the second place, there has been no precedent or analogy upon which to draw and the very nature of the commission's duties under the act made any such rules and regulations almost impossible of speedy enactment.

It is respectfully submitted that no board or commission under either Federal or State law passes on problems which directly affect such a large part of the entire public and that in no other field of litigation are the parties to the proceedings drawn from such widely separated geographical districts. It is not uncommon in the case of a hearing involving the designation of one of the regional or local channels to have residents of the Pacific and Atlantic coastal areas interested as parties as well as others who reside at intermediate points. Obviously any system of orderly procedure tends to work a hardship on the parties in certain cases, and in the case of the minor operator the cost of personally attending hearings every time that his interests might be affected is virtually prohibitive. On the other hand, orderly administration without orderly procedure is an impossibility. It was with this in mind that the commission adopted General Order No. 93 providing for a comprehensive set of rules and regulations governing practice and procedure before it. A sufficient number of copies have been printed to supply all persons having a legitimate interest therein, and these are available by request directed to the secretary of the commission. Copies have been mailed to all station licensees and others who are interested in cases set for hearing.

5. Appointment of Examiners

Although the radio act of 1927, as originally enacted, authorized the appointment of examiners, and the steady growth of commission business has made it increasingly apparent that the commission and the individual commissioners should be relieved of the duty of actually conducting hearings, no provision for examiners was made until the 25th day of June, 1930, when the commission created three new positions in the legal division, one chief examiner and two attorney examiners.

The duties of these examiners will be to conduct hearings in such cases as the commission directs. It is believed that by thus pro-

viding for the conduct of all but exceptional hearings by examiners under the regulations of General Order No. 93,[5] the individual commissioners will be permitted to devote more time to other pressing business and the time of the commission will not be taken up by the consideration of cases until all irrelevant and immaterial matter has been eliminated, the issues to be decided have been reduced to the absolute minimum, and are presented for determination in a regular and orderly manner.

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[5] SEC. 4. *Taking of testimony and argument.*—In case of any formal hearing herein provided for, the testimony may be taken before a quorum of the commission, before less than a quorum of the commission, or before any examiner appointed by the commission in the discretion of the commission, as follows:

(*a*) In the event that the testimony is taken before the commission it may be followed by oral argument by the parties or by the filing of briefs, or both, at the discretion of the commission, and the case shall thereafter be decided by the commission on the basis of the testimony heard and the proceedings had.

(*b*) In the event that the testimony is taken before less than a quorum of the commission or before an examiner, the testimony, duly transcribed, shall be reported back to the commission by the person or persons conducting such hearing together with a written report containing recommendations as to the decision to be made thereon and the facts and grounds upon which such recommendation is based. A copy of such report shall be mailed by the commission to each party participating in the hearing, and such party or parties shall have the right, providing the same is exercised within a period of 15 days from the mailing of such report, to file exceptions to said report. Such exceptions shall point out with particularity the alleged error in said report and shall contain specific reference to the page or pages of the transcript of hearing or report referred to. In case any party filing an exception to a report desires oral argument thereon, he shall accompany the exceptions with a written request for such argument before a quorum of the commission and shall file therewith an affidavit stating that a copy of such exceptions and request for oral argument has been mailed to or served upon every other party participating in the hearing. Upon receipt of such request and affidavit, the commission may in its discretion fix a time for such oral argument to be held at its offices in Washington, D. C., and give adequate notice to all parties participating in the hearing, or it may consider and decide such matter without argument.

REPORT OF THE CHIEF ENGINEER

C. B. JOLLIFFE

(Capt. Guy Hill served as acting chief engineer until March 1, 1930)

GENERAL

The Federal Radio Commission regulates the use of the entire radio frequency spectrum except that portion used by Government stations, and makes assignments to the various classes of radio stations. The following radio services have been established to which assignments have been made:

Broadcasting.
Fixed point-to-point.
Maritime.
Aviation.
Amateurs.
Police.
Fire.
Emergency communication for power companies.
Experimental visual broadcasting.
Experimental relay broadcasting.
General experimental.
Geophysical prospecting.

ORGANIZATION

By amendment to the radio act of 1927, signed by the President December 18, 1929, the commission was authorized to appoint a chief engineer and two assistant chief engineers. On March 1, 1930, Dr. C. B. Jolliffe was appointed chief engineer and on March 25, 1930, Mr. V. Ford Greaves was appointed assistant chief engineer. The second assistant chief engineer has not yet been appointed. On June 30, 1930, the personnel of the engineering division consisted of eight engineers and nine clerks.

The engineering division is divided into three sections—(*a*) broadcasting, (*b*) commercial communications, and (*c*) international and interdepartmental relations.

BROADCASTING

ALLOCATION OF FREQUENCIES

The basic plan of allocation of frequencies set up by General Order No. 40, which resulted in the reallocation of November 11, 1928, has been maintained. Minor changes in frequency assignments were made from time to time in order to improve local conditions. One major shift of frequencies was ordered by General Order No. 87.

It appeared to the commission that certain stations were suffering from and causing cross-talk interference to other stations on other channels, in some cases due to improvements which increased the efficiency of transmitters since the present allocation was put into effect.

The engineering division made a comprehensive study and research, covering a period of several months, and the consideration

of many hundreds of possible combinations. The frequency shift specified in General Order No. 87 was selected as the best average of those then considered. It showed a total net gain in the reduction of intereference between stations, which would result in reduction of interference in large areas throughout the United States.

General Order No. 87 was adopted by the commission on April 7, 1930, and ordered effective at 3 a. m. on April 30, 1930. However, three of the owners of broadcasting stations which would be affected by the proposed shift obtained restraining orders from the courts preventing the commission from putting the shift into effect.

EQUITABLE DIVISION OF RADIO BROADCASTING FACILITIES WITHIN THE UNITED STATES

The Davis amendment to the radio act, approved March 28, 1928, required that the radio supervising authority of the United States "* * * 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 (five) zones and shall make a fair and equitable allocation of licenses, wave lengths, time of operation and station power to each of the States * * * within each zone, according to population (of each State)."

The proportion of the maximum possible national broadcasting facilities due each State is, therefore, fixed by law. The percentages or number of units due each State were based upon official estimates of 1928 populations prepared by the United States Census Bureau, which will be used until the figures of the official 1930 census are available.

It is evident from a consideration of the estimated and variable factors and the different economic and geographic conditions in various parts of the United States that the quota allocation can never be exact. The ratio will vary from time to time as conditions are further improved by continued development of the radio art and decisions of the Federal Radio Commission.

General Order No. 40, adopted by the commission, August 20, 1928, is an outline basis for an equitable distribution of broadcasting facilities in accordance with the Davis amendment considering public interest, convenience, and necessity. As amended, it provided for a certain number of higher power stations on interference-free channels to serve rural and sparsely settled areas over long distances under favorable conditions. It also provided for a comparatively large number of smaller stations to serve State and city local areas.

It was necessary for the commission to determine the maximum number of stations of various powers which could operate simultaneously at night in the United States without objectionable interference, so that quota tables could be prepared showing the facilities assigned to each zone, and each State within a zone, for comparison with facilities due.

The following table was established in 1928:

40 night stations, each 5 kilowatts or more.
130 night stations, each 250 to 1,000 watts.
150 night stations, each 100 watts or less.

In accordance with this table, two or more stations dividing time on one assignment were considered as one station. ("Limited time stations" operating on clear channels and "day stations" were not charged to "quota.")

The "quota" system adopted in 1928 showed the number of full-time station assignments of each of the three classes due each State as compared to the number of full-time assignments licensed. These figures nearly all came out in fractions showing further the impossibility of an exact allocation among States based on population.

Under the 1928 system, if a State was "under quota" on one class of service and "over quota" on another class, it was not practicable to determine the total value of the three classes of assignments so that one could be balanced against another to determine if a State was actually "under or over quota" on total radio facilities.

Therefore, the development of a "unit system" was undertaken to evaluate stations, based on type of channel, power, hours of operation, and all other considerations required by law.

The result of this research was General Order, No. 92, specifying the "unit value" of stations of various types, powers, etc., including "limited time" and "day" stations as chargeable to "quota."

In order to calculate the number of units due each zone and each State in accordance with population, it was necessary to determine the number of channels of different classes and number of stations of various powers which could be used for simultaneous operation without objectionable interference, and calculate the unit values, taking into account the factors of the Davis amendment. Taking these into consideration, the commission on June 25, 1930, selected 400 units as fairly representing the total broadcasting facilities of the United States. This gives 80 units to be divided among the States in each zone.

A complete tabulation of the revised quota figures by zones and States follows, giving "units" due, based on estimated population of 1928 by the United States Census Bureau.

Detail of quota units by zones and States

Zone 1: State	Total units due
Connecticut	4. 87
Delaware	. 71
District of Columbia	1. 53
Maine	2. 33
Maryland	4. 73
Massachusetts	12. 54
New Hampshire	1. 34
New Jersey	11. 18
New York	33. 77
Rhode Island	2. 10
Vermont	1. 03
Porto Rico	3. 80
Virgin Islands	. 07
Total	80. 00
Zone 2:	
Kentucky	7. 26
Michigan	13. 06
Ohio	19. 42
Pennsylvania	28. 03
Virginia	7. 33
West Virginia	4. 90
Total	80. 00
Zone 3:	
Alabama	7. 33
Arkansas	5. 54
Florida	4. 02
Georgia	9. 12
Louisiana	5. 55
Mississippi	5. 10
North Carolina	8. 37
Oklahoma	6. 91
South Carolina	5. 31
Tennessee	7. 13
Texas	15. 62
Total	80. 00

Zone 4: State	Total units due
Illinois	22.08
Indiana	9.49
Iowa	7.25
Kansas	5.48
Minnesota	8.13
Missouri	10.52
Nebraska	4.21
North Dakota	1.92
South Dakota	2.10
Wisconsin	8.82
Total	80.00

Zone 5: State	Total units due
Arizona	3.37
California	32.34
Colorado	7.74
Idaho	3.88
Montana	3.90
Nevada	.55
New Mexico	2.81
Oregon	6.41
Utah	3.77
Washington	11.27
Wyoming	1.75
Alaska	.39
Hawaii	1.82
Total	80.00

Following is a table giving the total quota by zones and the total assignments as of June 30, 1930. The assignments vary from day to day by actions of the commission and because of surrender of licenses by stations for various reasons.

	Total units due	Total units assigned	Total units under or over quota
Zone 1	80.00	74.19	−5.81
Zone 2	80.00	69.34	−10.66
Zone 3	80.00	89.19	+9.19
Zone 4	80.00	96.08	+16.08
Zone 5	80.00	93.8	+13.8
Totals	400.00	422.6	+22.6

The United States was 22.6 units (5.6 per cent) over the maximum 400 as of June 30, 1930, averaging less than one-half unit per State. Twenty-six States were under quota as compared to 22 States over quota. This is a fair balance, considering the many technical complications and conflicting interests.

As pointed out, the distribution of radio facilities can never be exactly proportional, but it is evident that conditions will be gradually improved as some stations are deleted for one reason or another and other assignments are transferred from overquota to underquota areas.

TRANSMITTING EQUIPMENT

In the past there was no standard method adopted by the commission for rating the power of broadcasting stations, and several methods used by different stations did not agree. In order to standardize the method of rating, the commission adopted General Order, No. 91. This general order specifies the power rating of the equipment which may be installed in the various classes of stations and sets up standard methods of measuring the operating power of stations. By means of this order all stations are rated on the same basis. Since one of the factors in the allocation of broadcasting facilities is power, a standard method of measuring power is essential to a fair and equitable distribution.

SYNCHRONIZATION OF BROADCASTING STATIONS

Methods of piezo-electric control of the frequency of radio stations have improved and the accuracy of setting and maintaining the frequency of a transmitter to 1 part in 100,000 is not unusual. While this accuracy of control is sufficient to reduce the frequency of the beat note between two broadcasting stations operated on the same frequency to below audibility, it was found that a different type of interference appeared, usually referred to as "flutter interference." This interference results in a destruction of quality of the two stations when the frequency difference between the stations is a few cycles per second. Experiments showed, however, that if this difference in frequency could be reduced to less than one-tenth cycle per second the impairment of quality would be greatly reduced, provided both stations broadcast the same program and the geographical separation was within certain limits.

For example, equipment capable of maintaining this constancy was installed in two stations which were under the same control and carried the same programs. These stations are 190 miles apart and are licensed to use 5 kilowatts each. This equipment is the combination of good frequency control by each station with a manual control of the frequency at one of the stations. A receiving set placed halfway between the two stations indicates the difference in frequency. When the frequency difference was held to less than 0.1 cycle per second, the interference was confined to a relatively small area. The net result was that the two stations operating simultaneously on the same frequency and with the same program were able to double the good-service area of either station alone at the expense of a very small area. The commission granted authority to operate these two stations simultaneously on an experimental basis during broadcasting hours, and the results showed that there was a very small number of objections to such operation.

INTERNATIONAL AND INTERDEPARTMENTAL RELATIONS

INTERNATIONAL TECHNICAL CONSULTING COMMITTEE ON RADIO COMMUNICATIONS

The international radio convention signed at Washington, November 25, 1927, created the International Technical Consulting Committee on Radio Communications (C. C. I. R.) and charged the Netherlands Government with the duty of calling the first meeting. This meeting was held at The Hague, September 18 to October 2, 1929. The preparatory work of the United States for this conference was carried on by a joint conference of Government and commercial representatives, and a very complete document was sent to the Netherlands Government which formed the basis for much of the discussion at the conference. The United States delegation was headed by Maj. Gen. C. McK. Saltzman, of the Federal Radio Commission.

The conference formulated 26 recommendations which covered all phases of radio communications, but principally served to define the present state of the radio art.[1]

[1] The report of this meeting was published by the State Department.

The Department of State on March 12, 1930, transmitted these recommendations to the Federal Radio Commission and made the following request:

* * * If there is no objection to the proposals adopted at the conference, the department will be glad to be advised whether the commission will put them into effect. If the commission has any objections to the proposals contained in the above-mentioned inclosures, you are requested to inform the department concerning them.

To this the commission replied:

* * * The Federal Radio Commission has no objection to the recommendations made by this conference and will put them into effect as soon as practically possible.

In addition to the recommendations the conference referred seven unfinished questions for study for the second meeting of the C. C. I. R. which is to be held in Copenhagen, Denmark, in 1931. The study of these questions was assumed by different nations; the United States agreed to centralize the study of two questions and to collaborate in the the study of the other five.

The Federal Radio Commission has assumed the responsibility for organizing the studies of the unfinished questions and the preparation for the next meeting of the C. C. I. R. An organization of representatives of commercial radio companies and Government departments was formed and active preparatory work started.

The International Radio Conference will meet in Madrid, Spain, in 1932. The preparatory work and the organization preparing for the next meeting of the C. C. I. R. will contribute to the preparatory work for the larger conference. International radio communications are important to the commercial relations of the United States and it is necessary, in order to protect the position of the United States, that complete preparation be made for all international radio conferences.

REGISTRATION OF FREQUENCIES USED IN INTERNATIONAL SERVICE

The international radio convention provides as follows for the notification of the use of radio frequencies:

SEC. 17. (1) Each administration shall promptly advise the international bureau when it decides upon, or authorizes, the establishment of a radio-communication station, the operation of which necessitates the assignment for its regular service of a particular frequency below 37.5 kilocycles (wave length above 8,000 meters) in the case where the use of this frequency might cause international interference over broad areas. This notice must reach the international bureau four months prior to the construction of the station contemplated in order to dispose of objections which any of the administrations might raise against the adoption of the proposed frequency.

(2) In the case of a fixed short-wave station intended to carry on regular service and the radiation of which would be likely to cause international interference, the administration concerned must, as a general rule, before the completion of the station and in any case before it is open for service, notify to the international bureau the frequency assigned to that station.

(3) Such notification, however, shall be sent only when the administration concerned shall have ascertained that the service in question can be established within a reasonable time.

The convention further provides a procedure for settling international disputes concerning interference between stations of different countries.

Up to the present time all cases of international interference have been settled by mutual agreement between operating agencies, since in every case it was possible to adjust the frequency of one of the stations and avoid interference. As the frequency spectrum becomes more and more congested the possibilities of changes in frequencies will be reduced, and cases may be expected to arise in the near future where changes are impossible, or, if made, would result in impairment of service. At that time it will be necessary to determine which station must discontinue use of the disputed frequency. The dates of the beginning of construction and inauguration of service will become of great importance. The notification of these dates to the International Bureau of the Telegraph Union at Berne, Switzerland, is official. Arrangements have been made to insure that these notifications are made regularly and that the publication of lists agree with the records of the commission.

INTERDEPARTMENTAL RELATIONS

The work of the commission must be coordinated with Government departments. Several departments are operating radio stations and are interested in assignments made to commercial stations which may affect their communications. Furthermore, the radio act of 1927 provides that the assignment of frequencies to Government departments shall be made by the President. The commission has cooperated with the Government departments in recommending assignment of frequencies, in the interdepartmental radio advisory committee, and by direct contact with the operating agency.

The development of commercial airways and the use of radio on aircraft have created many problems of mutual interest between the commission and the aeronautics branch, Department of Commerce. These problems have been considered and solved by representation on committees and attendance at conferences called by either of the two agencies. The licensing of transmitting stations and the control of communication facilities are the duties of the Federal Radio Commission.

INFORMAL AVIATION CONFERENCE BETWEEN REPRESENTATIVES OF CANADA AND OF THE UNITED STATES

A conference called by the Department of State of the United States at the suggestion of the Federal Radio Commission, in order to provide closer coordination between aviation radio in the United States and Canada, was held in New York on April 10, 1930, and was attended by three representatives of the Federal Radio Commission, as shown by the following list of delegates:

Representing Canada:

Commander C. P. Edwards, director of radio telegraph branch, Department of Marine.

Mr. G. C. W. Browne, chief inspector, radio telegraph branch, Department of Marine.

Maj. W. A. Steel, royal Canadian signals, Department of National Defense.

Capt. W. L. Laurie, royal Canadian signals, Department of National Defense.

Representing the United States:

Commissioner W. D. L. Starbuck, Federal Radio Commission.
Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.
Mr. W. R. Vallance, assistant to the solicitor, Department of State.
Capt. F. C. Hingsburg, chief engineer, airways division, Department of Commerce.
Dr. C. B. Jolliffe, chief engineer, Federal Radio Commission.
Mr. Gerald C. Gross, engineer, Federal Radio Commission.

The following set of resolutions were adopted at this meeting as a result of the conference. Canada and the United States have both stated that these recommendations will be adopted:

INFORMAL CANADIAN-UNITED STATES AVIATION RADIO CONFERENCES

The coordination of airways communications and radio aids to air navigation in Canada and the United States is desirable, and the following principles are proposed as a guide in the operation of these systems.

The conference recommends that the two Governments study these principles and attempt to apply them to their respective systems, and that by correspondence and future conferences these principles be further developed and closer coordination obtained.

It is further recommended that:

1. The international air calling frequency 333 kilocycles be not required regionally for aircraft or aeronautical stations in Canada or the United States.

2. It be recognized that a frequency separation of 6 kilocycles is ordinarily sufficient between stations operating radio range beacon and radiotelephone services.

3. A minimum distance of 750 miles between radiobeacon stations operating on the same frequency is desirable. It is recommended that this separation be maintained between nations, although in some cases it may be necessary to reduce the separation within the interior of either country.

4. The following frequencies, 237, 240, 248, and 278 kilocycles out of the band 194–284 kilocycles, be reserved regionally for air services.

5. The following frequencies shall remain free from assignments in the United States within 750 miles of Canadian airways radio stations: 248, 290, 296, 326, and 332 kilocycles. In addition, no further assignments in the United States should be made on the following frequencies within 750 miles of Canadian airways radio stations: 240 and 314 kilocycles.

6. The following frequencies shall remain free from assignments in Canada within 750 miles of United States airways radio stations: 254, 260, 266, 272, 284, 302, 308, 320, 338, 344, and 350.

7. The frequency 278 kilocycles should be reserved primarily for low-power air-port use.

8. One frequency, approximately 237 kilocycles, shall be reserved for emergency messages from ground stations to aircraft in cases where such messages might interfere with the regular airways beacon service.

9. The following frequencies should be reserved for Canadian stations operating along the Canadian transcontinental airways from Halifax to Vancouver: 3,492 and 5,630 kilocycles.

The United States authorities will discuss with aviation companies operating between Chicago, Minneapolis, and St. Paul a change of frequencies from those now specified in the United States aviation plan for the green-chain to the red-chain frequencies in order that Canadian planes flying from Winnipeg to Minneapolis and St. Paul will be able to have closer frequency coordination.

10. The United States will continue to use 3,106 kilocycles as a national calling frequency and Canada will use the frequency 5,630 kilocycles for the same purpose, since the experience gained to date in the United States and Canada would indicate that the common calling frequency selected in the United States might not be equally suitable in Canada.

COMMERCIAL COMMUNICATIONS

FIXED SERVICES

Only minor changes have been made in assignments of frequencies to fixed services. Three orders of the Court of Appeals of the District of Columbia suspending acts of the commission have resulted in preventing the commission from making practically any changes in the frequency range of 1,500 to 23,000 kilocycles.

In order that the various communication companies might determine the best frequencies for use between the various points of their systems, the commission permitted any company to use any or all frequencies at any or all stations of the company. Sufficient time has elapsed to conclude such tests under actual traffic conditions; therefore, the commission announced that after December 31, 1930, only the exact frequencies for regular use shall be specified for each location.

The commission, by General Order No. 62, authorized the use of the center frequencies of the particular channels licensed to the various companies, and in addition provided for the use of mid-channels or adjacent frequencies of standard two-tenths per cent channels. This order was repealed and superseded by General Order No. 88.

Authorization to use transoceanic frequencies, i. e., frequencies above 6,000 kilocycles, for domestic communications on condition that no interference from such use will result to the services of any foreign country was granted to communication companies engaged in the transoceanic service.

The band of frequencies above 23,000 kilocycles was opened for commercial service to United States stations for the first time when permission was granted to the Mutual Telephone Co., which operates the telephone system of the Hawaiian Islands, to construct sixteen 150-watt transmitters for interisland public telephone service in the frequency band 34,000 to 54,000 kilocycles. Experimental tests of this service carried on for a 6-month period prior to the granting of these permits proved that these frequencies are particularly well suited for short-range communication.

MARITIME

Experience of the past year indicated that the maritime mobile radio-frequency operating plan of May 10, 1929, was not entirely satisfactory for present-day requirements. This was brought about principally because of the inauguration of public telephone service between passenger vessels at sea and the shore, which necessitated the allocation to this service of additional frequencies free of radiotelegraph interference.

A conference was held, beginning January 14, 1930, for the purpose of considering the May 10. 1929, allocation, which was attended by representatives of commercial companies and Government engineers. As a result of the conference a committee was formed to assist the commission in the formulation of a new plan. The objectives of the work of the committee were:

(1) To make more efficient use of the frequency space by arranging shore and ship channels in groups so as to permit the greatest possible operating efficiency in conformity with the technical limitations.

(2) To provide for new services and expansion of old services, especially for ship and shore telephony and telegraphy.

(3) To provide for the elimination of interference between maritime services and aircraft services.

(4) To provide for the necessary technical relationship between telephone and telegraph channels on the same ship.

(5) To form the basis of a plan which might be submitted by the United States at the next international radio conference.

The committee recommended the following rules and operating practices as being essential to the accomplishment of the foregoing objectives.

1. In so far as practicable, the block system of allocation of channels should be applied not only to services but also to classes of stations.

2. The frequency separation should be based on that recommended by the conference of the C. C. I. R. at The Hague on October 2, 1929, to the effect that the standard channels should be separated by approximately one-tenth of 1 per cent.

3. Single channels should be assigned to land and fixed stations and more than one adjacent channel should be assigned to stations and types of emissions requiring such widths.

4. Between 1,500 and 23,000 kilocycles the standard channel separation in the mobile and in the fixed and mobile bands should be designated as indicated below:

Frequency (kilocycles)	Channel width (kilocycles)	Frequency (kilocycles)	Channel width (kilocycles)
1,500 to 3,000	4	11,000 to 15,500	15
3,000 to 6,000	5	15,500 to 20,500	20
6,000 to 11,000	10	20,500 to 23,000	25

5. The tolerances of the average wave actually transmitted as compared with the frequency of the nomical wave, should be as follows:

(*a*) 10 to 550 kilocycles:	
Fixed and land stations	0.1 per cent
Ships and aircraft during a transmission	.5 per cent
(*b*) 1,500 to 6,000 kilocycles:	
Fixed and land stations at least 0.025 per cent, but preferably	.02 per cent
Ships and aircraft during a transmission	5 kilocycles
(*c*) 6,000 to 23,000 kilocycles:	
Fixed stations	.01 per cent
Land stations	.02 per cent
Ships and aircraft during a transmission	5 kilocycles

6. The engineering requirements for percentage separation between ship and coastal telephone and telegraph assignments are approximately as follows:

2½ to 3 per cent separation between mobile telephone and coastal telephone;

3 to 4 per cent separation between mobile telephone and mobile telegraph;

3 per cent separation between mobile telephone and coastal telegraph;

3 per cent separation between coastal telephone and mobile telegraph;

1 per cent separation between coastal telegraph and mobile telegraph;

0.5 per cent separation between coastal telephone and coastal telegraph; and

0.4 per cent separation between mobile telegraph and mobile telegraph (duplex operation).

7. Ship telegraph frequencies should be grouped in the lower frequency end of each of the mobile-service bands and the ship telephone frequencies should be grouped in a higher frequency end of the band. The coastal telephone frequencies should be as nearly as possible midway between the ship telegraph and the ship telephone frequencies.

8. In the assignment of ship and coastal telephone frequencies for 2-way communication with specific coastal stations, such frequencies should be desig-

nated in pairs, and the assignment of actual channels under the plan should be in accordance with the lists which follow.

9. Ships should be licensed on all of the ship-working frequencies in each band. This can be done by specifying the limits of each ship band. In addition, all ship licenses should include a clause permitting ships to transmit on the individual working frequencies of coastal stations when directed to do so by a coastal station controlling the frequency, provided, however, that when a ship utilizes a coastal station's frequency the tolerances of its frequency emission shall not exceed the limits allowed the coastal station.

10. The service assignments as provided in the International Convention of Washington, 1927, and in the North American Radio Conference of Ottawa, 1929, should be maintained. The relative proportions of assignments of channels to each type of service should be those represented on the spectrum chart contained in the annual report of the Federal Radio Commission for 1929.

11. In so far as is practicable, the various assignments of frequencies to types of service should be in harmonic relation.

12. Consideration should be given to the possible future action of international conferences relative to the division of the "shared bands." In this consideration due weight should be given to the requirements of ship telephone services, and the relative position in the spectrum in which such services should be with respect to ship telegraph services and coastal telephone and telegraph assignments. Consideration should therefore be given to the engineering requirements for percentage separation between such assignments as indicated in paragraph 6 above.

13. Consideration should also be given to the possibilities of avoiding interference in the assignment of coastal station frequencies by utilizing geographical separation.

14. In the utilization of coastal station working frequencies, consideration should be given to the interference to be expected from similar foreign stations. In this connection, it is entirely possible that each of the various regions of the earth may be able to make use of all the frequencies available for assignment to coastal stations, by reason of the fact that this is an intermittent service and it has been the practice in the past.

15. The Government authorities should take steps to prepare plans which incorporate the principles set forth herein and which should be presented as a basis of United States proposals at future international conferences.

16. The present assignments to stations in the bands, 100–195 and 390–485 kilocycles are working satisfactorily except for the fact that in a few individual cases there is need for improvement. It is therefore felt that if changes are necessary to secure improvement, the Federal Radio Commission should make use of the additional frequencies for coastal stations in the band 160–194 kilocycles.

17. It is considered impracticable in the low-frequency portion of the spectrum to assign stations in the same area 1 kilocycle apart.

18. In the assignment of low-frequency coastal and ship frequencies, the informal European agreement of November, 1927, should be maintained. If any European frequencies are to be duplicated in the United States, this must be done in such a way as not to cause interference with the service of the European stations.

19. The agreement made with Canada relative to the use of frequencies in the band, 390–485 kilocycles should be maintained.

20. In the assignment of low frequencies for coastal stations, attention should be given to the reduction of interference with the Canadian stations, and possibly an arrangement with Canada should be negotiated.

21. Before adopting finally the new specific channels in the band, 1,500 to 6,000 kilocycles, the matter should be accomplished in cooperation with other North American nations.

The commission has not yet adopted the recommendations or designated specific channels for use by the various companies for the reason that a large number of the proposed channels are in the mobile and fixed service bands, and such frequencies will not be available for allocation until the litigation now in the Court of Appeals of the District of Columbia is disposed of.

EMERGENCY SERVICES

Police.—A new operating plan for police-radio service was established. The general policies were adopted in General Order No. 85. Emergency police service may be granted to any municipally controlled station, and the allotted power range is from 50 to 500 watts according to the latest population figures published by the Bureau of the Census. Eight channels were set aside for the exclusive use of police service, and each channel is assigned on a shared basis to all cities in the same general area.

It is believed that the plan of employing a common channel in a specific area will lend itself to the accomplishment of a more efficient service, for the reason that all squad cars or other mobile units in the area will receive all of the emergency messages originating from any municipality in that general area, and thus coordinate the police activities in adjacent cities.

In order to facilitate the handling of State police radio communications, the commission granted a special license to the State of Michigan. Massachusetts and Pennsylvania are the only other States which are using radio for State police communication with mobile units, the former employing the same frequency assigned to Michigan and the latter a radiotelegraph service on a low frequency (257 kilocycles).

Fire.—The frequency 1,596 kilocycles was designated for emergency communication with fire boats. All requests to establish this service were granted.

The commission did not consider that there is sufficient justification for the establishment of emergency communication with mobile fire-department units on land or between fixed stations of municipal fire departments. Such service can best be rendered by coordination with police departments using radio or by wire communication.

Power companies.—Emergency radio service for power companies is a service providing for emergency radio communication between power-company stations when all forms of wire communication fail. The frequency 3,184 kilocycles with maximum power of 500 watts, continuous wave emission, was designated for this service. The policy adopted by the commission regarding the use of radio by such stations was set forth in General Order No. 86.

EXPERIMENTAL SERVICES

Relay broadcasting.—Much progress was made in the technical aspects of relay broadcasting, and as a consequence increased demands were made upon the Federal Radio Commission for the allocation of frequencies in the bands set aside for that purpose. The quarterly reports required from the stations operating in the relay broadcasting bands by General Orders No. 64 and No. 68 were used as a guide to indicate whether or not full use was being made of all the frequencies allocated, and this information has been useful in the determination of recommendations for the renewal of such licenses. The large number of applicants for the very small number of channels available requires that these channels be put to the maximum use.

Frequencies set aside for relay broadcasting were assigned to stations only if the broadcasting was destined for foreign countries and arrangements were made for reception in those countries.

Visual broadcasting.—" Visual broadcasting " includes the broadcasting of both television and pictures, which are intended to be received by the public. Point-to-point picture transmission, such as facsimile or telephotography, are not included with visual broadcasting.

Four frequency bands, each 100 kilocycles wide, were set aside for visual broadcasting by General Order No. 74, viz, 2,000–2,100, 2,100–2,200, 2,750–2,850, and 2,850–2,950 kilocycles. In addition, the channel 2,200–2,300 kilocycles is designated for experimental visual broadcasting on condition that no interference is caused to the radio services of any other nation on the North American Continent and in the West Indies.

The commission did not recognize visual broadcasting as having developed to the point where it has real entertainment value. Therefore, all licenses were issued on an experimental basis, and licensees are required to submit quarterly reports covering the experimental development of this service. Frequency assignments were made only as the result of hearing and based on the fact that the applicant was a qualified experimenter and could be expected to contribute to the advancement of the art.

General experimental.—The commission set aside the following frequencies for the use of qualified experimenters who desire to conduct radio research work: 1,604, 2,398, 3,256, 4,795, 6,425, 8,650, 12,850, and 17,300 kilocycles. Reports of work carried on show that the use of frequencies for this use resulted in many advances in the art of radio transmission.

In addition to the eight frequencies listed above, assignments of certain frequencies above 23,000 kilocycles for experimental work were also made. Assignment of frequencies other than those listed for experimental work were made only for limited periods and for experiments which by their nature could not be done on the frequencies above. In order to protect the regularly established commercial communications from interference, use of such frequencies was limited to such time as not to produce interference.

GEOPHYSICAL STATIONS

On March 10, 1930, the commission adopted the policy that the following frequencies set aside by General Order No. 74 for portable stations would be made available for all responsible applicants for geophysical explonation purposes: 1,600, 1,652, 1,664, 1,680, and 1,704 kilocycles. The maximum power assigned was 10 watts, except in cases where it could be shown by the applicant that exceptional conditions prevail, in which case a power not exceeding 50 watts was assigned.

Geophysical prospecting for oil has been very extensive and dependable, and radio communication is necessary in practically every method used. Radio is used for transmission of timing signals, operation of automatic devices, and communication between parties.

RADIO COMMUNICATIONS IN ALASKA

The Signal Corps of the United States Army has the task of assuring reliable communication between the United States and Alaska and within Alaska by means of the Signal Corps radio network. The commission has not authorized commercial stations in Alaska on a competitive basis with the Army. This provision eliminated all commercial radio circuits between the United States and Alaska and placed intra-Alaska communications under the supervision of the Army.

As a result of an intensive study of a commercial situation of Alaska, with the cooperation and collaboration of Signal Corps officials who have had direct supervision of radio communications in Alaska in the past, the commission adopted General Order No. 79, which set forth a definite licensing policy whereby the commercial operation of stations fitted in with the Signal Corps plan.

Under these provisions of this general order, all applications for commercial radio stations in Alaska are submitted to the commission through the radio supervisor, Seattle, the officer in charge, Washington-Alaska Military Cable and Telegraph System, the Chief Signal Officer of the Army, and the radio division of the Department of Commerce. In this manner important alterations and pertinent recommendations can be made on the application, so that the commission may be assured in passing on the application that the proposed station is properly licensed in accordance with the foregoing considerations.

Under the plan, long-distance communication within Alaska and messages destined to or from points outside of Alaska are routed through the Signal Corps collecting stations. Short-range communication with stations in the same vicinity and messages between ship and shore are handled direct between commercial stations.

AVIATION RADIO

The use of radio on aircraft has materially contributed toward the safety of aircraft in flight. The air-transport companies realized this fact, and several voluntarily equipped all aircraft with radio receiving sets to make use of the radio aids provided by the Department of Commerce. Many of these companies have also installed equipment for carrying on 2-way communications between aircraft and ground. Satisfactory transmitting and receiving sets specially designed for use on aircraft have been made commercially available.

It was evident that the limited number of suitable frequencies available for aviation was not sufficient to meet the demands of all the operating companies without coordination and cooperation. A conference of representatives of air-transport companies and interested Government departments was called by the commission. As a result of this conference a plan for the use of frequencies along established airways was adopted September 9, 1929. After further study and trials several amendments were made, and on June 26, 1930, General Order No. 94 was adopted, which made minor revisions to the plan and incorporated all amendments to the original plan.

Section 2 of General Order No. 94 provides for the cooperative use of frequencies by several air-transport companies. In order to coordinate more closely their radio activities and to assure dependable and adequate communications the air-transport companies formed a cooperative communications company for the aviation public and known as Aeronautical Radio (Inc.). Practically all companies which are operating radio-equipped aircraft are members.

○

FIFTH ANNUAL REPORT

of the

FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

For the Fiscal Year 1931

▼

COMMISSIONERS

C. McK. SALTZMAN, *Chairman*
EUGENE O. SYKES, *Vice Chairman*
IRA E. ROBINSON HAROLD A. LAFOUNT
WILLIAM D. L. STARBUCK

JAMES W. BALDWIN, *Secretary*



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1931

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FIFTH ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION

FEDERAL RADIO COMMISSION,
Washington, D. C., December 7, 1931.

To the Senate and House of Representatives of the United States of America in Congress assembled:

Herewith is submitted the Fifth Annual Report of the Federal Radio Commission covering the fiscal year ended June 30, 1931.

PERSONNEL

No change occurred during the fiscal year in the membership of the commission. The commissioners appointed February 24, 1930, from the five radio zones remained as follows:

	Commissioner	Term expires
First zone	W. D. L. Starbuck	February 23, 1934.
Second zone	Ira E. Robinson	February 23, 1932.
Third zone	Eugene O. Sykes	February 23, 1933.
Fourth zone	Charles McK. Saltzman	February 23, 1936.
Fifth zone	Harold A. Lafount	February 23, 1935.

At the close of the fiscal year the commission included 132 employees, all of whom have a civil-service status except the attorneys of the legal and examiners' division.

The system of utilizing examiners for the holding of public hearings having been adopted, a chief examiner and three examiners were appointed. During the year representatives of the Personnel Classification Board made a survey of the positions in the commission in order that they might be properly classified with respect to other Government departments.

ORGANIZATION

The reorganization of the commission's force, which was referred to in the last annual report, has been accomplished and has resulted in a more efficient and expeditious operation of the commission. During the year an examiners' division was added to the organization. In order to further facilitate the work of the commission, a docket section, with responsibilities similar to those of the office of the clerk of a court, was organized as a part of the office of the secretary for the preparation of the hearing calendar, the publication of the reports of examiners, and the preparation of the docket for commission action.

During the year the commission organized an additional section of the license division to handle applications received from amateurs,

this duty having previously been performed by the radio division of the Department of Commerce, due to lack of personnel and adequate housing facilities of the commission.

VOLUME OF WORK

The volume of work done by the commission during the year far exceeded that of preceding years. More than 30,000 formal matters required commission action. Applications for permits and licenses were received at a rate averaging over 550 per week. The commission held 176 formal meetings; sat en banc to hear the proceedings or arguments in 30 cases; granted 27,747 applications and denied 584. During the year over 113,000 communications were received by the commission.

STAGGERED LICENSE PERIOD

Since the organization of the commission, licenses for broadcasting stations were issued for a period of 90 days and all terminated on the same day. Four times each year this practice caused an enormous load to be suddenly thrown on the limited personnel available for the examination of all broadcasting applications for the renewal of license. To avoid this unfortunate peak load and to bring about a system which would cause the work to be more uniformly distributed throughout the year, all broadcasting stations have been divided into six classes, each class having a different date on which licenses of that class terminated. At the same time, due to greater stabilization in the broadcast field and less necessity for the shifting of stations, the commission increased the period for which a broadcasting license is granted from three months to six months.

RULES AND REGULATIONS

During the four years of its existence the commission has promulgated rules and regulations in the form of "general orders." In the growth and development of the art it has been necessary not only to adopt, from time to time, new and additional orders but to revise, modify, enlarge, or repeal previous orders. These orders have reached such a volume that codification is now desirable. The commission has taken the necessary steps to have all its rules and regulations studied with a view to a general revision and codification. It is expected that the new compilation will be ready for issue during the present calendar year.

HEARINGS

Prior to this fiscal year all public hearings were held with the commission sitting en banc or were heard by one commissioner. During the fiscal year ended June 30. 1930, 240 formal hearings were held. It was found that such system of holding hearings was no longer permissible, as the time involved prevented commissioners from attending to a great amount of other work. On September 1, 1930, the system of holding public hearings by examiners was instituted in accordance with adopted rules of practice and procedure.

The increasing familiarity with the system now in vogue by those appearing before the commission has resulted in a considerable speeding up of the conduct of the hearings and the securing of a record clearly setting out both sides of the questions in issue. Upon this record the commission is able to make its determination of facts and base its decisions. At the close of the year the examiners were practically current in their reports of cases heard, leaving them free to handle the approximately 200 applications which the commission has found necessary to designate for hearing at the beginning of the new fiscal year. Provisions have been made in the hearing procedure to safeguard the rights of applicants and all other interested parties. All pertinent facts may be shown, and, in addition, full argument may be made or briefs may be submitted, and all parties may except to the report submitted by the examiner. The record of hearing and examiner's report, together with any exceptions which have been filed, are presented to the commission for its decision, and, in addition, provision is made for the oral argument before the commission. The right to argue cases before the commission is granted only upon petition therefor.

In preparing the hearing docket, applications are grouped as much as possible in order that applications from the same territory or for the same facility may be heard at the same time. This is done in order to avoid the expense to applicants or licensees incident to repeated trips to Washington to participate in hearings. It frequently happens that a licensee who has been assigned a desirable broadcasting facility finds himself under the necessity of defending his right to the facility from a group of applicants therefor or from successive applicants. Inasmuch as there is no provision under the law whereby such an applicant who is unsuccessful in his effort can be required to reimburse the licensee for the expense to which he has been put in defending his right to the facility, the plan of grouping related applications is of great value to licensees and justifies some delay in handling applications which such a plan of necessity entails.

COMMERCIAL RADIO

There is popular belief that the principal duty of the Radio Commission pertains to radio broadcasting. Although the importance of broadcasting in the daily lives of our people is duly appreciated by the commission, it is proper to state that this interesting use of radio is only one of a long list of radio services administered by the commission under the provisions of the radio act of 1927. Some of the other services are of very great importance to the commerce and industry of this country, to safety of lives at sea, in the development and operation of aviation, in the prevention of crime and the detection of criminals, in the scientific research and development of radio, and in other national services. In addition to the broadcasters, our commercial radio companies, with their far-flung network of telegraph and telephone stations, reaching the uttermost parts of the earth, the great maritime fleet of the country, the rapidly growing aviation transport lines, the municipal and State police systems, the technical research laboratories, and many other services, all present problems to the Radio Commission in requests for additional frequencies. These requests present many technical problems.

The number of frequencies for all purposes for the entire world is limited. It has been often said that the United States is using more than its share of frequencies. The United States to-day is the foremost radio country of the world. The very remarkable use that this country is making of the frequencies assigned to it, together with the stupendous contribution which this country is making in the technical advance and development of radio, must be carefully considered when such a statement is made. Many interesting details as to the use which this country is making of its radio facilities are contained in the report of the chief engineer hereto appended. A brief reference to some of these services are as follows:

Fixed radiotelegraph.—The great network of radiotelegraph circuits operated by commercial companies of the United States has become a most important factor in international communication and has contributed much in making the United States the foremost radio country of the world. These circuits reach almost every nation of the earth, directly or indirectly, and are of great value to commerce and industry in this country. They are commercial assets of the Nation. As in the case of all other classes of radio service, the number of frequencies available is limited and the demands by other nations for the use of additional frequencies is constantly growing. Much time and study has been devoted in the commission to bring about the most economical use of wave lengths and such assignments as would enable the best service to be rendered to the people of this country.

Radiotelephone.—In the use of the radiotelephone the United States has led the world during the year. Compared with the provisions for international telephone communication that existed five years ago, the opportunities to-day are astounding. To-day over 86 per cent of the world's telephones are offered commercial interconnection in one network by the use of radio for the intercontinental circuits. During the fiscal year a new radiotelephone circuit has been opened to South America, and the construction of a station to communicate with Bermuda has been commenced. Tests are under way for the installation of radiotelephone communication to Hawaii, and probably to the Far East. It is possible for any telephone subscriber in the United States to speak from his home or office to passengers on the larger passenger lines on the North Atlantic. The commission has authorized the establishment of low-power radiotelephone stations in several of the principal harbors of the United States for the control and dispatch of big boats and small harbor craft.

The number of frequencies available and suitable for the radiotelephone service is very limited, and the commission has had many difficulties in providing for this service.

Aviation.—The needs of aircraft for radio facilities are greater than the needs of any other utility, due to the fact that no other form of communication is available. Since the International Conference of 1927 set aside certain blocks of frequencies for the use of aircraft, aviation in the United States has grown by leaps and bounds, and the task of providing the necessary frequencies for aircraft communication has been a most difficult one. The success achieved in providing sufficient channels to meet the needs of aviation in this country

has been possible only with the assistance and cooperation of the commercial aviation companies. In all the major aviation routes there has been installed radio communications between airplane and ground and ground and airplane. Thus, a pilot flying an airplane can at all times be in communication with one or more airports, and the officials responsible for the operation of the aircraft may at all times be in touch with the aircraft in flight. Thus, many flights which could not have been made without radio can now be safely made with radio. Aviation radio has added materially to the safety of all passengers carried in aircraft.

Police radio.—The development of the use of radio by city and State police departments has been an outstanding development during the past year. The Federal Radio Commission adopted a coordinated plan for the use of a number of frequencies for police use in such a way that maximum service would be rendered in each section of the country. Many city police departments have installed radio transmitters controlled by a central police official. Automobiles carrying patrolmen on the streets were equipped with receiving sets. Thus, from a police headquarters the police cars are ordered to the site of crimes or disturbances and immediate police control can be established. This has made it possible to very materially decrease the time required for dispatching police units and contributed to the reduction of crime in the cities so equipped. A few States have extended this to state-wide police service, but this phase of the work has not developed as far as the city police departments.

Experimentation and research.—During the year the commission has continued its policy of encouraging technical experimentation and research in the development and improvement of radio by the issue of licenses and the assignment of frequencies designated for this purpose. On many occasions permission has been given for special experiments of major importance or for the development of special equipment on other frequencies. The technical contributions from the radio laboratories of this country in the development of the art have done much in making the United States the foremost radio country of the world.

Experimental visual broadcasting.—In the field of visual broadcasting rapid strides have been made, but as yet the commission has not recognized commercial television. There has been a great improvement in the quality of images transmitted and in the amount of detail which it is possible to transmit. However, the present number of visual broadcasting frequencies present a severe limitation on the number of stations which may be operated without interference and on the character of the image which can be transmitted. The commission has therefore encouraged the investigation of the use of frequencies above 30,000 kilocycles for the purpose of visual broadcasting.

AMATEUR

At the close of the fiscal year there were approximately 22,000 amateur stations in the United States licensed by the commission. The story of the useful and constructive service rendered by amateur stations during the year is most interesting. In addition to many instances of useful service, the long-distance amateur service con-

tributes to the development of data concerning transmission effects on high frequencies. More detailed data concerning this service are set forth in the report of the chief engineer.

BROADCASTING

The past year has seen almost a complete revolution in the type of equipment used in broadcasting stations. By the commission's General Order No. 111 all stations were required to have equipment which was capable of more than 75 per cent modulation. Such equipment results in the approach to an equalization between the service area and the nuisance area of a broadcasting station, thus extending materially the service area for most stations. In many cases the changes in equipment which were necessary to meet the requirements of this general order likewise resulted in improved quality of transmission. In less than a year all stations were brought to the high level of service of which only a few stations boasted at the beginning of the year. The broadcasting stations of this country should be congratulated upon their willing cooperation in bringing this condition about.

In addition to the improvements in the equipment which gave more complete coverage for the stations, General Order No. 105 required that all full-time stations use the time assigned to them. Thus, full use is made of all the broadcast assignments.

The development of broadcast transmitters, and particularly the frequency control of such transmitters, has been very rapid. At an informal hearing held April 20, 1931, the radio broadcasting industry unanimously agreed that much stricter frequency maintenance is possible in the operation of broadcast transmitters. It was developed that a ±50-cycle tolerance could be met by modern broadcast equipment, and that if stations maintain their frequency within ±50 cycles per second there would be a large decrease in the amount of heterodyne interference. The commission, therefore, by General Order No. 116, promulgated on June 22, 1931, required that installations thereafter made must be capable of maintaining the frequency of the station within ±50 cycles, and that within one year all broadcasting stations must be brought within that degree of efficiency.

The interference caused by harmonics of one class of stations to another class is extremely disturbing to all classes of radio communication. While in the design of broadcast transmitters manufacturers have made an attempt to keep harmonics to a minimum, there have been some cases of broadcasting stations causing interference to communications carried on the higher frequencies. Each case which has been brought to the attention of the commission has been handled individually, and the broadcasting stations have in every case cooperated to reduce the interference. The continual improvements which have been made in broadcast transmitters have assisted materially in the solution of this problem.

The commission has on many occasions authorized the use of low-power transmitters for picking up, directly for rebroadcast purposes, events of national interest at points where wire lines were not available. This has made possible the description of many events which would not be available without such equipment.

During the year 11 new broadcasting stations were authorized, while 20 were deleted from the active records. Of the 20 deleted, 5 were consolidated with other stations, 2 were consolidated into 1 new station, 2 voluntarily relinquished their licenses, 1 which had been inactive since 1928 was dropped, and 10 were denied the renewal of their licenses.

Interesting data on certain broadcasting problems are set forth in the report of the chief engineer.

INTERNATIONAL RADIO

International Radio Conference of 1932.—Although the Federal Radio Commission has been given national jurisdiction over radio by the Congress of the United States, it is a well-known scientific fact that radio waves are not confined by national boundary lines and, as a matter of fact, are capable of causing serious international interference. For this reason it is necessary for periodic conferences to be held among all the nations of the world, in order to draw up certain international rules and regulations governing radio which will permit the best and most economic use of the ether to be made. The last such conference was held in Washington in 1927. It was attended by 79 nations of the world, and resulted in the adoption of what is known as the "International Radiotelegraph Convention and General Regulations Annexed Thereto."

The next world conference of this nature is scheduled for Madrid in September, 1932.

Preparation by the United States for such conferences involves the formulation of proposals which will best serve to govern radio for the ensuing five years. It is evident that the United States, as the foremost radio-using nation in the world, must be very active in the formulation of such proposals. The Federal Radio Commission, with the cooperation of other Government departments and the principal commercial communications companies of the United States, has, in conjunction with the Department of State, organized frequent meetings at which the various representatives interested could discuss such proposals. These were then transmitted to the International Bureau of the Telegraph Union at Berne, Switzerland, for incorporation into the Book of Proposals for general circulation to the nations of the world. In the preparation for the 1927 conference, over 2,000 separate proposals were submitted by the various nations.

International Radio Technical Consulting Committee.—In order to keep up to date with the technical progress that is being made in radio, the 1927 International Convention provided for the establishment of a technical committee, known as the International Technical Consulting Committee on Radio Communications (C. C. I. R.), to meet every two years in order to consider technical recommendations which would be consistent with the technical progress made since the holding of the last world conference. The second of these meetings was held in Copenhagen, Denmark, from May 27 to July 8, 1931. Three members of the staff of the Federal Radio Commission attended this conference.

At the request of the Department of State, the Federal Radio Commission, with the cooperation of the other Government departments

and the principal commercial communications companies, prepared technical proposals to be submitted to this conference, and a number of these recommendations were adopted by the conference in the final 20 " opinions " adopted. These opinions, which are technical recommendations for the guidance of all nations, cover such topics as the organization of a commercial radiotelephone service between mobile stations and the land network; the establishment of a world frequency list; a definition of the power of a transmitter; the setting up of reasonable tolerances for various types of stations; methods for the comparison of frequency standards; reduction of interference in the shared bands; the elimination of nonessential emissions; the reduction of the frequency band used by a transmitter; and the suppression of harmonics.

LEGAL ASPECTS OF RADIO

The legal problems which have confronted the commission during the past year have been many and varied. Their complexity, due to the formative state of radio law, has severely taxed the commission's legal staff. There are many important questions yet to be answered authoritatively by the higher courts, ranging from most important fundamentals, such as whether the radio act itself is constitutional, and the question as to whether the test of " public interest, convenience, or necessity " as laid down by the act is a sufficient limitation on the powers vested in the commission, to questions of less importance, but which must eventually be settled by the courts, such as what constitutes a " radio signal " as that term is used in the act. Through this maze of unsettled and unformed law it has been necessary for the legal staff of the commission to pick its way in the handling of the 57 appeal cases to which the commission was a party and of the 321 cases heard before the commission or its examiners. In addition to the research work and procedural matters requiring attention in these 378 formal cases, the legal division has examined more than 10,000 applications received during the fiscal year to determine the legal sufficiency of such applications prior to their submission to the commission for its formal consideration, and has prepared briefs and opinions on the many and varied questions submitted to it by the commission.

One of the outstanding developments in the legal aspect of broadcasting occurring during the fiscal year was the decision by the Court of Appeals of the District of Columbia in the case of KFKB Broadcasting Association, Inc., *v.* Federal Radio Commission.

In this case the court upheld the commission's action in denying the renewal of a broadcasting license for the reason that the character of program broadcast during the previous license term did not meet the legislative requirement that such programs should serve public interest, convenience, and necessity. The court in its opinion said that the commission had exercised its undoubted right of taking note of this broadcaster's past conduct which was not censorship. In the same opinion the court upheld the commission's contention that broadcasting should not be a mere adjunct of a particular business, but should be of a public character.

Steps have been taken in conjunction with the Department of Justice to more actively prosecute criminal violations of the radio

act of 1927, as amended. So far as concerns prosecutions for unlawful radio transmission—that is, transmission by an unlicensed station—comparatively few cases have come to the attention of the commission. Prosecution of such cases involves the necessity of showing the interstate character of the elusive, intangible radio impulse from the unlicensed station, or that it has interfered with an interstate signal. It is the intention of the commission to make every effort toward the prosecution of all such cases.

Several instances have come to the attention of the commission in which amateur radio transmitters have been used in connection with liquor and narcotic activities. These cases have been handled in connection with the proper agencies of the Government.

During the past fiscal year there was presented to the commission a question of far-reaching importance, involving a determination as to whether or not the Radio Corporation of America and its subsidiary companies had been adjudicated guilty of monopoly within the language of section 13 of the radio act of 1927, as amended. After a public hearing on the subject a majority of the commission held the view that the provisions of this section of the law had not been violated. This question is treated in detail in the report of the general counsel which is appended hereto.

During the year there has been widespread complaint against stations broadcasting fortune telling, lotteries, games of chance, gift enterprises, or similar schemes offering prizes dependent in whole or in part upon lot or chance. By reason of the widespread complaint against this class of program the commission found it necessary to issue a statement giving its position regarding them. After mature deliberation the commission announced that there exists a doubt that such programs are in the public interest and that complaint from a substantial number of listeners will result in the station's application for renewal of its license being set for a hearing. Copies of this statement were mailed to each broadcasting station licensed by the commission.

It is believed that this warning has had the effect of materially limiting this class of program, and in such instances as came to the attention of the commission after its issuance the programs were discontinued voluntarily by the station after the matter had been brought to its attention.

A detailed statement of the work of the legal division of the commission is set forth in the report of the general counsel hereto appended.

STATEMENTS OF FACT AND GROUNDS FOR DECISION

Section 16 of the radio act of 1927, as amended, requires the Federal Radio Commission, in all appeals from its decisions, to file with the Court of Appeals of the District of Columbia a "copy of its decision * * * and a full statement in writing of the facts and the grounds for its decision as found and given by it." In line with this provision the commission, in February, 1931, decided to issue a decision or a statement in writing of the facts and the grounds for its decision in all cases where the decision is adverse to a party of record in the case, or in all cases which may be appealed under the

provisions of section 16 of the act. Very little precedent has been established in the field of radio law, either through pronouncements of the courts or of the commission. The issuance of opinions by the commission has served two distinct purposes—first, to apprise the parties and the courts of the position taken by the commission as well as the reasons therefor; and, second, to make known certain definite elements essential in reaching a determination on the standard of public interest, convenience, and necessity.

It would seem necessary that a litigant be advised as to the position of the commission in order that he may fully protect his interests upon appeal. It is also important that there exist certain well-defined principles which the radio profession may reasonably expect the commission to consider in arriving at a decision upon any application. If these purposes are served, the commission will better be able to carry out the duties imposed upon it by the Congress in the radio act of 1927.

The commission desires to express its appreciation of the assistance and coperation received during the year from the Radio Division, the Aeronautics Branch, and the Bureau of Standards, Department of Commerce; the Department of State; the War Department; the Navy Department; the Coast Guard, Treasury Department; and the Interdepartment Radio Advisory Committee. The cooperation of these agencies has facilitated the work of the commission in many instances.

Respectfully submitted.

C. McK. Saltzman, *Chairman.*

ORGANIZATION CHART
—FEDERAL RADIO COMMISSION—

The government of the Commission is vested in five members appointed by the President by and with the advice and consent of the Senate. There are elected, by the members, a Chairman and a Vice Chairman.

EXAMINERS DIVISION
The Examiners Division is supervised by a Chief Examiner and is charged with the duty of hearing applicants on their applications for radio facilities which have been designated by the Commission for a hearing; the submission of written reports and recommendations thereon to the Commission.

LEGAL DIVISION
The General Counsel is the chief legal adviser of the Commission and the head of the Legal Division.

ENGINEERING DIVISION
The Chief Engineer is the chief technical adviser of the Commission and head of the Engineering Division.

PRESS SECTION
This Section is responsible for the preparation and release of all Press releases; the distribution to the press of Commission orders, publications, etc. The head of the Section acts as contact man with the members of the press.

RESEARCH AND DRAFTING SECTION
The Research and Drafting Section is supervised by an Assistant General Counsel and is responsible for the preparation for trial and trial of cases in which the Commission is a party arising under the Radio Act of 1927, as amended; the drafting of decisions, orders, rules, and advising the Commission concerning legal phases of international treaties and agreements.

HEARING AND RECORD SECTION
The Hearing and Record Section is supervised by an Assistant General Counsel and is charged with the duty of representing the Commission at all formal hearings.

ADMINISTRATIVE SECTION
The Administrative Section is supervised by an Assistant General Counsel and is responsible for the legal examination of all legal phases relating to all applications for radio facilities and the preparation of recommendations thereon to the Commission; to investigate complaints of alleged violations of the Radio Act of 1927 as amended and/or rules and orders made thereunder.

BROADCASTING SECTION
The Broadcasting Section is supervised by an Assistant Chief Engineer and is responsible for the technical examination of all matters relating to applications for radio broadcasting facilities (550 to 1500 kc); preparation and presentation of expert testimony at formal hearings; study and preparation of technical regulations; study and research to determine ways and means of making better use of the facilities available.

COMMERCIAL COMMUNICATIONS SECTION
The Commercial Communications Section is supervised by an Assistant Chief Engineer and is responsible for the technical examination of all matters relating to applications for radio communications facilities (10 to 550 kc and above 1500 kc); preparation and presentation of expert testimony at formal hearings; study and preparation of technical regulations; study and research to determine ways and means of making better use of the facilities available.

INTERNATIONAL AND INTERDEPARTMENTAL RELATIONS SECTION
The International and Interdepartmental Relations Section is supervised by an engineer and is charged with the duty of coordinating the international and interdepartmental relations of the Commission and to make plans for United States participation in the organized preparatory work for international radio conferences and technical meetings; to advise the Commission concerning technical engineering phases of international treaties, agreements, etc.

OFFICE OF THE SECRETARY
The Secretary is the Chief Administrative Officer of the Commission; pursuant to Section 214 of the Act approved June 10, 1921, (U. S. C. Title 31, Sec. 22) the Secretary is designated the Budget Officer of the Commission.

MINUTE SECTION
This Section is charged with the preparation and preservation of minutes of Commission meetings.

ASSISTANT SECRETARY
The Assistant Secretary is charged with the immediate supervision and direction of the work in the Divisions and Sections here indicated and acts for the Secretary in the latter's absence.

LICENSE DIVISION
The License Division is charged with the receipt of all applications for radio facilities, the administrative examination thereof, the maintenance of records showing Commission action thereon; the issuance of licenses and orders in conformity therewith.

DOCKET SECTION
The Docket Section is charged with the preparation of the Hearing Calendar, the publication of reports of Examiners and the preparation of the dockets for Commission action.

DISBURSING OFFICE
The Disbursing Office is charged with the disbursement of all moneys appropriated for use by the Commission; the maintenance of fiscal control records.

DIVISION OF MAIL AND FILES
The Division of Mail and Files is the depository of all the files of the Commission (except technical files) and is charged with the receipt, recording, indexing and classifying of all mail received in and sent out of the Commission.

CORRESPONDENCE SECTION
The Correspondence Section is charged with the receipt of all correspondence of a general character and the preparation of replies thereto.

DUPLICATING SECTION
The Duplicating Section is charged with the mimeograph, multigraph and addressograph work of the Commission and the preparation of such material for mailing.

SUPPLY SECTION
The Supply Section is charged with the procurement, storage and issue of all supplies

TELEPHONE SECTION
The Telephone Section is charged with the operation of the telephone switchboard and the examination and audit of vouchers for telephone service.

SUB CLERICAL SECTION
The sub clerical section is charged with performance of miscellaneous custodial work.

APPROVED APRIL 30, 1931
—FEDERAL RADIO COMMISSION—
BY [signature]
SECRETARY

83414—31. (Face p. 11.)

REPORT OF THE SECRETARY

JAMES W. BALDWIN

ORGANIZATION

The work begun last year incidental to the reorganization of the commission was carried into and completed in the fiscal year 1931. The completion of this work gives to the commission a staff and personnel to which the problems received in the commission may be assigned for thorough study before they are presented for commission action. There is appended hereto a chart showing in detail the organization of the commission and the duties and responsibilities assigned to each division and section.

During the year an additional section was created in the license division to handle matters related to the licensing of approximately 22,000 amateurs. There was organized during the year a docket section. This section is charged with the responsibility of preparing calendars of cases to be heard before the commission examiners, the publication of the reports of examiners, the receipt of exceptions to such reports, and the publication of the opinions of the commission.

GENERAL

The year 1931 was a very busy one. There were more than 30,000 formal matters requiring commission action. The commission held 176 formal meetings, and sat en banc to hear the proceedings in the R. C. A. cases growing out of the decision of the District Court of Delaware, to hear oral argument in 27 cases, and to hear revocation proceedings in 2 cases. The commission granted 27,747 applications and denied 584. There were handed down 203 decisions in docket cases, of which 132 were denied, 58 were granted, 6 were granted in part, and 7 were dismissed.

FINANCES

In order to have current and accurate information concerning the commission's finances, there was created a fiscal control section, the maintenance of which furnishes information from day to day concerning the status of the commission's funds as they are allocated for the different objects of expenditure.

For the fiscal year 1931 there was appropriated $450,000. This sum is accounted for as follows:

01 Personal services	$328,978.56
02 Supplies and materials	11,479.50
05 Communications	3,181.12
06 Travel expenses	6,412.04
07 Local transportation	349.70
08 Printing and binding	34,811.29
11 Rents	44,011.50
12 Repairs and alterations	959.95
13 Miscellaneous	250.00
30 Furniture, fixtures, equipment	13,746.28
Total	444,179.94

The following is a report of the activities of the license division:

LICENSE DIVISION

GEORGE S. SMITH, Chief

The license division has been charged with the receipt of all applications for radio facilities, the administrative examination thereof, the maintenance of records showing commission action thereon, and the issuance of instruments of authority in conformity therewith.

This division has undergone considerable expansion and for the purpose of better administration was reorganized into three sections: (1) The amateur section receives and records all applications for amateur radio-station licenses and issues all licenses for that service; (2) the broadcast section receives and records all applications for broadcast radio stations and issues all instruments of authority relative thereto; (3) the commercial section receives and records applications for all radio stations, exclusive of amateur and broadcast. This section issues all instruments of authority for 20 different classifications of stations.

AMATEUR SECTION

Since the creation of the amateur section there were received 20,609 license applications and there were granted and issued 20,204 station licenses. The applications received and licenses issued necessitated the preparation of 61,017 card records, all of which have been currently maintained.

BROADCAST SECTION

This section received 3,784 applications as compared with 3,970 for the previous year, a decrease of 186 applications. There were prepared and issued 3,233 instruments of authority, as compared with 3,345 during last year, a decrease of 112.

Twenty radio broadcasting stations were deleted from the active records, five of which were consolidated with other licensed stations, and two of which were consolidated into one new station. A list of the stations deleted and/or consolidated is set forth as follows:

Radio broadcasting stations deleted during the fiscal year 1931

Call letters	Grantee and location	Date of deletion
WBBS	Boston Broadcasting Co., Boston, Mass.	June 11, 1931
WBBW	Ruffner Junior High School, Norfolk, Va.	Do.
WBBY	Washington Light Infantry, Charleston, S. C.	July 15, 1930
WCHI	Radiophone Broadcasting Corporation, Chicago, Ill.	Oct. 31, 1930
WMAF	Round Hills Radio Corporation, South Dartmouth, Mass.	June 3, 1931
WMAY	Kingshighway Presbyterian Church, St. Louis, Mo.	June 12, 1931
WMBJ	Rev. John W. Sproul, Penn Township, Pa.	Feb. 21, 1931
WRK	S. W. Doron and John C. Slade, doing business as Hamilton Radio Service, Hamilton, Ohio.	Sept. 29, 1930
KFHA	Waldo L. Hawkins and Dr. A. R. Craig, doing business as The Hawkins-Craig Syndicate, Gunnison, Colo.	Jan. 7, 1931
KPSN	Pasadena Star-News Publishing Co., Pasadena, Calif.	Apr. 30, 1931
KPWF	Pacific-Western Broadcasting Federation, Los Angeles, Calif.[1]	June 26, 1931
KTNT	Norman Baker, Muscatine, Iowa	July 1, 1931
KZM	Leon P. Tenney, Hayward, Calif.	June 23, 1931

[1] Construction permit only.

Radio broadcasting stations consolidated during the fiscal year 1931

Call letters	Grantee and location	Date of consolidation	Call letters and location of station consolidated with
WCSO	The WGAR Broadcasting Co., Springfield, Ohio.	June 12, 1931	WFJC, to form new station WGAR, Cleveland, Ohio.
WFJC	The WGAR Broadcasting Co., Akron, Ohio.	....do....	WCSO, to form new station WGAR, Cleveland, Ohio.
WGBC	Memphis Broadcasting Co., Memphis, Tenn.	June 17, 1931	WNBR, Memphis, Tenn., under call letters WNBR-WGBC.
WISJ	Badger Broadcasting Co., Madison, Wis.	June 4, 1931	WIBA, Madison, Wis.
WMAC	Clive B. Meredith, Cazenovia, N. Y.	Oct. 31, 1930	WSYR, Syracuse, N. Y., under call letters WSYR-WMAC.
WSSH	Tremont Temple Baptist Church, Boston, Mass.	May 15, 1931	WAAB, Boston, Mass.
WTNT	Life & Casualty Insurance Co. of Tennessee, Nashville, Tenn.	Dec. 16, 1930	WLAC, Nashville, Tenn.

Eleven new radio broadcast stations were authorized to be constructed, making a total of 612 authorized stations, as compared with 621 for the previous year. A list of the new stations is set forth as follows:

New radio broadcasting stations authorized during the fiscal year 1931

Call letters	Applicant and location	Frequency	Power	Hours of operation
		Kilocycles	*Watts*	
WGAR	The WGAR Broadcasting Co., Cleveland, Ohio.	1,450	500	Unlimited.
WSYB	Philip Weiss, trading as Philip Weiss Music Co., Rutland, Vt.	1,500	100	Do.
KGVO	Mosby's Incorporated, Missoula, Mont.	1,420	100	Daytime.
WBEO	The Lake Superior Broadcasting Co., Marquette, Mich.	1,310	100	Unlimited.
WWSW	William S. Walker, Pittsburgh, Pa.	1,500	100	Do.
WBHS	W. T., M. M., W. C., and V. F. Hutchens, doing business as The Hutchens Co., Huntsville, Ala.	1,200	50	Share with WFBC.
WJMS	Marius Johnson, Prop., trading as Johnson Music Store, Ironwood, Mich.	1,420	100	Daytime.
WAGM	Aroostook Broadcasting Corporation, Presque Isle, Me.	1,420	100	Unlimited.
WDEV	Harry C. Whitehill, Waterbury, Vt.	1,420	50	Daytime.
WEEU	Raymond A. Gaul, Harold O. Landis, and H. S. Craumer, doing business as Berks Broadcasting Co., Reading, Pa.	830	1,000	Do.
WFEA	Rines Hotel Co., Manchester, N. H.	1,430	500	Unlimited when no interference is caused with other stations operating on 1,430 kilocycles.

In order to solve a major problem of administration concerning the method and policy of handling the applications for renewal of licenses, a plan staggering the license periods of all radio broadcast stations was adopted. The 612 stations have been segregated into six groups according to operating frequency, and each group has been assigned a fixed license term of six months. The text of the license plan that was adopted by the commission on April 16, 1931, is set forth as follows:

The commission ordered:

That the licenses of radio broadcasting stations expiring at 3 a. m., eastern standard time, April 30, 1931, which may be regularly granted hereafter will be for the periods hereinafter mentioned and that thereafter succeeding licenses be for a term of six months.

Stations operating on the frequencies 640, 650, 660, 670, 680, 700, 710, 720, 740, 750, 760, 770, 790, 800, 810, 820, 830, 850, 860, 870, 970, 980, 990, 1,000, 1,020, 1,040, 1,050, 1,060, 1,070, 1,080, 1,090, 1,100, 1,110, 1,130, 1,140, 1,150, 1,160, 1,170, 1,180, and 1,190 kilocycles will be licensed for a period of three months ending 3 a. m., eastern standard time, August 1, 1931.

Stations operating on the frequencies 550, 560, 570, 580, 590, 600, 610, 620, 630, 780, 880, 890, 900, and 920 kilocycles will be licensed for a period of four months ending 3 a. m., eastern standard time, September 1, 1931.

Stations operating on the frequencies 930, 940, 950, 1,010, 1,120, 1,220, 1,230, 1,240, 1,250, 1,260, 1,270, 1,280, and 1,290 kilocycles will be licensed for a period of five months ending 3 a. m., eastern standard time, October 1, 1931.

Stations operating on the frequencies 1,300, 1,320, 1,330, 1,340, 1,350, 1,360, 1,380, 1,390, 1,400, 1,410, 1,430, 1,440, 1,450, 1,460, 1,470, 1,480, and 1,490 kilocycles will be licensed for the period of six months ending at 3 a. m., eastern standard time, November 1, 1931.

Stations operating on the frequencies 1,200, 1,210, and 1,310 kilocycles will be licensed for a period of seven months expiring at 3 a. m., eastern standard time, December 1, 1931.

Stations operating on the frequencies 1,370, 1,420, and 1,500 kilocycles will be licensed for a period of eight months ending at 3 a. m., eastern standard time, January 1, 1932.

Provided, however, That applications for renewal of station licenses which have been designated for hearing or which may be issued for shorter periods of time than those hereinabove enumerated, pending decision of the commission, or licenses which may be granted for shorter periods of time than those hereinbefore enumerated, for the purpose of affording an opportunity to investigate such stations, shall not be affected by this action.

A complete list of radio broadcasting stations of the United States, arranged into three parts—(*a*) alphabetically by call signals; (*b*) alphabetically by States and cities; (*c*) by frequency—was compiled and published and placed on sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. Supplements have been prepared on a monthly basis for distribution to the general public.

COMMERCIAL SECTION

This section received a total of 6,246 applications, as compared with 4,573 during the previous year, an increase of 1,673 applications. There were issued 5,395 instruments of authority as compared with 4,310 for last year, an increase of 1,085.

The instruments of authority that were issued were comprised of construction permits, licenses, modification of construction permits and/or licenses, consent to voluntary and involuntary assignment of construction permits and/or licenses, extension of licenses, special authorizations, and emergency authorizations.

Lists of radio stations arranged numerically by frequency assignment have been compiled on a semimonthly basis, and copies have been regularly sent to the International Bureau of the Telegraph Union, Berne, Switzerland, for registration on behalf of the United States Government. These lists were necessarily comprehensive and contained the following information: Frequency (kilocycles), wave lengths (meters), date of notification of the frequency to the International Bureau, call signals, location of station, type of emission, antenna power, nature of service and countries with which communication is proposed or already established, proposed date of completion or date of placing station into operation, administration or operating company, and remarks.

Lists of police and fire, experimental relay broadcasting, and experimental visual broadcasting radio stations have been prepared from time to time for the use of the general public and press.

With certain exceptions and subject to specific limitations, all licenses for the following services which were in full force and effect on November 14, 1930, were extended to 3 o'clock a. m., eastern standard time, October 1, 1931:

Point-to-point.
Coastal.
Marine relay.
Ships above 1,500 kilocycles.
Aeronautical and aeronautical point-to-point.
Aircraft.
Police.
Mobile press.

Licenses for all other commercial services have been issued for a period not exceeding one year, with the exception of special experimental, which have been issued for a period of time not exceeding three months.

There follows herewith a tabulation arranged according to service, which shows the number of new stations authorized, the number of stations deleted, and the total number of authorized radio stations.

Nature of service	Number of new radio stations authorized	Number of radio stations deleted	Total number of radio stations as of June 30, 1931
Aeronautical and point-to-point aeronautical	110	37	170
Agriculture	None.	6	9
Aircraft	133	61	293
Amateur	(1)	(1)	22,739
Broadcasting	11	20	612
Coastal	8	13	143
Fire	1	3	5
Forestry	None.	None.	2
General experimental	31	100	113
Geophysical	11	24	113
Marine relay	28	8	36
Mobile press	1	None.	3
Motion pictures	6	2	5
Point-to-point	34	135	297
Police	25	6	62
Power	2	21	22
Relay broadcasting	2	3	13
Ships	134	98	2,213
Special experimental	41	18	47
Temporary pick-up for rebroadcast	6	None.	6
Visual broadcasting	6	8	21
Grand totals	590	563	26,924

[1] No figures available.

The following is a report of the division of mail and files:

DIVISION OF MAIL AND FILES

EDWARD L. PAYNE, Chief

The past year has seen a rapid growth in the activities of the division of mail and files. In addition to the establishment of proper procedure for the expeditious handling of correspondence, this division has constructed and installed a numerical filing system, known as the duplex filing system. This system provides for the classification of correspondence and other material by subjects and is composed at the present time of several hundred main subjects and subdivisions. Under this system, files also are maintained for individual radio stations, in order that a history of the station may be available. A card-index system has likewise been constructed and installed for the recording of correspondence and other material.

This division has been made the sole depository for all files of the commission, with the exception of the license files. The applications and licenses of amateur operators, numbering about 20,000, are maintained in this division. Files which have been maintained in other parts of the office have now been transferred to this division and are being consolidated, along with other old correspondence, into the new filing system. This consolidation is taking place gradually, and it is expected that it will be completed during the next year. The receipt of incoming mail and the dispatch of outgoing mail has also been centralized in this division.

The statistics for the year show the receipt and dispatch of mail as follows:

Incoming mail	113,720
Outgoing mail	164,855
Total	278,575

Inasmuch as no statistics were maintained for the previous years, no comparative statement can be made. There is no doubt, however, that there has been a substantial increase in the volume of mail.

GENERAL ORDERS

The commission adopted 24 general orders during the year, a number of which are treated elsewhere in this report. Their text is printed in Appendix A.

REPORT OF THE CHIEF ENGINEER

Dr. C. B. Jolliffe

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GENERAL

For the purpose of allocation of frequencies and technical regulation, radio stations are classified into various services, as follows:

Broadcasting.
Fixed point-to-point:
- Radiotelegraph.
- Radiotelephone.
- Press (telegraph).

Maritime:
- Coastal telegraph.
- Coastal telephone.
- Ship telegraph.
- Ship telephone.
- Harbor telephone.
- Marine relay.
- Mobile press.

Aviation.
Police.
Alaska.
Broadcast pick-up.
Motion picture.
Experimental visual broadcasting.
Experimental relay broadcasting.
General experimental.
Special experimental.
Amateurs.
Geophysical prospecting.
Fire.
Emergency communication for power companies.

There have been many demands for other classes of service, but the allocation of frequencies to new services is always given careful consideration and the needs weighed in comparison with its relation to existing services. When it can be shown that there is a public need for radio communications for a new service it must then be fitted into the radio spectrum in accordance with the needs. The extensive use of the radio spectrum is making this more and more difficult. The allocation of frequencies to services and stations is being continually studied, with the view of organizing all communications so that the maximum use is made of the limited facilities available.

Such studies require special and careful consideration of the problems involved, and in each of the two sections dealing with allocation of frequencies men have been assigned exclusively to research work in the respective fields. These men deal with the routine work of the commission only in so far as it is necessary in order to be acquainted with the problems involved. By continual study of such matters as interference between stations, allocation of frequencies to services and stations, new equipment, transmission phenomena, and scientific development in various laboratories it is possible to propose regulations and allocations which insure that operation of all stations is in accordance with good engineering practice and that full use is made of the frequency spectrum.

In connection with the routine work of the commission, the engineering division examines all applications for instruments of authorization and makes an engineering report which is considered by the commission when action is taken on the application. Many of these reports are of major importance and the preparation involves much original study. In case an application is set for hearing and technical questions are involved, an engineer presents engineering testimony at the hearing and gives assistance to the legal division in the conduct of the case.

BROADCAST SECTION

V. FORD GREAVES, Chief

ALLOCATION OF BROADCAST FACILITIES

The basic plan of allocation of broadcast facilities, General Order 40, has been maintained. Changes have been made from time to time upon applications from station licensees and as the result of hearings.

On June 30, 1931, there was a total of 612 licensed broadcast stations. Of this number, 420 were authorized to operate simultaneously at night. An analysis of the various types of stations authorized is given in Table I.

TABLE I.—*Broadcast stations in operation June 30, 1931*

	Clear	Regional	Local	Total
Number of stations operating simultaneously at night	45	187	188	420
Number of day stations [1]	15	23	8	46
Number of limited-time stations [2]	21			21
Number of part-time stations [3]		5	8	13
Number of stations sharing time [4]	22	133	77	232
Total number of stations	90	284	238	612
Number of frequencies used	40	44	6	90

[1] Operate from 6 a. m. to sunset. (See General Orders 41 and 105.)
[2] Operate during daylight at dominant station and at night when dominant station is not in operation. (See General Orders 48 and 105.)
[3] Operate portion of time, remainder of time on same frequency not allocated in the same geographical location.
[4] 2 to 4 stations in same geographical location operate on same frequency at different hours.

The method of evaluating the broadcast facilities which are assigned to stations of various classes as given in General Order 92 has been followed. The 1930 census, which was published during the year, made it necessary to revise the proportions of the broadcasting facilities due each zone and State. The status of assignments of facilities to zones and States as of June 30, 1931, is given in Table II, the units due being based on the preliminary announcement of the official population of the various States as published by the United States Census Bureau.

TABLE II.—*Details of quota units by zones and States*

(Total broadcasting facilities of the United States, 400 units)

ZONE 1

State	Units due	Units assigned	Net amount over or under quota	
			Units	Per cent
New York	35.10	39.20	+4.10	+12
Massachusetts	11.85	9.98	−1.87	−16
New Jersey	11.21	11.53	+0.32	+3
Maryland	4.56	4.10	−0.46	−10
Connecticut	4.46	3.55	−0.91	−20
Porto Rico	4.32	0.40	−3.92	−91
Maine	2.22	2.20	−0.02	−1
Rhode Island	1.91	1.40	−0.51	−27
District of Columbia	1.33	1.30	−0.03	−2
New Hampshire	1.31	0.80	−0.51	−39
Vermont	1.00	0.60	−0.40	−40
Delaware	0.67	0.70	+0.03	+4
Virgin Islands	0.06	----------	−0.06	−100
Total	80.00	75.76	−4.24	−5

ZONE 2

Pennsylvania	27.64	20.24	−7.40	−27
Ohio	19.05	18.65	−0.40	−2
Michigan	13.88	11.40	−2.48	−18
Kentucky	7.54	7.62	+0.08	+1
Virginia	6.94	9.50	+2.56	+37
West Virginia	4.95	4.90	−0.05	−1
Total	80.00	72.31	−7.69	−10

ZONE 3

Texas	16.22	22.77	+6.55	+40
North Carolina	8.83	7.82	−1.01	−11
Georgia	8.09	7.95	−0.14	−2
Alabama	7.39	6.22	−1.17	−16
Tennessee	7.29	12.83	+5.54	+76
Oklahoma	6.67	9.00	+2.33	+35
Louisiana	5.83	8.50	+2.67	+46
Mississippi	5.60	3.00	−2.60	−46
Arkansas	5.17	4.40	−0.77	−15
South Carolina	4.82	1.70	−3.12	−65
Florida	4.09	8.35	+4.26	+104
Total	80.00	92.54	+12.54	+16

ZONE 4

Illinois	22.50	33.84	+11.34	+50
Missouri	10.72	12.05	+1.33	+12
Indiana	9.53	7.48	−2.05	−21
Wisconsin	8.66	7.95	−0.71	−8
Minnesota	7.59	9.01	+1.42	+19
Iowa	7.30	11.45	+4.15	+57
Kansas	5.56	4.71	−0.85	−15
Nebraska	4.08	7.23	+3.15	+77
South Dakota	2.04	3.01	+0.97	+48
North Dakota	2.02	2.99	+0.97	+48
Total	80.00	99.72	+19.72	+25

ZONE 5

California	36.85	36.43	−0.42	−1
Washington	10.16	15.80	+5.64	+56
Colorado	6.74	9.42	+2.68	+40
Oregon	6.19	9.15	+2.96	+48
Montana	3.48	3.00	−0.48	−14
Utah	3.27	6.60	+3.33	+102
Idaho	2.89	2.60	−0.29	−10
Arizona	2.83	2.60	−0.23	−8
New Mexico	2.77	4.03	+1.26	+45
Hawaii	2.39	1.40	−0.99	−41
Wyoming	1.46	0.20	−1.26	−86
Nevada	0.59	0.80	+0.21	+36
Alaska	0.38	1.00	+0.62	+163
Total	80.00	93.03	+13.03	+16

TABLE II.—*Details of quota units by zones and States*—Continued

SUMMARY

	Total units due	Total units assigned	Net amount over or under quota	
			Units	Per cent
Zone 1	80	75.76	−4.24	−5
Zone 2	80	72.31	−7.69	−10
Zone 3	80	92.54	+12.54	+16
Zone 4	80	99.72	+19.72	+25
Zone 5	80	93.03	+13.03	+16
Total	400	433.36	+33.36	+8

This is a fair balance of broadcasting facilities as between zones, considering the inequalities in the sizes of the zones and the differences in the distribution of population as shown in Table III.

TABLE III.—*Relation of radio facilities to size and population of zone*

	Total facilities due	Portion of total facilities assigned	Portion of total United States population	Portion of total United States area	Average population per square mile
	Per cent	*Per cent*	*Per cent*	*Per cent*	
Zone 1	20	17.5	23	4	202
Zone 2	20	16.7	22	7	111
Zone 3	20	21.3	23	22	37
Zone 4	20	23.0	22	18	41
Zone 5	20	21.5	10	49	7

As a part of the 1930 census a count was made of the number of receiving sets in the United States. For the purpose of comparison with the tables above, Table IV is given, which shows that portion of these data now available, classified according to zones and States.

TABLE IV.—*Number of receiving sets in United States*

ZONE 1

State	Number of families	Number of receiving sets	Percentage of familes owning receiving sets
New York	3,162,118	1,829,123	57.8
Massachusetts	1,024,527	590,105	57.6
New Jersey	987,616	625,639	63.4
Maryland	386,087	156,465	42.9
Connecticut	389,596	213,821	54.9
Porto Rico	(1)	(1)	(1)
Maine	198,372	77,803	39.2
Rhode Island	165,911	94,594	57.1
District of Columbia	126,014	67,880	53.9
New Hampshire	119,660	53,111	44.4
Vermont	89,439	39,913	44.6
Delaware	59,295	27,183	45.8
Virgin Islands	(1)	(1)	(1)

ZONE 2

Ohio	1,700,877	810,767	47.7
Michigan	1,183,157	599,196	50.6
Kentucky	610,288	111,452	18.3
Virginia	530,092	96,569	18.2
West Virginia	374,646	87,469	23.4

[1] Compilation not released by Census Bureau at time of going to press.

TABLE IV.—*Number of receiving sets in United States*—Continued

ZONE 3

State	Number of families	Number of receiving sets	Percentage of families owning receiving sets
Texas	1,383,280	257,686	18.6
North Carolina	645,245	72,329	11.2
Georgia	654,009	64,908	9.9
Alabama	592,530	56,491	9.5
Tennessee	601,575	86,229	14.3
Oklahoma	565,348	121,973	21.6
Louisiana	486,424	54,364	11.2
Mississippi	492,354	25,475	5.4
Arkansas	439,408	40,248	9.2
South Carolina	366,265	28,007	7.7
Florida	377,823	58,446	15.5

ZONE 4

Illinois	(1)	(1)	(1)
Missouri	941,821	352,252	37.4
Indiana	844,463	351,540	41.6
Wisconsin	713,576	364,425	51.1
Minnesota	608,398	287,880	47.3
Iowa	636,905	309,327	48.6
Kansas	488,055	189,527	38.8
Nebraska	343,781	164,324	47.8
South Dakota	161,332	71,361	44.2
North Dakota	145,382	59,352	40.8

ZONE 5

California	1,618,533	839,846	51.9
Washington	1,426,019	180,229	42.3
Colorado	268,531	101,376	37.8
Oregon	267,690	116,299	43.5
Montana	137,010	43,809	32.0
Utah	116,254	47,729	41.1
Idaho	108,515	32,869	30.3
Arizona	106,630	19,295	18.1
New Mexico	98,820	11,404	11.5
Hawaii	(1)	(1)	(1)
Wyoming	57,218	19,482	34.0
Alaska	(1)	(1)	(1)
Nevada	25,730	7,869	30.6

[1] Compilation not released by Census Bureau at time of going to press.

TECHNICAL IMPROVEMENTS IN BROADCASTING

In recent years there has been rapid development in the improvement of radio broadcast transmitters. When installed in a station these improvements result in an increase in the service area of the station and in improvement in the service rendered to the listeners. These improved transmitters were installed in some stations, and others made modifications in licensed transmitters to include these improvements. However, there was not universal adoption by all, and the net improvement possible could not be realized because of the failure of adoption by all. Thus there was not complete use of all broadcast facilities.

In order that the radio listeners may be given the best service possible, it is essential that all licensees of broadcast stations be required to install modern equipment and make full use of the facilities allocated. It is a well-accepted principle of radio regulation that, in

order to enjoy the privileges of making use of a portion of the limited radio facilities available, the user must keep his equipment up to a standard "consistent with good engineering practice." During the past year the Federal Radio Commission has, in General Order 111 (first issued as General Order 97) and General Order 116, defined "good engineering practice" with respect to broadcast stations. These regulations require all stations to install equipment in accordance with this standard.

As a result of these regulations there is now taking place in the broadcast stations of the United States a complete modernization of equipment. When completed this will result in a marked improvement in the service rendered by broadcast stations and a reduction in the amount of interference. In this modernization program the engineering division has given much engineering advice to stations and has assisted in every way possible. The stations have, in general, cooperated fully in this work, and there has been a general desire on the part of stations to improve equipment in order to improve service to the public.

General Order 111 requires that all stations have transmitting equipment capable of 75 per cent modulation or more. The area which a station can serve satisfactorily, provided there is no interference (service area), is a function of two factors—carrier power used and the amount of modulation which is applied to the power used (percentage modulation). The area over which a station is capable of producing interference (nuisance area) is a function of carrier power only. It is desirable that the ratio of "nuisance area" to "service area" be as small as possible. An increase in the percentage modulation of a station increases the service area of that station without increasing the nuisance area and has the effect of an increase in the power of the station. For example, it can be shown that increasing the percentage modulation of a station from 40 to 80 per cent, for example, gives the same result in increase of signal delivered by the output of a given receiving set as if the carrier power were increased four times. That is, a station operating with a power of 500 watts and 80 per cent modulation would deliver a program at the output of a given radio receiver with an intensity equal to that from a station of 2,000 watts and 40 per cent modulation. The interference area of the 500-watt station, however, would be very much less than that of the 2,000-watt station.

The improvements resulting from increased percentage modulation can be fully realized only if there is no interference within the service area of the station. On the broadcast frequencies on which two or more stations operate simultaneously at night, heterodyne interference exists in the greater portion of the territory between the stations. This heterodyne interference is the limiting factor in the service of most regional and local stations.

The present regulations permit broadcast stations to deviate a maximum of ± 500 cycles per second from the assigned frequency. If two stations are operating on their assigned frequencies and within their tolerance, the heterodyne beat note may have any frequency between zero and 1,000 cycles per second. A beat note having a frequency between 100 and 1,000 cycles per second is very annoying

and is well reproduced in the audio system of the modern radio receiver. However, frequencies below 100 cycles per second are in general rapidly attenuated by the modern radio receiver. It has frequently been urged that the Federal Radio Commission reduce the allowable deviation from assigned frequency for broadcasting stations, and thus reduce very materially the heterodyne interference between stations operating simultaneously on the same frequency.

The feasibility of a change in the regulations was dependent on the equipment available. In order to determine this, an informal hearing was held April 20, 1931, before the chief examiner. There was almost unanimous agreement that it was reasonable to reduce the allowable frequency deviation of broadcast stations from the assigned frequency to ±50 cycles per second. It was further shown that equipment capable of maintaining this stability at all frequencies between 550 and 1,500 kilocycles was available from several sources.

Frequency measurements of broadcast stations made by the radio division, Department of Commerce, showed that several stations were operating within the tolerance limit proposed. Where two or more stations operating on the same frequency were maintaining their assigned frequency within ±50 cycles per second, observation showed that there was material increase in the good service area of these stations.

Following this hearing the commission adopted General Order 116, which reads in part as follows:

* * * * * * *

2. On and after one year from the effective date of this order all radio broadcasting stations operating between 550 and 1,500 kilocycles shall maintain the assigned frequency between the limits of 50 cycles per second above to 50 cycles per second below the assigned frequency, and said stations are hereby required to make provision for the checking of the frequency of the emitted wave by means independent of the frequency control of the transmitter, said independent means having capability of the accuracy above mentioned.

3. On and after the effective date of this order the commission will authorize the installation of new transmitting equipment in broadcasting stations or changes in the frequency control equipment at present licensed for operation only if such equipment is so designed that there is reasonable assurance that the transmitter is capable of maintaining the assigned frequency to the accuracy set forth in paragraph 2 above.

* * * * * * *

This order is a recognition of the greatest technical advancement in the broadcast transmitter art in recent years. The general improvement due to the reduction of the frequency deviation tolerance to ±50 cycles per second may be realized from the fact that under the old regulation heterodyne interference limited the good service radius of the average 1-kilowatt station to about 20 miles, which is an area of approximately 315 square miles. With all stations operating in accordance with the new order the service radius of this station would be extended to about 44 miles, or an area of 1,500 square miles, or an increase in the area served of approximately 4.6 times. Similar improvements would be realized by all regional and local stations. Thus, when all regional and local stations comply with this order, many persons not now receiving service from such stations because of heterodyne interference will receive good service free of interference.

It will, of course, require some time to accomplish full operation in accordance with this order, but public interest and the general gain to the listening public and to the broadcast stations themselves require that all stations use every effort to make their equipment and operations comply with this regulation as soon as possible.

In the development of broadcast transmitters to meet the specific requirements of "good engineering practice" in General Orders 111 and 116, attention has been given to detailed improvements throughout the transmitting equipment, and many incidental improvements in the service and reliability of broadcast stations will result because of the replacement and redesign of transmitters. One of the most important of these improvements is in audio frequency circuits, which to a large extent determine the quality of the program transmitted. The new broadcast transmitters in general transmit programs which are very faithful reproductions of the original programs, and thus give listeners a marked improvement in the programs delivered by their receiving sets.

There has also been a marked reduction in the amount of harmonics and other spurious emissions radiated by modern broadcast transmitters. In the intensive use of the radio spectrum it is necessary to protect all stations and services against interference which is not essential to the service being carried on by other stations. Since many commercial stations operate on frequencies higher than those used for broadcasting, harmonics radiated by broadcasting stations will cause interference to these services and may disrupt a particular service completely. It is extremely difficult to fix maximum limits for the amount of power or the intensity of the field which may be permitted. A harmonic radiation of a given intensity may under one condition cause no interference, while under another set of circumstances may cause interference which is destructive to another service.

Every case of interference due to harmonics from broadcasting stations has been considered with the individual station involved. In most cases there has been complete cooperation by the station which has taken steps to eliminate the interference. In the new broadcast transmitters which have been produced commercially, special attention has been given to the reduction of harmonics, with the result that interference from this source has been materially reduced. More intensive use of the high-frequency spectrum, however, will make this problem increasingly difficult.

There is considerable research being carried on by laboratories and by stations which will undoubtedly result in improvements in transmitting sets and make it possible to get greater use from the limited number of broadcast frequencies. Synchronization of broadcast stations is considered separately below.

The principal cause of interference between broadcasting stations is that portion of the power which leaves the transmitting antenna at an angle, goes to the reflecting layer ("heaviside layer"), is there reflected back, and returns to the earth at a distance from the transmitting station with an intensity much greater than that portion of the power that travels along the surface of the earth. The portion of the radiation so reflected is usually referred to as the "sky wave." The intensity of this sky wave is variable, and while it makes possible

reception from distant stations, such reception is unreliable because of the waxing and waning of its intensity (fading).

In order to reduce interference from this source, considerable work has been done in an attempt to develop an antenna system which will concentrate the radiated power along the ground and reduce the power radiated in the "sky wave."

Experiments are being made with antenna structures to reduce the power radiated in the sky wave. The results reported on these structures, in the broadcast band, are not as yet very promising.

The commission has given every possible encouragement to experiments which promise to result in the improvement of broadcasting or which may make possible more efficient use of the broadcast-frequency spectrum, thus resulting in better service being rendered to the broadcast listeners.

SYNCHRONIZATION OF BROADCAST STATIONS

The problem of operating broadcast stations on the same frequency with exact or partial synchronization has been given attention by several broadcasting and engineering organizations. Many experiments have been carried on, and the engineering division of the commission has cooperated in most of these experiments by making observations of test transmissions and in some cases giving engineering advice concerning the experiments and observations. The commission has granted special authority for special transmissions and has endeavored in every way to assist and encourage such tests.

At the present time three experimental operations and one regular operation involving synchronization of broadcasting stations are authorized for operating during broadcasting hours.

(1) Stations WTIC and WEAF, located at Hartford, Conn., and New York City, respectively, operate one-half time on 660 kilocycles with 50 kilowatts power, and station WBAL, 10 kilowatts power, and station WJZ, 30 kilowatts power, located at Baltimore, Md., and New York City, respectively, operate on 760 kilocycles one-half time. The four stations during the other one-half time operate on frequencies not shared by other stations. This is, in effect, one experiment, stations WTIC and WBAL normally sharing time on 1,060 kilocycles. The frequencies of two stations operating simultaneously in these cases are maintained exactly the same by means of a low-frequency synchronizing current transmitted by wire from a central point to each station.

(2) Stations WHO–WOC, located at Des Moines and Davenport, Iowa, respectively, operate on 1,000 kilocycles, each station having 5 kilowatts power. The frequencies of these two stations are maintained approximately equal by means of special automatic frequency control of each transmitter and observations at a monitoring station halfway between the two stations.

(3) Stations WCAH, Columbus, Ohio; WHP, Harrisburg, Pa.; WHEC, Rochester, N. Y.; and WOKO, Albany, N. Y., operating on 1,430 kilocycles, 500 watts power at each station. Station WFEA, Manchester, N. H., will be added to this group at a later time. These stations are synchronized only partially. All stations have special

frequency control which will maintain the beat-note interference between the stations at a frequency below audibility. There is no form of monitoring or direct control among the stations other than occasional listening tests which may be necessary.

(4) In addition to these experimental operations, stations WBZ, 15 kilowatts, and WBZA, 1 kilowatt, at Boston, Mass., and Springfield, Mass., respectively, operate regularly on the same frequency and with the same program synchronized by means of wire line control similar to (1) above.

In all of these operations the stations carry the same programs when synchronized, except in the third case, where the separation and power are such that different programs may be carried during daylight hours. All these experiments are being observed very carefully, but as yet no general conclusions can be drawn.

The most exact of the three methods is that in which a wire line is maintained between the stations for the purpose of synchronization (1 and 4 above). In this method a low-frequency current of the order 5,000 cycles is transmitted from a central point to both stations. The radio frequency of each station is then obtained by multiplying the frequency of the synchronizing current by electric means to the assigned frequency of the station. This method, which results in exact synchronization, requires considerable special terminal equipment at each station and the continuous maintenance of a wire line between the stations.

A less involved method (2 above), with consequent reduction in the precision of control, is that in which special frequency-control equipment is installed in each station and the frequency is observed by a monitoring station midway between the stations which are synchronized. This method involves a wire connection between the monitoring station and one of the broadcast stations, assuming two stations are being synchronized. The synchronization is maintained either by continuous manual or automatic adjustment of the frequency of one station to that of the other station.

The third method (3 above) is capable of still less precision. The stations operate independently of each other, but with automatic frequency controls that have been previously adjusted to give as exactly the same frequency as possible.

The reason for synchronizing broadcast stations is to make it possible to give a better class of service to a larger number of listeners, and thus make more complete use of all broadcast frequencies. From the standpoint of results, the problem is divided into two distinct parts:

(1) The operation of " booster " stations for a principal station on a frequency now occupied by the single principal station (clear channel) thus extending the good-service area of that station without changing materially the present service.

(2) The operation of several lower power stations on a frequency now used by several stations in such a way that each station increases its good-service area.

A clear channel is assigned to a single station in order that the program of that station may be received at any point within its range

free of interference. Such a station will provide interference-free reception within a normal service area, and in addition it also serves listeners who do not have the benefit of a station in the immediate vicinity and who must depend for service from stations at a distance. Such reception is not always reliable, due to fading and nonradio interference. However, it is the only type of reception which is available for a large number of people in the United States. Synchronization which is carried on in these channels should not deprive people of the latter class from reception to which they are accustomed and should not impair the normal good-service area of any existing station.

On regional and local stations, however, there is a different set of circumstances. On any channel on which more than one station operates simultaneously at night there is, at a certain distance from each station, interference which makes it impossible for listeners to use that station. Thus such stations have only a service area adjacent to the station and no possibility of a service beyond the interference limits. Each station so operating on the same frequency can maintain its frequency so that the heterodyne interference is below audibility, and the service area of each station can be somewhat extended. If, however, the stations are already serving the area which they are designed to serve, other stations may be added with precision frequency control to give other communities service without destroying the present service. Consequently, on regional and local channels the requirements as to the result of the synchronization experiments are not as rigorous as on clear channels.

In all cases of synchronization the principal difficulty is caused by the sky wave—that is, the power which is radiated from a broadcast antenna and which is not transmitted along the earth but at an angle to it. This radiation goes to the ionized layer (heaviside layer) and is reflected to the earth. This type of radiation, which varies in intensity, is responsible for the normal fading of radio signals. The combination of this signal of variable strength with a signal of constant intensity results in the appearance of fading within the normal-service area of the other station on the same frequency and the destruction of the quality of the signals. This type of interference has been generally recognized as a limitation to the service of broadcast stations on the same frequencies, even though they be exactly synchronized. Attention has been directed toward the study of antenna systems which will suppress a large amount of the power which is radiated in the sky wave and increase the radiation along the earth.

An alternate method which has been used is to adjust the relative powers of the two stations to such values that the indirect radiation of each station is of intensity below the point where it would cause interference within the good-service area of the other station or by adjustment of power to place the areas of poor quality where the population is small.

The experiments which are being carried out are demonstrating the advantages and disadvantages of the synchronization of broadcast stations and are yielding very valuable data, which will make possible the determination of the value of such operation.

THE EMPIRICAL STANDARDS USED AS BASIS FOR ENGINEERING TESTIMONY IN HEARINGS CONCERNING BROADCAST STATIONS (550–1,500 KILOCYCLES)

In making recommendations to the commission and giving testimony at hearings before the commission on applications concerning broadcast stations in the band 550–1,500 kilocycles, the engineering division is confronted with the problem of using standards of radio transmission. To insure uniformity it has been necessary to adopt many empirical standards of reception, interference, service, etc., that have not previously been published. In making up these standards the division has used all sources of information now available, and as more and more technical broadcasting data are obtained these standards will necessarily change. Since many of the standards are also based on present-day average receiving sets, average standards of listeners, present design of antennas, etc., they will, of course, be changed as the art progresses.

The empirical standards set out below were prepared and averaged upon data obtained from the following sources:

1. Evidence given in hearings by expert radio engineers.
2. Experience of engineers of the engineering division, based upon their personal experiences and observations in the field and on studies of reports and publications on the subject.
3. Averages of many hundred field-intensity measurements made by the radio division, Department of Commerce.
4. Study of the channel interference reports made by the radio division, Department of Commerce, which cover all points in the United States where offices are located.
5. Several complete surveys made on individual stations by the radio division of the Department of Commerce and by other engineers with respect to service area and interference.
6. Various published formulas on radio transmission.
7. Characteristics of receiving sets.

Figure 1, page 37, shows in graphical form the data as derived from the various sources as indicated. Differences between curves are in many cases very large. During the past year the radio supervisors have made many measurements on the intensity of broadcast stations, both day and night. These measurements, shown in Figure 2, page 39, were taken at many points in the entire United States, and represent the actual conditions that are encountered. The plain circles show day measurements and solid circles night measurements. All of the readings were reduced to a power of 1 kilowatt before plotting. These measurements were taken on stations of various frequencies within the broadcast band and no attempt was made to differentiate between different portions of the band or between different seasons of the year. Each circle is the average of from 4 to 50 readings taken on one station during a given period.

These measurements represent the largest collection of field-intensity measurements that have been taken, and undoubtedly come nearest to presenting the average broadcast transmission range in the United States. It is expected that many more measurements will be

made, and if these justify it the curve will be changed. The curves given in Figure 2, page 39, are used as the basis for values of field intensity given below. While they may be approximate, they do represent the best present knowledge concerning average radio transmission in the United States in the range of frequencies 550–1,500 kilocycles. The transmission of a particular station over a particular area may depart considerably from these values, but to determine that fact the data must be obtained as the result of an individual study of the station. Beyond about 50 miles from a station the field intensity in general varies ("fading"), due to natural phenomena. Under these conditions average values were used.

The problem that is most difficult to solve and at the same time the most important to consider with respect to service on a channel on which more than one station operates simultaneously at night is the interference range or "nuisance area" of a station. The nuisance area of a broadcasting station is here defined as that area over which interference may be caused to reception of other stations operating on the same frequency. Generally speaking, the nuisance area is beyond the service range of a station and extends to many times the radius of the good-service area. For example, a 1-kilowatt station has an average good-service radius of approximately 40 miles and a nuisance radius of about 1,000 miles. A 1-kilowatt station located less than 1,000 miles from a second 1-kilowatt station will have mutual interference that will limit the good-service radius to less than 40 miles.

Interference to broadcast radio reception in its general meaning is defined as any spurious or extraneous sound accompanying radio reception, but as used in connection with this work it refers to objectionable sounds which are present over 10 per cent of the time. The good-service area of a station is defined as that area in which satisfactory reception free from interference is obtained at least 90 per cent of the time.

The field intensities necessary to render *good* service are divided into three classes, depending upon the noise level of the area to be served. The nature of the area and the necessary field intensities are given in Table V, as follows:

TABLE V

Area	Signal
	Millivolts per meter
Business city	10
Residential city	2
Rural	0.5

For *fair* service the signal is one-half the above values, and for *poor* service, one-fourth. The figures are all subject to change if the noise level is unusual or fading is experienced.

The average distance over which average stations of various powers can be expected to give the above classes of service are set out in Table VI, as follows:

TABLE VI

Power	Field intensity	Average radius	Power	Field intensity	Average radius
	Millivolts per meter	*Miles*		*Millivolts per meter*	*Miles*
100 watts	10	2	5 kilowatts	10	14
	2	10		2	44
	1	18		1	67
	0.5	30		0.5	93
250 watts	10	3	10 kilowatts	10	18
	2	15		2	55
	1	26		1	81
	0.5	41		0.5	115
1 kilowatt	10	6	50 kilowatts	10	32
	2	26		2	78
	1	41		1	120
	0.5	63		0.5	160

The distances in Table VI were taken from Figure 2 (day). The average of the day reading is taken as determining the service radius of a station and the average of night readings is taken as determining the nuisance radius. This is not entirely fair, as 50 per cent of the night measurements are above the average night curve, and since the nuisance area is defined as that area where interference is created over 10 per cent of the time, it is seen from this that the average station may create interference more than 10 per cent of the time, whereas the service range of a station is determined by service 90 per cent of the time.

General Order No. 40 divides broadcasting stations into three classes, namely, clear channel, regional channel, and local channel stations. The dominant station assigned to a clear channel is presumably given sufficient power to provide service to the large rural areas, and since only one station is assigned to operate at night on such channel, there is no interference from other stations in the United States. Other stations which are assigned to the same frequency are restricted in operation to such periods (daylight and limited time) that no interference will be caused to reception of the dominant station.

The good-service area of a clear channel station is empirically defined as that area which receives a field intensity of 0.5 millivolts per meter or more. Fundamentally, such a station renders service with field intensities far below this value and consequently to a larger area, but fading and local interference make the service necessarily of an intermittent character. A field intensity of 0.5 millivolts may be subject to fading and will undoubtedly be subject to local interference in many places. The primary purpose of such a station is to serve a center of population and a large rural area that is not within the service range of any other statien and can not be economically served by any other means than clear channel stations. The power of the dominant clear channel stations range from 5 to 50 kilowatts.

Regional channel stations are divided into two groups—high-power regional stations and low-power regional stations. The low-power regional stations operate with night power from 250 to 1,000

watts. The high-power regional stations are assigned from 5 kilowatts to 10 kilowatts.

The service area of a regional station is empirically defined as that area receiving a field intensity of 1 millivolt per meter or more. In making up the separation tables, service tables, and in all reference to such stations, this is considered the service area of such stations, and they are not given protection and are not expected to give regular service to the area outside this limit. The purpose of the regional stations is to serve a center of population and a small surrounding area or region.

The service area of a local station, which is assigned power not exceeding 100 watts at night, is empirically defined as that area receiving a field intensity of 2 millivolts per meter or more. Local stations are assigned to serve local centers of population, and as the field intensity necessary for good service in populous residential districts is 2 millivolts per meter, this is the extent to which the separation tables provide for this class of stations.

A summary of the classes of stations and the approximate separation of stations of the same power assigned the same frequency, which is necessary to give the class of service indicated, as determined from Figure 2, is given in Table VII, frequency maintenance assumed to be ±50 cycles per second.

TABLE VII

Channel	Power (night)	Boundary of service	Frequencies	Approximate separation necessary to give service
	Watts	*Millivolts per meter*		*Miles*
Local	5- 100	2	6	200
Regional	250- 1,000	1	40	1,050
High-power regional	5,000-10,000	1	4	2,000
Clear	5,000-50,000	0.5 and extent of intermittent service.	40	(1)

[1] Not duplicated.

Another factor which must be taken into account in assigning frequencies to broadcast stations is the geographical separation of stations on adjacent frequencies. The present plan of broadcast allocations provides for the assignment of stations on frequencies separated by 10 kilocycles. Receiving sets are not at present made which will give good quality of reception and at the same time be selective enough to accept a signal on one frequency and reject a signal of equal intensity having a frequency 10 kilocycles removed therefrom. The selectivity of receiving sets of different design varies widely. Many confidential quantitative measurements on receiving sets have been made available to the engineering division. From a study of the selectivity of radio receivers and on observations and testimony concerning objectionable interference, it has been determined that on the average the empirical values given in Table VIII represent the ratio of field intensity of the desired

station to the field intensity of the undesired station which should be maintained for good service.

TABLE VIII

Frequency separation	Ratio of desired to undesired signals
0	20 to 1.[1]
10 kilocycles	4.65–0.85 to 1.
20 kilocycles	3 times the selectivity at 10 kilocycles.
30 kilocycles	7.5 times the selectivity at 10 kilocycles.
40 kilocycles	15 times the selectivity at 10 kilocycles.

[1] Frequency maintenance ± 50 cycles per second.

Tables IX and IXA combine the data given in Tables VII and VIII with the data from the curves in Figure 2 and give the average separation between stations of different power and class for the same and adjacent frequencies in order to give on the average the service area specified above.

Tables VII, VIII, IX, and IXA assume that the frequency of all stations will be maintained to within ±50 cycles per second of the assigned frequency. With all stations maintaining their frequency within 50 cycles per second of the assignment, the frequency of the average heterodyne note to be expected between stations would be 50 cycles. Under such conditions it is believed that a ratio of desired to undesired signals of 20 to 1 would give satisfactory reception. If the frequency is maintained within only 500 cycles per second of the assigned frequency, an average heterodyne note of 500 cycles would result, and a ratio of desired to undesired signal of 100 to 1 would be considered necessary. This is the condition that will exist until General Order No. 116 is effective.

When the heterodyne note has the frequency of 50 cycles, it is a question whether the cross talk or beat note will be the more objectionable, and it may vary somewhat with the type of receiving set used. A ratio of 20 to 1 between desired and undesired signals represents a modulation of the desired signal of 5 per cent at 50 cycles, or 5 per cent cross talk, providing each of the stations employ the same percentage of modulation and have comparable programs. These ratios are considered satisfactory for the majority of rural areas where the standard of reception is not the highest; but in metropolitan areas, where programs may be selected from several stations, it is admitted that this is not a sufficiently high standard and the service would not be considered as satisfactory by most listeners.

In determining the mileage separation on adjacent frequencies, in Tables IX and IXA, the ratio between the desired and undesired signals at 10-kilocycle frequency separation is given as varying from 4.65 to 1 to 0.85 to 1. A study of the characteristics of many receiving sets reveals that the ratio necessary to prevent interference varies widely with different sets. The limit of common commercial broadcast receivers was found to lie within the ratios of 1 to 10 and 10 to 1. Old receivers with vacuum tubes of impaired emission, changed tuning, etc., will undoubtedly be less selective, and the characteristics

of new receiving sets studied. Many reports from listeners are now received complaining of cross-talk interference, and a study of these cases reveals that the separation is often greater than that set out in Tables IX and IXA. It can not be expected, however, that any plan of allocation will protect completely the poor grade of receivers and those in improper operating condition. Likewise, the full opportunities of allocation possible based on the better grade of receiving sets can not be realized, but an average must be used.

As the mileage separation becomes greater a lower ratio is used between the desired and undesired signal, varying from 4.65 to 1 down to 0.85 to 1 on a sliding scale inversely with the mileage separation. This sliding scale is justified and represents the true condition, on account of the fact that as the separation becomes greater the consistency with which the interfering signal is received becomes less, due to the fact that interference is caused by fading signals which are intermittent.

The ratios used for 20, 30, and 40 kilocycle separation are based on a study of many receivers, with an endeavor made to protect a majority of the receivers located in the proper service areas of stations. A fixed ratio is used throughout with respect to the ratio used on the 10-kilocycle separation. All of the separations used in Tables IX and IXA are to protect the service areas of stations to the field-intensity values given in Table VII 90 per cent of the time under average conditions and average degree of propagation that is encountered throughout the United States. It is recognized that the absorption varies widely throughout different parts of the United States and that the table may be excessively conservative for certain areas of the country and give unnecessary protection in other areas. This is taken into consideration in studying any individual case.

All of the average values herein set out must necessarily give way to actual measurements in any particular case. However, it does not follow that the average measurements do not represent a particular case if one or two measurements taken at selected times do not agree. To show that these empirical and average standards do not apply in any particular case requires a series of measurements, extended over a considerable period of time, which take in periods of known good propagation. Isolated measurements of field intensities of a station, particularly at distances greater than 50 to 100 miles from the station, are of little value when standing alone and do not represent what interference may be expected from that station.

TABLE IX.—*Average day separation between broadcast stations recommended by engineering division, Federal Radio Commission, based on frequency maintenance of ± 50 cycles* *

Day power	Frequency difference in kilocycles	Local		Regional			High-power regional		Clear			
		50 watts	100 watts	250 watts	500 watts	1 kilowatt	2.5 kilowatts	5 kilowatts	5 kilowatts	10 kilowatts	25 kilowatts	50 kilowatts
Local: [1]	0	95	120	155	190	240	285	315	315	380	450	520
	10	37	47	82	100	120	157	187	197	222	242	257
50 watts	20	18	22	38	48	59	80	101	109	126	151	171
	30	12	15	31	38	46	60	72	98	120	145	165
	40	9	12	28	35	43	57	69	95	117	142	162
	0	120	120	155	190	240	285	315	315	380	450	520
	10	47	50	85	103	123	160	190	200	225	245	260
100 watts [1]	20	22	25	41	51	62	83	104	112	130	156	175
	30	15	16	32	39	47	61	73	99	122	146	166
	40	12	13	29	36	44	58	69	96	118	143	163
Regional: [2]	0	155	155	250	260	310	380	430	430	490	580	660
	10	82	85	101	119	139	176	206	216	241	265	276
250 watts	20	38	41	57	67	78	99	120	128	146	171	191
	30	31	32	39	46	54	68	80	106	128	153	173
	40	28	29	31	40	48	62	74	100	122	147	167
	0	190	190	260	260	310	380	430	430	490	580	660
	10	100	103	119	126	146	183	213	223	248	268	283
500 watts [2]	20	48	51	67	74	85	106	127	135	156	181	201
	30	38	39	46	51	59	73	85	111	133	158	178
	40	35	36	40	43	51	65	77	103	125	150	170
	0	240	240	310	310	310	380	430	430	490	580	660
	10	120	123	139	146	154	191	221	231	256	276	291
1 kilowatt [2]	20	59	62	78	85	93	114	135	145	167	192	212
	30	46	47	54	59	66	80	92	118	140	165	185
	40	43	44	48	51	54	68	80	106	128	153	173
High-power regional: [3]	0	285	285	380	380	380	380	430	490	490	580	660
	10	157	160	176	183	191	205	235	245	270	290	310
2.5 kilowatts	20	80	83	99	106	114	128	149	157	188	213	233
	30	60	61	68	73	80	92	104	130	152	177	197
	40	57	58	62	65	68	75	87	113	135	160	180
	0	315	315	430	430	430	430	430	560	560	580	660
	10	187	190	206	213	221	235	247	273	295	320	340
5 kilowatts [3]	20	101	104	120	127	135	149	161	187	209	234	254
	30	72	73	80	85	92	104	116	142	164	189	209
	40	69	69	74	77	80	87	95	121	143	168	188
Clear:	0	315	315	430	430	430	490	560	560	620	710	810
	10	197	200	216	223	231	245	273	283	308	338	350
5 kilowatts [4]	20	109	112	128	135	145	157	187	195	217	242	262
	30	98	99	106	111	118	130	142	147	169	194	214
	40	95	96	100	103	106	113	121	124	146	171	191
	0	380	380	490	490	490	490	560	620	620	710	810
	10	222	225	241	248	256	270	295	308	330	355	375
10 kilowatts [4]	20	126	130	146	156	167	188	209	217	232	270	277
	30	120	122	128	133	140	152	164	169	179	211	224
	40	117	118	122	125	128	135	143	146	151	176	196
	0	450	450	580	580	580	580	580	710	710	710	810
	10	242	245	265	268	276	290	320	338	355	375	395
25 kilowatts [4]	20	151	156	171	181	192	213	234	242	270	270	290
	30	145	146	153	158	165	177	189	194	211	212	231
	40	142	143	147	150	153	160	168	171	176	181	201
	0	520	520	660	660	660	660	660	810	810	810	810
	10	257	260	276	283	291	310	340	350	375	395	410
50 kilowatts [4]	20	171	175	191	201	212	233	254	262	277	290	315
	30	165	166	173	178	185	197	209	214	224	231	236
	40	162	163	167	170	173	180	188	191	196	201	205

* These separations are calculated to minimize objectionable interference in the good service areas of stations about 90 per cent of the time approximately as follows:

[1] 50 to 250 watts local channels, 7 to 15 miles.

[2] 250 watts to 2.5 kilowatts regional channels, 1 millivolt, 26 to 55 miles.

[3] 5 to 10 kilowatts high-power regional channels, 1 millivolt, 65 to 80 miles.

[4] 5 to 50 kilowatts clear channels, 0.5 millivolt, 93 to 160 miles.

TABLE IXA.—*Average night separation between broadcast stations recommended by engineering division, Federal Radio Commission, based on frequency maintenance of ±50 cycles* *

Night power	Frequency difference in kilocycles	Local		Regional			High-power regional		Clear			
		50 watts	100 watts	250 watts	500 watts	1 kilowatt	2.5 kilowatts	5 kilowatts	5 kilowatts	10 kilowatts	25 kilowatts	50 kilowatts
Local: [1]	0	140	200									
	10	40	52	106	144	196	302	400	444	522	617	697
50 watts	20	18	22	39	52	71	107	147	162	197	232	257
	30	12	13	31	38	46	60	72	98	120	145	165
	40	9	10	28	35	43	57	69	95	117	142	162
	0	200	200									
	10	52	55	109	147	199	305	403	447	525	620	700
100 watts [1]	20	22	25	42	55	74	110	150	165	200	235	260
	30	13	16	32	39	47	61	73	99	121	146	166
	40	10	13	29	36	44	58	70	96	118	143	163
Regional: [2]	0			560	770	1,050						
	10	106	109	125	163	215	321	419	463	541	636	716
250 watts	20	39	42	58	71	90	126	166	181	216	251	281
	30	31	32	39	45	54	68	84	106	128	153	173
	40	28	29	33	36	48	62	74	100	122	147	167
	0			770	770	1,050						
	10	144	147	163	170	222	328	426	470	548	643	723
500 watts [2]	20	52	55	71	78	97	133	173	188	223	258	288
	30	38	39	45	52	60	74	91	112	134	159	179
	40	35	36	36	43	51	65	77	103	125	150	170
	0			1,050	1,050	1,050						
	10	196	199	215	222	230	336	434	478	556	651	731
1 kilowatt	20	71	74	90	97	105	141	181	196	231	265	291
	30	46	47	54	60	67	82	99	119	141	166	186
	40	43	44	48	51	54	68	80	106	128	153	173
High-power regional: [3]	0						1,500	1,950				
	10	302	305	321	328	336	350	448	492	570	665	745
2.5 kilowatts	20	107	110	126	133	141	155	195	210	245	280	305
	30	60	61	68	74	82	96	113	134	156	181	201
	40	57	58	62	65	68	75	87	113	135	160	180
	0						1,950	1,950				
	10	400	403	419	426	434	448	460	504	582	677	757
5 kilowatts [3]	20	147	150	166	173	181	195	207	222	257	292	317
	30	72	73	84	91	99	113	125	151	175	198	218
	40	69	70	74	77	80	87	96	122	144	169	189
Clear:	0											
	10	444	447	463	470	478	492	504	530	608	703	783
5 kilowatts [4]	20	162	165	181	188	196	210	222	248	283	318	343
	30	98	99	106	112	119	134	151	158	180	205	225
	40	95	96	100	103	106	113	122	126	148	173	193
	0											
	10	522	525	541	548	556	570	582	608	630	725	805
10 kilowatts [4]	20	197	200	216	223	231	245	257	283	305	340	365
	30	120	121	128	134	141	156	175	180	192	217	237
	40	117	118	122	125	128	135	144	148	154	179	199
	0											
	10	617	620	636	643	651	665	677	703	725	750	830
25 kilowatts [4]	20	232	235	251	258	265	280	292	318	340	365	390
	30	145	146	153	159	166	181	198	205	217	232	252
	40	142	143	147	150	153	160	169	173	179	186	206
	0											
	10	697	700	716	723	731	745	577	783	805	830	850
50 kilowatts [4]	20	257	260	281	288	291	305	317	343	365	390	410
	30	165	166	173	179	186	201	218	225	237	252	260
	40	162	163	167	170	173	180	189	193	199	206	210

* These separations are calculated to minimize objectionable interference in the good service areas of stations about 90 per cent of the time approximately as follows:

[1] 50 to 250 watts local channels, 2 millivolts, 7 to 10 miles.

[2] 250 to 1,000 watts, regional channel, 1 millivolt, 26 to 40 miles.

[3] 5 to 10 kilowatts high-power regional, 1 millivolt, 65 to 80 miles.

[4] 5 to 50 kilowatts clear channels, 0.5 millivolt, 93 to 160 miles and extent of intermittent service.

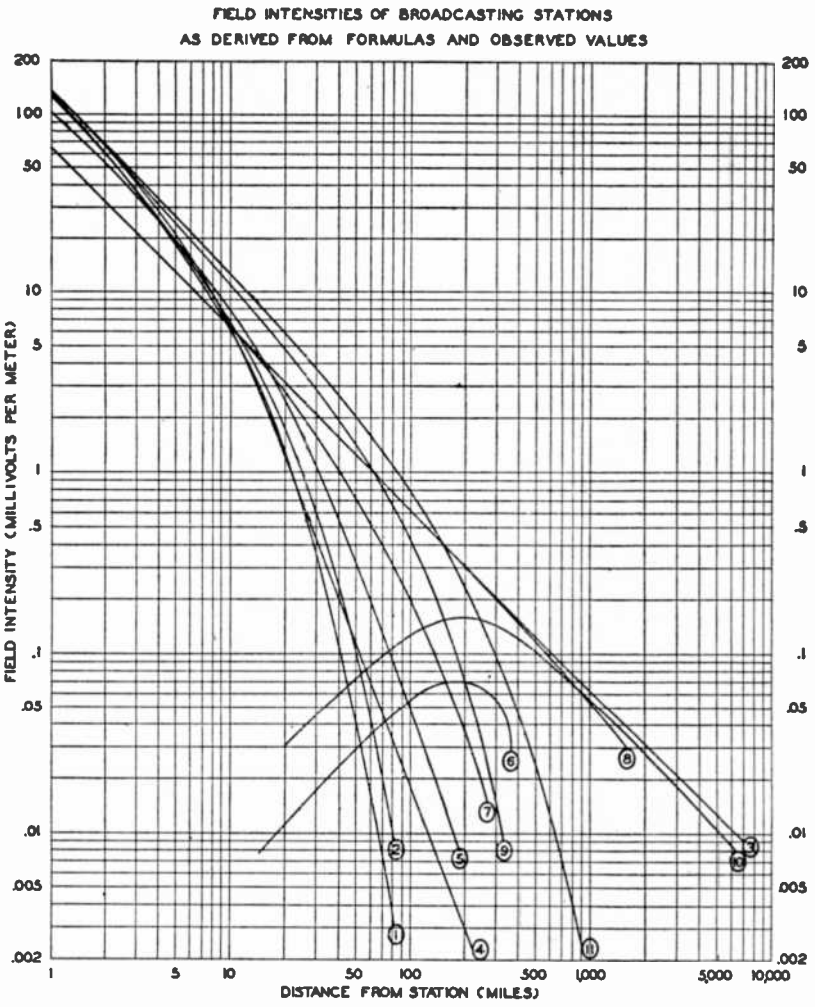


FIGURE 1

LEGEND FOR FIGURE 1

(1) Bell Laboratory—ground wave:

$$E=\frac{19.42\times10^{4}}{D}\sqrt{P_r}\;e^{\frac{-101.5\;a\;D}{\lambda^{0.6}}}$$

a=0.0246 for suburban territory in northeastern United States

(Proceedings of I. R. E., August, 1929.)

(2) Hogan—ground wave:

$$E=\frac{5.8\sqrt{P_r}}{D}\;e^{-a\;D\sqrt{f}}$$

a=0.002 for Detroit territory

(Testimony before the Federal Radio Commission November 22, 1930, Docket 790 WWJ.)

(3) Hogan—sky wave:

$$E=\frac{2.9\sqrt{P_r}}{D}$$

(Testimony before the Federal Radio Commission February 18, 1930, Docket 679 WTMJ.)

(4) Van der Pol—ground wave:

$$E=\frac{300\sqrt{P_r}}{D}\times\frac{2+0.2p}{2+p+0.6p^2}$$

$$p=\frac{\pi}{6\times10^{15}\times\delta\times\lambda}$$

(C. C. I. R. Document No. 70, March 21, 1931.)

(5) Eckersley—ground wave.
(Proceedings of I. R. E., July, 1930.)

(6) Eckersley—maximum sky wave.
(Proceedings of I. R. E., July, 1930.)

(7) Average of day measurements made by United States supervisors of radio.

(8) Average of night measurements made by United States supervisors of radio.

(9) Barron—ground wave:

$$E=\frac{379\pi h\ I f}{10^7\ D}(1-a)^D$$

$$a=0.01$$

(Testimony before the Federal Radio Commission June 26, 1931, Docket 1183 WAAT.)

(10) Barron—average sky wave:

$$E=\frac{190\pi h\ I f\cos\theta}{10^7\ D}$$

(Testimony before the Federal Radio Commission June 26, 1931, Docket 1183 WAAT.)

(11) Austin-Cohen—ground wave:

$$E=\frac{300\sqrt{P_r}}{D}e^{\frac{-a\ Dkm}{\lambda^{0.6}}}$$

a=0.0014 for sea water

(C. C. I. R. Document No. 70, March 21, 1931.)

These curves are plotted for the following values, unless otherwise noted above:

E=field intensity, millivolts per meter.
P_r=radiated power=500 watts.
P_i=antenna power=1,000 watts.
a=absorption coefficient.
λ=wave length=300 meters.
D=distance in miles.
δ=conductivity of ground=10^{-13}.
f=frequency=1,000 kilocycles per second.
h=effective height of transmitting antenna=105 feet.
I=current at base of antenna, amperes=$\sqrt{\frac{P_i}{R}}$
R=total antenna resistance=10 ohms.
θ=angle between ground and sky ray at transmitter.

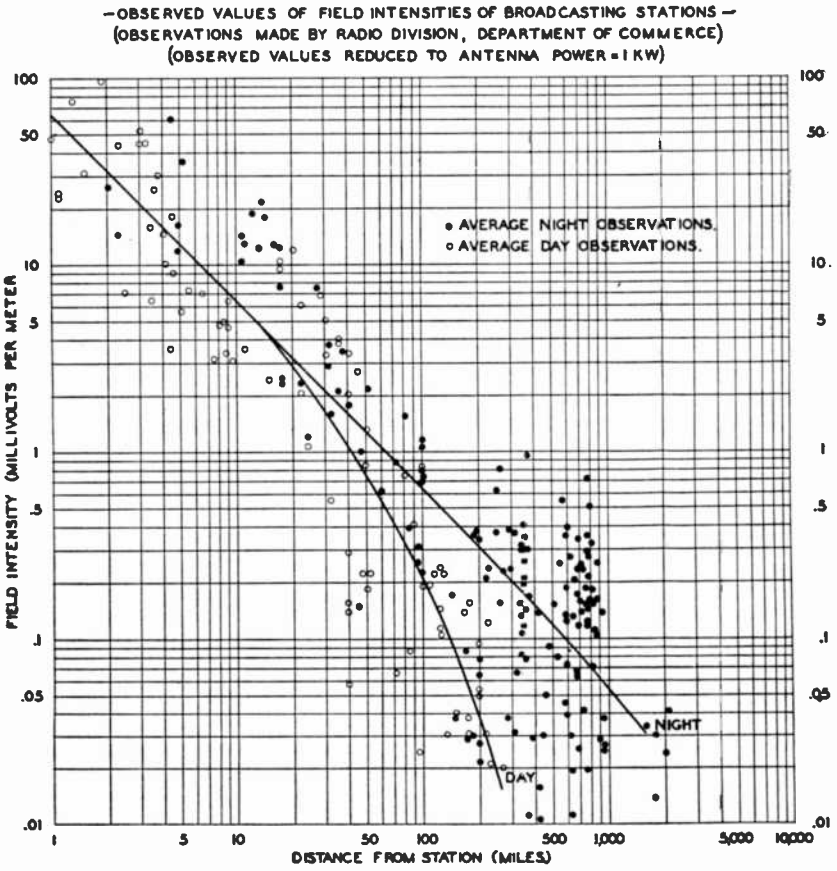

—OBSERVED VALUES OF FIELD INTENSITIES OF BROADCASTING STATIONS—
(OBSERVATIONS MADE BY RADIO DIVISION, DEPARTMENT OF COMMERCE)
(OBSERVED VALUES REDUCED TO ANTENNA POWER = 1 KW)
FIELD INTENSITY (MILLIVOLTS PER METER)
100
50
10
5
1
.5
.1
.05
.01
AVERAGE NIGHT OBSERVATIONS.
AVERAGE DAY OBSERVATIONS.
NIGHT
DAY
1
5
10
50
100
500
1,000
5,000
10,000
DISTANCE FROM STATION (MILES)

FIGURE 2

COMMERCIAL COMMUNICATIONS SECTION

E. K. JETT, *Acting Chief*

GENERAL

Radio engineers of the world who attended the first meeting of the International Technical Consulting Committee on Radio Communications at The Hague in 1929 recognized that it is technically possible to operate radiotelegraph stations with a frequency separation of approximately 0.1 per cent, in Opinion No. 18, as follows:

ALLOCATION OF FREQUENCIES ABOVE 6,000 KILOCYCLES—GENERAL GROUPING OF FREQUENCIES

The C. C. I. Radio, with a view to the development of world communications on frequencies above 6,000 kilocycles, recommends, to facilitate the methodical use of these in the future as fast as progress in the technic is made, that, in the bands in this part of the spectrum exclusively reserved for fixed services, only frequencies expressed as far as possible in numbers multiples of 5 be allocated by the administrations.

It is understood that the present state of the art, especially in the higher frequencies, does not always permit two stations to work simultaneously on two frequencies differing only by 5 kilocycles and that present practice shows that a difference of frequencies of about 0.1 per cent between two telegraph stations is generally desirable in order to secure sufficient protection against interference.

However, when the various conditions permit it, telegraph stations may work with a frequency interval less than 5 kilocycles.

It is further recommended that, in any band exclusively reserved for fixed services, the frequencies used by a single administration or a single private enterprise should, as far as possible, be grouped together.

The communication band width of a radiotelegraph station is used as a unit. The band width necessary for any other type of emission is determined in each case by the type of emission.

The commission has desired to conform to this opinion and reallocate the high-frequency spectrum above 1,500 kilocycles to services and stations in accordance therewith. A plan to take this action was prepared, but no action could be taken to place it in effect because of stay orders of the Court of Appeals of the District of Columbia. These stay orders, however, were modified by the court, May 23, 1931, and the new plan can now be presented to the commission. The communication companies have been consulted and have cooperated fully in this work and are in agreement with the changes proposed. In order that changes consistent with such a plan could be made and special cases of interference could be rectified, General Orders 62, 88, and 88 amended, were repealed by General Order 117.

The total number of frequencies available for assignment to stations of the various services under the proposed plan is given in Table X. All of these frequencies, however, are not available to the United States.

TABLE X.—*Number of frequencies allocated to all services*

A. LOW AND MEDIUM FREQUENCY RANGE, 10 TO 1,500 KILOCYCLES

Service	10 to 100 kilocycles	100 to 550 kilocycles	550 to 1,500 kilocycles	Total each service	Total all bands
1. Fixed	184	2		186	186
2. Government	22	161		183	183
3. Maritime					65
(a) Coastal telegraph		53		53	
(b) Ship telegraph		9		9	
(c) Maritime calling		2		2	
(d) Direction finding		1		1	
4. Guard bands		79		79	79
5. State police		1		1	1
6. Aircraft		2		2	2
7. Broadcast			96	96	96
8. Shared					62
(a) Government and fixed		7		7	
(b) Government and fixed—Alaska		6		6	
(c) Government and coastal telegraph		4		4	
(d) Government, fixed and coastal telegraph		6		6	
(e) Government and ship telegraph		2		2	
(f) Government, coastal telegraph and ship telegraph		2		2	
(g) Government, coastal telegraph, ship telephone, and ship telegraph		1		1	
(h) Government and aeronautical		2		2	
(i) Government and Canada—Aeronautical		6		6	
(j) Fixed and coastal telegraph		25		25	
(k) Coastal telegraph and ship telegraph		1		1	
Total	206	372	96	674	674

B. MEDIUM-HIGH FREQUENCY RANGE, 1,500 TO 6,000 KILOCYCLES

Service	1,500 to 3,000 kilocycles	3,000 to 6,000 kilocycles	Total each service	Total all bands
9. Fixed		193	193	193
10. Government	34	67	101	101
11. Maritime				77
(a) Coastal telegraph		7	7	
(b) Coastal telephone		11	11	
(c) Coastal harbor	20		20	
(d) Ship telegraph		11	11	
(e) Ship telephone		12	12	
(f) Ship harbor	12		12	
(g) Fire	2		2	
(h) Maritime calling	2		2	
12. Guard bands	3	2	5	5
13. Emergency				20
(a) Municipal police	15		15	
(b) State police	4		4	
(c) Power		1	1	
14. Experimental				128
(a) General experimental	4	4	8	
(b) Experimental visual broadcasting	118		118	
(c) Experimental visual broadcast sound track	2		2	
15. Special				11
(a) Broadcast pick-up	6		6	
(b) Motion picture	2		2	
(c) Agriculture		3	3	
16. Amateur	72	85	157	157
17. Aviation	66	76	142	142
18. Shared				140
(a) General communication		100	100	
(b) Government and amateur		16	16	
(c) Government and aviation		7	7	
(d) Broadcast pick-up and aviation	6		6	
(e) Experimental visual broadcast and geophysical	6		6	
(f) Government and experimental visual broadcast	2		2	
(g) Aviation and maritime calling		1	1	
(h) Ship telegraph and coastal telegraph		2	2	
Total	376	598	974	974

TABLE X.—*Number of frequencies allocated to all services*—Continued

C. HIGH-FREQUENCY RANGE, 6,000 TO 28,000 KILOCYCLES

Service	6,000 to 8,000 kilocycles	8,000 to 10,000 kilocycles	10,000 to 12,000 kilocycles	12,000 to 14,000 kilocycles	14,000 to 16,000 kilocycles	16,000 to 18,000 kilocycles	18,000 to 21,550 kilocycles	21,550 to 23,000 kilocycles	23,000 to 28,000 kilocycles	Total each service	Total all bands
19. Fixed	100	111	125	61	89	46	166	11	------	709	709
20. Government	2	36	2	32	1	23	6	3	21	126	126
21. Maritime											213
(a) Coastal telegraph	17	20	15	21	------	13	------	28	------	114	------
(b) Coastal telephone	3	3	3	3	------	3	------	3	------	18	------
(c) Ship telegraph	8	9	6	7	------	10	------	7	------	47	------
(d) Ship telephone	3	3	------	6	------	3	------	3	------	18	------
(e) Mobile press	2	2	2	------	------	2	------	2	------	10	------
(f) Maritime calling	1	1	1	1	------	1	------	1	------	6	------
22. Guard band	1	------	------	------	------	------	------	------	------	1	1
23. Amateur	31	------	------	------	27	------	------	------	------	58	58
24. Aviation	16	1	------	1	------	1	------	------	------	19	19
25. Experimental											74
(a) Relay broadcast	14	10	14	------	16	3	5	------	------	62	------
(b) General experimental	2	2	------	2	------	2	------	------	4	12	------
26. Shared, Government and fixed	------	2	------	------	------	------	------	------	------	2	2
27. Unreserved	------	------	------	------	------	------	------	------	175	175	175
Total	200	200	168	134	133	107	177	58	200	1,377	1,377
Total number of frequencies allocated to all services	------	------	------	------	------	------	------	------	------	------	3,025

FIXED SERVICE—RADIOTELEGRAPH

In the United States there are seven communication companies authorized to conduct public radiotelegraph communication service between the United States and other nations of the world. There are radio channels of communication to practically all nations of the world, either directly or indirectly, through foreign communication agencies. A continual effort is being made by the operating companies to extend their service by opening new circuits and improving the reliability of existing circuits.

Table XI shows the extent of the international radiotelegraph service from the United States and the number of frequencies used for this service.

TABLE XI.—*Points of communication and number of frequencies used in international point-to-point radiotelegraph service*

Company	Number of licensed frequencies: 10 to 100 kilocycles	1,500 to 6,000 kilocycles	6,000 to 23,000 kilocycles	Points of communication		
				42 POINTS		
1. R. C. A. Communications (Inc.).	11	4	96	England.	Czechoslovakia.	Cape of Good Hope.
				Italy.	China.	Canada.
				Holland.	Philippine Islands.	Russia.
				Turkey.	Hawaii.	Iceland.
				Norway.	Java.	Spain.
				Venezuela.	Switzerland.	Santo Domingo.
				France.	Chile.	Cuba.
				Brazil.	Denmark.	Dutch Guiana.
				Sweden.	Curacao.	Porto Rico.
				Germany.	St. Martin.	Panama.
				Poland.	Nicaragua.	Mexico.
				Belgium.	Persia.	India.
				Colombia.	Syria.	Fiji Islands.
				Argentina.	French Indo-China.	Liberia.
				23 POINTS		
2. Mackay Radio & Telegraph Co.	[1] 11	[1] 8	52	Japan.	Australia.	China.
				Dutch East Indies.	Hawaii.	Guam.
				Philippine Islands.	Midway Island.	England.
				France.	Germany.	Hungary.
				Portugal.	Colombia.	Venezuela.
				Spain.	Argentina.	Chile.
				Peru.	Brazil.	Cuba.
				Austria.	Czechoslovakia.	
				16 POINTS		
3. Press Wireless (Inc.).	------	[1] 21	20	Hawaii.	South America.	
				England.	Mexico.	Italy.
				China.	Cuba.	France.
				Philippine Islands.	New Zealand.	Canada.
				Australia.	Central America.	Germany.
				Nova Scotia.	Alaska.	
				4 POINTS		
4. Globe Wireless (Ltd.).	------	------	10	Hawaii.	Guam.	
				Philippine Islands.	China.	
				10 POINTS		
5. Tropical Radio Telegraph Co.	5	------	7	Nicaragua.	Panama.	Salvador.
				Costa Rica.	Cuba.	Guatamala.
				Porto Rico.	Mexico.	Colombia.
				Honduras.		
6. U. S. Liberia Radio Corporation.	------	------	[2] 2	Liberia.		
7. Southern Radio Corporation.	------	------	[2] 2	Bolivia.		

[1] Licensed at present for domestic communication only.
[2] The U. S. Liberia Radio Corporation and Southern Radio Corporation shared with each other a total of 2 frequencies.

There is no company at present authorized to conduct a nation-wide domestic point-to-point radio service. International communication companies are permitted to use frequencies above 6,000 kilocycles for domestic communications on condition that no interference to international service will result. Long-established domestic radio circuits on the Pacific coast and between these points and New York City continue in operation. Radio is used also for communication between certain points in the States of Oklahoma, Texas, and Kansas, where wire-line facilities are inadequate to serve the industries centered in these localities.

A new type of domestic public press service, known as multiple address radiotelegraph, was authorized by the issuance of permits for the construction of radio stations at San Francisco, Calif.; Denver, Colo.; Chicago, Ill.; Atlanta, Ga.; and Carlstadt, N. J. These stations will be used for the transmission by radiotelegraph on two low frequencies, supplemented by the use of five high frequencies during daylight hours only, of information intended for publication by newspapers and press agencies. The messages will be recorded automatically by receiving printer instruments located at points throughout the United States.

The three high-frequency channels in the medium-high-frequency band, 1,500–6,000 kilocycles, allocated for agriculture service continue to be used to advantage by the Federal-State Marketing Service of California for the dissemination of market reports and other agricultural information throughout the State by radiotelegraph. In addition, the commission granted this licensee the use of two high-frequency channels in the band above 6,000 kilocycles for daylight use within the State of California, subject to the limitation that no interference shall result from the use of these frequencies to any international service.

FIXED SERVICE—RADIOTELEPHONE

International radiotelephone communication has had further growth and development during the year. To provide for an additional telephone circuit between the United States and Europe and to provide greater reliability of service, a permit was issued for the construction at Bradley, Me., of a second low-frequency transoceanic radiotelephone station. This station will be used to augment the present circuits, particularly at times when the high frequencies become erratic in operation, due to magnetic storms or other peculiar phenomena which at times seriously interrupt the high-frequency circuits. It has been determined, by systematic observation, that a combination of low and high frequency channels leads to far more reliable radiotelephone service than either portion of the radio spectrum used separately.

The volume of traffic over the present trans-Atlantic radio circuits and estimates of future growth show that ultimately more circuits may be required to provide the necessary service to Europe and other parts of the world. At present about 92 per cent of the world's telephones are offered commercial interconnection in one network by the use of radio for the intercontinental circuits.

Several new connections have been planned, some of which are under construction. A permit has been granted for the construction of new facilities at Lawrenceville, N. J., to provide, upon completion, about December 1, 1931, a public telephone service to Bermuda. The corresponding station in Bermuda is being established by Imperial & International Communications (Ltd.), of London, and will be operated in conjunction with the Bermuda Telephone Co. There is now under construction a radiotelephone station at Dixon, Calif., through which telephone service will be provided to the Hawaiian Islands, through the system of the Mutual Telephone Co. in the Hawaiian Islands, and at a later time to Australia, the Philippine Islands, Japan, and countries in the Far East.

All international radiotelephone stations in the United States are operated by the American Telephone & Telegraph Co. or its associated companies. The number of frequencies used and the points of communication are given in Table XII.

TABLE XII.—*Points of communication and number of frequencies used in international point-to-point radiotelephone service*

Company	Number of licensed frequencies		Points of communication
	10 to 100 kilocycles	6,000 to 23,000 kilocycles	
American Telephone & Telegraph Co.	2	15	England: Connection with telephone network of western Europe and with Australia, Java, Canary Islands, and Ceuta, Africa. Argentina: Connection with telephone networks of Argentina, Chile, and Uruguay. Brazil. Bermuda.
Transpacific Communications Co.	-------	6	This company is not yet licensed, but construction permits issued for communication with Hawaii and other points in the Pacific and Far East.

MARITIME

Maritime mobile service, which includes both radiotelegraph and radiotelephone communications between ships and the shore and between ships at sea, uses groups of frequencies below 550 kilocycles and above 1,500 kilocycles. The use of low frequencies for radiotelegraph is long established and carries a large amount of the present traffic. In the last few years, however, the use of frequencies above 1,500 kilocycles has been rapidly developed.

The assignment of these frequencies is now made under a plan which was formulated in 1929. Because of new developments, principally radiotelephony, this plan is not now entirely satisfactory. Early in 1930 a proposed revision of this plan, based on a frequency separation between stations of approximately 0.1 per cent, was worked out in cooperation with representatives of the commercial operating companies.[1] However, it has not been possible to put this plan into effect because of the existence of stay orders issued by the Court of Appeals of the District of Columbia. These stay orders have been modified, and it is now possible to proceed with the reallocation of frequencies to maritime services. The changes in frequency assignments necessary are being worked out in cooperation with the operating companies in such a way as to cause the minimum amount of confusion and interruption to service.

The increasing use of frequencies above 1,500 kilocycles by ocean-going vessels makes it possible for passengers on board ship to have a direct radiotelegraph message service with land stations in all parts of the world. Satisfactory communication with ships at great distances from land is now being maintained by the use of relatively

[1] See Annual Report of Federal Radio Commission for year ending June 30, 1930, p. 65, for details of this plan.

low-power and inexpensive installations, as compared with transmitters necessary for equivalent service using frequencies below 550 kilocycles. The medium frequencies are more reliable at the present stage of development for consistent contact with shore over comparatively shorter distances, and the majority of ships continue to operate only in this band.

The steamship *Leviathan*, of the United States, and the steamships *Olympic*, *Majestic*, *Homeric*, *Belgenland*, and *Empress of Britain* are now equipped to provide radiotelephone connection either to Europe or the United States. Communication with either the British or American land stations is possible at practically all times during the passage between New York and Europe. A passenger on these ships may therefore speak by telephone at any stage of the journey to any telephone subscriber in the United States, Canada, Mexico, or Cuba, on the one hand, or to any telephone subscriber in Europe.

A new type of service, designated as "public coastal harbor telephone service," was authorized by the granting of a permit for the construction of a radiotelephone station on Staten Island, N. Y., to provide general public telephone communication with any and all harbor vessels equipped for this service. Three subsequent construction permits have been issued, authorizing the installation of additional stations of this class at Seattle, Wash., San Francisco, Calif., and Wilmington (near Los Angeles), Calif. Applications have been filed for authority to erect similar stations at Boston, Mass. Statistics indicate that this service may be required at other harbors of major importance, and frequency allocations have been made with this in view.

The stations now being established will provide service primarily for tugboats, car ferries, and other small harbor craft. They will, however, provide public telephone service with ocean vessels or other craft while such vessels are within transmission range. Connections will be made to the public telephone wire network at each of these harbors. The frequencies selected for this service are in the vicinity of 2,500 kilocycles for land stations and of 2,300 kilocycles for ship stations.

The commission granted a construction permit for the erection of a radiotelegraph land station near Cincinnati, Ohio, in response to a growing need for communication with vessels traversing the Mississippi, Ohio, and Missouri Rivers. The site near Cincinnati was chosen because of its advantageous location on the Ohio River, midway between the terminus of navigation at Pittsburgh and the juncture with the Mississippi River near Cairo, Ill. Communication with any vessel on the Ohio River will be over a maximum distance of approximately 750 miles, which will allow the use on board ship of inexpensive low-power radiotelegraph equipment. At the beginning of this service, message traffic is anticipated from eight different companies operating a total of 47 ships.

Marine relay service, which has existed for several years in connection with the routing of marine traffic between the major coastal telegraph stations, was officially recognized as a separate service by the commission by the adoption of General Order 100. This order defines marine relay service as a radiotelegraph communication service carried on between coastal stations communicating with one another for the relaying of maritime mobile communications or

messages pertaining thereto. The order limits the service to the exchange of operating signals and the movement of message traffic destined to or originating at maritime mobile stations at times when the use of other means of communication would cause undue delay, and the service is not to be used for the regular routing of traffic. Licenses for this service are issued only to coastal radiotelegraph stations that provide service to ocean going and Great Lakes vessels. The frequencies authorized are those already assigned to individual coastal stations.

AVIATION

The application of radio to the needs of aviation has kept pace with the rapid development of aviation, and the Federal Radio Commission has made every effort to provide frequencies to meet the needs of the service. Because of the extreme congestion in all portions of the radio spectrum, great care had to be exercised in the frequency allocation to this new service. The needs of aviation have been met, however, by careful planning and through the cooperation of all users of radio frequencies, including Government departments, commercial radio operating companies, and the operators of air transport lines.

The increased safety in aviation and the increase in reliability of air transportation are in a large measure due to radio. Transport airplanes which are now flying over the air routes are in constant communication with the airports, reporting positions and other pertinent information and receiving instructions and assistance from the ground. Practically every established air transport line now flying a regular schedule is equipped with 2-way radio communication.

In addition to the service supplied their own airplanes, the transport companies provide service to itinerant aircraft or other aircraft which may come over their lines. Twenty-four-hour service is available in many cases.

At the time the plan of frequency assignments to aviation was originally developed the air transport companies were operating a large number of more or less disconnected routes. During the last year, however, there has been a reorganization of these companies which has resulted in three major transcontinental lines, an Atlantic coast line, and one international line to the nations south of the United States, each with a number of "feeder" systems. These lines are the principal ones now interested in radio communication.

This reorganization of air transport companies necessitated a readjustment of frequency assignments to meet the needs. This was done by means of General Order 99, and amendments were made to that order as the experience and needs of operations required.

Under the present organization, as provided by General Order 99 and subsequent amendments, there are five major chains of communication—the northern transcontinental chain, from New York to San Francisco via Chicago and Salt Lake City; the midtranscontinental chain, from New York to Los Angeles via St. Louis (Mo.), Tulsa (Okla.), and Albuquerque (N. Mex.); the southern transcontinental chain, from Boston to Los Angeles via Albany (N. Y.), Cleveland (Ohio), Memphis (Tenn.), Little Rock (Ark.), Dallas

and El Paso (Tex.); the eastern continental chain, from New York to Miami either by Atlanta (Ga.) or Charleston (S. C.); and the southern international chain, extending from Miami (Fla.) and Brownsville (Tex.) to the West Indies, Mexico, and Central and South America. These routes have shorter routes which connect with the main route, and, as far as communications are concerned, they operate as integral parts of the main route. A complete picture of the extent of the aviation communication systems is given in the map in Figure 3.

Radiotelephone is used in all communications with airplanes except on the southern international chain where radiotelegraph is used.

The frequencies assigned to these chains under the provisions of General Order 99 and amendments are, with a few exceptions, available for use on all points on the chain. The responsibility of distributing the use of these frequencies over a chain to reduce interference to a minimum is left to the air transport company flying airplanes over the route.

All frequencies assigned for aviation purposes are designated in three classes, as follows:

(*a*) Frequencies used for distress, calling, and aids to navigation.

(*b*) Frequencies used by aeronautical or aircraft stations on a chain or chains for communication purposes either between aeronautical stations and aircraft or between aeronautical stations.

(*c*) Other aviation frequencies.

The distress, calling, and navigational frequencies are as follows:

278 kilocycles, airport frequency: Calling and working frequency from all ground stations to aircraft. Power not to exceed 15 watts. Aeronautical stations licensed to use this frequency are required to provide service, without discrimination, for all and any aircraft.

333 kilocycles: International air calling frequency to be used only beyond the limits of the United States, and then only for communication between aircraft and foreign stations.

375 kilocycles: Radio compass.

500 kilocycles: International calling and distress frequency for ships and aircraft over the seas.

3,106 kilocycles: National calling and working frequency for all itinerant aircraft. It may also be assigned to transport aircraft in addition to the chain frequencies. Aircraft calling or working ground stations on this frequency will conduct a 2-way communication by utilizing the 3,106-kilocycle frequency for transmitting from aircraft to the ground and the 278-kilocycle frequency for receiving from the ground to aircraft.

5,525, 11,050, 16,580 kilocycles: Primarily for coastal stations and ships. May also be assigned to aircraft only for the purpose of calling a coastal station or ship when aircraft is in flight over the sea.

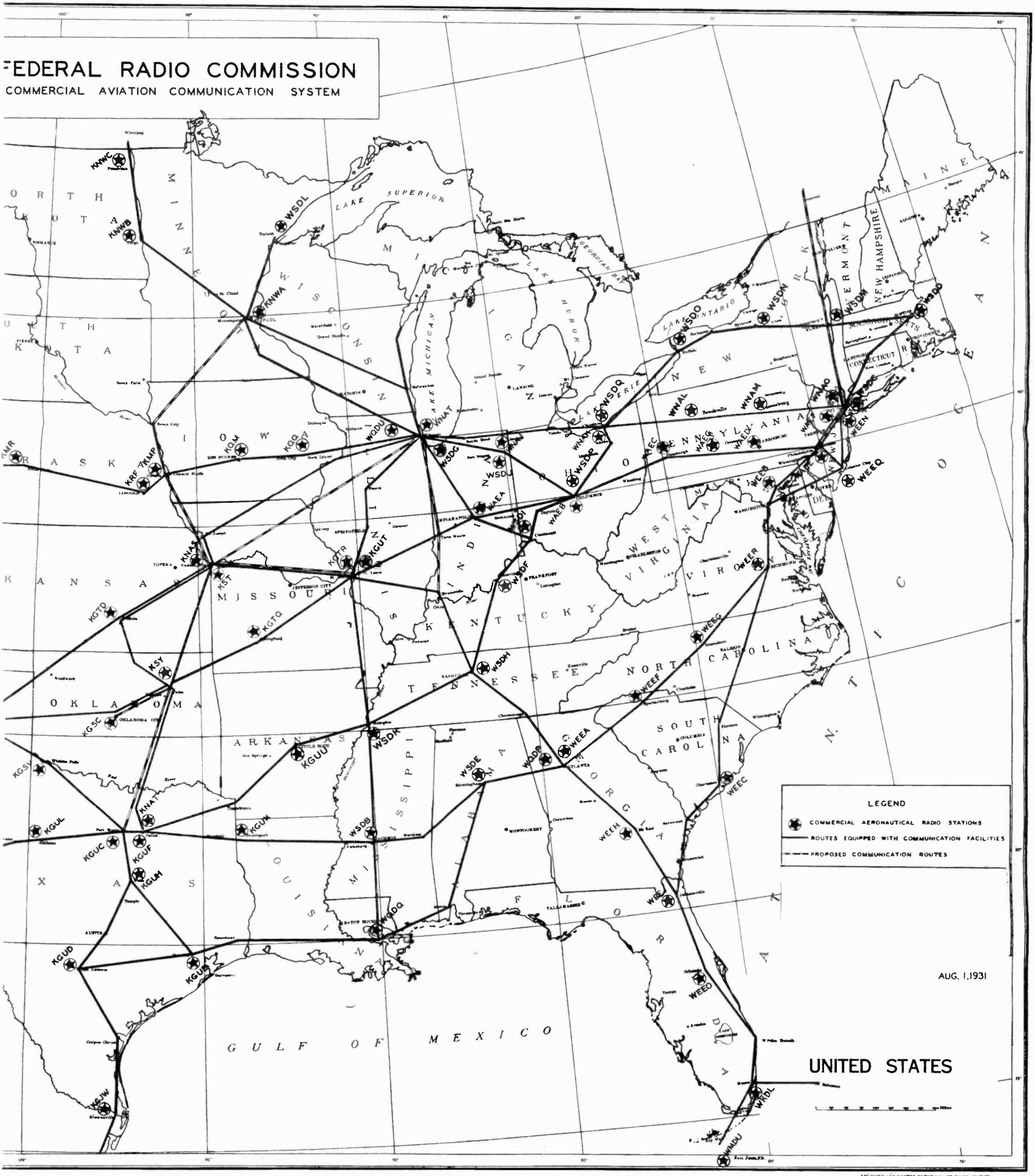
414, 457 kilocycles: Working frequencies for aircraft on sea flights desiring intermediate frequencies. Those desiring high frequencies may use the frequencies designated for maritime calling and working.

The frequencies used by aeronautical or aircraft stations on a chain or chains and the reserve list of other aviation frequencies appear in the bands above 1,500 kilocycles. The majority of these, however, are of the order of 3,000 kilocycles for night communication and 5,500 kilocycles for day operation.

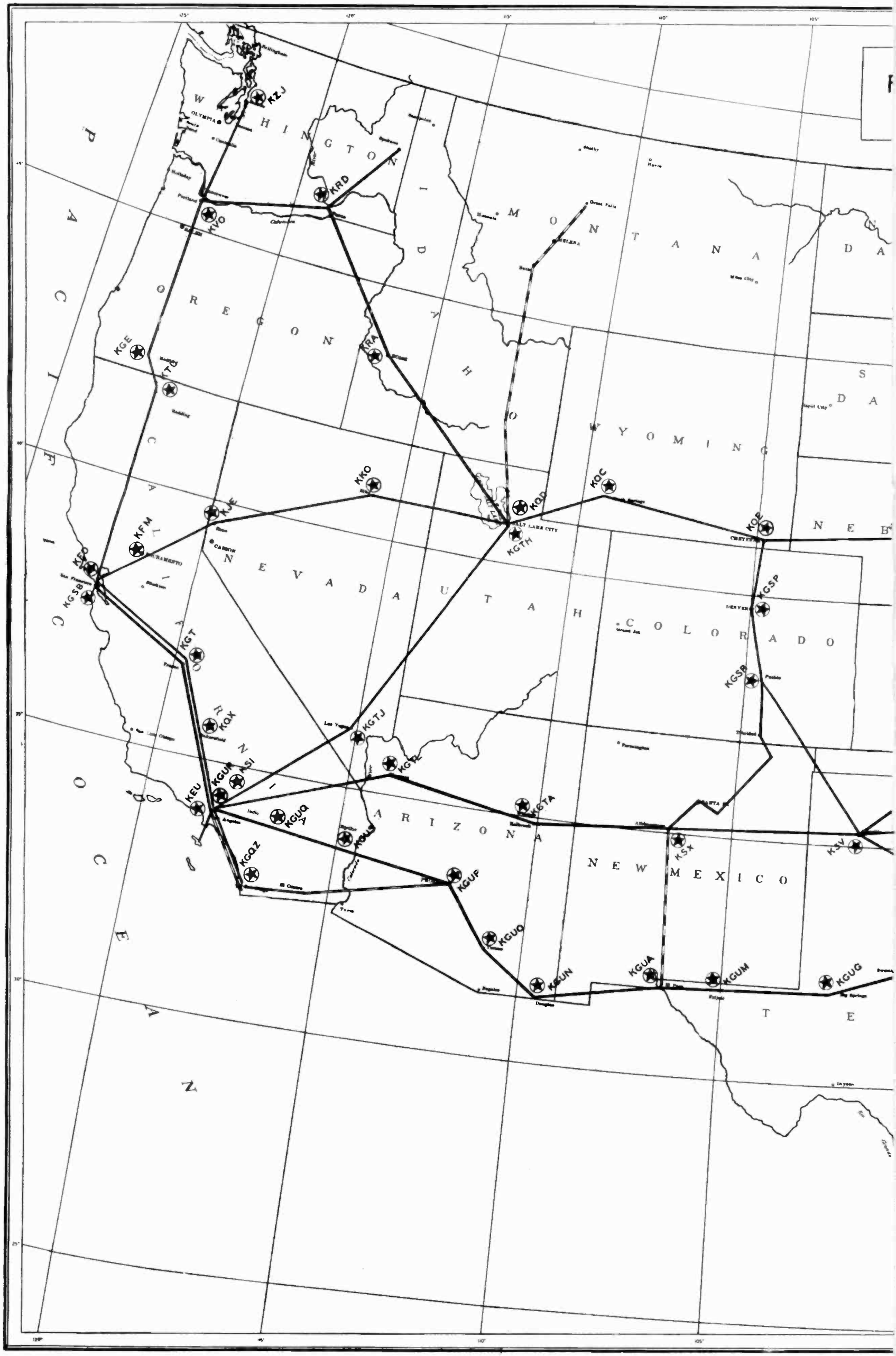
There was on June 30, 1931, a total of 101 ground stations, either licensed or under construction, for aeronautical radio service on the five chains. In addition, many independently owned airport sta-

FEDERAL RADIO COMMISSION

COMMERCIAL AVIATION COMMUNICATION SYSTEM



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tions were in operation to provide radiocommunication between ground and itinerant aircraft at points where regular chain service is not in operation.

POLICE

The use of radio by police departments for transmission of orders from police headquarters to policemen in automobiles patrolling the streets has developed rapidly. The first radio station for the exclusive use of a city police department was established in Detroit in 1927. In April, 1930, the commission adopted the first organized plan (General Order 85) for the assignment of frequencies to municipal police in order to make possible an efficient service on the limited number of frequencies available. At that time 29 cities had stations in operation. On June 30, 1931, there were 62 separately licensed police radio stations. In addition a State police service is maintained in Michigan, Massachusetts, and Pennsylvania, the latter State carrying on only a point-to-point radiotelegraph communication service with State police barracks.

In the municipal police radio service, policemen patrol the streets in automobiles which are equipped with radio receivers permanently adjusted to the frequency of the transmitting station of that city. Orders are given in voice from a central point by a police officer, who dispatches the various cars to locations requiring police attention. There is consequently no delay in getting orders from headquarters to police in the vicinity of a crime or disorder. The frequencies used for the service are above 1,500 kilocycles, and the orders can not be heard on a radio-broadcast receiver and there is no interference to broadcast reception.

A number of city police departments have established a police service to serve an entire metropolitan area. Each of these cities entered into agreement with surrounding municipal and county governments under the provisions of which they agreed to furnish police service to all municipalities without discrimination, and the subscribing municipalities agreed, in turn, not to request independent broadcasting facilities. This agreement makes it possible to give a coordinated and efficient police service.

With only eight frequencies available for emergency police service it is obviously impracticable to authorize a different frequency for each municipality. The allocation plan, therefore, is based on a zone system of frequency assignment whereby all cities within the same zone are required to cooperate in the joint use of a common frequency. It is believed also that the zone system of allocation is to be preferred, because it permits the interception of emergency broadcast messages by all police forces within the area, thereby increasing the efficiency of the system in combating major crimes. The use of several units of low power instead of a single unit of higher power to cover a city has been encouraged as a means of avoiding interference and of giving better coverage of the city. This has been used in a few cities with good results.

An illustration of the joint use of one frequency is the Detroit area, in which there are located the two transmitters of the city of Detroit and transmitters operated by two neighboring cities, Grosse

Point and Highland Park. The actual operation in this area is conducted as follows: In each control room there is installed a monitor receiver, together with loud-speaker, tuned to the joint police frequency. If the frequency is in use by either of the other municipalities, the operator is aware of such fact and will not attempt to put his call through until the other city has signed off. If, however, he has an emergency message which can not be delayed, it is possible to gain the immediate use of the frequency by the exchange of signals over a private leased wire. In any event it takes but a few seconds to announce an alarm, and serious delay is not experienced.

The information transmitted over most police radio stations is obtained from two general sources:

(1) From citizens by means of the telephone or call boxes.

(2) From the precinct stations and the several divisions of the police department.

The radio-equipped patrol cars are, in general, arranged throughout the city by precincts and each regular police precinct is divided into what are termed "patrol districts." A radio car is assigned to each district and is constantly on watch while patrolling the district. When an emergency arises in the district, the car is immediately dispatched to the scene of trouble.

The patrol districts are chosen with the following points in mind:

(1) Density of population.

(2) Crime record of the territory considered.

(3) The traffic problem:

(*a*) Density of traffic.

(*b*) Congested points.

(*c*) Possible obstructions, such as railroads, etc.

(4) Other police protection.

The radio cars are usually of two types, termed "scout cars" and "cruisers." The scout cars are light automobiles and are usually manned by two policemen. It is these cars that are assigned to the patrol districts. The cruisers are heavy, high-powered cars, and usually carry about four men. The cruisers are equipped with riot guns, tear-gas bombs, and are designed to handle the more serious crimes. A cruiser patrols through an entire precinct and covers territory which may also be covered by scout cars, so that during serious trouble the two policemen in a scout car are augmented by the crew in the cruiser.

The following method of handling a call is used by many police departments: A citizen calls the police department by telephone. This call comes direct to the telephone operator in the main dispatching room, who turns the information over to the police dispatcher. The dispatcher then determines the orders to be given and connects a microphone through to the radio station. He then gives his orders by talking into the microphone, and those orders are received by all automobiles in the streets, thus informing all cars of movements of any others. His orders are also heard by loud-speakers in various parts of his station and by means of receiving sets in other police stations of the city and adjacent communities. The call is sometimes repeated, either by the dispatcher or the radio operator, to insure that it is received.

The car upon receiving its orders immediately proceeds to the scene of the trouble. As soon as the patrol crew has completed its work, one member of the crew telephones back to the radio station, and the patrol car is then considered ready for new service. There is no provision for radio transmission from the automobile to the central station.

The following is a typical report taken from the log of a large city and representing one month's record of emergency broadcast messages:

Total messages broadcast	6,639
Total number of runs	4,079
Total minutes on runs	8,774
Total arrests	418
Average time on runs, in minutes	1.99
Recoveries:	
Taxicabs	3
Automobiles	10
Motor cycles	1
Lost children	4
Insane persons	1
Cash register	1
Confiscated:	
Guns	10
Knives	1

From the above it is noted that if the average time consumed in making one announcement is 30 seconds, an emergency message was transmitted on the average of once in every 13 minutes. It is of further interest to note that an average of one arrest was made during each successive period of 1 hour and 45 minutes.

Another large city reported only 3,001 messages broadcast during the same month. These are classified as follows:

Number of messages	Nature of transmission
955	Call your station; meet detectives.
411	Automobiles stolen.
342	Automobiles recovered.
318	Minor complaints.
101	Accidents.
91	Robberies.
77	Descriptions of persons wanted.
71	Pick up automobiles; persons wanted.
62	Fights.
28	Burglaries.
20	Assaults.
4	Murders.
1	Rape.

NOTE.—Other announcements related to bank box alarms, prowlers, drownings, mad dogs, false fire alarms, suspicious persons, shootings, etc.

The use of radio by State police departments is only in service in three States, and it has not yet been determined whether or not this use will be extended. This service is closely related to city service.

The engineering division is in close touch with the police departments operating radio service and will assist in developing it to the maximum efficiency.

Table XIII gives the cities and States authorized to operate police radio stations or which have stations under construction.

TABLE XIII.—*State and municipal police radio stations*

(*a*) LICENSED AND IN OPERATION

Call letter	Name	Call letter	Name
WPDO	City of Akron.	WPDE	City of Louisville.
WPDY	City of Atlanta.	WPDW	Metropolitan police, Washington, D. C.
KGPJ	City of Beaumont.	WRDS	State of Michigan.[1]
KSW	City of Berkeley.	WPDK	City of Milwaukee.
WMJ	City of Buffalo.	KGPB	City of Minneapolis police department.
KGOZ	City of Cedar Rapids.	WPY	City of New York police department.[2]
WPDV	City of Charlotte.	KGPI	City of Omaha, Nebr.
WPDC	City of Chicago police department.	WPDJ	City of Passaic, N. J.
WPDD	Do.	KGJX	Pasadena police department.
WPDB	Do.	WBA	Pennsylvania State police.[1]
WKDU	City of Cincinnati.	WBR	Do.[1]
WBBH	City of Cleveland.	WDX	Do.[1]
WMP	Commonwealth of Massachusetts, department of public safety, division of State police.[1]	WJL	Do.[1]
		WMB	Do.[1]
KVP	City of Dallas police and fire signal department.	WPDP	City of Philadelphia.
		WPDU	City of Pittsburgh.
KGPN	City of Davenport.	WPDH	City of Richmond.
WCK	Detroit police department.	WPDR	City of Rochester.
WPDX	Do.	KGPC	City of St. Louis.
WPDF	City of Flint.	WPDS	City of St. Paul, department of public safety.
WPDI	Franklin County Board of County Commissioners.	KGPA	Seattle police department and Seattle fire department.
WRDR	Township of Grosse Point.	KGPK	City of Sioux City.
WMO	City of Highland Park.	WRDQ	City of Toledo.
WMDZ	City of Indianapolis.	WPDA	City of Tulare police department.
KGPE	City of Kansas City.	KGPG	City of Vallejo.
WPDL	City of Lansing.	WPDG	City of Youngstown.
KGPL	City of Los Angeles.		

(*b*) CONSTRUCTION AUTHORIZED BUT NOT COMPLETED

WPDN	City of Auburn.	KGPH	County of Oklahoma.
WPDZ	City of Fort Wayne.	WGPP	City of Portland.
WPEB	City of Grand Rapids.	KGPM	City of San Jose.
WPDT	City of Kokomo.	WPEA	City of Syracuse.
WPEC	City of Memphis.	KGPO	City of Tulsa.

[1] State police. [2] Harbor police.

RADIO COMMUNICATIONS IN ALASKA

In the Territory of Alaska radio communication is used extensively by the fishing industry for communication between shore stations and fishing vessels and between canneries. These communications are coordinated by the Washington-Alaska Military Cable and Telegraph System of the Signal Corps, United States Army, which maintains radio communications within Alaska, and by means of radio and cable with the United States.

Most of the private radio operations are by radiotelegraph on frequencies below 550 kilocycles. Many of the stations operating on these frequencies have in the past used spark transmitters, and a large amount of interference resulted therefrom. In accordance with modern engineering practice and in order to reduce interference, General Order No. 79 prohibited the use of spark transmitters after June 1, 1931. All the stations now operating have complied with the order and have installed modern vacuum-tube transmitters.

A limited number of frequencies above 1,500 kilocycles are used by stations in Alaska both for telegraph and telephone. A small number of shore stations and ships have been equipped with low-power

radiotelephone transmitters. This permits direct voice communication between the superintendent of operations and the masters of the ships under his control.

BROADCAST PICK-UP SERVICE

Events of interest to broadcast listeners often occur at locations at which wire-line facilities are unavailable or unsuitable. In order to make it possible to broadcast such events directly, six frequencies, all above 1,500 kilocycles, were allocated for broadcast pick-up service. Two of these frequencies are assigned for the use of each group originating the broadcast program for the period of the broadcast only.

In general, a low-power transmitter operating on one of the frequencies is located at the point of origin of the program, which may be an airplane, a train, an automobile, etc., or the transmitter may be carried by an announcer. The description of the event or the program is transmitted by the small transmitter and is received by a receiving set located at the nearest point at which connection can be made to suitable telephone-wire lines. At that point the output of the receiving set is connected through suitable equipment to the wire lines and is distributed by the regular wire facilities to the broadcasting stations which transmit the program to the broadcast listener. The second frequency is used for a second transmitter, either at a second location to pick up additional descriptions or broadcasts, or is used as an "order circuit" to direct the broadcasting of the mobile station in order to fit it into other parts of a program.

Many interesting descriptions of events, such as sporting events (boat races, golf tournaments, etc.), take-off and landing of several international airplane flights, submarine rescue demonstrations, airplane events, and other events described from aircraft, etc., have been broadcast which otherwise would not have been available.

MOTION-PICTURE SERVICE

Many motion pictures or portions of motion pictures are produced at locations where wire lines are not available. Often large numbers of people are involved and units are distributed over wide areas. In order to provide communication between field production units, or between field units and headquarters where no other form of communication is available, two frequencies were allocated for use by the motion-picture industry. These frequencies provide two radiotelegraph channels or one radiotelephone channel.

Licenses for this class of station provide that the transmitter is to be used only upon specific authorization of the commission for the period of time actually required. This restriction was required because of the limited frequencies available and the possibilities of adjustments being required in order to avoid interference.

EXPERIMENTAL VISUAL BROADCASTING

There has been a large amount of public interest shown in the development of visual broadcasting (television) and its possibilities for public entertainment and use. The public interest has stimulated

the laboratories working in this field to increase their efforts to improve the art.

There has been in the past year very material improvement in the quality of the transmissions of visual broadcast stations and the detail of the image which is received. Many of the experimental transmissions consist of motion-picture films which provide ample opportunity for observation. However, there has been much development in the production of studio programs of public interest. The development of pick-up devices to include a complete scene and the production of plays especially for visual broadcasting purposes have received special attention. Several stations have coordinated the visual broadcasting with regular sound broadcasting.

The amount of detail which can be transmitted and received in an image is a function of the number of picture elements which are transmitted. The majority of the stations now operating in the visual broadcast bands between 2,000 and 3,000 kilocycles have standardized their transmissions for the present, and their images are made up of 60 lines per frame and 20 frames per second; but this has not been universally adopted.

In order to obtain greater detail in transmitted images, there have been developed methods of scanning which differ materially from the method used in the majority of visual broadcast stations. There has been no effort on the part of the commission to require any standard method of scanning or a standardization of the number of lines per frame or frames per second which are transmitted. The experimental visual broadcast stations have been given complete freedom in developing the art.

In order to obtain an image of great detail it appears to be necessary, using the present methods of radio technique, to transmit higher modulation frequencies, which in turn require a wider frequency band to accommodate the transmissions of this type of station. The present band widths permitted for visual broadcasting on frequencies between 2,000 and 3,000 kilocycles are 100 kilocycles wide, or ten times the band width required for a sound-broadcast station. Consensus of engineering opinion indicates that in order to transmit a picture having satisfactory detail the band width required will be many times that now available in this frequency range. The needs of other essential services for frequencies in this band appear to make it impossible to provide frequencies in this frequency range other than those now used for visual broadcasting.

The commission has authorized a number of laboratories to investigate the possibilities of transmission of images in the following bands of frequencies:

43,000–46,000 kilocycles
48,500–50,300 kilocycles
60,000–80,000 kilocycles

Preliminary reports indicate that these very high frequencies show great possibilities, and many transmissions are now being observed. It is, however, too early to form an opinion as to the suitability of these bands. In view of the possibility of visual broadcast requiring very wide frequency bands, no limitation has been put on the band width to be used in the very high frequencies. Licensees in these bands are authorized for the present to use as great a portion of the band as is necessary in order to transmit the best picture possible.

EXPERIMENTAL RELAY BROADCASTING

Most of the relay broadcast stations of the United States maintained regular programs on their authorized frequencies (above 6,000 kilocycles) and made observation of their reception in other countries. These stations provide programs which are of principal interest to those parts of the world in which there is no organized broadcasting in the broadcast bands below 1,500 kilocycles.

Certain of the relay broadcast stations are also used for transmitting programs of special interest to foreign countries, where they are received by specialized equipment and rebroadcast through the transmitting stations on regular broadcast frequencies. This use of relay broadcast channels provides one means of interchange of programs between nations.

An outstanding case of this use of international exchange of programs was in connection with the ceremonies incident to the deposition of the naval treaty at London on October 27, 1930. On this occasion the voices of the President of the United States, the Prime Minister of England, the Premier of Japan, and other prominent people were broadcast to the inhabitants of the North American Continent, Europe, Australia, and Japan. In connection with this program both relay broadcast stations and fixed point-to-point stations were used to provide the necessary connections.

There has been no material increase in the number of licensees for the experimental relay broadcast service. A number of licensees have been granted increased power in order to make possible a more satisfactory and reliable service.

GENERAL AND SPECIAL EXPERIMENTAL SERVICE

The following frequencies are now set aside for the use of stations conducting general radio research, and all or a limited number of them are assigned to general experimental service as required by the type of research being done:

Kilocycles:	Kilocycles:	Kilocycles:	Kilocycles:
1,604	8,650	26,000	60,000–400,000
2,398	12,850	27,100	401,000 and above
3,256	17,300	34,600	
4,795	23,100	41,000	
6,425	25,700	51,400	

Confidential reports of the work of these stations, which are filed quarterly show that the use of these frequencies has resulted in many advancements in radio engineering and the knowledge of radio transmission.

All radio research work, however, can not be done on these frequencies. To accommodate such research a class of license has been authorized for "special experimental stations." These licenses cover the operation of stations used for research in the radio art which requires the transmission of power on frequencies other than those set aside for general experimental service. Licenses of this class are issued for short periods of time and only after a satisfactory showing that the research to be conducted is very important to the development of radio transmission and that the general experimental frequencies are entirely unsuited for the research problem involved.

Since frequencies other than those set aside for general experimental stations are used by regular commercial services, use by special experimental stations is only authorized at such time and under condition that no interference will be caused to the regular established communications on those frequencies.

AMATEUR RADIO SERVICE

There were on June 30, 1931, approximately 22,739 amateur stations licensed. These stations operate on the frequencies allocated for this service by the international radio convention of Washington, 1927, the North American agreement of 1929, and under regulations imposed by the international convention and by General Order 84. Most amateur communications are carried on by radiotelegraph, but there is an increasing interest in radiotelephone transmissions, and portions of the amateur bands have been allocated for use by radiotelephone stations. There has been some activity in the investigation of the ultra-high frequencies above 28,000 kilocycles, but to date there are practically no amateurs consistently communicating on these frequencies, although many experiments are in progress.

A large number of the amateur stations have communicated with similar stations in practically all foreign countries, and such contacts have contributed to development of data concerning transmission effects on high frequencies.

Amateur stations cooperated with the Army, Navy, and Red Cross in handling of emergency traffic and by engaging in mobilization practice in connection therewith. A plan has been worked out by the Navy Department and the American Red Cross for the employment of the Naval Communication Reserve, of which many amateur operators are members, in times of emergency when the Red Cross functions to bring relief to distressed communities. This plan also provides for the use of amateur stations not affiliated with the Naval Reserve. The large number of amateurs that are members of the volunteer Naval Communication Reserve and the Army Amateur Reserve Corps are qualifying themselves for future service in times of national emergencies.

Since 1925 a Navy day receiving contest has been held for amateur operators, and interest has been continually increasing. On October 27, 1930, a message from the Secretary of the Navy to the radio amateurs of the United States was broadcast by radiotelegraph from the naval radio stations at Arlington, Va., and San Francisco, Calif., and from the naval reserve station at Hartford, Conn. This message was copied in full by operators of 285 amateur stations.

On March 16, 1931, 494 amateur stations were successful in copying a message from the Red Cross national chairman, which was addressed to all the chapters and representatives of the Red Cross throughout the United States and broadcast by radiotelegraph from the Army amateur net control station in Washington, D. C. Of the 494 amateurs who copied the message, 481 delivered it personally to the local Red Cross representative within 24 hours. The average time interval between the time the message left Washington and the time that the information was received by Red Cross representatives throughout the United States was 2 hours and 25 minutes.

Of the operators participating, 338 delivered the messages inside of 18 minutes. This was the first nation-wide mobilization of the amateur radio system for the Red Cross, and resulted in direct contact between these amateur operators and the nation-wide personnel of the American Red Cross, who will require, as they often have in the past, the services of these men to furnish rapid emergency communication in times of disaster when commercial facilities fail.

Immediately upon receiving word of the disastrous earthquake which destroyed the city of Managua, Nicaragua, operators of amateur radio stations throughout the United States, and particularly in Washington, D. C., proceeded to do all in their power to establish communication with the stricken area. From March 31 to April 12, 1931, a large number of messages of a personal nature were handled which could not be routed through Government or commercial stations, since those stations were overtaxed with official traffic.

Amateur operators also have maintained communication between various expeditions and their sponsors in the United States. Among these were the expedition to Africa which made motion pictures in connection with the production of Trader Horn, the all-American Malaysia expedition to Dutch Borneo, the first international highway exploring expedition in Mexico, the MacMillan Arctic expedition, and the Byrd Antarctic expedition.

Many of the amateur stations participated in competitive activities, arranged by their own organization. Some of these were as follows: 276 stations engaging in a message-handling contest resulted in the winning station exchanging messages with 305 amateur stations distributed throughout the United States and Canada (February 14 to 28). A radiophone versus radiotelegraph transcontinental relay contest, held on January 11, 18, and 25, resulted in the transmitting of a radiotelegraph message from the east to the west coast and the receipt of a reply in two minutes. An international relay contest, conducted from March 8 to 21, inclusive, culminated in 160 American amateur stations communicating with foreign amateur stations in five continents.

The amateurs as a class are continually endeavoring to improve their skill as operators and to so organize their activities that they will contribute to the development of the radio art, particularly in the study of high-frequency transmissions, and at the same time to equip themselves to render the maximum service to the United States in times of emergency.

INTERNATIONAL AND INTERDEPARTMENTAL RELATIONS SECTION

GERALD C. GROSS, Chief

INTERNATIONAL TECHNICAL CONSULTING COMMITTEE ON RADIO COMMUNICATIONS

The second meeting of the International Technical Consulting Committee on Radio Communications (C. C. I. R.) met at Copenhagen, Denmark, May 27 to June 8, 1931. The United States delegation, which was headed by the Hon. Wallace H. White, jr., included Dr. C. B. Jolliffe, chief engineer, and Mr. Gerald C. Gross, engineer, of the Federal Radio Commission. One member of the secretarial staff which accompanied the delegation was also from the Federal Radio Commission.

The preparatory work of the United States for this conference, which was done prior to the appointment of the official delegation on April 7, 1931, was organized by the Federal Radio Commission upon request of the Department of State. This preparatory work was done by a group of representatives from Government departments, commercial operating companies, and other interested organizations. The seven questions which were listed as unfinished by the first meeting of the C. C. I. R. and the questions which were subsequently added to the agenda were studied, and complete material was prepared and sent to the various administrations prior to the formation of the official delegation. This material was circulated to the various nations and published by the International Bureau in the documents of the conference. In many cases during the conference these documents formed a basis for the work and the final opinions which were issued.

At the time of the opening of the conference 25 questions were listed on the agenda for consideration. From the study of these questions, 20 opinions [1] were formulated and 14 new questions were designated for further study. The opinions which were formulated by the conference covered practically all technical phases of radio communication and served principally to define the present state of the radio art. They were in substantial agreement with the proposals of the United States on these questions, and there was no conflict with the position of the technical experts of the United States on the various matters discussed.

Many of the opinions adopted are in accordance with existing regulations of the Federal Radio Commission. Other recommendations which are applicable to the regulation of radio in the United States will be considered in formulating new regulations.

[1] A report of the meeting will be published by the Department of State. Copies of the opinions and new questions adopted may be obtained from the Federal Radio Commission.

The third meeting of the C. C. I. R. is to be held in Lisbon, Portugal, at a date to be fixed later by the International Radio Conference which will be held in Madrid, Spain, in 1932.

INTERNATIONAL RADIO CONFERENCE

The International Radio Conference, to revise the international radio convention signed at Washington in 1927, is to meet in Madrid, Spain, in the fall of 1932. The International Telegraph Conference, to revise the international telegraph convention and regulations, is to meet at the same time and place. It has been proposed that these two conferences be joined and that a joint radio and telegraph convention be formulated. The International Bureau of the Telegraph Union has asked for proposals for both of these conventions to be filed by August 1, 1931. The Federal Radio Commission has cooperated with the Department of State in the preparation of these proposals.

The study of the general regulations annexed to the international radio convention was organized by the commission at the request of the Department of State, and proposals for the revision of the regulations prepared. This work was done by a group of representatives of Government departments, commercial operating companies, and other interested organizations, which held frequent meetings on the subject.

The study of the revision of the convention and of the proposals concerning the amalgamation of the two conventions which was carried on by the State Department was participated in by members of the commission's staff. The proposals were tentatively completed before the delegation left to attend the second meeting of the International Technical Consulting Committee on Radio Communications at Copenhagen, but were held for final approval until the completion of that meeting.

The International Radio Conference will be one of the most important communication conferences yet held and involves many important considerations of governmental policy. Since changes in the regulations affect the regulations which may be promulgated by the United States, the Federal Radio Commission is vitally interested and will continue to be actively interested in all preparatory work for the conference.

INTERDEPARTMENTAL

The Interdepartment Radio Advisory Committee, which includes representatives from all Government organizations interested in radio communication, prepared a revision of previous Executive orders assigning frequencies to Government departments. This revision resulted in the issuance of Executive Order No. 5638, which lists the frequencies assigned to all Government fixed and land stations. Representatives of the Federal Radio Commission on this committee cooperated in the preparation of this revision, in particular with relation to coordination with the assignments made to commercial radio stations. This work resulted in a more effective use and closer coordination between the Government stations and new assignments to commercial radio stations, thus providing for more efficient and economical use of the radio spectrum.

REPORT OF THE GENERAL COUNSEL

THAD H. BROWN

I. INTRODUCTION

The legal division of the commission has been organized into three principal sections:

(1) The administrative section, which is subdivided into the application and form subsection and the complaint and investigation subsection. It has charge of all applications for facilities coming through the legal division and the preparation of all forms used by the commission. Complaints, except those of a technical nature, are referred to it for investigation and report to the commission.

(2) The hearing section, which conducts all hearings before the commission and the examiners. It is responsible for the preparation of the commission's case and to see that all facts are properly brought to the attention of the examiners for their decision.

(3) The research and drafting section, which prepares all legal opinions, rules and regulations of the commission, general orders, and has charge of the cases appealed to the appellate courts.

The work of the legal division is carried on by a general counsel and three assistants to the general counsel provided for by amendment of March 4, 1929, to the radio act, and six junior assistant attorneys. The plan of dividing the legal division into three sections, with an assistant to the general counsel in charge of each section, has proved very efficient and satisfactory.

THE GENERAL COUNSEL'S OFFICE

The general counsel has direct charge of all court matters of the commission, including briefs, record on appeal, as well as the presentation of matters in all courts. All correspondence, opinions, memoranda, and reports on applications are prepared for his signature and supervised by him. Direct contact with the commission is maintained at all times and legal advice or opinions are presented to the commission by the general counsel. It is his duty to handle interdepartmental affairs of a legal nature and to interview parties having matters pending before the commission and representatives of the public.

II. ADMINISTRATIVE SECTION

This section is divided into two main subdivisions, the first being application and form subsection, whose duties are to handle all applications coming before the commission and to draft all new forms for the use of the commission, and the second being complaint and investigation subsection, whose duties are to make a study of all

formal complaints, except those dealing with the technical operation of a station. This work is in charge of an attorney, who makes a careful investigation of all the facts surrounding the case and reports the same to the commission, who, in turn, determines whether the violating station shall be set down for hearing. If the commission deems it necessary, an investigator is sent into the field with a carefully prepared outline of the information required, and a thorough check is made of all the facts surrounding the case. In this way the commission is fully informed before a case is set down for hearing and a station cited to appear and defend its position.

1. The application and form subsection is responsible for the preparation and revision of forms of application and authorization and such other forms relating to the administrative or routine work of the commission as the legal division is called upon to prepare, revise, or approve. All applications for licenses and authorizations are referred to this subsection, where they are examined, and recommendation of the legal division with respect thereto is made. The number of applications that have been investigated and passed upon by this subsection during the past year is 5,679.

2. The complaint and investigation subsection of the legal division has investigated numerous complaints against station licensees for operating in violation of the rules and regulations of the commission. The diligence with which these investigations have been made has resulted in a greater respect by the station licensees for such regulations. It has been found that almost all stations are now willing to cooperate with the commission in correcting any error, with the result that the stations have improved their service to the public through improvements in their physical equipment by refusing to broadcast questionable programs and by generally raising their program standards.

3. During the fiscal year there were three criminal convictions secured for violations of the radio act of 1927:

(*a*) *United States v. Joseph Travers.*

The defendant, Joseph Travers, was indicted at the September term, 1930, of the United States District Court for the District of Massachusetts. The indictment in one count charged the defendant with operating radio transmitting apparatus without a license in that behalf granted, in violation of section 1 (d) and (e) of the radio act of 1927 (47 U. S. C. A. 81 (d) and (e)). The second count charged a violation of section 1 (b) of the radio act of 1927 (47 U. S. C. A. 81 (b)).

The defendant was tried, convicted, and sentenced to two years' imprisonment on each count, the sentences to run concurrently. These sentences were suspended and the defendant released on probation by the court.

(*b*) *United States v. Robert Gordon Duncan.*

The defendant, Robert Gordon Duncan, was indicted by the United States grand jury for the district of Oregon in June, 1930. The indictment contained five counts, charging the defendant with uttering obscene, indecent, and/or profane language by means of radio

communication in violation of section 29 of the radio act of 1927 (47 U. S. C. A. 109).

The defendant was tried and convicted in the United States District Court for the district of Oregon at Medford, Oreg., in October, 1930, on one of the five counts and acquitted as to the other four counts. The court sentenced the defendant to six months in jail and to pay a fine of $500.

The defendant appealed his conviction and sentence to the United States Circuit Court of Appeals for the Ninth Circuit. That court affirmed the conviction and sentence imposed by the lower court, holding that the language charged in the indictment was profane. (See Duncan *v.* United States, 48 Fed. (2d) 128.) The defendant then attempted to secure a review of the case by the Supreme Court of the United States. This the Supreme Court declined to do. (See Duncan *v.* United States, 75 L. ed. 876.)

(*c*) *United States v. Malcolm McMasters and Cecil Molyneaux.*

The defendants, Malcolm McMasters and Cecil Molyneaux, were indicted September 26, 1930, by the United States grand jury at Brooklyn in the eastern district of New York. This indictment contained three counts. The first count charged the defendants with operating radio transmitting apparatus without a license in that behalf granted, in violation of section 1 of the radio act of 1927 (47 U. S. C. A. 81). The second count charged the operation of radio transmitting apparatus without an operator's license, in violation of section 20 of the radio act of 1927 (47 U. S. C. A. 100). The third count charged the operation of radio transmitting apparatus without a license in that behalf granted, in violation of the provisions of the international radio telegraph convention of 1927 and specifically in violation of section 32 of the radio act of 1927 (47 U. S. C. A. 112).

An amateur radio-station license had been issued by the Federal Radio Commission to authorize the operation of an amateur radio station at the address where it was charged that the defendants carried on and conducted their illegal operations. The amateur in making application for a station license had described his apparatus as a transmitter having six vacuum tubes, employing a Heising modulation circuit and capable of transmitting continuous wave, and interrupted continuous wave telegraph, as well as being operated as a radiotelephone transmitter for the transmission of sound. The apparatus being used by the defendants, McMasters and Molyneaux, was a 1-tube radio transmitter and was not capable of being used as a radiotelephone transmitter for the transmission of sound.

The amateur-station license described the equipment, which was authorized to be used at the address where the defendants operated, as " vacuum-tube transmitter." The court held that this description was so general and so broad as to cover any vacuum-tube transmitter and that it did specifically cover, generally, the apparatus which was operated by the defendants. Because of this the court directed a verdict of " not guilty " as to counts 1 and 3 of the indictment.

The second count, which charged the operation of radio transmitting apparatus by the defendants without holding operators' licenses from the Secretary of Commerce authorizing them to operate such apparatus, went to the jury, which returned a verdict of "guilty" under count 2 of the indictment. The court sentenced the defendants to serve three years in the Federal penitentiary, but suspended the sentence against Malcolm McMasters and released him on probation.

This case has been appealed to, but not decided by, the United States Circuit Court of Appeals for the Second Circuit.

(*d*) Indictments for violations of the radio act of 1927 have been returned by United States grand juries in other cases which have yet to be tried. Four other defendants have been held under bond by United States commissioners pending action and possible indictments by United States grand juries. Numerous cases of alleged illegal operation of unlicensed radio stations have been reported and are being investigated, and evidence is being secured by the United States Department of Justice and by the legal division of the commission.

It has been found that most of the unlicensed stations being operated in the United States are operated as aids in the commission of other crimes. Among these crimes are violations of the national prohibition act, the Federal narcotic act, and the customs act. The radio division of the Department of Commerce, Department of Justice agents, and the United States Coast Guard have cooperated with the commission in locating unlicensed radio stations and in securing evidence against those engaged in such illegal operations.

Realizing the importance of enforcing strict adherence to the radio act, especially the criminal provisions thereof, the commission has authorized the designation of an assistant to the general counsel, cooperating with the Department of Justice and the radio division of the Department of Commerce, to assist United States attorneys in preparing and presenting evidence to grand juries, in drafting indictments, and in the prosecution of such cases.

III. HEARING AND RECORD SECTION

The hearing and record section has had a very strenuous year, due to the fact that there were a great number of cases pending at the beginning of the calendar, and for the further reason that General Order No. 93 of the commission went into effect on September 1, 1930, which was a new practice and procedure before the commission.

This General Order No. 93, which sets up the entire practice and procedure and manner of holding hearings before the commission, has worked very satisfactorily during its first year of existence, and it is believed that very few amendments or changes will be necessary to make this splendid order a more workable and satisfactory one.

Hearings were started on Tuesday, September 2, and at that time there were over 400 applications pending and set for hearing. This necessitated a tremendous amount of work in the matter of giving notices to all parties interested and the preparation of the docket. The following statistics will give some idea of the amount of work handled by the hearing and docket sections through the past year:

Month	Set for hearing	Answered and docketed	Defaults	Continued	Dismissed	Heard
September	130	94	38	2	1	53
October	254	85	1	3	2	79
November	71	23	0	1	0	22
December	101	22	0	2	0	20
January	99	32	3	1	1	27
February	83	21	1	4	1	15
March	85	27	1	2	3	21
April	110	43	1	3	2	37
May	88	38	0	6	2	30
June	75	45	1	4	1	39
Total	1,096	430	46	28	13	343

Number of cases reported by examiners	258
Number of cases heard, unreported by examiners	57
Number of commission decisions	212

There were set for hearing and docketed 1,096 applications of all kinds. The greater portion of these were applications for new facilities, but they also included all other types of applications and had to be given a hearing date and opportunity to the applicant to present his case. Of this number, 430 responded to the notice for hearing and requested that their applications be heard by the commission, in accordance with General Order No. 93. Of the 430 actually set down and placed on the permanent docket, there were 46 defaults, 28 applications continued, 13 dismissed, and 343 finally heard by examiners, with counsel from the legal division handling the commission's side of these cases.

Of the 343 cases heard throughout the past fiscal year the examiners have submitted reports on 258 and the commission has made its final decision and determination upon 212 applications. There are pending at this time 57 cases which have been heard and upon which the examiners have not made their reports.

In addition to the above work the hearing section has had charge of the taking of depositions in the field and the hearing of one case at Los Angeles, which took almost a month. A considerable portion of the time of the hearing section is devoted to the preparation of depositions and the actual taking of same in the field.

The hearing section is busy at all times in preparing the cases to be heard and is making an effort to be fully advised in each case before the same comes on for hearing, which involves an enormous amount of work, due to the fact that approximately 25 cases are set for hearing each week.

In addition to this a large portion of the time of the hearing section is devoted to the review of the examiners' reports to find any legal difficulties or technicalities. Also a considerable amount of the time of one of the members of the hearing section is taken with the drawing up of commission orders which are submitted to the applicant, showing the determination of the cases.

IV. RESEARCH AND DRAFTING SECTION

This section maintains a file of the "opinions of the general counsel," and drafts, correlates, and indexes all such new opinions. Under the direction of the commission it prepares all proposed

rules and regulations and general orders. It examines, from a legal point of view, the minutes of the commission. This section collects all available foreign laws and treaties, digests all court opinions pertaining to radio communication, and has charge of the library of the commission and keeping the same up to date. Briefs in all cases in which the commission is a party are prepared under the supervision of this section. It also prepares for commission consideration and action statements of fact, grounds for decision, and orders of the commission upon cases heard by examiners. During the past year 78 of these opinions were prepared by this section. Perhaps the major activity of this section is the conduct of litigated cases in which the commission is interested as a party. As this subject is not susceptible of summary treatment, it follows under separate title.

1. Litigation

Although a great majority of all cases reported as pending at the end of the fiscal year 1930 were decided or dismissed during the fiscal year just ended and a number of cases filed during that period were disposed of prior to June 30, 1931, there has been no appreciable reduction in the number of pending cases in which the commission is interested as a party.

Of the 31 cases pending June 30, 1930, 13 have been finally decided by the courts; opinions and interlocutory orders have been handed down in 7; 9 have been dismissed by the courts or by the complaining parties and 2 are still pending, although steps have been taken to dispose of them. In the 7 cases in which opinions and interlocutory orders have been rendered, jurisdiction has either been retained or the cases have been remanded to lower courts for further proceedings. These cases must therefore be classed as "pending," leaving a total of 9 cases still pending out of the 31 reported June 30, 1930.

During the fiscal year, 25 new cases were filed, and the commission appealed 1 case to the Court of Appeals of the District of Columbia from a decree of the Supreme Court of the District of Columbia granting a preliminary injunction. Of the 25 new cases filed, 2 have been finally decided by the courts; 10 have been dismissed by the courts or by the complaining parties prior to or following preliminary hearing, and 14 are still pending. The total number of cases pending on July 1, 1931, was therefore 22, as compared with 31 at the same time last year.

CASES FINALLY DECIDED DURING FISCAL YEAR

The 13 cases finally decided during the fiscal year were all decided by the Court of Appeals of the District of Columbia. A number of these were consolidated for hearing and argument, so that they were finally disposed of by nine opinions. In order of their decision, these cases were:

THE ANSLEY CASE

(Ansley *v.* Federal Radio Commission, 46 F. (2d) 600)

This case was an appeal from a decision and order of the commission denying an application for a construction permit. The

station sought to be constructed was an entirely new one, and in this respect the appeal presented a novel question. The commission's decision was based upon evidence adduced at the hearing, which, in the opinion of the commission, established: (1) That the proposed station would result in the creation of additional heterodyne interference with existing stations on the same frequency; (2) That the State of Texas already had more than its fair and equitable share of available broadcasting facilities according to population as prescribed by the Davis amendment; and (3) that neither the radio needs nor the economic support of Abilene, Tex., and vicinity justified the construction and operation of the station applied for.

In affirming the commission's decision the court of appeals held that on appeal from such an order the question presented is whether the commission's decision is manifestly against the evidence. The court found that the commission's findings were not so defective, and refused to pass upon a number of procedural questions, saying that they did not affect the substantial issues in the case.

THE HAVENS & MARTIN CASE

(Havens & Martin *v.* Federal Radio Commission, 45 F. (2d) 295)

This case involved a refusal by the commission to grant a construction permit which, in effect, would have authorized the increase in power of an existing station from 100 to 500 watts and a change in its assigned frequency. The commission based its decision upon: (1) The creation of additional interference, and (2) the fact that the State of Virginia already enjoyed more than a fair and equitable proportion of the facilities available to that zone; and the city of Richmond, in which the station was located, already enjoyed a full share of the radio facilities of the State.

The court of appeals, in affirming this decision, again applied the rule that commission findings after hearing should be sustained unless manifestly against the evidence. The court stated that a review of the record convinced it that the commission's findings were justified.

THE COURIER-JOURNAL CASE

(Courier-Journal Co. et al. *v.* Federal Radio Commission, 46 F. (2d) 614)

This case arose upon an appeal from an order of the commission which sought to change the frequency assignment of station WHAS, at Louisville, Ky., and a number of other stations so as to bring about a limited reallocation in the cleared-channel class. The commission orders extant at the time the appeal was perfected provided that the change in frequency assignment should be effective April 30, 1930, at 3 a. m., eastern standard time. No hearing was provided for prior to this date, but provision was made that any station dissatisfied with its new assignment might be heard on June 17, 1930, provided 20 days' notice of desire to be heard was given prior to that date.

The court reversed the commission and held that an order changing a broadcasting station's frequency, the change to become effective prior to the date of hearing therein provided for, was erroneous; that its effect was to deprive the station, without an opportunity to

be heard, of the frequency for which it was contending and which it had previously been allotted.

During the pendency of this appeal the commission made certain amendments to its orders designed to provide appellant and others similarly situated with prior notice and opportunity to be heard in opposition to the proposed change. The commission urged that these amendments had rendered the appeal moot, but the court held otherwise, and remanded the case to the commission with directions to permit appellant to use its then assigned frequency until such time as it might be determined, as a result of a hearing after due notice upon issues clearly defined, that such continued operation is not in the public interest, convenience, and necessity.

THE BRINKLEY CASE

(KFKB Broadcasting Assn., Inc., *v.* Federal Radio Commission, 47 F. (2d) 670)

This case arose upon an appeal from a decision and order of the commission denying an application for renewal of broadcasting station license filed by KFKB Broadcasting Association, Inc., owners and operators of station KFKB, at Milford, Kans. The commission designated this application for hearing pursuant to section 11 of the act and upon the theory that the burden was upon an applicant for station facilities to show that its continued operation would be in the public interest, convenience, and necessity.

At the hearing it was shown that the real owner of the station (Dr. J. R. Brinkley) had been using the station in connection with his medical practice and through the "medical question box" received inquiries at the station as to medical advice. Persons making inquiry in response to broadcasts were induced by means of the station to come to Brinkley's hospital for treatment or were referred by the same means to some member of Doctor Brinkley's pharmaceutical association who sold Brinkley's prescriptions, returning a part of the purchase price to Brinkley. Transcripts of the broadcasts showed that the medical advice given by means of the station was given without examination of the patients and was of doubtful value. The commission found that the station's operation had been in the private interest of Brinkley and not in the public interest; that the practices of the station, particularly that of the "medical question box" were inimical to public health and safety, and for that reason were not in the public interest.

In affirming this decision the court again applied the rule that the commission's findings, after hearing, will be sustained unless manifestly against the evidence. It was also held: (1) That the business of radio broadcasting is impressed with a public interest; (2) that the requirements of the act making a finding of public interest, convenience, or necessity a prerequisite to the renewal of a broadcasting license means that broadcasting should not be a mere adjunct of a particular business but should be of a public character; (3) that the burden is on an applicant to establish that a renewal of a radio broadcasting station license will be in the public interest, convenience, or necessity; (4) that the commission, in passing on applications for renewal of station license, must consider the character and quality

of service to be rendered; (5) that an applicant's past conduct is an important consideration in passing on an application to renew a broadcasting license, especially where the evidence clearly justifies the conclusion that the applicant's future conduct will not differ materially from that in the past; and (6) that the refusal of the commission to renew a broadcasting license on the ground that public interest, convenience, or necessity would not be served thereby does not constitute censorship within the meaning of section 29 of the radio act of 1927.

In passing on the question of censorship the court said:

> Appellant contends that the attitude of the commission amounts to a censorship of the station contrary to the provisions of section 29 of the radio act (47 U. S. C. A., sec. 109). This contention is without merit. There has been no attempt on the part of the commission to subject any part of appellant's broadcasting matter to scrutiny prior to its release. In considering the question whether the public interest, convenience, or necessity will be served by a renewal of appellant's license, the commission has merely exercised its undoubted right to take note of appellant's past conduct, which is not censorship.

THE MARQUETTE UNIVERSITY CASE

(Marquette University *v.* Federal Radio Commission, 46 F. (2d) 406)

This case involved a refusal by the commission to modify the license of station WHAD, owned and operated by Marquette University. The modification of license sought involved a change of frequency and additional hours of operation, the contention being made that the present assignment was not adequate for the educational and other needs of the licensee. In affirming this decision the court stated that only a question of fact was involved, that there was evidence to sustain the commission's decision, and that the court will hesitate to set aside a finding of the commission unless it is manifestly contrary to the evidence.

THE WGBS CASE

(General Broadcasting System, Inc., *v.* Federal Radio Commission, 47 F. (2d) 426)

This case grew out of a decision and order of the commission denying an application of the General Broadcasting System for renewal of station license. The appellant had previously been licensed to operate on the frequency 1,180 kilocycles, but applied for and received a modification of license which permitted it to use the frequency of 600 kilocycles on an experimental basis, the assignment to be subject to change if interference developed with other stations in the same geographical area. During this experimental operation protests were received from the stations in question, stating that destructive interference had resulted from the experimental assignment, whereupon the commission designated appellant's application for renewal of station license for hearing. As a result of the hearing held the commission found as a fact that destructive interference did exist which required the denial of appellant's application. In the order denying this application provision was made that appellant's station should be assigned to the frequency used by it before the experimental assignment.

In affirming this decision the court again applied the rule previously stated in the Ansley case with respect to the effect of the commission's findings based on evidence adduced at a hearing. The appellant also presented numerous procedural questions which the court declined to pass upon, saying that they did not affect the substantial issue in the case.

THE WESTINGHOUSE CASES

(Westinghouse Elec. & Mfg. Co. *v.* Federal Radio Commission, 47 F. (2d) 415)

Four separate appeals brought by the Westinghouse Electric & Manufacturing Company, owners and operators of station KYW, Chicago, Ill., were disposed of by the court with a single opinion.

The first of these cases arose out of the action of the commission in inserting a condition in a license issued to this station which provided "that the cleared channel or frequency 1,020 kilocycles has been allocated for use by stations in the second zone created by section 2 of the radio act of 1927, and this license is issued only for a temporary period of 90 days and will not be renewed, provided application is made for the use thereof by a proper applicant or applicants within said second zone above referred to." This condition was inserted in the license of appellant's station without prior notice and hearing.

The second and third of these cases presented substantially the same questions with respect to subsequent licenses granted and issued to appellant's station.

The fourth appeal arose out of the same action of the commission which gave rise to the appeal in the Courier-Journal case (46 F. (2d) 614). By that action and as a part of the limited reallocation of cleared-channel stations thereby attempted, it was proposed to change the frequency of appellant's station from 1,020 to 1,140 kilocycles, with no provision made for notice and hearing until after the date of the proposed change.

In reversing these cases the court held that the action of the commission in inserting the condition in appellant's licenses without prior notice and hearing, and in attempting to change its frequency assignment under the circumstances presented, was erroneous, and the cases were remanded with direction that the commission should renew appellant's license without the qualification in question until such time as it might be determined, as a result of hearing after due notice upon issues clearly defined, that such continued operation is not in the public interest, convenience, or necessity.

THE MILWAUKEE JOURNAL CASES

(Journal Company *v.* Federal Radio Commission, 48 F. (2d) 461)

Here again the court disposed of four separate appeals by a single opinion. The first of these appeals was taken before the amendment to section 16 of the radio act of 1927 by Public Law No. 494, approved July 1, 1930, and challenged the legality of the action of the commission in making certain changes in the power and assignments of other stations operating on a common frequency with that of ap-

pellant's station. The second of these appeals was also taken before the amendment of section 16 of the act but involved a denial by the commission of an application to use 5,000 watts power on the regional frequency 620 kilocycles for the purpose, as appellant alleged, of reestablishing appellant in the position occupied by it prior to the commission action involved in the first appeal.

The third and fourth of these appeals grew out of the action of the commission in renewing the station licenses of WLBZ, located at Bangor, Me., and WFLA–WSUN, located at Clearwater, Fla., to operate on the frequency 620 kilocycles, together with appellant's station. The effect of these grants complained of was to continue the conditions brought about by the action of the commission involved in the first appeal. These appeals were, however, taken subsequent to July 1, 1930, and were governed by the provisions of section 16 of the act as amended.

The court dismissed the first appeal on the ground that section 16 of the act as originally enacted did not provide for an appeal from a decision of the commission granting the application of another, even though the effect of such grant was to adversely affect the status of appellant's station.

The court reversed the commission in the other three cases, and in so doing held that the commission erred as a matter of law in increasing the power of the Maine station and shifting the assignments of the Florida stations without notice to appellant and an opportunity for it to be heard, and that the effect of such action, according to the proofs submitted, was to materially reduce the service area of appellant's station. The court pointed out in the course of its opinion that the purpose of the regulation provided for by the radio act was obviously to prevent chaos and to insure satisfactory service; that the installation and maintenance of broadcasting stations involve considerable expense; and that no station that has been operated in good faith should be subjected to a change of frequency or power or to a reduction of its normal and established service area except for compelling reasons.

The court remanded the last three cases to the commission, saying that appellant was entitled to some form of relief; that the court was reluctant to direct the particular form of such relief, but that the interests of justice would be subserved by affording appellant, after notice and opportunity to be heard, such relief as would measurably reestablish it in the position occupied by it prior to the acts complained of.

THE READING CASE

(Reading Broadcasting Co. *v.* Federal Radio Commission, 48 F. (2d) 458)

This case arose out of a decision and order of the commission's refusing an application of appellant for an increase in power and change in frequency assignment for its station, WRAW, located at Reading, Pa. The refusal of the commission to grant the application was based principally upon evidence and findings to the effect that the changes applied for would result in the creation of additional serious heterodyne interference not only with appellant's station but with other stations operating on the same frequency. The appellant

relied upon the fact that the second zone, in which the State of Pennsylvania is situated, is under quota in radio facilities as compared with other zones established by section 2 of the act, and upon the further fact that the State of Pennsylvania is similarly under quota as compared with the other States of the second zone, based upon the rule established by section 9 of the act, as amended by section 5 of the act of March 28, 1928 (the Davis amendment).

In affirming the commission's decision the court again refused to disturb the findings of the commission based upon evidence adduced at the hearing, saying that they were not manifestly against the evidence. The court also held that it would not be consistent with the legislative policy to equalize the comparative broadcasting facilities of the various States and zones by unnecessarily injuring stations already established and which are rendering valuable service to their natural service areas.

2. Cases in Which Opinions and Interlocutory Orders Were Handed Down During the Fiscal Year

A. IN THE SUPREME COURT OF THE UNITED STATES

(1) White *v.* Johnson, 75 L. ed. 137, and (2) American Bond & Mortgage Co. *v.* United States of America, 75 L. ed. 140

These cases, the manner in which they arose, and the questions certified to the Supreme Court of the United States in each were considered in the fourth annual report (pp. 48–50). In opinions reported as indicated above the Supreme Court of the United States on January 5, 1931, dismissed the certificates in each of these cases.

In the opinion of the court the principal question certified in each case was "so broad and indefinite as to admit of one answer under one set of circumstances and a different answer under another." The other questions certified were considered as contingent upon the first, and therefore not required to be answered.

Since the dismissal of these certificates the latter case has been argued in the United States Circuit Court of Appeals for the Seventh Circuit, where it is now pending decision by that court.[1]

B. IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

THE STROMBERG-CARLSON CASE

(Saltzman et al. *v.* Stromberg-Carlson Telephone Mfg. Co., 46 F. (2d) 612)

This case arose upon an appeal by the commission from a decree of the Supreme Court of the District of Columbia granting a preliminary injunction. The action of the commission involved in this litigation was essentially the same as that involved in the Courier-Journal case (46 F. (2d) 614) and the fourth appeal perfected by the Westinghouse Electric & Manufacturing Company (47 F. (2d) 415). The commission sought to change the frequency assignment of station WHAM from 1,150 to 1,160 kilocycles and to assign station

[1] On July 9, 1931, the United States Circuit Court of Appeals for the Seventh Circuit handed down its opinion affirming the decree of the District Court for the Northern District of Illinois, Eastern Division.

KTNT, located at Muscatine, Iowa, to the frequency of 1,160 kilocycles for operation during daytime hours. Station WHAM had previously enjoyed the exclusive day and night time use of the frequency 1,150 kilocycles, and immediately upon the promulgation of the commission's orders seeking to bring about these changes as a part of its plan for a limited reallocation of the cleared-channel stations, filed a bill for injunctive relief in the Supreme Court of the District of Columbia. After the filing of this bill and before hearing on the application for preliminary injunction, the commission amended its orders so as to make the proposed changes conditional upon the result of the commission's decision, after prior notice and hearing. These amendments and the effect thereof were brought to the attention of the court by amendments and supplements to the bill and answer. Notwithstanding these amendments, the lower court granted a preliminary injunction, which in effect enjoined the commission from changing the frequency assignment of station WHAM without prior notice and hearing, or changing its assignment as the result of any hearing in which the station was required to show cause why a change should not be made.

In affirming the action of the lower court in granting the preliminary injunction, the court of appeals held that the commission's orders as originally enacted were void and that the amended orders, which required station WHAM to show cause why its frequency assignments should not be changed, did not afford it the sort of hearing provided by section 11 of the radio act.

The court remanded the case for further proceedings in conformity with its opinion, and although the commission's orders involved in this litigation have been repealed, the case has not as yet been finally disposed of.

THE SHORT-WAVE CASES

(Intercity Radio Telegraph Co. *v.* Federal Radio Commission and Three Other Cases, 46 F. (2d) 602)

This case involved four separate but interrelated appeals taken from various decisions and orders of the Federal Radio Commission which refused to authorize the issuance of certain construction permits and station licenses to appellants for point-to-point communication within the United States. The cases were consolidated by order of the court for argument and decision.

These appeals involved the conflicting claims of the several appellants for a limited number of available frequencies, there being two or more applications for each available frequency. At the time these cases came on for argument before the court of appeals there had been material changes in the status of certain of the companies involved, brought about by their bankruptcy and/or insolvency. Under the circumstances the court permitted, and gave consideration to, a stipulation of the parties reciting the facts concerning these changes. Upon a review of the record and the stipulation filed the court affirmed such of the commission grants as were not affected by the facts stipulated to by the parties and, while retaining jurisdiction of the cases, remanded them to the commission for appropriate proceedings and decisions, in view of the altered conditions. Since

the receipt of the order remanding these cases the commission has proceeded with the hearings necessary to such a decision. These, however, had not been completed on June 30, 1931.

3. Cases Dismissed During the Fiscal Year

A. CASES PENDING JULY 1, 1930

The following cases, which were reported as "pending" and in which the issues were stated in the fourth annual report, were dismissed during the fiscal year, as indicated:

(1) IN THE COURT OF APPEALS

No. 5204—Missouri Broadcasting Corporation and C. W. Benson *v.* Federal Radio Commission. (Dismissed by the court upon appellant's failure to deposit costs for printing record.)
No. 5207—American Fishermen's Protective Association *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5208—J. E. Bennett Music Co. *v.* Federal Radio Commission. (Dismissed by court upon appellant's failure to file brief.)
No. 5227—Shortwave & Television Lab., Inc., *v.* Federal Radio Commission. (Dismissed by court upon appellant's failure to file brief.)
No. 5228—William B. Schaeffer (doing business as Schaeffer Radio Co.) *v.* Federal Radio Commission. (Dismissed by the court upon appellant's failure to deposit costs for printing record.)
No. 5256—Pere Marquette Railway Co. *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5257—Ann Arbor Railroad Co. *v.* Federal Radio Commission. (Dismissed on motion of appellant.)

(2) IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF CONNECTICUT

No. 2064—Bridgeport Broadcasting Station, Inc., *v.* Federal Radio Commission. (Dismissed by court on petition of intervenor, General Broadcasting System, Inc.)

B. CASES FILED DURING THE FISCAL YEAR

The following cases, which were filed during the fiscal year, were dismissed prior to July 1, 1931, as indicated:

(1) IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 5281—WOBU, Inc., *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5321—WDAY, Inc., *v.* Federal Radio Commission. (Dismissed by court upon failure of appellant to deposit costs for printing record.)
No. 5343—Journal Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5399—Stuart Broadcasting Corp. *v.* Federal Radio Commission. (Dismissed on motion of appellant.)

(2) IN THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

Equity No. 51872—Atlass Co., Inc., *v.* Charles McK. Saltzman et al. as the Federal Radio Commission

Plaintiff in this case, the owner and operator of station WBBM, at Chicago, Ill., brought suit against the commission and the individual members thereof to enjoin the continuance of the assignment of station WISJ, Madison, Wis., on the frequency 780 kilocycles.

The assignment complained of was made by the commission on an experimental basis. Plaintiff's bill alleged, among other things, that the action of the commission in making this experimental assignment without notice to it and an opportunity for hearing was contrary to the provisions of the radio act, and therefore void; and that such assignment had effectively reduced the normal and established service area of plaintiff's station by the creation of cross talk and other interference in and adjacent to the city of Madison, Wis.

On filing the bill a temporary restraining order was issued, but after hearing the court denied plaintiff's application for preliminary injunction. The bill was then dismissed upon motion of plaintiff.

Equity No. 52955—National Broadcasting Co., Inc., *v.* Federal Radio Commission et al.

Equity No. 52956—R. C. A. Communications, Inc., *v.* Federal Radio Commission et al.

Equity No. 52957—Radiomarine Corporation of America *v.* Federal Radio Commission et al.

Equity No. 52958—R. C. A.-Victor Co., Inc., *v.* Federal Radio Commission et al.

These were four separate but interrelated cases brought by subsidiaries of the Radio Corporation of America.

In an opinion reported as Lord, Receiver, *v.* R. C. A. (35 F.(2d) 962), the United States District Court for the District of Delaware granted a final injunction against the Radio Corporation of America enjoining the further enforcement of certain contracts for the sale of radio vacuum tubes for radio broadcast receiving sets on the ground that such contracts were violative of the provisions of section 3 of the Clayton Act. The Circuit Court of Appeals for the Third Circuit affirmed this decision in an opinion reported as R. C. A. *v.* Lord, Receiver, et al (28 F.(2d) 257, and on April 27, 1931, the Supreme Court of the United States denied a petition for certiorari filed by Radio Corporation of America (49 S. Ct. 83).

In view of the uncertainty as to the effect of this decision upon the status of Radio Corporation of America and its subsidiary companies and their eligibility to receive instruments of authorization in view of sections 13 and 15 of the radio act, the commission, on May 7, 1931, entered an order which provided:

That any renewal applications filed by R. C. A. or any of its so-called subsidiary companies which are now pending decision before the commission be designated for hearing, and if such applications request licenses which are necessary for the maintenance of the existing service, that until after the conduct of such hearing and the decision of the commission as a result thereof the existing licenses be extended upon a temporary basis to 3 a. m., July 15, 1931.

That such further renewal applications, if any, as come before the commission prior to its decision in these matters be treated in a similar manner.

That the hearing on these renewal applications should be held before the entire commission sitting en banc on Monday, June 15, 1931, at 10 a. m.

That such steps should be taken prior to the hearing date as will be necessary to insure that at least one renewal application of each of the above-named companies is designated for hearing on that date, and that if necessary to accomplish this result these companies should be directed by the commission to file applications for renewal forthwith and without regard to the expiration

date of the existing licenses or the requirements of General Order No. 89 with respect to filing applications for renewal of license.

That any applications other than applications for renewal of licenses or applications for instruments of authorizations necessary for the maintenance of an existing service now pending upon behalf of the above-named parties or hereinafter filed by them be held in abeyance and no decision made thereon until after the conduct of the hearing herein recommended and the rendition of a decision as a result thereof.

Pursuant to this action, the commission designated a number of applications of each of the above-named subsidiaries of Radio Corporation of America for hearing on June 15, 1931 (commission minute No. 374, June 8, 1931):

To determine whether or not said applicant is a company or corporation or any subsidiary thereof which has been finally adjudged guilty by a Federal Court of unlawfully monopolizing or attempting to monopolize radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive traffic arrangements, or by any other means, or to have been using unfair methods of competition within the meaning of section 13 of the radio act of 1927.

To determine whether or not said applicant is eligible, under the terms of the radio act of 1927, to receive the instrument of authorization applied for.

To determine whether or not the radio act of 1927 prohibits the granting to said applicant of the instrument of authorization applied for.

On June 5 these cases were commenced to enjoin the commission from holding the hearings set for June 15 and/or from denying any applications filed by any of said companies by reason of the decree of the Delaware district court above referred to. The bills filed upon behalf of each of said companies were essentially similar and the legal questions presented thereby were identical.

Each of these bills alleged, in effect, that the decree of the Delaware court was not the kind of judgment referred to in sections 13 and 15 of the act, and that the provisions of said sections were therefore not applicable to any of the plaintiff companies; and further, that, if held to be applicable, such sections were unconstitutional as being violative of the due process clause of the fifth amendment and section 9 of article 1 of the Constitution of the United States. Facts were also alleged which were designed to show that plaintiffs had no adequate legal remedy and that the mere conduct of the hearing, and certainly the denial of plaintiffs' licenses pursuant thereto, would cause great and irreparable injury.

The plaintiffs filed motions for preliminary injunction and the commission filed motions to dismiss for want of equity in each of these cases. These motions in the several cases were consolidated for hearing and were submitted on the pleadings and supporting affidavits of the plaintiffs after extensive argument. After taking the matter under advisement the court denied the several motions for preliminary injunction, denied the motions to dismiss the bills, and retained jurisdiction of the cases to permit a supplementary showing at the election of the plaintiffs.

No supplementary showing was made. The hearing of June 15 was held as scheduled, and these bills were subsequently dismissed on motion of the plaintiffs.

4. Cases Pending at End of Fiscal Year

A. CASES PENDING JULY 1, 1930

The nine cases which were carried over from the fiscal year 1930 were all dealt with and the principal issues discussed in the fourth annual report. In so far as the developments in these cases have been important, they have again been considered here under the heading, Cases in Which Opinions and Interlocutory Orders Were Handed Down During the Fiscal Year (pp. 71 to 72, supra).

In the interest of brevity, no further reference to these cases will be made other than to identify them and to refer to their treatment in the fourth annual report.

(1) IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 4987—Intercity Radio Telegraph Co. *v.* Federal Radio Commission.
No. 4988—Wireless Telegraph & Communications Co. *v.* Federal Radio Commission.
No. 4990—R. C. A. Communications, Inc., *v.* Federal Radio Commission.
No. 4991—Mackay Radio & Telegraph Co. *v.* Federal Radio Commission.
(See Fourth Annual Report, pp. 42 and 43.)

(2) IN THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SEVENTH CIRCUIT

No. 4291—American Bond & Mortgage Co. and Trianon, Inc., *v.* United States of America.
No. 4119—Clinton R. White *v.* George E. Q. Johnson and H. D. Hayes.
(See Fourth Annual Report, pp. 48, 49, and 50.)

(3) IN THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

Equity No. 51439—Baltimore Radio Show, Inc., *v.* Federal Radio Commission.
Equity No. 51325—Stromberg-Carlson Telephone Mfg. Co., a Corporation, *v.* Federal Radio Commission.
(See Fourth Annual Report, pp. 47 and 48.)

(4) IN THE DISTRICT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT OF ILLINOIS, EASTERN DIVISION

Equity No. 9882—Agricultural Broadcasting Co. & Great Lakes Broadcasting Co. *v.* Federal Radio Commission et al.
(See Fourth Annual Report, p. 48.)

B. CASES FILED DURING THE FISCAL YEAR

The following summary will serve to briefly identify the cases filed during the fiscal year which were pending July 1, 1931, the principal issues involved, and their status:

(1) IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 5335—Fisher's Blend Station, Inc. (station KOMO), *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for construction permit. Appellant's station is now and has been assigned to operate on the frequency 920 kilocycles with 1-kilowatt power, hours of operation unlimited (a regional as-

signment). The application denied requested authority to construct a station to operate on the frequency 970 kilocycles with power of 5 kilowatts, hours of operation unlimited (a cleared-channel assignment). The commission denial was made after a full hearing which involved a competitive showing between appellant and station KJR, now utilizing the requested assignment. The questions presented are chiefly with respect to the correctness and propriety of the commission findings on the evidence presented. This appeal also involves a question of law, to wit, the right of appellant to appeal from a decision of the commission denying an application for construction permit in view of the provisions of section 16 of the act as amended by Public Law No. 494, approved July 1, 1930. The record has been printed, and appellant's briefs are due early in the fall term.

No. 5349—Rev. John W. Sproul *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for renewal of station license. The hearing on this application was heard together with certain other applications for the same facilities. The evidence adduced tended to establish disregard by the applicant of the rules and regulations of the commission, and a financial condition which, in the opinion of the commission, made operation in the public interest, convenience, and necessity an impossibility. Appellant filed a petition for and obtained an order of the court of appeals to proceed *forme pauperis.* Appellant's briefs are due early in the fall term.

No. 5378—Rines Hotel Co. *v.* Federal Radio Commission. (Dismissed on motion of appellant July 22, 1931.)

No. 5391—John R. Sylvester *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for construction permit to construct a new radio broadcasting station at Derry, Pa. The sole question presented is one of public interest, convenience, and necessity in view of the showing with respect to the service which the territory now enjoys and the probability of destructive interference to this and other stations in the event that the proposed station is constructed and placed in operation. The commission has filed the record, its statement of facts, grounds for decision, and order pursuant to section 16 of the act. The record has, however, as yet not been printed.

No. 5413—Keystone Broadcasting Corporation (station WCOD) and Norman R. Hoffman *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for construction permit. Authority is sought to increase the daytime power from 100 to 250 watts. Here again the sole question presented is one of public interest, convenience, and necessity in view of the showing with respect to the service which the territory now enjoys and the probability of destructive interference to this and other stations in the event that the proposed increase in power is authorized. The record in this case has been filed but not yet printed.

No. 5414—John H. Brahy (station WLBX) *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for renewal of station license. Acting under the provisions of section 11 of the act, the commission failed to find that public interest, convenience, and necessity would be served by granting the renewal application and designated the same for hearing. The showing made upon the hearing with respect to the past and probable future operation of the station was such that the commission was constrained to deny this application for renewal. The primary question presented is one of public interest, convenience, and necessity. This appeal also presents certain procedural questions, it being contended by the appellant that the action taken by the commission is in effect a revocation of license, which should have been commenced and prosecuted under section 14. The record in this case has been filed but not yet printed.

No. 5146—WHB Broadcasting Company *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for modification of station license. The station is now assigned daytime operation with 500 watts power. Authority was sought to increase the power output from 500 watts to 1 kilowatt. No other change in the assignment was involved. This appeal involves the issue of public interest, convenience, and necessity in view of the admittedly good service which the territory now receives, and in addition thereto involves a question of the interpretation and application of section 9 of the radio act of 1927 as amended by the act approved March 28, 1928 (Davis amendment). The record in this case has been filed but not yet printed.

No. 5417—Pioneer Broadcasting Company *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for a construction permit. Authority is sought to construct a new radio broadcasting station at Adamsburg, Pa., to operate, when constructed, on the regional frequency of 620 kilocycles with 100 watts power and daytime hours of operation. The issue presented is principally one of public interest, convenience, and necessity in view of the good radio broadcasting service now received by the locality in question from a number of stations, the questionable financial ability of the applicant to construct and operate the proposed station, and the assignment of a 100-watt station to a regional frequency. The record in this case has been filed but not yet printed.

No. 5418—Norman Baker (station KTNT) *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for renewal of station license. Upon examination of the application the commission was unable to determine that public interest, convenience, and necessity would be served by the grant thereof, and designated the same for hearing

pursuant to section 11 of the act. Upon the hearing evidence was adduced which tended to establish that the licensee of this station had utilized the same to make bitter attacks upon various individuals, companies, and associations with whom he had personal differences; that the station programs were composed largely of these attacks and direct selling and price quoting of licensee's merchandise, as well as the exploitation of the medical theories and practices of licensee and his cancer hospital. Upon this showing the commission denied the application for renewal on the authority of the Brinkley case (47 F. (2d) 670). The principal issue involved is that of public interest, convenience, and necessity in view of the character of the station's operation. A number of procedural questions are also presented by this appeal, as is also the question of whether or not the commission's refusal to grant an application for renewal, based upon the character of a station's past and probable future operation, constitutes censorship. The record has been filed but not yet printed.

No. 5422—W. E. Riker (station KFQU) *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for renewal of station license. The application was designated for hearing pursuant to the provisions of section 11 of the act. The evidence adduced at the hearing tended to establish that the applicant did not possess financial ability to maintain the proper operation of the station; that there had been repeated violations of the commission's rules and regulations with respect to maintenance of the assigned frequency; and that the service being rendered by the station was not such as to justify its continued operation. The principal question involved is one of public interest, convenience, and necessity in view of the facts developed at the hearing. Certain procedural questions are also presented, the contention of the appellant being that the commission should have proceeded against the station, if at all, under section 14 of the act. The record has been filed but not yet printed.

No. 5425—Woodmen of the World Life Insurance Co. (station WOW) *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for modification of station license. Appellant's station, located at Omaha, Nebr., operates on the frequency 590 kilocycles, with 1 kilowatt power, upon a time-sharing basis with station WCAJ of Lincoln, Nebr., owned and operated by Nebraska Wesleyan University. Station WOW uses six-sevenths of the time and station WCAJ uses one-seventh of the time on this frequency. By the application in question station WOW sought unlimited time on this frequency. The principal question involved is one of public interest, convenience, and necessity and of the correctness and propriety of the commission's findings on the evidence adduced at the hearing. The record in this case has been filed but not yet printed.

No. 5426—Kunsky-Trendle Broadcasting Corporation (station WXYZ) *v.* Federal Radio Commission[2]

[2] Dismissed on motion of appellant, July 17, 1931.

No. 5427—KFQW, Inc., *v.* Federal Radio Commission

This is an appeal from a decision and order of the commission denying an application for renewal of station license. The application was designated for hearing pursuant to section 11 of the act. The evidence adduced at the hearing tended to show that appellant lacked the financial ability to properly conduct and operate the station; that it had frequently violated the commission's rules and regulations, particularly those with respect to maintenance of the assigned frequency; that the character of the station's operation was not such as to justify its continuance. The principal question involved is one of public interest, convenience, and necessity in view of the record disclosures, although certain procedural questions are presented. The record in this case has been filed but not yet printed.

V. CONCLUSION

The principal developments of the fiscal year from the standpoint of the legal division can be said to consist of—

1. The court decisions heretofore summarized, clarifying and applying the provisions of the radio act of 1927, as amended, in criminal as well as civil cases.

2. A marked improvement in the manner in which cases before the commission are handled, due to—

(*a*) The creation of an examiners division, the members of which hear all but exceptional cases, relieving the commission of this burden.

(*b*) The adoption of a code of rules governing practice and procedure.

(*c*) The preparation by the commission of formal opinions in virtually all cases which go to hearing.

(*d*) The cooperation of parties having business before the commission and the more careful preparation of their cases.

3. Active complaint and investigation work, making possible the deletion of stations not performing a public service, and the prosecution of those violating the criminal provisions of the act.

4. The elimination of duplication of effort and a corresponding increase in opportunity for specialization within the division, brought about by the establishment of sections with clearly defined duties and responsibilities.

REPORT OF THE CHIEF EXAMINER

ELLIS A. YOST

Although the radio act of 1927 authorized the Federal Radio Commission to appoint examiners no such appointments were actually made prior to June 30, 1930, all hearings being conducted before one or more members of the commission. The steady growth of commission business made it apparent that the commission and the individual commissioners should be relieved of the duty of conducting hearings, and General Order No. 93, embodying rules of practice and procedure and providing for the conduct of hearings by examiners, was adopted on June 25, 1930, to become effective September 1, 1930. At the same time three new positions were created in the legal division—a chief examiner and two examiners, and subsequently, in February, 1931, provision was made for the appointment of an additional examiner.

On June 30, 1930, Ellis A. Yost was appointed chief examiner and Elmer W. Pratt, formerly an assistant counsel of the commission, was appointed an examiner. The appointments of Rosel H. Hyde and Ralph L. Walker, both formerly assistant counsel of the commission, on November 25, 1930, and February 2, 1931, respectively, completed the present complement of examiners.

On December 19, 1930, a separate examiners division was created, of which the chief examiner was made the head.

With few exceptions all hearings held since July 1, 1930, have been conducted by an examiner. Each case is made the subject of an examiner's report, containing findings of fact, conclusions, and recommendation as to the action which should be taken thereon by the commission. All parties to the hearing are afforded an opportunity to file exceptions to the examiner's report, and, in the discretion of the commission, present oral argument to the commission before a final decision is made.

During the fiscal year ending June 30, 1931, a total of 317 cases were heard by examiners. Of this number, 260 have been reported, leaving 57 unreported.

APPENDIX A

TEXT OF GENERAL ORDERS ADOPTED DURING THE YEAR ENDED JUNE 30, 1931

GENERAL ORDER No. 95

At a session of the Federal Radio Commission held at its offices in Washington, D. C., September 29, 1930, for the purpose of giving the Federal Radio Commission more accurate information concerning radio stations, for the prevention of violations of section 12 of the radio act of 1927, as amended, and further to give effect to other provisions of the law,

It is hereby ordered:

1. That all applications for consent to the assignment of a construction permit or license shall be made upon forms prescribed by the commission setting forth such facts as are necessary to show that the assignee is eligible and qualified to receive a construction permit or license, and that the continued operation of the station will be in the public interest. Where the assignment is voluntary the application shall be executed in duplicate by both assignor and assignee, and duplicate verified copies of the sale or lease contract shall be attached to such application and made a part thereof. Such contract shall provide that the assignee will have complete control of the station equipment and apparatus and of its operation, including unlimited supervision of programs to be broadcast from the station, and shall be subject only to the consent of the commission; where involuntary it shall be executed by the assignee and shall, in addition, set forth the nature of such involuntary assignment and a certified copy of the court order or legal instrument by which assignee has obtained such right.

2. That the insolvency of the licensee of any radio station shall be grounds for the revocation of the station license and/or the refusal of the renewal thereof. The appointment of receivers upon grounds of insolvency and preliminary adjudications of bankruptcy will be considered by the commission as prima facie proof of insolvency. Final adjudications will be accepted as conclusive.

3. That a violation of any of the provisions of this order will be deemed grounds for the revocation of station license, under section 14 of the radio act of 1927, as amended, or for denial of the application for renewal of the station license held by a licensee so violating any provision of this order.

4. That General Order No. 9 is repealed.

GENERAL ORDER No. 96

At a session of the Federal Radio Commission, held at its offices in Washington, D. C., on October 6, 1930, the commission adopted the following general order:

AUXILIARY BROADCASTING TRANSMITTERS

I

Upon a showing that a need exists therefor, a license may be issued upon application for an auxiliary transmitter in addition to the regular transmitter of a broadcasting station. Auxiliary transmitters are defined as transmitters maintained for the purpose of transmitting the regular program of the station only in case of failure of the main transmitter.

Auxiliary transmitters will be permitted to be installed only at the same location as the main transmitter, except that upon suitable showing of technical necessity therefor the commission may grant permission for other locations.

II

A licensed operator shall be in control whenever an auxiliary transmitter is placed in operation. The provisions of General Order 90 shall apply to licenses covering auxiliary transmitters.

All auxiliary transmitters shall be maintained so that they may be put into immediate operation at any time upon failure of the main transmitter or upon request of a duly authorized Government official.

All auxiliary transmitters shall be tested at least once each week to determine that they are in proper operating condition and that they are adjusted to the proper frequency. Such tests shall be conducted between 1 a. m. and 12 o'clock noon. A record of the time, conditions, and results of tests shall be kept in a special record available for inspection at any time.

All auxiliary transmitters shall be equipped with satisfactory frequency checking or control equipment which will enable the maintenance of the frequency emitted from the station within the limits prescribed by the regulations of the commission.

All auxiliary transmitters which may be licensed at geographical locations different from that of the main transmitters shall be equipped with a frequency-control device which will automatically hold the frequency within 500 cycles of the licensed frequency without any manual adjustment during operation or when preparing to place in operation.

III

All auxiliary transmitters licensed at the present time and not in compliance with the above sections shall be made to comply therewith by the end of the license period ending January 31, 1931, or the license will not be renewed at that time.

All regulations applying to changes in the main transmitter equipment shall also apply to auxiliary transmitters. All provisions of General Order No. 91 apply equally to auxiliary transmitters as to main transmitters.

IV

Where broadcasting stations have their transmitting equipment in duplicate and arranged for alternate operation, one such duplicate shall be considered as an auxiliary transmitter subject to the terms and conditions of this order: *Provided, however,* That duplicate transmitters for alternate operation may be licensed where the commission is satisfied that desirable experimental development work is being carried on. In this event the licensee shall file reports with the commission at the quarterly periods ending March 31, June 30, September 30, and December 31, setting forth the nature of the experiments conducted and the results thereof during the preceding period of three months. These reports shall be mailed in time to reach the commission within 15 days after the end of each quarter.

V

Within two days after each use of the auxiliary transmitter, except for testing, the radio supervisor shall be notified of the date, time, and power at which the auxiliary transmitter is operated and the reasons for each use.

GENERAL ORDER NO. 97

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on October 6, 1930, the commission adopted the following general order:

It is hereby ordered:

SECTION I. That no radio broadcasting station will be licensed by the Federal Radio Commission to operate after January 31, 1931, with a greater power than can be satisfactorily delivered and maintained by the licensed transmitter with a percentage of modulation of over seventy-five per cent (75%) on peaks with not over ten per cent (10%) combined audio harmonics.

SEC. II. No radio broadcasting station license will be granted by the Federal Radio Commission authorizing the operation of any station after January 31, 1931, with a greater power than the maximum rated carrier power of the transmitter as determined by existing general orders of the Federal Radio Commission.

SEC. III. All radio broadcasting stations specifying or claiming operating constants that give greater carrier power than the maximum rated power of the transmitter as determined by existing general orders of the Federal Radio Commission shall submit data showing the antenna input power by direct measurement and oscillograms of the maximum satisfactory modulation to prove licensed power output and proper modulation.

SEC. IV. (*a*) The oscillograms required by Section III of this general order shall be taken while modulating the transmitter with a frequency of approximately 200 cycles at maximum licensed power and under normal operating conditions. Reference lines shall be run on the oscillograms as follows: (1) One line indicating carrier position, (2) one line for one hundred per cent (100%) negative modulation, and (3) one line for one hundred per cent (100%) positive modulation. These lines shall be one-half (½) inch or more apart. Such oscillograms may be taken with time delay relays so that one-third of the oscillogram shows no current through vibrator, one-third shows rectified carrier only, and one-third shows modulation.

(*b*) One overload oscillogram shall be taken with the 200-cycle tone input voltage twenty-five per cent (25%) greater than the input voltage necessary to produce the maximum satisfactory modulation which the licensee claims the transmitter is capable of producing.

(*c*) Complete data on a measuring of the antenna resistance shall be submitted to the commission for its approval, together with full operating constants of the transmitter while taking such oscillograms.

SEC. V. (*a*) The data required in Section IV shall be submitted and approved by the commission on or before January 31, 1931, or the licensed power will be reduced to conform to maximum rated carrier power of the transmitter as determined by existing general orders of the Federal Radio Commission.

(*b*) No changes shall be made in any radio broadcasting transmitter affecting the maximum rated carrier power thereof until such changes have been authorized by the commission.

GENERAL ORDER No. 98

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 27th day of October, 1930,

It is ordered:

That General Order No. 28, heretofore issued by the commission on April 20, 1928, be, and the same is hereby, amended to read as follows:

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 is located and not where the transmitter is located."

In this particular it is ordered that no broadcasting station shall move its main studio outside of the borders of the city, State, District, Territory, or possession in which it is located without first making written application to the commission for authority to so move said studio and securing written permission for such removal. Permission to move the main studio of a station from one location to another within a city or town is not required, but licensees shall notify the commission first of any such change.

The studio from which the majority of the local programs originate and from which a majority of station announcements are made of programs originating at remote points shall be considered the main studio.

This order shall not apply to purely secondary or auxiliary studios or remote-control apparatus.

This order shall be effective on the day first above written.

GENERAL ORDER No. 99

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 27th day of October, 1930,

It is ordered:

(1) That General Order No. 94 is hereby repealed.

(2) Upon proper application of any companies or agencies maintaining, or proposing to maintain, aeronautical stations, if the commission is satisfied that the particular applicant is qualified and that the issuance of the license or licenses in question would serve public interest, convenience, or necessity, frequencies will be designated solely for use by all of said stations which comprise a continuous series of stations, or chain, along a particular airway.

(3) In the interest of economy in the use of frequencies, to coordinate the radio facilities and secure the maximum flexibility, it is required that where the service provided by a chain is regularly used as distinguished from casual, incidental, or emergency use, the owners of the transport aircraft which use such chain or chains shall cooperate among themselves as to the operation, maintenance, and liability of the stations: *Provided, however*, That nothing herein shall impose upon the commission any authority or responsibility whatever with reference to the private business or transactions of any licensee. Aeronautical stations licensed pursuant to this plan are required to provide service, without discrimination, for all and any aircraft the owners of which enter into such cooperation. In addition, chain stations shall provide reasonable and fair service to itinerant aircraft upon the frequencies designated for that purpose.

(4) For the purpose of this order, two types of aircraft are defined:

a. Transport aircraft: Those commercially transporting persons and/or property and operating regularly on fixed routes

b. Itinerant aircraft: All those other than transport or Government aircraft.

(5) An aeronautical station shall be defined as one being capable of giving—

1. Ground-to-aircraft communication.

2. Point-to-point communication (provided frequencies have been designated for this service pursuant to paragraph *a* of section 9).

3. Distress, calling, and navigational service.

(6) All frequencies assigned for aviation purposes shall be designated in three classes, as follows:

a. Frequencies used by aeronautical or aircraft stations on a chain or chains for communication purposes either between aeronautical stations and aircraft or between aeronautical stations.

b. Frequencies used for distress, calling, and aids to navigation.

c. Other aviation frequencies.

(7) The distress, calling, and navigational frequencies and frequencies other than those permanently assigned to chains shall be as follows:

278 kilocycles. Airport frequency. Calling and working frequency from all ground stations to aircraft. Power not to exceed 15 watts. To be required for all ground stations after September 1, 1931.

333 kilocycles. International air calling frequency to be used only beyond the limits of the United States, and then only for communication between aircraft and foreign stations.

375 kilocycles. Radio compass.

500 kilocycles. International calling and distress frequency for ships and aircraft over the seas.

3,106 kilocycles. National calling and working frequency for all itinerant aircraft. It may also be assigned to transport aircraft in addition to the chain frequencies. Aircraft calling or working ground stations on this frequency will conduct a 2-way communication by utilizing the 3,106-kilocycle frequency for transmitting from aircraft to the ground and the 278-kilocycle frequency for receiving from the ground to aircraft.

5,525, 11,050, 16,580 kilocycles. Primarily for coastal stations and ships. May also be assigned to aircraft only for the purpose of calling a coastal station or ship when aircraft is in flight over the sea.

414, 457 kilocycles. Working frequencies for aircraft on sea flights desiring intermediate frequencies. Those desiring high frequencies may use the frequencies designated for maritime calling and working.

(8) The frequencies 12,180 and 12,210 kilocycles designated by the President as reserved for Government experimental stations, but available for assignment to commercial companies subject to recall by the Government upon six months' notice, are made available on such temporary basis for aeronautical point-to-point communications on chains during daylight hours only: *Provided, however*, That applicants desiring the use of such frequencies can show that such frequencies are necessary. Licensees are hereby notified that these frequencies may be recalled on or before July 1, 1931.

(9) Frequencies licensed for use by aeronautical stations shall not be used for point-to-point service except in conjunction with communication between aircraft and ground, and then only—

a. Where frequencies are allocated to a chain and cooperatively used, as described in paragraph 2, a point-to-point service will be licensed upon application for frequencies to be designated: *Provided*, That the use of such service shall be open to all of the cooperative participants upon an equal basis, and then only to the extent of the actual aviation needs of the users.

b. That at all times the licensee of point-to-point service shall be required to transmit, without charge or discrimination, all necessary messages in times of public emergency which involve the safety of life or property.

(10) In no event shall the use of any frequency authorized under the provisions of this order by a licensee extend to commercial correspondence or to paid or toll messages in the sense in which these terms are generally understood and accepted.

(11) The chains shall be established as indicated upon a map to be maintained by the commission, and this map shall show (1) the location of all aeronautical stations, (2) the frequencies allocated by the commission, and (3) as nearly as possible all proposed chains (following, connecting with or independent of existing chains). Copies of this map are available upon request.

(12) The chains shall be established as indicated upon this map in colored lines, the colors having the frequency designations as follows:

NORTHERN TRANSCONTINENTAL CHAIN AND FEEDERS (RED)

Mobile service—Available for aircraft and aeronautical stations

3,160 kilocycles. Unlimited hours.
3,166 kilocycles. Unlimited hours.
3,172 kilocycles. Unlimited hours.
3,178 kilocycles. Unlimited hours.
5,570 kilocycles. Day only.
5,660 kilocycles. Day only.

Fixed service

The primary use shall be for the relay of messages destined for or originating on aircraft and relating to the actual aviation needs of the users and on condition that no interference is caused to mobile services.

2,482 kilocycles. Unlimited hours.
2,506 kilocycles. Unlimited hours.
4,124 kilocycles. Unlimited hours.
6,215 kilocycles. Day only.
6,230 kilocycles. Day only.

MIDTRANSCONTINENTAL CHAIN AND FEEDERS (BLUE)

Mobile service—Available for aircraft and aeronautical stations

3,070 kilocycles. Unlimited hours. West of Kansas City, Kans.
3,076 kilocycles. Unlimited hours. West of Kansas City, Kans.
3,082 kilocycles. Unlimited hours. East of Kansas City, Kans.
3,088 kilocycles. Unlimited hours. East of Kansas City, Kans.
5,510 kilocycles. Day only. West of Kansas City, Kans.
5,540 kilocycles. Day only. East of Kansas City, Kans.

Fixed service

The primary use shall be for the relay of messages destined for or originating on aircraft and relating to the actual aviation needs of the users and on condition that no interference is caused to mobile services.

2,722 kilocycles. Unlimited hours.
2,734 kilocycles. Unlimited hours.
4,108 kilocycles. Unlimited hours.
6,350 kilocycles. Day only. West of Kansas City, Kans.
6,365 kilocycles. Day only. East of Kansas City, Kans.
6,380 kilocycles. Day only. Los Angeles to Salt Lake City to Great Falls.
8,015 kilocycles. Day only.
12,180 kilocycles. Day only.

SOUTHERN TRANSCONTINENTAL CHAIN AND FEEDERS (BROWN)

Mobile service—Available for aircraft and aeronautical stations

3,238 kilocycles. Unlimited hours. Must not interfere with Canadian services.
3,244 kilocycles. Unlimited hours. Must not interfere with Canadian services.
3,452 kilocycles. Unlimited hours. Not to be used west and north of Chicago, Ill.
3,460 kilocycles. Unlimited hours. Not to be used west and north of Chicago, Ill.
3,468 kilocycles. Unlimited hours. Not to be used west and north of Chicago, Ill.
3,484 kilocycles. Unlimited hours. Not to be used west and north of Chicago, Ill.
5,600 kilocycles. Day only.
5,630 kilocycles. Day only. For Canadian aeronautical services. May be assigned in southern United States, provided no interference is caused to Canadian communications.

Fixed service

The primary use shall be for the relay of messages destined for or originating on aircraft and relating to the actual aviation needs of the users and on condition that no interference is caused to mobile services.

2,326 kilocycles. Unlimited hours.
2,344 kilocycles. Unlimited hours.
4,140 kilocycles. Unlimited hours.
6,260 kilocycles. Day only.
6,275 kilocycles. Day only.
12,210 kilocycles. Day only.

ATLANTIC COASTAL CHAIN AND FEEDERS (ORANGE)

Mobile service—Available for aircraft and aeronautical stations

3,070 kilocycles. Unlimited hours.
3,076 kilocycles. Unlimited hours.
5,405 kilocycles. Day only—Miami, Fla., and Brownsville, Tex., and other stations south of these locations. Not available for aircraft.
5,690 kilocycles. Day only.
8,650 kilocycles. Unlimited hours. Available only for assignment to aircraft and to be used only when operating south of Miami, Fla., and Brownsville, Tex.

Fixed service

The primary use shall be for the relay of messages destined for or originating on aircraft and relating to the actual aviation needs of the users and on condition that no interference is caused to mobile services.

2,662 kilocycles. Unlimited hours; also available for mobile service.
4,164 kilocycles. Unlimited hours.
6,305 kilocycles. Day only.
6,320 kilocycles. Day only.
8,015 kilocycles. Day only.
12,210 kilocycles. Day only.

(13) In all cases herein where the word "day" occurs in connection with a specific frequency, such use of the word "day" shall be construed to mean that period of time included between two hours after local sunrise and two hours before local sunset. If, for any reason, it is impossible to shift from a day to a night frequency at the exact time required, such shift in frequency shall be made at the earliest possible moment, and with respect to any aircraft; under no circumstances shall the use of a day frequency be continued at night after

such aircraft has once landed at one of the regular airports along its route, following the time when such shift is required to be made.

(14) No aeronautical station will be licensed to use more than 1 kilowatt power on frequencies of 1,500 kilocycles and above.

(15) All aeronautical stations will maintain a watch on such frequencies and for such periods of time as may be designated.

(16) Licensees, both of aeronautical and aircraft stations, shall install equipment of such construction and efficiency as will assure the service which the station is intended to give.

(17) All licenses, whether aircraft or aeronautical, shall be posted at all times in a conspicuous place in the station so licensed. The license of every station operator shall be available for inspection at all times while on duty.

(18) This order is, and shall be, construed as a regulation of the commission, violation of which will be cause for revocation of license as provided by the act of 1927, as amended.

It is further ordered that all general orders or parts thereof and all rules and regulations in conflict herewith be, and the same are hereby, repealed.

This order shall be effective on the day first above written.

AMENDMENT TO GENERAL ORDER No. 99

JANUARY 19, 1931.

The commission amended General Order No. 99 as follows: Under "Mid-transcontinental Chain and Feeders (Blue)" change so as to read:

5,510 kilocycles. Day only. East of Kansas City, Kans.
5,540 kilocycles. Day only. West of Kansas City, Kans.

AMENDMENT TO GENERAL ORDER No. 99 AS AMENDED

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 19th day of February, 1931,

The commission amended General Order No. 99 as follows:

1. With regard to the frequency 278 kilocycles, change section 7 to read as follows:

"278 kilocycles. Airport frequency. Calling and working frequency from all ground stations to aircraft. Power not to exceed 15 watts. To be required for all ground stations after September 1, 1931. Aeronautical stations licensed to use this frequency are required to provide service, without discrimination, for all and any aircraft."

2. By deleting that portion of section 12 which refers to "Atlantic Coastal Chain and Feeders (Orange)" and substituting therefor the following:

(*a*) Eastern Continental Chain and Feeders (Green) with routes to be indicated on map in conformity with section 12 of General Order No. 99, and frequency assignments as follows:

EASTERN CONTINENTAL CHAIN AND FEEDERS (GREEN)

Mobile service—Available for aircraft and aeronautical stations

3,070 kilocycles. Unlimited hours.
3,076 kilocycles. Unlimited hours.
5,690 kilocycles. Day only.

Fixed service

The primary use shall be for the relay of messages destined for or originating on aircraft and relating to the actual aviation needs of the users and on condition that no interference is caused to mobile services.

2,662 kilocycles. Unlimited hours.
4,164 kilocycles. Unlimited hours.
6,305 kilocycles. Day only.
6,320 kilocycles. Day only.
8,015 kilocycles. Day only.

(*b*) Southern International Chain and Feeders (Orange) with routes to be indicated on map in conformity with section 12 of General Order No. 99 and frequency assignments as follows:

SOUTHERN INTERNATIONAL CHAIN AND FEEDERS (ORANGE)

Mobile service—Available for aircraft and aeronautical stations

3,070 kilocycles. Unlimited hours.
3,076 kilocycles. Unlimited hours.
5,405 kilocycles. Day only—Miami, Fla., and Brownsville, Tex., and other stations south of these locations. Not available for aircraft.
5,690 kilocycles. Day only.
8,650 kilocycles. Unlimited hours. Available only for assignment to aircraft and to be used only when operating south of Miami, Fla., and Brownsville, Tex.

Fixed service

The primary use shall be for the relay of messages destined for or originating on aircraft and relating to the actual aviation needs of the users and on condition that no interference is caused to mobile services.
2,662 kilocycles. Unlimited hours; also available for mobile service.
4,164 kilocycles. Unlimited hours.
6,305 kilocycles. Day only.
6,320 kilocycles. Day only
8,015 kilocycles. Day only.

GENERAL ORDER No. 100

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 10th day of November, 1930, the commission adopted the following general order:

It is ordered:

1. That the term "marine relay service" shall be construed to mean a radiotelegraph communication service carried on between coastal stations communicating with one another for the relaying of or pertaining to maritime mobile communications.

2. Upon application and proper showing being made the commission may issue a license or other instrument of authorization for marine relay service:

(*a*) *To any coastal station* for the transmission of radio operating signals utilizing the calling or individual working frequencies licensed to such coastal station for mobile service. Radio operating signals are defined as a letter, figure, or combination of letters and figures, or both, designed to facilitate the conduct of communications; for example, the List of Abbreviations to be Used in Radio Transmissions, Appendix 1 to the General Regulations of the International Radio Convention.

(*b*) *To any Great Lakes coastal station* for the relaying of messages either destined to or originating at mobile stations on the Great Lakes: *Provided, however*, That such messages shall be relayed only upon the working frequencies licensed to such coastal station which are available for both fixed and mobile service under the provisions of the international radio convention.

(*c*) *To any other coastal station* for the relaying via another coastal station of messages destined to a mobile station: *Provided, however*, That such messages shall be relayed only upon the working frequencies licensed to such coastal station for mobile service: *And provided further*, That this service is not to be used for the normal routing of traffic, but only when, for any reason, the initial coastal station has been unable to communicate directly with such mobile station.

3. Licenses for marine relay service will authorize communication only between coastal stations located in the same geographical area. The areas to be designated are as follows:

a. Atlantic-Gulf area.
b. Great Lakes area.
c. Pacific area.

This order shall be effective the day first above written.

GENERAL ORDER No. 101

At a session of the Federal Radio Commission held in its offices in Washington, D. C., on the 14th day of November, 1930,

It is ordered:

That all existing licenses, except those for stations in Alaska, for the services specified below be, and the same are hereby, extended as follows:

(*a*) Until 3 o'clock a. m., eastern standard time, April 1, 1931:
Point-to-point.
Coastal.
Marine relay.
Ships above 1,500 kilocycles.
Aeronautical and aeronautical point-to-point.
Aircraft.

(*b*) Until 3 o'clock a. m., eastern standard time, May 1, 1931:
Police.
Fire.
Experimental visual broadcasting.
Experimental relay broadcasting.

It is further ordered:

That all licenses covering the operation of any radio station in Alaska, except broadcasting stations, which expire between the date of this order and June 1, 1931, are hereby extended until 3 o'clock a. m., eastern standard time, June 1, 1931.

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 serve, 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. The commission reserves the right to change the frequency assignment of any station, the license of which is affected by this order, during the extension herein provided if, in the opinion of the commission, such change is advisable.

The provisions of General Order No. 89, requiring that applications for renewal of license be filed so as to be received at the offices of the supervisor of radio in charge of the district in which the station is located at least 30 days prior to the expiration date of the license sought to be renewed, shall be construed to apply to the extension dates hereinabove authorized.

The licenses for the following services are not affected by the terms of this order, and the expiration date shall be as specified in the existing license:
Geophysical.
General experimental.
Special experimental.
Temporary services.
Ships below 1,500 kilocycles.
Amateur.

This order shall be effective on the day first above written.

Amendment to General Order No. 101

At a session of the Federal Radio Commission held in its offices in Washington, D. C., on the 26th day of February, 1931,

It is ordered:

That the following licenses heretofore extended by General Order No. 101, except those granted to Universal Wireless Communication Co. (Inc.) and the Intercity Radio Telegraph Co., covered by the commission's revocation order of January 29, 1931, be, and the same are hereby, further extended until 3 o'clock a. m., eastern standard time, October 1, 1931:
Point-to-point.
Coastal.
Marine relay.
Ships above 1,500 kilocycles.
Aeronautical and aeronautical point-to-point.[1]
Aircraft.
Police.

It is further ordered:

[1] Exception is made (1) to those licenses authorizing the use of 12,180 kilocycles and 12,210 kilocycles; these shall expire at 3 o'clock a. m., eastern standard time, July 1, 1931; and (2) to those licenses issued to the Ford Motor Co. authorizing the use of the frequencies 290, 393, and 414 kilocycles, which shall expire on the date specified in the existing licenses.

That all applications for renewal of licenses for any of the above services shall be acknowledged by the secretary and retained in the files of the commission for subsequent action: *Provided, however,* That such applications that are allowed to remain in a delayed action status may be acted upon on or prior to the renewal date, in accordance with the rules and regulations in effect at the time of such action.

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 serve, or will serve, public interest, convenience, or necessity beyond the express terms of this order, 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. The commission reserves the right to change the frequency assignment of any station, the license of which is affected by this order, during the extension herein, provided, if in the opinion of the commission, such change is advisable.

The provisions of General Order No. 89, requiring that applications for renewal of license be filed so as to be received at the offices of the supervisor of radio in charge of the district in which the station is located at least 30 days prior to the expiration date of the license sought to be renewed, shall be construed to apply to the extension date hereinabove authorized.

The licenses for the following services are not affected by this order, and the expiration date shall be as specified in General Order No. 101, as follows:

(*a*) Until 3 o'clock a. m., eastern standard time, May 1, 1931:

Fire.
Experimental visual broadcasting.
Experimental relay broadcasting.

(*b*) Until 3 o'clock a. m., eastern standard time, June 1, 1931:

All licenses covering the operation of any radio station in Alaska, except broadcasting stations, which expire between the date of this order and June 1, 1931.

(*c*) The expiration date of the following licenses shall be as specified in the existing license:

Geophysical.
General experimental.
Special experimental.
Temporary services.
Ships below 1,500 kilocycles.
Amateur.

This amendment to General Order No. 101 shall be effective on the day first above written.

GENERAL ORDER No. 102

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 8th day of January, 1931, the commission adopted the following general order:

Whereas under the unit and quota figures adopted by the commission the first and second zones are under quota and the remaining three zones are over quota;

And whereas there are a number of States that are over quota and a number of States that are under quota;

And whereas there is now pending before the commission a number of applications from under-quota States which, under the law, are entitled to their pro rata share of radio facilities:

Therefore, in order to bring about an equalization of these radio facilities among the States in the zones, the commission adopts the following with reference to applications:

1. Where a zone has already in use its pro rata share of facilities, the commission will not allocate any further radio facilities to that zone which would increase its quota.

2. Applications from under-quota States in zones which have already allocated to them their pro rata share of radio facilities should be for a facility already in use in that zone by an over-quota State.

3. Likewise, where a State is already over quota, the commission will not allocate any further radio facilities to that State which would increase its quota.

4. Applications from States which now have their quotas or from States which are over quota should be for facilities already in use in that State.

5. An applicant from an under-quota State in an under-quota zone may apply either for facilities in use in an over-quota State in that zone or an over-quota State in an over-quota zone.

The further questions of kilocycle and mileage separations should also be considered by an applicant in selecting the frequency to be applied for.

Since the commission has classified stations in accordance with power into three classes, namely, clear channel, regional, and local stations, and has allocated certain frequencies for the use of each of these three classes of stations, applications should be for frequencies set aside by the commission for the character of station applied for.

All applications now pending before the commission which have not been heard or designated for hearing by the commission may be amended by the applicants to conform to this order.

This order shall be effective on the day first above written.

EXPLANATION OF GENERAL ORDER NO. 102

FEBRUARY 26, 1931.

General Order No. 102 of the Federal Radio Commission must be considered together with other general orders of the commission and its established policy. General Order No. 40 of this commission designates six frequencies for use by local stations and restricts the nighttime power of stations of these frequencies to a maximum of 100 watts. The same general order designates certain frequencies to be occupied by regional stations operating with powers of 250, 500, or 1,000 watts at night. General Order No. 40, therefore, would prohibit the operation of a station using more than 100 watts power on any of the six local frequencies. The established policy of the commission, based on what is believed to be sound engineering and economic principles, has been to authorize no 100-watt stations to operate at night on regional frequencies.

Applicants for construction permits for local stations (meaning stations operating with the power of 100 watts or less at night) are restricted to the six frequencies designated for that purpose by General Order No. 40 above referred to.

In the final analysis, and from a practical viewpoint, it appears that applications from States which have their quota, or more, of radio facilities assigned to them should, in general, be confined to facilities of a station, or stations, of the same class as that proposed to be constructed and/or operated by the applicant. That is, if the applicant applies for authority to construct or operate a local station in a State which has its quota, or more, the application should be to supplant a local station in that State. Applications for regional assignments should be made for the facilities of a regional station and applications for clear-channel assignments should be for the facilities of a clear-channel station.

In some cases, however, where facilities of one class can be installed without interference but the State and/or zone has its quota already assigned, then applications may be made for all or part of the facilities of any station of any class in that State or zone. In this case the applicant should specify the facility which he desires to have transferred.

GENERAL ORDER NO. 103

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 20th day of January, 1931,

It is ordered:

The licenses of all broadcasting stations, with the following exceptions, are hereby extended subject to the terms and conditions provided in said licenses for the period beginning 3 a. m., eastern standard time, January 31, 1931, and ending 3 a. m., eastern standard time, April 30, 1931:

(A) WLBX, KFQU, WJBW, KTSA, WHK, WCGU, KFQW, KGEF, and KZM, which have been heretofore designated for hearing. The licenses for

these stations are hereby extended until decision of the commission as a result of the said hearings, but in no event later than 3 a. m., eastern standard time, March 31, 1931.

(B) KFXY, KGB, KWKH, WJAY, WRUF, WMRJ, WIBR, WJW, WALR, WWL, WHBC, WRBL, WGCM, KRLD, KONO, KFYO, KLRA, WLOE, and WMBC, which are pending investigation. The licenses for these stations are hereby extended until the completion of said investigation or until decision of the commission if, after a result of said investigation, the applications are designated for hearing, but in no event later than 3 a. m., eastern standard time, March 31, 1931.

(C) WBRE, WCLS, WELL, WEVD, WHEC-WABO, WKBO, WKBQ, WLTH, WMBJ, WMBQ, WWRL, KBPS, KFUL, KGAR, KGBZ, KMPC, KTNT, KTRH, WNJ, WAIU, and WREC-WOAN, which have been heard and are pending the decision of the commission. The licenses for these stations are hereby extended until decision of the commission, as a result of said hearings, and in no event later than 3 a. m., eastern standard time, April 30, 1931.

(D) WAWZ, WDRC, WKAQ, WOAX, WDBJ, WGAR, WHP, WACO, WDAG, KGCR, KFVD, KFXJ, KOL, KSEI, and KUJ, which have not filed applications for renewal of station licenses.

No authority herein contained shall be construed as a finding by the Federal Radio Commission that the operation of these stations is now or will be in the public interest beyond the dates specified in this order.

It is further ordered:

The operation of General Order No. 97 is hereby postponed to 3 a. m., eastern standard time, April 30, 1931.

This order shall be effective on the day first above written.

Amendment to General Order No. 103

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 30th day of January, 1931:

It is ordered:

That paragraph (D) of General Order No. 103, adopted on January 20, 1931, be, and the said paragraph is hereby, amended so as to exclude from the provisions thereof and to delete therefrom the following radio broadcasting stations, to wit:

WDRC, WKAQ, WOAX, WDBJ, WHP, WACO, WDAG, KGCR, KFVD, KOL, and KSEI.

This order shall be effective on the day first above written.

General Order No. 104

At a session of the Federal Radio Commission held at its offices in Washington, D. C., February 2, 1931,

It is ordered:

MARITIME STATIONS

1. All ship stations, coastal stations, and stations licensed for marine relay service shall maintain an accurate log of their operation on the international calling and distress frequency, 500 kilocycles (410 kilocycles on the Great Lakes), as follows:

(*a*) At stations where continuous watch is maintained, an entry shall be made at least every 15 minutes. At stations having limited hours of operation, similar entry shall be made during the time the station is active. All calls or answers made shall be entered, giving time and call letters of station worked. Stations may be designated by their call letters in all log entries.

(*b*) Entry shall be made of any unlawful interference from other stations.

(*c*) Distress calls and any unusual and special incidents shall be duly entered.

(*d*) Notations shall be made of any breakdowns of apparatus, failure of power supply, noises, or disturbances tending to delay traffic.

(*e*) When a change in the watch is made the operator relieved shall sign his name with the indication "off watch" and the relieving operator shall sign his name showing that he is "on watch."

(*f*) Each sheet of the log shall be numbered and dated. The time used for making an entry in the radio log shall be stated at the top of each sheet; i. e., Greenwich mean time, seventy-fifth meridian time, or whatever time is used, depending upon the location of the station.

2. In addition, ship stations shall show the following:

(*a*) Time of arrival at and departure from ports, giving names of each.

(*b*) Approximate position of vessel, showing miles and direction from some given point each day. Latitude and longitude may be used (noon position is preferred).

3. These logs shall be available to inspection by Government radio inspectors in the course of their official duties, and information therein contained shall be held confidential by said inspectors, except as may become necessary in the discharge of their official duties.

This order shall be effective on March 1, 1931.

GENERAL ORDER No. 105

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 12th day of February, 1931,

It is ordered:

SECTION 1. *The broadcasting day.*—That period of time between 6 o'clock a. m. and 12 o'clock midnight shall constitute a broadcasting day; the period between 6 o'clock a. m. and local sunset to be designated as daytime and that between local sunset and 12 o'clock midnight as nighttime. The monthly average sunset at all locations will be specified by the Federal Radio Commission, and the references herein made to times shall be taken as referring to local standard time unless otherwise ordered. In determining the quota value of a given assignment or in the computation of time division, the average time of local sunset shall be taken to be 6 o'clock p. m., and one hour of nighttime operation shall be considered as the equivalent of two hours of daytime operation.

SEC. 2. *The test or experimental period.*—That period of time between 12 o'clock midnight and 6 o'clock a. m. local time shall constitute the test or experimental period and may be used for this purpose by any regularly licensed broadcasting station on its assigned frequency and with its authorized power: *Provided, however,* That no interference is caused with other stations maintaining a regular operating schedule during all or any part of said time.

SEC. 3. *Unlimited time stations.*—All broadcasting stations now or hereinafter licensed to operate without limit as to time may operate on any schedule of hours that meets their requirements, whether during the broadcasting day or test or experimental period: *Provided, however,* That from and after the 1st day of May, 1931, no licenses authorizing unlimited hours of operation will be issued to broadcasting stations which are not on said date and do not continuously thereafter maintain a minimum regular operating schedule of 12 hours per broadcasting day, at least 3 hours of which shall be between 6 o'clock p. m. and 12 o'clock midnight local time. In all cases where the minimum regular operating schedule herein provided is not adhered to, such stations may, after hearing, be required to share time with other stations or be reduced to part-time stations.

SEC. 4. *Stations sharing time.*—(*a*) In all cases where broadcasting stations are licensed to share time they shall not operate simultaneously at any time, either day or night, unless specifically authorized to do so by the terms of their licenses.

(*b*) In all cases where broadcasting stations are licensed to share time and specified hours of operation are designated in the license, that schedule shall be adhered to until otherwise ordered by the commission or deviation therefrom is permitted pursuant to paragraph (*d*) of this section.

(*c*) In all cases where broadcasting stations are required to share time and the specific hours of operation are not designated in the license, the licensees of such stations shall endeavor to reach an agreement as to a definite schedule of periods of time to be used by each of them, and if successful each of said stations shall reduce said agreement to writing and file the same in triplicate with the commission with each application for renewal of license. If and when such written agreements are properly filed in conformity with this order, the file

mark of the commission shall be affixed thereto; one copy shall be retained by the commission, one copy shall be forwarded to the radio division of the Department of Commerce, and one copy shall be returned to the licensee of said station to be posted with its license and considered as a part thereof. If the license specifies a definite proportionate time division, the agreement shall maintain this proportion. In case no proportionate time division is specified, the stations will agree upon a division of time. Nothing contained in this order shall be construed as authorizing or permitting the simultaneous operation of such stations unless specifically authorized to do so by the terms of their licenses.

(*d*) In all cases enumerated in paragraphs (*b*) and (*c*) hereof, departure from the regular operating schedule will be permitted only in cases where an agreement to that effect is reduced to writing, signed by the stations affected thereby, and filed in triplicate with the commission prior to the time of said departure: *Provided, however*, That in cases where time is of the essence the actual departure in the operating schedule may, after appropriate notice to the commission and to the radio division of the Department of Commerce, precede the actual filing of the written agreement with the commission: *And provided further*, That nothing herein contained shall be taken as authorizing any simultaneous operation not specifically authorized in the licensees of the station affected.

(*e*) In all cases enumerated in paragraph (*c*) hereof where the station licensees are unable to reach an agreement as to a definite schedule of periods of time to be used by each of them, the commission shall be so notified by the filing of a statement to that effect with the application for renewal of license. Upon receipt of such statement the commission will designate the applications for hearing, and pending such hearing the operating schedule previously adhered to shall remain in full force and effect.

SEC. 5. *Limited time and day stations.*—(*a*) In all cases where a broadcasting station is licensed to operate limited time or during daytime it shall not operate simultaneously with any other station assigned to that frequency at any time unless specifically authorized to do so by the terms of its license.

(*b*) In all cases where a broadcasting station is licensed to operate with limited hours and required to cease operation at the time of sunset at some point within the United States, the license will provide the hour of the day during each month of the license period when said station shall cease operation.

(*c*) In all cases where limited-time stations are licensed to resume operation at the time the unlimited-time station on the same channel ceases operation, the licensee of said limited-time station shall file in triplicate with the commission a copy of its regular operating schedule, signed and approved by the licensee of the unlimited-time station. Upon receipt of such operating schedule, properly executed, the commission will affix its file mark, retain one copy, forward one copy to the radio division of the Department of Commerce, and return one copy to the licensee of the limited-time station filing the same who shall cause it to be posted with and considered as a part of the station license. Departure from said operating schedule may be had only by compliance with the provisions of paragraph (*d*) of section 4 with respect to such departures by stations sharing time.

SEC. 6. *Reducing power at sunset.*—In all cases where a broadcasting station is licensed to operate with more power during daytime operation than for nighttime operation and the licensee is required to reduce the power of the station at the time of sunset, the license issued to said station will specify the hour of the day during each month of the license period at which said station is required to reduce its power.

SEC. 7. *Part-time stations.*—Any broadcasting station other than a day or a limited-time station, which is licensed to operate part time on a channel where the entire available broadcasting time (i. e., the broadcasting day) has not been designated for the use of any other station or stations, may operate temporarily and until the further order of the commission upon all or any part of the time not so designated: *Provided, however*, That where two or more part-time stations are eligible to operate on said undesignated time, they shall comply with the provisions of paragraph (*c*) of section 4 with respect to the regular operating schedule of stations sharing time.

SEC. 8. *Violations.*—(*a*) In all cases where a licensee is required by the terms of this order to file any document pertaining to its operating schedule at the time of its application for a license, the failure to file such a document shall

be considered as a defect in the application for license within the meaning of section 1 of subtitle B of Practice and Procedure Before the Federal Radio Commission adopted by General Order No. 93.

(*b*) In all cases where a station licensee is required to prepare and file a regular operating schedule, any deviation or departure from such schedule, except as herein authorized, shall be considered as a violation of a material term of the license and of this order.

(*c*) In all cases where the specific hours of operation are fixed in the license, any deviation or departure therefrom, except as herein authorized, shall be considered as a violation of a material term of the license and of this order.

(*d*) Unless specifically authorized to do so by the terms of their licenses, no stations operating on the same frequency assignments shall be permitted to operate simultaneously. Any unauthorized simultaneous operation shall be considered as a violation of a material term of the station license and of this order without regard to any understanding or agreement as between the stations affected thereby.

This order shall be effective on March 1, 1931.

AMENDMENT TO GENERAL ORDER No. 105

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 2d day of March, 1931,

It is ordered:

The effective date of General Order 105 is hereby postponed until 3 a. m., eastern standard time, April 30, 1931.

GENERAL ORDER No. 106

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on February 16, 1931,

It is ordered:

BROADCASTING STATIONS

That all broadcasting stations be, and they hereby are, required to maintain two logs, as follows:

1. *Program log.*—This log shall contain—

(*a*) An entry of all station and call announcements and the time made.

(*b*) An entry describing each program broadcast, with the time beginning and ending. If phonograph records or electrical transcriptions are used, that fact shall be noted, together with the announcement made thereof.

2. *Operating log.*—This log shall contain—

(*a*) An entry of the time the station's carrier wave goes on the air and the time the station's carrier wave is stopped.

(*b*) An entry of the time the program begins and ends.

(*c*) An entry of every interruption of the carrier wave, its cause and duration.

(*d*) An entry of each of the following shall be made every 30 minutes.

(1) Operating constants on last radio stage (total plate current and plate voltage); antenna current.

(2) Frequency check.

(3) Temperature of crystal chamber (if used).

These logs shall be kept by the person or persons competent to do so, having actual knowledge or information of the facts herein required, who shall sign the log when coming on duty and again when going off duty. The logs herein required shall be open to inspection at all reasonable times by Government radio inspectors and other persons authorized to do so by the Federal Radio Commission.

This order shall be effective on the 1st day of March, 1931.

AMENDMENT TO GENERAL ORDER No. 106

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 27th day of February, 1931,

It is ordered:

The effective date of General Order No. 106 is hereby postponed until 3 a. m., eastern standard time, April 30, 1931.

GENERAL ORDER No. 107

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 24th day of March, 1931.

It is ordered that General Order No. 87, as amended, be, and the same is hereby, repealed.

This order shall be effective on the date first above mentioned.

GENERAL ORDER No. 108

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on March 26, 1931,

It is ordered:

That General Order No. 97, adopted and promulgated by the Federal Radio Commission on October 6, 1930, be, and said general order is hereby, amended so as to read as follows:

Section I.

Section II.

Section V (*a*).

Change date from January 31, 1931, to April 30, 1931.

GENERAL ORDER No. 109

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on March 26, 1931,

It is ordered:

That General Order No. 103, adopted by the Federal Radio Commission on January 20, 1931, and General Order No. 103 as amended and promulgated by the Federal Radio Commission on January 30, 1931, be, and they are hereby, rescinded and repealed.

GENERAL ORDER No. 110

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 27th day of March, 1931,

It is ordered:

That General Order No. 101, as amended, be, and the same is hereby, repealed.

This order shall be effective at 3 a. m., eastern standard time, April 1, 1931.

GENERAL ORDER No. 111

At a session of the Federal Radio Commission held at its offices in Washiigton, D. C., on the 20th day of April, 1931,

It is ordered:

That General Order No. 108 be, and the same is hereby, repealed;

That General Order No. 97, adopted and promulgated by the Federal Radio Commission October 6, 1930, be, and it is hereby, amended so as to read as follows:

"SECTION I. That no radio broadcasting station will be licensed by the Federal Radio Commission to operate after April 30, 1931, with a greater power

than can be satisfactorily delivered and maintained by the licensed transmitter with a percentage of modulation of over seventy-five per cent (75%) on peaks with not over ten per cent (10%) combined audio harmonics.

"SEC. II. No radio broadcasting station license will be granted by the Federal Radio Commission authorizing the operation of any station after April 30, 1931, with a greater power than the maximum rated carrier power of the transmitter as determined by existing general orders of the Federal Radio Commission.

"SEC. III. All radio broadcasting stations specifying or claiming operating constants that give greater carrier power than the maximum rated power of the transmitter as determined by existing general orders of the Federal Radio Commission shall submit data showing the antenna input power by direct measurement and oscillograms of the maximum satisfactory modulation to prove licensed power output and proper modulation.

"SEC. IV. (*a*) The oscillograms required by Section III of this general order shall be taken while modulating the transmitter with a frequency of approximately 200 cycles at maximum licensed power and under normal operating conditions. Reference lines shall be run on the oscillograms as follows: (1) One line indicating carrier positions, (2) one line for one hundred per cent (100%) negative modulation, and (3) one line for one hundred per cent (100%) positive modulation. These lines shall be one-half (½) inch or more apart. Such oscillograms may be taken with time delay relays so that one-third of the oscillograms shows no current through vibrator, one-third shows rectified carrier only, and one-third shows modulation.

"(*b*) One overload oscillogram shall be taken with the 200-cycle tone input voltage twenty-five per cent (25%) greater than the input voltage necessary to produce the maximum satisfactory modulation which the licensee claims the transmitter is capable of producing.

"(*c*) Complete data on a measuring of the antenna resistance shall be submitted to the commission for its approval, together with full operating constants of the transmitter while taking such oscillograms.

"SEC. V. (*a*) The data required in Section IV shall be submitted and approved by the commission on or before April 30, 1931, or the licensed power will be reduced to conform to maximum rated carrier power of the transmitter as determined by existing general orders of the Federal Radio Commission.

"(*b*) No changes shall be made in any radio broadcasting transmitter affecting the maximum rated carrier power thereof until such changes have been authorized by the commission."

GENERAL ORDER No. 112

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 4th day of May, 1931,

It is ordered:

That General Order No. 99 be, and it is hereby, amended in the following particulars:

The frequencies hereinafter mentioned are hereby added to those already assigned the Southern Transcontinental Chain and Feeders (Brown):

(*a*) Mobile service:

2,680 kilocycles. Unlimited hours. To be used west and north of Chicago, Ill.

5,375 kilocycles. Day only. To be used west and north of Chicago, Ill.

(*b*) Fixed service:

2,680 kilocycles. Unlimited hours. To be used west and north of Chicago, Ill.

GENERAL ORDER No. 113

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on May 11, 1931,

It is ordered:

I. All stations licensed under the radio act of 1927 shall keep the licensed operator or operators of the grade specified by the Secretary of Commerce

on duty during all periods of actual operation at the place where the radio transmitting apparatus is located: *Provided, however*, that in the case of a remotely controlled transmitter delivering power to the antenna not in excess of 1,000 watts, operating on frequencies other than those in the broadcast band (550 to 1,500 kilocycles, the commission may authorize such operator or operators to be on duty at the control station during all periods of operation of the station if and when

(1) The transmitter can be properly operated in accordance with the terms of the station's license; and

(2) The transmitter will be monitored from the control station with apparatus which will permit placing the transmitter in an inoperative condition in the event there is a deviation from the terms of the license, in which case the radiation of the transmitter shall be suspended immediately until corrective measures are effectively applied to place the transmitter in proper condition for operation in accordance with the terms of the station license; and

(3) The separation between the transmitter and the remote-control station does not exceed 5 miles by air-line distance; and

(4) The transmitter is so located or housed that it is not accessible to other than duly authorized persons.

II. A licensed operator in charge of the transmitter on duty as specified hereinabove may be employed at the discretion of the licensee for additional operator's duties commensurate with the grade of operator's license which he holds.

III. The person manipulating the transmitting key of a manually operated radiotelegraph mobile or amateur transmitting station shall be a regularly licensed operator. The licensees of other stations which are operated under the constant supervision of duly licensed operators may permit any person or persons, whether licensed or not, to transmit by voice or otherwise, in accordance with the type or types of emissions specified by their respective licenses.

GENERAL ORDER No. 114

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on May 15, 1931,

It is ordered:

SECTION 1. Unless otherwise directed by the commission, all applications for renewal of license shall be filed so as to be received at the office of the supervisor of radio in charge of the district in which the station is located at least sixty (60) days prior to the expiration date of the license sought to be renewed. Where an applicant for renewal of license fails to meet these requirements and as a result thereof the commission fails to take action upon any such application before the expiration date of the license sought to be renewed, the licensee shall cease operating, in accordance with the terms of said license, and no temporary extension thereof will be granted pending decision of the commission on said delinquent application.

SEC. 2. In all cases where an application for renewal of license is regarded as essential to the proper conduct of a hearing or investigation by the commission and the commission as a result thereof specifically directs that the same be filed on or before a date certain, such application shall be filed so as to be received at the office of the supervisor of radio in charge of the district in which the station is located within the time specified by the commission. Upon the failure of any licensee to file an application within such time as the commission shall prescribe by specific direction or such extension thereof as the commission may grant upon proper showing, the commission shall proceed with the hearing upon the premise and assumption that said delinquent licensee does not desire or intend to make application for renewal of its existing license; said delinquent licensee shall be defaulted in the matter of said hearing and no renewal of license will be granted or issued to it.

SEC. 3. That General Order No. 89 be, and the same is hereby, repealed.

This order shall be effective on the day first above written.

GENERAL ORDER No. 115

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on May 25, 1931,

It is ordered:

That General Order No. 91 be, and the same is hereby, amended to read as follows:

SECTION 1. The maximum rated carrier power of all broadcast transmitters installed after this date shall be determined by the authorized power as given in Table I of this section. The maximum rated carrier power shall be determined as provided in section 2 of this general order.

TABLE I

Authorized power (watts)	Maximum rated carrier power allowed to be installed (watts)
(*a*)	
5 to 100	100
100 night and 250 day	250
(*b*)	
250 to 1,000	1,000
2,500 to 5,000	5,000
(*c*)	
The maximum rated carrier power of transmitters hereafter installed in stations with an authorized power of over 5,000 watts shall be not more than twice the authorized power.	

Applicants requesting power from 5 to 50 watts or from 250 to 500 watts, inclusive, may be allowed to install transmitters of the same maximum rated carrier power as the authorized power.

SEC. 2. The maximum rated carrier power of all broadcast transmitters shall be determined by the installed vacuum-tube capacity of the last radio stage (i. e., oscillator or radio-frequency power amplifier which supplies power to the antenna), depending on the system of modulation employed.

(*a*) The maximum rated carrier power of transmitters employing high-level modulation shall be considered the same as the total installed tube-power capacity of the last radio stage as determined by Table II.

(*b*) The maximum rated carrier power of transmitters employing low-level modulation shall be considered as one-fourth the total installed tube-power capacity of the last radio stage as determined by Table II.

(*c*) The maximum rated carrier power of transmitters employing grid bias modulation on the last radio stage shall be considered the same as the total installed tube-power capacity of the last radio stage as determined by Table III.

(*d*) If the methods of rating in paragraphs (*a*), (*b*), and (*c*) of this section do not give an even power rating, the nearest rating recognized in the commission's plan of allocation will be accepted.

(*e*) The power capacity of standard vacuum tubes commonly used in broadcast transmitters having a power rating of 50 watts and above as oscillators, class 3 or class C amplifiers, is fixed and approved as set out in Tables II and III, hereafter set out in this section. Any vacuum tube of a type number and power rating not listed in Tables II or III may be specified and accepted on an application to the commission, provided the manufacturer's complete maximum and normal operating constants as oscillator or class 3 or class C amplifier and for class of service for which vacuum tube is specified in the application and complete curves, which are considered necessary to determine the complete characteristics of the vacuum tube, are submitted to and approved by the commission.

TABLE II

Power rating (watts)	De Forest type No.	R. C. A.—radiotron type No.	Western Electric type No.
50	503-A	UV-203-A	211-D
	511	UV-211	211-E
	545	UV-845	242-A
			248-A
			262-A
75	552	UX-852	----------
	560	UX-860	----------
250	504	UV-204-A	212-D
	504-A	----------	----------
350	549	UV-849	----------
500	561	UV-861	270-A
1,000	----------	UV-851	----------
5,000	520-B	RCA-1652	228-A
	520-M	----------	----------
	521	----------	----------
10,000	507	UV-207	220-B
	548	UV-848	----------
	563	UV-863	----------
20,000	----------	UV-858	----------
35,000	----------	----------	232-A
100,000	----------	UV-862	----------

TABLE III

Power rating (watts)	De Forest type No.	R. C. A.—radiotron type No.	Western Electric type No.
50	----------	----------	270-A

SEC. 3. No licensee shall change the number of vacuum tubes or change to vacuum tubes of different power rating in the last radio stage, or change the system of modulation except upon authority from the commission.

SEC. 4. The operating carrier power of broadcast stations shall be determined from the antenna input power either (*a*) by direct measurement or (*b*) by indirect measurement by means of the plate input power of the last radio stage.

(*a*) The antenna input power determined by direct measurement is the square of the antenna current times the antenna resistance at the place where the current is measured and at the operating frequency. The direct measurement of the antenna input power will be accepted as operating power, provided the data on the antenna resistance measurements are submitted under oath, giving detailed description of the method used and the data taken. The antenna current shall be measured by an ammeter of accepted accuracy. These data must be submitted to and approved by the commission before any licensee will be authorized to operate by this method of power determination.

Any licensee authorized by the commission to determine the operating power by direct measurement of antenna input power shall not make any changes in the antenna system except upon authority from the commission.

(*b*) The antenna input power shall be determined by indirect measurement from the plate input power of the last radio stage by multiplying plate voltage by the total plate current of the last radio stage and by the proper percentage given in Table IV, V, or VI, in accordance with the power and system of modulation used.

The operating power of transmitters employing high-level modulation shall be computed from the maximum rated carrier power of the transmitter as determined by section 2 of this order and the plate input power in accordance with Table IV.

TABLE IV

Maximum rated carrier power of transmitters as determined by section 2	The operating power shall be this per cent of the total plate input
Watts	*Per cent*
5–100	50
250–1,000	60
2,500–50,000	65

The operating power of transmitters employing low-level modulation shall be computed from the maximum percentage of satisfactory modulation and the total plate input power in accordance with Table V. No distinction will be recognized between transmitters of different powers.

TABLE V

Maximum percentage of satisfactory modulation	The operating power shall be this per cent of the total plate input
Per cent	*Per cent*
100–86	33⅓
85–75	40

The operating power of transmitters employing grid bias modulation in the last radio stage shall be computed from the maximum percentage of satisfactory modulation and the total plate input power in accordance with Table VI. No distinction will be recognized between transmitters of different powers.

TABLE VI

Maximum percentage of satisfactory modulation	The operating power shall be this per cent of the total plate input
Per cent	*Per cent*
100–86	22½
85–75	27

In computing the operating power of stations by indirect measurement, the above percentages shall apply in all cases and no distinction will be recognized due to the operating power being less than the maximum rated carrier power.

SEC. 5. The operating power of broadcast stations determined by the radiated power computed from field intensity measurements may be accepted in lieu of antenna input power, provided a sufficient number of measurements are taken to insure accuracy and an analysis of the antenna system is submitted indicating the relative distribution of the radiation (i. e., ground and sky wave radiation). The data on the antenna resistance, complete description of the antenna system, with dimensions and method of taking field intensity measurements and of relating these measurements to the operating power, shall be submitted to and approved by the commission before any licensee will be authorized to operate by this method of power determination.

Any licensee authorized by the commission to determine the operating power from radiated power shall not make any changes in the antenna system except upon the authority from the commission.

SEC. 6. All broadcast stations shall be required to maintain their operating power in exact accordance with their licensed power at all times during the broadcast day, and no departure from the licensed power will be permitted in any case except upon specific authorization from the commission.

SEC. 7. Unless specifically authorized by the commission to do otherwise, all broadcast licensees shall compute their operating power by the antenna input indirect measurement, and any broadcast licensee which has at any time been authorized by the commission to compute its operating power by any other method (i. e., antenna input direct measurement or radiated power measurement) shall, upon making any change in its antenna system or in the antenna current measuring instruments, revert to the use of the antenna, input indirect measurement until further order of the commission.

SEC. 8. (*a*) All broadcast stations shall be equipped with indicating instruments of accepted accuracy to measure the antenna current, direct plate circuit voltage, and the direct plate circuit current on the last radio stage.

(*b*) These indicating instruments shall not be changed or replaced except upon authority from the commission.

This order shall be effective on the day first above written

DEFINITION OF TECHNICAL TERMS USED IN GENERAL ORDER No. 115

The following definitions apply to the terms used in General Order No. 115, adopted May 25, 1931:

(1) *Authorized or licensed power:* The power assigned by the commission and specified in the instrument of authorization.

(2) *Maximum rated carrier power:* Determined by the design of the transmitter and orders of the commission and is independent of operating power, except that generally it is the greatest power at which the transmitter can be satisfactorily operated.

(3) *Operating power:* The power that is actually transmitted by the station. It must be determined by one of the several methods set out in General Order No. 115 and must agree with the authorized or licensed power.

(4) *Plate input power:* The product of the direct-plate voltage applied to the tubes in the last radio stage and the total direct-plate current of these tubes, measured under conditions of no modulation.

(5) *Radiated power:* The total power radiated from the antenna at all angles. In the absence of actual measurements, it is considered to be 50 per cent of the antenna input power for all computations.

(6) *Antenna input power or antenna power:* Product of the total antenna resistance and the square of the antenna current.

(7) *Last radio stage:* The oscillator or radio-frequency power amplifier stage which supplies the power to the antenna.

(8) *Modulation:* The superimposing of audio-frequency power on radio-frequency power resulting in the generation of side bands or varying the peak amplitude of the output current and voltage. May be accomplished by several methods.

(9) *System of modulation:* Determined by stage modulated, the method, and subsequent amplification.

(10) *Modulator:* The last audio-frequency amplifier stage which modulates a radio stage by plate modulation or otherwise.

(11) *Modulated stage:* The radio-frequency amplifier stage which is coupled to the modulator and is modulated by one of the several methods.

(12) *Percentage of modulation:* The ratio of the amplitude of the difference between the maximum or minimum rectified antenna current during modulation and the rectified carrier under conditions of no modulation to the rectified carrier under conditions of no modulation, multiplied by 100. If the positive and negative modulation are of different percentages, the one giving the lesser percentage is considered as determining.

(13) *Maximum percentage of satisfactory modulation:* Defined as the greatest percentage that may be obtained by supplying sound energy to the station microphone without over 10 per cent combined audio harmonics in the output being generated by the entire transmitter.

(14) *High-level modulation:* The plate circuit of the last radio stage is modulated.

(15) *Low-level modulation:* A stage before the last radio stage is modulated and the last stage operates only as a linear power amplifier.

(16) *Grid bias modulation in the last radio stage:* The grid bias voltage of the stage which supplies power to the antenna is controlled at audio frequency. If such modulation is employed in other than the last radio stage, it is low-level modulation.

(17) *Antenna resistance:* The total resistance of the antenna system at the operating frequency and at the place of measuring the antenna current.

(18) *Antenna current:* The radio-frequency current at the operating frequency under conditions of no modulation.

GENERAL ORDER No. 116

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 22d day of June, 1931,

It is ordered:

1. On and after the effective date of this order and until one year from said date, all radio broadcasting stations operating between 550 and 1,500 kilocycles shall maintain the assigned frequency between the limits of 500 cycles per second above to 500 cycles per second below the assigned frequency.

2. On and after one year from the effective date of this order, all radio broadcasting stations operating between 550 and 1,500 kilocycles shall maintain the assigned frequency between the limits of 50 cycles per second above to 50 cycles per second below the assigned frequency, and said stations are hereby required to make provision for the checking of the frequency of the emitted wave by means independent of the frequency control of the transmitter, said independent means having capability of the accuracy above mentioned.

3. On and after the effective date of this order the commission will authorize the installation of new transmitting equipment in broadcasting stations or changes in the frequency-control equipment at present licensed for operation only if such equipment is so designed that there is reasonable assurance that the transmitter is capable of maintaining the assigned frequency to the accuracy set forth in paragraph 2 above.

4. Each broadcasting station is hereby required to announce twice each day, at the beginning and end of its program, that it is broadcasting on a frequency of —— kilocycles, by authority of the Federal Radio Commission.

5. General Order No. 7 is hereby repealed.

6. This order shall be effective on the date first above written.

GENERAL ORDER No. 117

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 24th day of June, 1931,

It is ordered:

That General Orders Nos. 62, 88, and 88 as amended, be, and the same are hereby, repealed.

This order shall be effective on the date first above written.

GENERAL ORDER No. 118

At a session of the Federal Radio Commission held at its offices in Washington, D. C., on the 24th day of June, 1931,

It is ordered:

That General Order No. 99 be, and it is hereby, amended in the following particulars:

The frequency hereinafter mentioned is hereby added to those already assigned the Southern Transcontinental Chain and Feeders (Brown):

MOBILE SERVICE

Available for aircraft and aeronautical stations

4,915 kilocycles. Day only, for use only between Chicago, Ill.; Peoria, Ill.; Springfield, Ill.; and St. Louis, Mo.

○

SIXTH ANNUAL REPORT

of the

FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

For the Fiscal Year 1932

▼

COMMISSIONERS

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SIXTH ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION

FEDERAL RADIO COMMISSION,
Washington, D. C., December 5, 1932.

To the Senate and House of Representatives of the United States of America in Congress assembled:

Herewith is submitted the Sixth Annual Report of the Federal Radio Commission covering the fiscal year ending June 30, 1932.

PERSONNEL

On January 15, 1932, Judge Ira E. Robinson resigned as commissioner. Col. Thad H. Brown was appointed to succeed Judge Robinson.

The personnel of the commission is now as follows:

	Commissioner	Term expires
First zone	W. D. L. Starbuck	February 23, 1934.
Second zone	Thad H. Brown	February 23, 1938.
Third zone	Eugene O. Sykes	February 23, 1933.
Fourth zone	Charles McK. Saltzman [1]	February 23, 1936.
Fifth zone	Harold A. Lafount	February 23, 1935.

and at the close of the fiscal year the staff included 124 employees, all of whom have a civil service status except the attorneys of the legal and examiners division.

NEW LOCATION

On June 18, 1932, the offices of the commission were moved from the National Press Building at Fourteenth and F Streets to the Interior Building, where very satisfactory offices are located on the second floor. This effected a saving to the Government of $45,185 annually, being the amount paid as rent for the former office space.

ORGANIZATION

There were no major changes in the organization of the commission as outlined in the last report.

VOLUME OF WORK

The volume of work continues to increase and of necessity must be handled by reduced personnel, which is accomplished only by extreme efficiency. There were received more than 40,000 matters which required formal consideration by the commission.

[1] Resigned close of business July 19, 1932.

RULES AND REGULATIONS

During the fiscal year the commission completed and published a codification of its rules and regulations. This codification carries forward all prior rules and regulations now in effect, and in addition thereto contains a great deal of new material which in the light of experience would seem to be properly the subject of formal regulation. In scope the regulations now published and in effect are extremely broad and cover all important phases of the technical and legal operation of stations of the several classes licensed by the commission. Complete and detailed information is also given concerning the procedural requirements of the commission beginning with the execution and filing of applications and covering each successive step including the actual conduct of hearings and the presentation of evidence before the commission or its examiners. The complete codification has been furnished by the commission to all station licensees and all changes or modifications when made will be handled in a similar manner. While the commission has been unable to distribute this manual to the public generally, due to the expense involved, it is available from the Superintendent of Documents, Government Printing Office, upon the payment of a nominal charge.

CLASSIFICATION OF SERVICE

In addition to the general rules and regulations and rules of practice and procedure, the regulations contain technical rules and definitions relating to the "Broadcast service," and services "Other than broadcast." The classes of services and stations in these two general classes for which radio station licenses have been granted, are as follows:

Class of service:	Class of station:
Broadcast.	Broadcast.
Ship.	First class.
	Second class.
	Third class.
Coastal.	Coastal telegraph.
	Coastal telephone.
	Coastal harbor.
Marine relay.	Marine relay.
Mobile press.	Mobile press.
Fixed.	Point-to-point telegraph.
	Point-to-point telephone.
Emergency.	Municipal police.
	State police.
	Special emergency.
	Marine fire.
Aviation.	Aircraft.
	Aeronautical.
	Aeronautical point-to-point.
	Airport.
Experimental.	General experimental.
	Special experimental.
	Experimental visual broadcasting.
	Experimental relay broadcasting.
Temporary.	Broadcast pick-up.
	Motion picture.
Geophysical.	Geophysical.

PUBLIC SERVICE

Detailed information concerning the administration of radio and the work done during the year in each class of service is covered in the various sections of the report. In this connection attention is invited to those sections of the report relating to the installation of frequency monitors, which has resulted in a reduction of interference between broadcast stations and the selection of sites for broadcast-station transmitters; the 0.1 per cent frequency separation plan for services other than broadcast under which 3,025 communication bands were made available as compared with only 1,846 such bands under the old 0.2 per cent frequency separation plan; the growth in the number of radio-equipped aeronautical stations which was accompanied by a marked increase in aviation efficiency; the continued progress in the extension of international radiotelephone and radiotelegraph communication; the expansion of the various maritime radio services, such as ship-to-shore telephony and telegraphy; the rapid growth of the police radio system, resulting in an increase in these facilities of 30 new stations during the year, making a total of 92 stations either licensed or under construction on June 30, 1932, with information indicating a combined police service to over 32,000,000 persons residing in an area of 28,190 square miles; the advancement made in the development of radio equipment through the use of experimental licenses; and the use of radio for many special services, such as the "temporary service" for reporting broadcast-program events from remote sections where wire-line facilities are not available, and the use of radio in connection with marine fire disasters. The number of amateur stations increased during the year from 22,739 on June 30, 1931, to 30,374 on June 30, 1932. In addition to the use of radio by amateurs for regular experimental work, many of these stations cooperated with the Army, Navy, and Red Cross in handling emergency traffic and by practicing the use of established military and naval operating procedure, thus preparing themselves for military service in time of war.

Special attention is also invited to the numerous and complex legal problems as a result of the newness of the subject and formative state of radio law; however, a real effort is being made to build a radio jurisprudence and code of ethics that will stand the test of appellate courts. On that subject your attention is invited to the fact that the Court of Appeals of the District of Columbia sustained the commission in each of the nine cases decided by the court during the year.

HEARINGS

During this fiscal year practically all cases designated for hearing by the commission were heard by examiners. Controversial points were raised before the commission upon exceptions to examiners' reports and in proper cases oral arguments were heard by the commission. The system of holding hearings before examiners has been more successful than in the preceding fiscal year. The rules and regulations of the commission which became effective February 1, 1932, provide for greater safety to the interests and rights of all

parties who might be involved in any hearing. Under the new regulations issues are more clearly defined than formerly. The ever-increasing body of judicial decisions relating to problems involved in this new field of law has been a distinct aid to the examiners in their application of rules of evidence and in the proper formulation of findings of fact, conclusions of law, and recommendations to the commission. Generally speaking, the cases which came to hearing during this fiscal year were more complex, involved more issues, and entailed more extensive technical testimony than cases heard during the preceding fiscal year. These factors have enabled the commission to render more accurate decisions, which in practically all instances have been upheld by the courts upon appeal.

Progress has been made in the matter of so grouping applications as to permit the hearing of those involving common issues at the same time and place, thus saving to applicants or licensees much of the expense incident to repeated trips to Washington for the purpose of participating in hearings. Also, the practice of taking depositions in different parts of the country of witnesses unable to appear in Washington, or when the expense involved in bringing witnesses to Washington is out of proportion to the importance of the case, has been extended and has proven a decided benefit to a licensee who, in the position of a respondent in the matter of an application for his facilities, is not required to go to such great expense in defending his right to the facilities which he has, as formerly. These, the outstanding forward steps in the matter of hearings, have resulted in a more expeditious handling of cases before both the examiners and the commission.

HAROLD A. LAFOUNT,
Acting Chairman.

REPORT OF THE SECRETARY

JAMES W. BALDWIN

During the fiscal year 1932 there were more than 40,000 matters requiring formal commission action. The commission held 177 formal meetings and sat en banc to hear the proceedings in 18 cases. The commission granted 40,218 applications, denied 260, and dismissed 235.

During the year the commission disposed of 252 docket cases. Of the 252 cases disposed of 76 were granted, 24 were granted in part, 142 were denied, and 10 were withdrawn.

In compliance with the instructions contained in the Couzens-Dill resolution (S. Res. 129) the commission conducted an exhaustive investigation into the use of radio facilities for purposes of commercial advertising. The commission's report containing the facts developed by the inquiry was transmitted to the Senate on June 9, 1932, and has been printed as a Senate document (No. 137—72d Cong., 1st sess.).

An important development of the year from an administrative point of view was the adoption by the commission on November 7, 1931, of new rules and regulations governing the administration of the radio act of 1927, as amended. These rules and regulations became effective February 1, 1932, and displaced the numerous general orders which had previously been the basis of rules and regulations. The new rules were printed in loose-leaf form and furnished to each licensee of record for his guidance.

As a measure of economy, the offices of the commission were moved during the month of June from the National Press Building to the Department of the Interior Building.

For the fiscal year 1932 there was appropriated $465,380. This sum is accounted for as follows:

01 Personal services	$359,060.69
02 Supplies and materials	4,710.42
05 Communications	2,486.73
06 Travel expenses	4,511.44
07 Local transportation	10.51
08 Printing and binding	30,501.85
11 Rents	45,209.90
12 Repairs and alterations	518.69
30 Furniture, fixtures, equipment	7,188.46
Total	454,197.79

Detailed information concerning the number of stations licensed, the number of applications received, etc., is shown, by services, in the following report of the chief of the license division.

LICENSE DIVISION

WILLIAM P. MASSING, Chief of Division

(George S. Smith served as chief of division until June 29, 1932)

The license division is charged with the receipt of all applications for radio facilities, the administrative examination thereof, the maintenance of records showing commission action thereon, and the issuance of authorizations in conformity therewith.

The following is a detailed report arranged according to service, showing the number of new stations authorized, the number of stations deleted, and the total number of authorized radio stations as of June 30, 1932.

Class of service and class of station	New stations authorized	Stations deleted	Total number of stations June 30, 1932
Agriculture:			
Point-to-point telegraph	0	0	9
Amateur:			
Amateur	12,522	2,578	30,374
Aviation:			
Aircraft	177	112	358
Aeronautical			131
Aeronautical point-to-point	92	41	69
Airport			21
Broadcast:			
Broadcast	8	14	606
Emergency:			
Municipal police			78
State police	11	1	13
Marine fire			6
Special emergency	1	0	24
Experimental:	2	0	
General experimental	30	25	118
Special experimental	24	21	50
Experimental relay broadcasting	1	2	12
Experimental visual broadcasting	13	3	31
Fixed public:			
Point-to-point telegraph	[1] 222	51	[1] 355
Point-to-point telephone			[1] 72
Fixed public press:			
Point-to-point telegraph	0	0	41
Geophysical:			
Geophysical	3	0	116
Marine relay:			
Marine relay	11	4	43
Mobile press:			
Mobile press	0	0	3
Public coastal:			
Coastal telegraph			129
Coastal telephone			2
Coastal harbor	38	20	32
Private coastal:			
Coastal telegraph			7
Coastal harbor			1
Ships:			
Ships	80	282	2,011
Temporary:			
Broadcast pick-up	20	5	21
Motion picture	1	0	6
Portable (forestry)	0	0	2
Total	13,256	3,159	34,741

[1] Separate call letters assigned to each international frequency Feb. 1, 1932 in accordance with Opinion No. 39 of the C. C. I. R.

AMATEUR SECTION

Amateur activity has continued its rapid growth. Licenses affecting amateur stations were granted at a rate of about 100 per working day during the fiscal year, including new, renewed, and modified licenses as follows:

New	12,522, approximately	38 per cent.
Renewals	17,324, approximately	52 per cent.
Modifications	3,176, approximately	10 per cent.
	33,022	100 per cent.

Licensed amateur stations increased more than 30 per cent and are approximately 87 per cent in number of all radio stations licensed by the commission. On June 30, 1932, there were 30,374 licensed amateur stations.

During the year 18 applications for amateur station licenses were denied and 29 such licenses were revoked, while authorizations of special character were granted in 31 cases. Records of applicants, licenses, call letters, and other details were maintained on cards, which aggregate about 100,000.

The operations of the amateur section are current. The great bulk of applications pending at any time are those received during the few days previous and those submitted for renewal of current licenses more than 30 days before expiration. The latter are held in suspense under the last paragraph of section 9 of the radio act of 1927 and considered promptly after the lapse of sufficient time to satisfy that provision of law.

BROADCAST SECTION

There were received in this section during the past year a total of 2,519 applications, as compared with 3,784 applications during the previous year, a decrease of 1,265. There were prepared and issued during the year 2,534 instruments of authority, as compared with 3,233 during the previous year, a decrease of 699. The instruments of authority which were issued comprised licenses, extensions of licenses, construction permits, modifications of construction permits and/or licenses, consent to voluntary and involuntary assignment of licenses and/or construction permits, automatic frequency control, special authorizations, and emergency authorizations.

The decrease in the number of applications received and the number of authorizations issued is due in a large measure to the lengthening of the license period of broadcast stations from a period of three months to six months. This change was effected by the commission on April 16, 1931.

Twelve radio broadcast stations were deleted during the year, as compared with 13 for the previous year.

A list of the stations deleted during the year is set forth as follows:

Call letters	Grantee and location	Date of deletion
KFIU	Alaska Electric Light & Power Co., Juneau, Alaska. (Station voluntarily surrendered its license.)	Aug. 28, 1931
KFJY	Cedar Rapids Broadcast Co., Riverdale (Fort Dodge), Iowa. (Station voluntarily surrendered its license.)	Feb. 15, 1932
KFQU	W. E. Riker, Holy City, Calif. (Application for renewal of license denied. (Decision May 22, 1931.) Decision affirmed by District Court of Appeals Jan. 12, 1932.) See also p. 19.	Jan. 12, 1932
KFQW	KFQW (Inc.), Seattle, Wash. (Application for renewal of license denied. (Decision May 22, 1931.) Dismissed by District Court of Appeals Oct. 10, 1931.) See also p. 22.	Oct. 10, 1931
KFUP	Fitzsimons General Hospital, Denver, Colo. (Application for renewal of license denied. (Decision Jan. 29, 1932, effective Feb. 1, 1932.) Applicant failed to utilize facilities assigned.)	Feb. 29, 1932
WCHI	Peoples Pulpit Association, Chicago, Ill. (Application for renewal of license denied without hearing (subtitle B, sec. 3, G. O. 93) Nov. 20, 1931. On motion of appellant dismissed by District Court of Appeals Apr. 30, 1932.) See also p. 23.	May 7, 1932
WIBR	George W. Robinson, Steubenville, Ohio. (Application for renewal of license denied. (Decision Oct. 30, 1931.) Terms of license violated. Equipment used not in compliance with commission's rules and regulations, and little use of the assignment granted.)	Nov. 19, 1931
WJAZ	Zenith Radio Corporation, Mount Prospect, Ill. (Application for renewal of license denied by default Oct. 23, 1931.)	Nov. 23, 1931
WKBO	Camith Corporation, Jersey City, N. J. (Application for renewal of license denied. (Decision Oct. 23, 1931.) On motion of appellant, dismissed by District Court of Appeals Feb. 6, 1932.) See also page 23.	Feb. 11, 1932
WLBX	John N. Brahy, Long Island City, N. Y. (Application for renewal of license denied. (Decision May 29, 1931.) Decision affirmed by District Court of Appeals June 6, 1932.) See also page 21.	June 25, 1932
WMAK	Buffalo Broadcasting Corporation, Buffalo, N. Y. (Application for renewal of license denied. (Decision Dec. 18, 1931.) Violation of G. O. 111.)	Feb. 1, 1932
WPOE	Nassau Broadcasting Corporation, Patchogue, N. Y. (License expired January, 1932, no application for renewal of license filed.)	Jan. 1, 1932

Two stations were consolidated during the past year, as compared with seven for the previous year.

A list of the stations consolidated during the year is set forth as follows:

Call letters	Grantee and location	Date of consolidation	Call letters and location of station consolidated with—
WHDI	Dr. George W. Young, Minneapolis, Minn.	Aug. 1, 1931	WDGY, Minneapolis, Minn.
WPAW	Shartenburg & Robinson Co., Pawtucket, R. I.	Feb. 9, 1932	WPRO, Providence, R. I., under call letters WPRO-WPAW.

Eight new radio broadcast stations were authorized to be constructed, making a total of 606 authorized stations, as compared with 612 as of June 30, 1931.

A description of the eight new stations authorized follows:

Call letters	Applicant and location	Frequency	Power	Hours of operation
		Kilocycles	*Watts*	
KICA	W. E. Whitmore, Clovis, N. Mex.	1,370	100	Shares with KGFL.
KIDW	The Southwest Broadcasting Co., Lamar, Colo.	1,420	100	Shares with KGIW.
WENC	H. P. Everett, Linwood Morris, and R. T. Crabb, d/b as Americus Broadcast Co., Americus, Ga.	1,420	100	Daytime.
WHEB	Granite State Broadcasting Corp., Portsmouth, N. H.	740	250	Do.
WHEF	J. Niles Boyd Wholesale Grocery Co.	1,500	100	Unlimited.
	J. O. Ashworth and J. R. Smithson, d/b as Attala Milling & Produce Co., Kosciusko, Miss.		250 L. S.	
WJED	Thirty-first Street Baptist Church, Morris H. Coers, pastor, Indianapolis, Ind.	600	250	Daytime.
WMAS	Albert S. Moffat, Springfield, Mass.	1,420	100	Unlimited.
WORK	York Broadcasting Co., York, Pa.	1,000	1 kw.	Daytime.

During the latter part of December, 1931, there was dispatched to each broadcasting station a questionnaire requesting information pertaining to the station, which information was made the basis of a statistical record. This record contains the following information: Name of licensee; location of station; call letters; class of licensee; State law under which organized; principal business or purpose; name and address of controlling or parent corporation; licensee's relation to station; owner of station; other stations owned or controlled by licensee; average percentage of time per month devoted to commercial and sustaining programs; average number of hours sold per month to and after 6 p. m.; average number of hours per month of sponsored programs and direct advertising; various financial data; chain affiliations and names of stockholders owning and voting 10 per cent or more of the licensee's stock.

This record is currently maintained from information procured from the application for renewal of license.

This section again compiled a complete list of radio broadcast stations of the United States arranged into three parts—

(*a*) Alphabetically by call signals;
(*b*) Alphabetically by States and cities;
(*c*) Numerically by frequency;

which was published and placed on sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. Supplements have been prepared on a quarterly basis for distribution to the general public.

COMMERCIAL SECTION

There were received in this section a total of 5,515 applications, as compared with 6,246 during the previous year, a decrease of 731 applications. The applications received comprised license, modification of license, and renewal of license applications, construction permit and modification of construction permit applications. There were issued 6,053 instruments of authority, as compared with 5,395 for last year, an increase of 658. The instruments of authority issued comprised construction permits, licenses, modification of construction permits and/or licenses, consent to voluntary and involuntary assignment of construction permits and/or licenses, extension of licenses, special authorizations, and emergency authorizations.

Lists of radio stations arranged numerically by frequency assignment have been compiled on a semimonthly basis, and copies have been regularly sent to the International Bureau of the Telegraph Union, Berne, Switzerland, for registration on behalf of the United States Government.

Lists of fixed and land stations, aircraft stations, and commercial ship stations were initiated during the year. These original lists were issued on November 15, 1931, and contained the following information: Fixed and land, name of station, call signal, exact geographical position of the transmitting aerial, type of emission, frequency (kilocycles), nature and hours of service, charges and name of licensee. Aircraft: Call sign, name of station, type of emission, frequency (kilocycles), nature and hours of service, customary route (home airport), mark and type, and licensee. Commercial ship[1]: Name of station, call sign, type of emission, fre-

[1] Original list issued April 1, 1932.

quency, normal power of radiation expressed in meter-amperes, height of the aerial and intensity of the current at its base, nature and hours of service, charges, administration or private enterprise to which accounts for charges must be addressed, and remarks. Copies of the original and semimonthly supplements thereto were transmitted to the International Bureau at Berne, Switzerland.

The compilation of the above-mentioned lists necessitated the preparation and maintenance of additional systematic card records containing substantially the same information as reported in the lists, the data for these records being procured from the daily applications and authorizations.

The list is kept current by supplements showing additional deletions and changes, and has been valuable in supplying information within the commission as well as other Government departments.

Pursuing the policy adopted by the commission last year, with respect to broadcast stations, a plan staggering the license period of all commercial stations was effected. The following list shows the expiration dates of the various classes of stations:

(1)	All classes of stations in Alaska with the exception of broadcast and amateur	June 1.
(2)	General experimental	Oct. 1.
(3)	Geophysical	Nov. 1.
(4)	Motion picture	
(5)	Broadcast pick-up	
(6)	Point-to-point telegraph	Dec. 1.
(7)	Point-to-point telephone	
(8)	Coastal telegraph	Feb. 1.
(9)	Coastal telephone	
(10)	Coastal harbor	
(11)	Marine relay	
(12)	Ship (above 1,500 kilocycles)	
(13)	Mobile press	
(14)	Aeronautical	Mar. 1.
(15)	Aeronautical, point-to-point	
(16)	Airport	
(17)	Aircraft	Apr. 1.
(18)	Municipal police	May 1.
(19)	State police	
(20)	Marine fire	
(21)	Experimental visual broadcast, including synchronized sound track	
(22)	Experimental relay broadcast	
(23)	Special emergency	

The licenses for special experimental stations, except those authorizing experimental synchronized sound transmission in connection with experimental visual broadcasting, are issued for a normal license period of three months from the date of expiration of the old license or the date of granting a new license.

On June 30, 1932, there were 1,739 authorized commercial stations, as compared with 1,360 on June 30, 1931, an increase of 379. During the year 285 stations were deleted and 664 new stations were authorized.

There were 2,011 authorized commercial ship stations on June 30, 1932, as compared with 2,213 on June 30, 1931, a decrease of 202. During the year 80 new ship stations were authorized and 282 were deleted.

REPORT OF THE GENERAL COUNSEL

DUKE M. PATRICK

(Thad H. Brown served as general counsel until March 28, 1932)

I. GENERAL

Although changes in the personnel of the legal division occurred during the fiscal year, the organization of the division into three principal sections as described in the Commission's Fifth Annual Report, was maintained. The work of the legal division was being carried on at the end of the fiscal year by a general counsel and two of the three assistants to the general counsel, authorized by the amendatory act of March 4, 1929 (45 Stat. 1559), assisted by five junior attorneys authorized by section 3 of the radio act of 1927 (44 Stat. 1162).

For convenience in presentation, the particular work and developments of a legal nature for the fiscal year will be divided according to the section charged with the primary responsibility therefor.

II. ADMINISTRATIVE SECTION

1. APPLICATIONS

Throughout the fiscal year covered by this report, the division has been called upon to render opinions in 6,242 cases as compared to 5,679 for the preceding year. A large number of these cases have involved new situations of growing complexity due not only to developments in the radio art, but because of the large number of applications presenting conflicting claims or interests. The opinions upon applications for construction permits, including those for new stations, numbered 878; for modification of construction permits, 245; while opinions upon applications for licenses and modification thereof were, respectively, 738 and 497. Applications for renewal of existing licenses accounted for 2,749 opinions. In addition to the regular work, extraordinary cases and authorizations of an unusual or emergency character which required examination and opinion aggregated 1,090.

In addition to the duty of rendering opinions upon all applications presented for the consideration of the commission, this section was charged with the duty of framing the issues in the 1,035 cases designated by the commission for formal hearing before the commission or its examiners. In so doing, substantial compliance with both the letter and spirit of the decisions of the Court of Appeals of the District of Columbia in such cases as The Courier-Journal Company et al. *v.* Federal Radio Commission (47 F. 2d 614) and John H. Brahy (Station WLBX) *v.* Federal Radio Commission, No. 5414, decided June 6, 1932, was attempted, while at the same time care was exercised to make the issues sufficiently broad to permit full inquiry into the merits of the applications involved.

This section was also charged with the responsibility for the preparation and revision of forms of application and authorization and such other forms relating to the administrative or routine work of the commission as the legal division was called upon to prepare, revise, or approve. Progress in the art and changes in the regulations and requirements of the commission during the fiscal year made necessary considerable work of this nature.

2. COMPLAINTS AND INVESTIGATIONS

The investigations of complaints against radio stations concerning all but strictly technical matters were handled by this section of the legal division. These complaints were received both through official and unofficial sources. Complaints against broadcasting stations far outnumbered those relating to other services. Next in point of volume involved amateur radio stations. Complaints against the various commercial radio services were relatively small and those dealing with the various emergency services, including police radio service, were negligible.

Complaints received and considered have ranged from letters voicing complaints based upon the writer's personal views as to how a radio station should be operated, to other matters of a real and substantial nature. Such complaints have been handled either by answers pointing out the reasons why action by the commission is not possible or desirable, or by further investigation with the view to determining what disposition should be made of the matter. This sifting process has resulted in the satisfactory disposition of a large majority of all complaints received, leaving 424 cases in which further investigation was found to be necessary. Of this number, 242 related to radio broadcasting stations, 19 to commercial stations, 4 to emergency policy radio stations, and 159 to amateur radio stations. In their nature, the complaints investigated ranged from violations of the law and regulations of the commission, such as the use of unlicensed radio operators, unauthorized changes in the equipment or location of a station, use of excess power, improper maintenance of station logs, etc., to questions of whether or not the licensee had sufficient financial ability to operate a station in the public interest.

In addition to the foregoing, numerous investigations were necessary in the case of broadcasting stations to determine the propriety of particular programs involving lotteries, fortune telling, medical advice, improper language, and misleading or deceptive advertising. In such cases, investigations were attempted for the purpose of securing information which would enable the commission to determine whether or not the station's license should be revoked or its application for renewal of license designated for hearing.

Of the 424 investigations undertaken, it was found in 145 cases that complaints were not justified, in 94 cases the conditions giving rise to the complaints were corrected by the stations involved, in 28 cases the stations were warned to discontinue the practices complained of, in 59 cases investigations resulted in formal hearings being instituted, in 69 cases the station licenses were revoked or surrendered by the licensees for cancellation, and 29 cases were still pending at the close of the fiscal year. The following tabular sum-

mary will serve to indicate the number of complaints, stations or services involved, and the disposition made thereof during the period dealt with in this report:

	Number of complaints	Complaint not justified	Condition corrected	Warning issued	Formal hearing	Cases still pending	Revocation and cancellation
BROADCASTING							
Violations of law and regulations as to—							
Announcements	30	11	12	3	2	2	
Unauthorized changes in equipment or location	8	4	2		1	1	
Using unlicensed operators	9	1	1	1	6		
Logs improperly kept	7		5		2		
Operation of unlicensed transmitter	2				2		
Time of operation shown in license	10	3	4		2	1	
Use of excess power	2	2					
Rebroadcasts	2	1	1				
Improper operation	16	10	3	1	1	1	
Finances:							
Insufficient	14	4	3		7		
Loss of control by licensee	18	12			3	3	
Improper programs involving—							
Lotteries	9	6	1	2			
Fortune telling	38	13	19		4	2	
Medical advice	11	4	4	1	2		
Improper language	7	4			1	2	
Misleading or deceptive advertising	33	24	5	1	1	2	
Miscellaneous	26	14	3	2	2	5	
Total	242	113	63	11	36	19	
COMMERCIAL							
Violations of law and regulations as to—							
Unlicensed operation	3	2		1			
Improper operation or use of facilities	5	4		1			
Log kept improperly	2			1		1	
Use of unlicensed operator	1		1				
Rebroadcast	1			1			
Finances:							
Transfer of stock	6	1	1		4		
Interference	1		1				
Total	19	7	3	4	4	1	
POLICE							
Using unlicensed operator	3		3				
Unauthorized change in equipment	1		1				
Total	4		4				
AMATEURS							
Obtaining station by fraud	3	1			2		
Interference with other services	24	6	11	2		3	2
Unauthorized removal	12	2		2	3	1	4
Broadcasting	13	5	2	1	1		4
Transmitting commercial messages	10	2	4	3	1		
Improper operation	15	6	2	3	1	1	2
Unlicensed operation	28	3	3	1	11	2	8
Unlicensed operator	53		2			2	49
Log not kept	1			1			
Total	159	25	24	13	19	9	69
Grand total	424	145	94	28	59	29	69

In connection with the investigation work, permanent records have been established to the end that evidence once obtained may be used in future cases and in connection with future applications filed by or on behalf of the parties in interest. In addition to conducting investigations on behalf of the commission and securing and preparing evidence for hearings to be conducted before the commission, a

representative of this section has assisted the Department of Justice in the preparation and trial of criminal cases. In such cases the commission representative has appeared as a witness before grand juries and upon the actual trial of the defendants.

3. CRIMINAL LITIGATION

An assistant general counsel has been assigned to the duties of assisting the Department of Justice in the various criminal cases that have arisen throughout the United States due to violation of the provisions of the radio act of 1927. In such cases the commission representative assists in the preparation of evidence for the use of grand juries, assists in the preparation of suggested indictments, and actually participates in the trial of the cases when the same are finally at issue.

During the past year such participation was had in the following cases with the results indicated:

U. S. v. *I. C. Lankford, Seymour, Tex.*—Plea of guilty to unlawfully operating a radio station; fined $500 and sentenced to jail for a period of 10 days.

U. S. v. *Lee Elton Spencer, Pittsburgh, Pa.*—Convicted upon 10 separate counts for the unlawful operation of a radio broadcasting station and the operation of said station without an operators' license; sentenced to two years in the penitentiary and paroled.

U. S. v. *Edwin Miles, Ashland, Nebr.*—Plea of guilty to the unlawful operation of a radio station and fined.

U. S. v. *Wm. Scholtz and Frank Bloom, Brooklyn, N. Y.*—Plea of guilty to a conspiracy to violate the radio act of 1927, and each sentenced to a year and a day in the penitentiary.

U. S. v. *Frederick H. Simpson, Trenton, N. J.*—Plea of guilty to the unlawful operation of a radio station whose signals were used in connection with rum-running boats; sentenced to two years in the penitentiary and placed on probation.

These cases have definitely established the legal proposition that it is a crime under the radio act to operate a radio station without a license from the Federal Radio Commission (1) where the signals from the unlicensed station interfere with those of other duly licensed stations coming from beyond the borders of the State where the unlicensed station is operating and (2) where the signals from the unlicensed station extend, are picked up and heard beyond the borders of the State where the illegal operation is taking place.

There are now pending for trial the following cases which have been participated in by the legal division of the commission and in which assistance will be given at the time of trial:

U. S. v. *Boden Electric Co., Harold G. Boden, Jonesboro, Ark.*—Defendant reindicted in March, 1932. Trial postponed until November term of court.

U. S. v. *James L. Splane and Richard Borra, Brooklyn, N. Y.*—Defendants to be reindicted. Case will be heard at later date.

U. S. v. *H. W. Willis, Jas. Leo Pekley, and Philip J. Waters, Brooklyn, N. Y.*—Defendants to be reindicted and the case heard at later date.

U. S. v. *Robert M. H. Verenocke, E. John Blake, and John Campbell.*—Indictment returned eastern district of New York, December 22, 1931; case now awaiting apprehension of defendants.

U. S. v. *Patrick Fitzgerald, Arthur H. Stevens, and N. D. Macris.*—Indictment returned eastern district of New York, December 22, 1931, for illegal operation of radio station. Case awaiting apprehension of defendants.

U. S. v. *Geo. H. Geiger.*—Arrested April 9 for illegal operation of radio station and conspiracy to violate prohibition laws, eastern district of New York, Brooklyn, N. Y.

U. S. v. *Patrick Fitzgerald, Elmer Linton, and Edw. Zuckoski.*—Eastern district of New York. Arrested April 29, 1932, for conspiracy to violate the radio act. Transmitter was seized in automobile. No indictment as yet.

U. S. v. *Sam Kaplan and Newton Carman.*—Eastern district of New York. Arrested June 7 for illegal operation of radio station. No operator's license.

U. S. v. *Ernest Renner.*—Eastern district of New York. Arrested June 15, 1932, for illegal operation of radio station. No operator's license.

In addition to the cases tried in the criminal courts of the United States this section also has had charge of the investigation of over 50 other cases pertaining to illegal operation of radio stations and has submitted many of these cases to the Department of Justice during the past year for further investigation and prosecution. Certain of these cases are now pending and prosecution will be started in the near future. The violations dealt with are principally of two types: (1) Plain violations of the criminal provisions of the radio act of 1927, and (2) violations of the criminal provisions of the radio act of 1927 in conjunction with other illegal activities, such as smuggling or rum running.

III. HEARING SECTION

The hearing section is charged with the duty of seeing that the applications set for hearing before an examiner or the commission go forward through the various steps outlined by the commission's rules of practice and procedure and active participation in all hearings held by the commission is required. These cases involve the bringing out of all facts pertinent to a given application, and in many cases involve the presentation of evidence obtained from investigations conducted by the commission or the radio division of the Department of Commerce.

During the past fiscal year the commission set for hearing about the same number of applications as during the preceding fiscal year. The following table will serve to indicate the number of cases involving formal action by the commission and the disposition made thereof:

Month	Set for hearing	Answered and docketed	Defaults	Dismissed and withdrawn	Heard by examiners	Heard by commission
September	122	40	3	8	25	4
October	161	58	1	23	33	2
November	146	47	5	15	29	0
December	88	31	2	7	20	2
January	79	23	0	4	14	2
February	49	13	2	5	5	0
March	71	34	3	12	15	2
April	76	33	0	13	22	3
May	71	58	3	12	40	2
June	72	26	1	7	16	1
Total	1,035	363	20	106	219	18

Cases reported in fiscal year 1931 and carried over to fiscal year 1932 for decision	57
Number of cases reported and decided by the commission fiscal year 1932	195
Total cases decided	252

During the course of the year and effective February 1, 1932, General Order 93 was superseded by the rules and regulations of the commission, Part II, Practice and Procedure. The procedure out-

lined in these rules follows, to a large extent, General Order 93, but at the same time a few changes were made which merit some discussion.

Notable among the changes adopted is rule 64 concerning evidence. Under General Order 93, any party desiring to present his case in whole or in part by affidavits could do so by adhering to certain procedure whereby the affidavits were limited in scope and to parties, their representatives, agents, and employees. Under the new rules, affidavits are no longer admissible as evidence but in lieu thereof the commission's rule 52 provides for the taking of depositions upon proper request and upon the issuance of such an order by the commission. Under the old rule permitting the receipt of affidavits as evidence, it was the experience of the commission that full information was not always furnished. From the standpoint of the rules of evidence, the affiant was not compelled to confront and be cross-examined by parties whose interests were involved in the subject matter of the affidavit. While the new rules still reserve in the commission the right to relax the rules of evidence governing civil proceedings in the courts of the United States where in its judgment the interests of justice will be better served by such action, the occasion for such relaxation has become less frequent. The more careful and adequate preparation of cases by parties involved has served to simplify as well as expedite hearings held by the commission.

Another material change in the rules concerns the action of the commission which may be taken upon applications without a formal hearing. In this connection, rule 44 provides that any application properly filed and conforming to the regulations of the commission may be granted without a hearing if, upon the face of the application and such information as the commission may have before it, the commission is of the opinion that public interest, convenience, and necessity would be served thereby. Such a grant, however, is expressly made conditional and subject to the provisions of rule 45 which permits any person aggrieved or whose interests are adversely affected by such grant to file a formal protest within 20 days from the date of the original grant. Such protest is required to conform to certain formalities with respect to the execution thereof and to set out the interest of the protestant and to make certain allegations of fact in support of the protest. Upon receipt of the protest, the authority granted becomes automatically suspended unless otherwise ordered by the commission, and the application is designated for hearing upon the issues contained in the protest. Although this provision has been in force for a relatively short time, it has been found that such procedure facilitates the work of the commission and at the same time affords all parties in interest opportunity to object and obtain the benefit of a formal hearing before the commission if they so desire.

These and other changes in the procedural requirements of the commission have not only served to facilitate work of the commission but to provide more definite methods of obtaining an orderly and fair public hearing. Although these changes have materially increased the work of the division and have operated to require a greater amount of preparation on the part of applicants or other parties to hearings before the commission, it is believed that they

have and will continue to expedite the disposition of cases and shorten the time intervening between the filing of an application and final decision.

IV. RESEARCH AND DRAFTING SECTION

During the period dealt with in this report, this section of the legal division assumed the primary responsibility for furnishing the commission with memoranda and opinions upon legal questions requiring research or involving an interpretation of pertinent laws and treaties; making a legal examination of the minutes and official records of the commission; drafting proposed rules, regulations, and orders; and the examination and study of proposed legislation relating to the commission or its functions.

In addition to the foregoing, this section prepared for the commission's consideration statements of fact, grounds for decision and orders in 155 cases heard by the examiners of the commission, and had active charge of the conduct of all litigated cases in which the commission was interested as a party. The preparation of briefs and papers, the compilation of records, and the actual presentation of court matters, constitute one of the major activities of this section and must be dealt with somewhat in detail.

On July 1, 1931, there were 17 cases pending in the Court of Appeals of the District of Columbia, 2 in the Supreme Court of the District of Columbia, and 1 in the District Court of the United States for the Northern District of Illinois, Eastern Division. Of these, 5 are still pending in the Court of Appeals of the District of Columbia, 1 in the Supreme Court of the District of Columbia, 7 were dismissed in the Court of Appeals of the District of Columbia, 1 dismissed in the Supreme Court of the District of Columbia, and 1 dismissed in the United States District Court for the Northern District of Illinois, Eastern Division, and 5 have been decided by the Court of Appeals of the District of Columbia affirming the commission's decisions appealed from.

During the fiscal year, 39 new cases were filed in the Court of Appeals of the District of Columbia, 16 of which are still pending; 19 were dismissed and 4 decided by that court, affirming in each case the decision of the commission appealed from. There were also filed during the fiscal year two injunction proceedings in the Supreme Court of the District of Columbia, both of which were dismissed, one by the court and the other on motion of the plaintiff. One proceeding was filed in the Circuit Court of Appeals of the United States for the Seventh Circuit which was dismissed and two applications for certiorari were made to the United States Supreme Court, both of which were denied.

The total number of cases pending July 1, 1932, was 22, which is the same number pending at the same time last year, although there were 44 new cases filed this year as compared with 25 cases filed last year.

The nine cases finally decided during the fiscal year, all were decided by the Court of Appeals of the District of Columbia and appear to merit separate consideration.

THE SPROUL CASE

(Rev. John W. Sproul *v.* Federal Radio Commission, 60 App. D. C. 333)

In this case the appellant made application for a renewal of its station license, and the commission being unable to determine from an examination of this application that the granting thereof would serve public interest, convenience, and necessity, set the application for hearing before an examiner of the commission. Due and timely notice was given appellant of this action. The examiner's report recommended denial of the application, to which appellant filed exceptions and requested oral argument. The commission considered and decided the case upon the record and exceptions without hearing oral argument, and denied the application.

It was contended by appellant that the hearing granted him by the commission was not a lawful hearing because the commission could not lawfully authorize an examiner to conduct such a hearing; that the examiner was without authority to administer an oath to the witnesses, and, accordingly, there was no lawful evidence before the commission; that it was contrary to law for the commission to deny appellant's counsel the right of oral argument which constituted a denial of due process of law.

The court affirmed the commission's decision holding that the evidence as disclosed by the record warranted the commission in denying the application for renewal and that the commission, in considering and passing on the application for renewal of license without oral argument, did not abuse its discretion. While not passing directly upon the right of the commission to appoint examiners, the court said it did not agree with the appellant's conclusion on the record before it because the appellant had appeared with his counsel at the hearing before the examiner and without objection participated therein; that he had voluntarily testified as a witness in his own behalf and that his testimony showed beyond any doubt that he was not entitled to a renewal of his broadcasting license.

THE DURHAM CASE AND THE PACIFIC CASE

(Durham Life Insurance Company *v.* Federal Radio Commission, 60 App. D. C. 375; Pacific Development Radio Company *v.* Federal Radio Commission, 60 App. D. C. 378)

These appeals were taken from decisions of the Federal Radio Commission denying the respective applications of the Durham Life Insurance Co., operating station WPTF, and the Pacific Development Radio Co., operating station KECA, for increase of power. Station KECA sought permission to use a certain 5-kilowatt transmitter and station WPTF sought permission to construct a new transmitter at a new location. Both appeals attacked the quota figures of the commission promulgated under General Orders, Nos. 92 and 102, pursuant to the Davis amendment to the radio act of 1927, on the ground that both were unconstitutional and therefore invalid. The cases were not consolidated although argued together, since the principal issues in each appeal were the same. They will be discussed together here to avoid repetition.

Because each appeal sought a change in equipment with increased power, and in the case of the Durham Life Insurance Co. a change in location was requested, each was required to, and did, file an application for a "construction permit." The commission moved to dismiss each appeal on the ground that denial of such applications was not appealable under section 16 of the radio act of 1927, as amended.

The Court of Appeals overruled the motion to dismiss and affirmed the commission's decision in each case and held: (1) That the application (in each case) was in effect an application for modification of an existing license, and that the refusal to grant it in each case was appealable; (2) that the commission's denial of application for increase in station power and new transmitter apparatus was not contrary to law, arbitrary, or capricious; (3) that the commission's general order limiting a 1,000-watt station to the use of a 1,000-watt transmitter was within the commission's reasonable regulatory authority and not violative of statute or constitution; (4) that the requirements of the commission's General Orders, Nos. 92 and 102, prescribing a schedule setting out a unit value for each facility used in broadcasting and providing for refusing to increase quota of over-quota States are plainly within the reasonable regulatory authority of the commission and do not offend against either statutory or constitutional provisions; and (5) that the "Davis amendment" to the radio act of 1927 providing for equality of broadcasting licenses in respective zones was valid under the commerce clause.

THE RIKER CASE

(W. E. Riker (Station KFQU) *v.* Federal Radio Commission, 60 App. D. C. 373)

This appeal arose upon a denial of an application for renewal of license. The commission's denial was based upon a showing of frequency deviations in excess of the tolerance permitted by its General Order No. 7, and not shown to have resulted from causes beyond the control of appellant and the applicant's failure to show that the continued operation of the station would serve public interest, convenience, and necessity. Certain procedural questions were also presented.

The court in affirming the commission's decision held that the rejection of an unverified written statement was not error; that the applicant for renewal of license has the burden of proof on issues on which the right depends, and that appellant had not sustained this burden. The court again laid it down as the rule that findings of fact by the commission, if supported by substantial evidence, were not reviewable on appeal.

THE WHB BROADCASTING COMPANY CASE

(WHB Broadcasting Company *v.* Federal Radio Commission, 56 F. (2d) 311)

This was an appeal from the decision of the commission denying the application of appellant for power increase for station WHB, Kansas City, Mo. The commission found that while the applicant station rendered a good service there was no substantial showing that

an additional assignment of daytime power would enable it to render a materially better service; that Kansas City and surrounding area was receiving good radiobroadcasting service from a number of local and nearby stations, including a program somewhat similar in type to that offered by the applicant, and that the granting of the application would work a violation of section 9 of the radio act of 1927, as amended by section 5 of the act of March 28, 1928 (Davis amendment), in that there would result an increase in radiobroadcasting facilities in a State and zone now enjoying more than their share of such facilities.

The Court of Appeals sustained the commission's decision saying that under the so-called Davis amendment the commission must consider the public interest, convenience, and necessity of the radio service of the entire country, and that the commission under that statute has the duty to establish and maintain, if possible, equality of radiobroadcasting service among different zones and States within zones according to population.

After citing the quota figures as shown by the commission, the court said:

> It is apparent, therefore, that, as found by the commission, the granting of appellant's application would work a violation of the so-called Davis amendment.

THE WOODMEN OF THE WORLD CASE

(Woodmen of the World Life Insurance Company *v.* Federal Radio Commission, 57 F. (2d) 420)

This was an appeal from a decision of the commission denying an application for modification of license seeking an increase in operating time from six-sevenths to full time. The remaining one-seventh time which appellant sought was assigned to and in use by Nebraska Wesleyan University (station WCAJ). The question was whether the evidence sustained the commission's findings that the granting of appellant's application would require the forfeiture of the entire assignment then used by respondent station WCAJ, based upon the quota condition of Nebraska, and that the showing made on the record did not justify such a forfeiture. The court affirmed the commission's decision and again refused to weigh conflicting evidence upon appeal.

THE STRAWBRIDGE & CLOTHIER CASE

(Strawbridge & Clothier (Station WFI) *v.* Federal Radio Commission, 57 F. (2d) 434)

This appeal arose as a result of a denial of an application for modification of license seeking an increase in power of station WFI, located at Philadelphia, Pa. The denial of the commission was based upon its findings that: (1) The city of Philadelphia and surrounding area already receives good broadcast service; (2) the granting of appellant's application would result in objectionable interference between its station and stations operating on the same frequency; (3) such action would likewise result in objectionable interference between appellant's station and stations upon the adjacent frequency of 570 kilocycles; and (4) public interest, convenience, and necessity would not be served thereby.

The court affirmed the commission's decision holding that the evidence sustained a refusal of the application for increased power on the grounds assigned in the commission's decision. The court also approved in principle the procedure established by the commission's General Order 102 for the transfer of all or part of the facilities of an existing station to an applicant therefor, and held that such procedure imposed upon the applicant the burden of showing that such action would comply with the statutory standard.

THE DAVIDSON CASE

(James W. Davidson (Station WBCM) *v.* Federal Radio Commission, decided May 16, 1932, not yet reported)

This appeal arose upon a denial of an application for modification of station license by which it was sought to improve the existing assignment of station WBCM. As justification for the assignment requested, it was contended that the station had formerly enjoyed a satisfactory assignment, but that subsequent changes and the allocation of other stations to its frequency and adjacent frequencies had so restricted its service area as to destroy the value of its assignment. No formal objections had ever been made to any of the changes in assignment which were relied upon as justifying the move requested and no claim was made that the parties to be affected by the proposed change were in any wise responsible for the alleged curtailment of appellant's service area. Moreover, it appeared from the evidence, and the commission found, that the modification of license requested would have the effect of substantially curtailing existing service areas of stations then operating upon the frequency requested.

In disposing of this matter, the court entirely disregarded the claim of appellant that its present situation had been brought about by changes in allocation to which it had not consented. Only the situation existing at the time of the hearing as disclosed by the evidence, was considered by the court, which again adhered to its previous rulings that the commission's findings of fact if supported by substantial evidence, were not reviewable upon appeal.

THE BRAHY CASE

(John H. Brahy (Station WLBX) *v.* Federal Radio Commission, decided June 6, 1932, not yet reported)

This appeal was taken from an order of the commission denying an application for renewal of station license. The notice to appellant had set out certain specific violations of the license and of the commission's rules and regulations. The evidence, in addition to sustaining one of the specific violations charged, tended to establish that the applicant was not financially responsible and that the terms of the station license and the commission's regulations had been frequently violated in other particulars. The appellant also failed to offer any evidence showing the character of the service being rendered and any need for the continuation of such service. Upon such a state of the record, the commission did not confine itself to the matters specifically charged in the notice, but rendered its findings and resulting decision in accordance with the showing made.

On appeal it was contended that the commission committed an error of law in failing to limit the scope of the hearing, its finding and resulting decision, to the two specific offenses charged in the notice. The court sustained the commission's decision upon the record before it, but in so doing declared that while the burden was upon an applicant for the renewal of a license to establish his right thereto, justice required that he should receive notice of the matters to be relied upon at the hearing a sufficient time in advance to enable him to prepare his defense. The appellant's failure to make timely objection to the procedure employed and his election to proceed with his defense notwithstanding the insufficiency of the notice was, however, construed by the court as a waiver of any objection to the validity of the proceedings.

The following cases, which were reported as pending and in which issues were stated in the fifth annual report, were dismissed during the fiscal year as indicated:

IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 5378. Rines Hotel Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5391. John R. Sylvester *v.* Federal Radio Commission. (Dismissed by court for failure of appellant to file brief.)
No. 5413. Keystone Broadcasting Corporation and Norman R. Hoffman *v.* Federal Radio Commission. (Dismissed by court upon appellants' failure to deposit costs for printing record.)
No. 5417. Pioneer Broadcasting Company *v.* Federal Radio Commission. (Dismissed by court upon appellant's failure to deposit costs for printing record.)
No. 5418. Norman Baker *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5426. Kunsky-Trendle Broadcasting Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5427. KFQW, Inc., *v.* Federal Radio Commission. (Dismissed by court upon appellant's failure to deposit costs for printing record.)

IN THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

No. 51439. The Baltimore Radio Show *v.* Federal Radio Commission, et al. (Bill dismissed by plaintiff.)

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT OF ILLINOIS, EASTERN DIVISION

No. 9852. Agricultural Broadcasting Company *v.* Great Lakes Broadcasting Company et al. (Bill dismissed as to individual members of the commission.)

The following cases, which were filed during the fiscal year, were dismissed prior to July 1, 1932, as indicated:

IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 5437. Virgil V. Evans *v.* Federal Radio Commission. (Dismissed by court for failure of appellant to deposit costs for printing.)
No. 5446. The Journal Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5447. University of Wisconsin *v.* Federal Radio Commission. (Dismissed by court for failure of appellant to deposit costs for printing.)
No. 5451. Agricultural Broadcasting Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5460. National Broadcasting Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)

No. 5461. The Tribune Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5516. John H. Dolan *v.* Federal Radio Commission. (Dismissed by court for failure of appellant to deposit costs for printing.)
No. 5442. Jenny Wren Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5544. Ozark Radio Corporation *v.* Federal Radio Commission. (Dismissed by court for failure of appellant to deposit costs for printing.)
No. 5545. Camith Corporation *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5550. Peoples Pulpit Association *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5551. Peoples Pulpit Association *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5557. Midland Broadcasting Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5549. Norman Baker *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5562. The Camith Corporation *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5565. The Journal Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5574. A. B. Murray & T. P. Singletary *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5575. Peoples Pulpit Association *v.* Federal Radio Commission. (Dismissed on motion of appellant.)
No. 5651. American Radio Telephone Company *v.* Federal Radio Commission. (Dismissed on motion of appellant.)

IN THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

No. 53171. Norman Baker *v.* Federal Radio Commission. (Dismissed by court on record and argument.)
No. 53477. Missouri Broadcasting Corporation *v.* Federal Radio Commission et al. (Dismissed by plaintiff after motion for injunction pendente lite had been overruled.)

Five of the cases carried over from the fiscal year 1931, and described in the Fifth Annual Report (p. 76), were still pending July 1, 1932, as indicated:

No. 4987. Intercity Radio Telegraph Company *v.* Federal Radio Commission.
No. 4988. Wireless Telegraph & Communications Company *v.* Federal Radio Commission.
No. 4990. RCA Communications, Inc., *v.* Federal Radio Commission.
No. 4991. Mackay Radio & Telegraph Company *v.* Federal Radio Commission.

(All pending decision of the court upon commission's supplemental petition for clarification or modification of mandate filed June 28, 1932, and the response of appellants Mackay Radio & Telegraph Co. and RCA Communications, Inc., thereto.)

No. 5335. Fisher's Blend Station, Inc., *v.* Federal Radio Commission. (Appellant's brief due September 1, 1932.)

Sixteen of the cases filed during the fiscal year were pending July 1, 1932, as indicated:

No. 5530. Nelson Brothers Bond & Mortgage Company *v.* Federal Radio Commission.
No. 5533. North Shore Church *v.* Federal Radio Commission. (Argued May 2, 1932; pending decision of the court on the merits.)
No. 5546. Radio Investment Company *v.* Federal Radio Commission. (Appellant's brief due September 1, 1932.)
No. 5555. LeRoy Joseph Beebe (WMBA) *v.* Federal Radio Commission. (Appellant's brief due September 1, 1932.)
No. 5561. Trinity Methodist Church, South (KGEF), *v.* Federal Radio Commission. (Argued May 3, 1932; pending decision of the court on the merits.)

No. 5567. National Broadcasting Company *v.* Federal Radio Commission.
No. 5568. General Electric Company et al. *v.* Federal Radio Commission.
No. 5569. The Tribune Company *v.* Federal Radio Commission.
No. 5570. Stromberg-Carlson Telephone Manufacturing Company *v.* Federal Radio Commission.
No. 5571. WMAQ, Inc., et al. *v.* Federal Radio Commission. (Appellants' briefs due September 1, 1932.)
No. 5582. Unity School of Christianity (Station WOQ) *v.* Federal Radio Commission. (Appellant's brief due September 1, 1932.)
No. 5598. Boston Broadcasting Company *v.* Federal Radio Commission. (Appellant allowed until July 16 to make deposit for printing of record.)
No. 5604. Fred H. Goss *v.* Federal Radio Commission. (Record filed by the Commission with the Court of Appeals of the District of Columbia February 15, 1932.)
No. 5605. William S. Pote *v.* Federal Radio Commission. (Appellant allowed until July 16 to make deposit for printing of record.)
No. 5647. Clarence R. Cummins *v.* Federal Radio Commission. (Designation for printing of record filed.)
No. 5695. The City of New York, Department of Plant and Structures (Station WNYC) *v.* Federal Radio Commission. (Designation for printing of record filed.)

REPORT OF THE CHIEF ENGINEER

Dr. C. B. JOLLIFFE

BROADCAST SECTION

ALLOCATION OF BROADCAST FACILITIES

The basic plan of allocation of broadcast facilities has remained unchanged. Changes have been made in station assignments from time to time upon applications from licensees and as the result of hearings.

A comparison of the number of broadcast stations in operation for the fiscal years 1927 to 1932 is given in Table I.

TABLE I.—*Comparison of broadcast stations for fiscal years 1927 to 1932*

	1927	1928	1929	1930	1931	1932
Total number of stations	681	677	606	618	612	604
Total simultaneous operations at night	565	514	400	416	420	397

The principal form of interference in the broadcast band is caused by the simultaneous operation of stations on the same frequency at night. In general, stations operating in the daytime are separated by a sufficient distance that there is no interference from this cause. At night, however, the indirect ray ("sky wave") appears and the emissions from stations can produce interference at great distances. Even a low-power station is capable of producing interference over the entire United States. Hence, the measure of the amount of this type of interference is the number of stations operating simultaneously at night.

Broadcast stations are divided in several classifications according to the type of service rendered. In order to comply with the radio act of 1927 as amended, a value in quota units is assigned to each station. (See rule 109, Rules and Regulations.)

An analysis of the various classes of stations and assignments, with quota values, as of June 30, 1932, is given in Table II.

TABLE II.—*Broadcast stations in operation June 30, 1932*

A. CLASSIFICATION OF STATIONS AND FREQUENCIES

	Clear	Regional	Local	Total
Stations operating—				
Unlimited time	31	126	127	284
Limited time [1]	20			20
Daytime [2]	15	20	7	42
Shared time [3]	18	104	53	175
Part time [4]		1	1	2
Specified hours [5]	5	30	46	81
Total stations operating	89	281	234	604
Total frequencies used	40	44	6	90

[1] Operate during daylight at dominant station and at night when dominant station is not in operation. (See Rule 77, Rules and Regulations.)
[2] Operate from 6 a. m. to sunset. (See Rule 78, Rules and Regulations.)
[3] Two to four stations in same geographical location operate on same frequency at different hours. (See Rule 79, Rules and Regulations.)
[4] Operate portion of time, remainder of time on same frequency not allocated in same geographical area. (See Rule 80, Rules and Regulations.)
[5] Operate according to exact hours specified in license. (See Rule 81, Rules and Regulations.)

TABLE II.—*Broadcast stations in operation June 30, 1932*—Continued

B. DAY AND NIGHT ASSIGNMENTS TO STATIONS OF DIFFERENT CLASSES

	Clear		Regional		Local		Total	
	Day	Night	Day	Night	Day	Night	Day	Night
Unlimited time	31	31	126	126	127	127	284	284
Limited time	20	6.59					20	6.59
Daytime	15	.67	20		7		42	.67
Shared time	13	9	50.92	43.92	26.09	24.09	90.01	77.01
Part time			.5	.5	.5	.5	1	1
Specified hours	2.13	2	14.07	14.17	18.86	18.64	35.06	34.81
Total	81.13	49.26	211.49	184.59	179.45	170.23	472.07	404.08

C. QUOTA UNITS ASSIGNED STATIONS OF DIFFERENT CLASSES

	Clear		Regional		Local		Total	
	Day	Night	Day	Night	Day	Night	Day	Night
Unlimited	74.50	74.50	59.00	52.20	14.8	12.7	148.3	139.4
Limited time	12.90	4.51					12.9	4.51
Daytime	6.25	.22	5.95		.7		12.9	.22
Shared time	32.50	22.50	18.55	14.59	2.7	2.4	53.75	39.49
Part time			.25	.25	.1	.05	.35	.30
Specified hours	5.07	5.00	4.55	5.28	2.11	1.88	11.73	12.16
Total	131.22	106.73	88.30	72.32	20.41	17.03	239.93	196.08

The proportions of broadcasting facilities due each zone and State were revised according to the official population of 1930, as published by the United States Census Bureau. The status of assignments of facilities to zones and States is given in Table III.

TABLE III.—*Details of quota units by zones and States as of June 30, 1932*

[Total broadcast facilities of the United States, 400 units]

ZONE 1

State	Units due	Units assigned	Net amount over or under quota	
			Units	Per cent
New York	35.07	38.12	+3.05	+9
Massachusetts	11.84	10.46	−1.38	−12
New Jersey	11.26	11.53	+.27	+2
Maryland	4.55	4.10	−.45	−10
Connecticut	4.48	3.55	−.93	−21
Puerto Rico	4.30	.50	−3.80	−88
Maine	2.22	2.23	+.01	+0
Rhode Island	1.91	1.40	−.51	−27
District of Columbia	1.35	1.30	−.05	−4
New Hampshire	1.29	.92	−.37	−29
Vermont	1.00	.45	−.55	−55
Delaware	.67	.70	+.03	+4
Virgin Islands	.06	0	−.06	−100
Total	80.00	75.26	−4.74	−6

TABLE III.—*Details of quota units by zones and States as of June 30, 1932*—Con.

ZONE 2

State	Units due	Units assigned	Net amount over or under quota	
			Units	Per cent
Pennsylvania	27.63	20.17	−7.46	−27
Ohio	19.07	18.84	−.23	−1
Michigan	13.89	10.73	−3.16	−23
Kentucky	7.50	8.50	+1.00	+13
Virginia	6.95	9.50	+2.55	+37
West Virginia	4.96	4.95	−.01	−0
Total	80.00	72.69	−7.31	−9

ZONE 3

Texas	16.22	22.67	+6.45	+40
North Carolina	8.82	8.15	−.67	−8
Georgia	8.10	8.10	−0	−0
Alabama	7.37	6.22	−1.15	−16
Tennessee	7.29	12.83	+5.54	+76
Oklahoma	6.67	9.00	+2.33	+35
Louisiana	5.85	8.39	+2.54	+44
Mississippi	5.60	3.41	−2.19	−40
Arkansas	5.16	4.70	−.46	−9
South Carolina	4.83	1.70	−3.13	−65
Florida	4.09	8.45	+4.36	+107
Total	80.00	93.62	+13.62	+17

ZONE 4

Illinois	22.52	34.46	+11.94	+53
Missouri	10.71	11.73	+1.02	+10
Indiana	9.56	7.70	−1.86	−19
Wisconsin	8.67	7.86	−.81	−9
Minnesota	7.57	9.08	+1.51	+20
Iowa	7.30	11.50	+4.20	+58
Kansas	5.55	5.09	−.46	−8
Nebraska	4.06	7.30	+3.24	+80
South Dakota	2.05	2.92	+.87	+42
North Dakota	2.01	2.99	+.98	+49
Total	80.00	100.63	+20.63	+26

ZONE 5

California	36.86	36.44	−0.42	−1
Washington	10.15	15.39	+5.24	+52
Colorado	6.72	9.32	+2.60	+39
Oregon	6.19	9.22	+3.03	+49
Montana	3.49	3.65	+.16	+5
Utah	3.30	6.60	+3.30	+100
Idaho	2.89	3.00	+.11	+4
Arizona	2.83	2.35	−.48	−17
New Mexico	2.75	4.03	+1.28	+47
Hawaii	2.39	1.84	−.55	−23
Wyoming	1.46	.60	−.86	−59
Nevada	.59	.80	+.21	+36
Alaska	.38	.57	+.19	+50
Total	80.00	93.81	+13.81	+17

SUMMARY

Zone 1	80.00	75.26	−4.74	−6
Zone 2	80.00	72.69	−7.31	−9
Zone 3	80.00	93.62	+13.62	+17
Zone 4	80.00	100.63	+20.63	+26
Zone 5	80.00	93.81	+13.81	+17
Total	400.00	436.01	+36.01	+9

TECHNICAL IMPROVEMENTS IN BROADCASTING

During the past two years the equipment in broadcast stations has been completely modernized and broadcast stations are now being operated in accordance with "modern engineering principles." This improvement in equipment was brought about by a series of technical regulations which required the rebuilding or replacement of many obsolete transmitting sets. In the design of new equipment there were incorporated not only improvements to meet the regulations of the commission but also those developments which have been the result of recent laboratory research. These improvements have made it possible for broadcast stations to deliver to the listening audience more faithful reproductions of the original programs with a material reduction of interference.

The principal interference in the past has been audible beat notes having frequencies up to 1,000 cycles per second. To reduce this type of interference the frequency tolerance permitted broadcast stations was reduced on June 22, 1932, from ±500 cycles per second to ±50 cycles per second. The regulation putting this into effect was promulgated by the commission one year previous and a large amount of publicity given to it. There has been much activity among the station licensees to comply with this regulation and there resulted a material improvement in the frequency control of broadcast stations. Measurements made by the radio division, Department of Commerce, showed that during March, 1931, only 19.3 per cent of the broadcast stations measured were within 50 cycles per second of their assigned frequencies and 39.1 per cent varied more than 200 cycles from their assigned frequencies. During June, 1932, 70.6 per cent were within 50 cycles per second and only 8.5 per cent varied more than 200 cycles per second from the assigned frequencies. This very marked improvement has been reflected in better service to broadcast listeners.

The result of this improvement in frequency maintenance of stations does not make possible the establishment of more broadcast stations, but reduces the interference to existing stations and increases the service area of all those stations that operate on frequencies used at night by more than one station.

The maintenance of the assigned frequencies of stations has been made more certain by the development of visual frequency monitors which indicate the number of cycles per second the station deviates. At the request of the Federal Radio Commission the Bureau of Standards tested the various types of these monitors designed by different manufacturers. On June 30, 1932, the Federal Radio Commission had approved five different types as the result of these tests and six were under test. Rule 145 (Rules and Regulations) requires that an approved frequency monitor must be installed in each broadcast station. These are being rapidly installed and more than 65 per cent of the stations are so equipped.

The commission on November 17, 1931, granted permission to 8 stations to increase power to 50 kilowatts, and 11 stations to increase power to 25 kilowatts. All of these stations operate on clear channel frequencies. The installation of this equipment has pro-

gressed steadily and in the summer and fall of 1932 most of these stations will be in operation.

There has been much study given to the design of antennas to improve the service of stations. The high single-mast antenna has been erected at several stations and studies are being made to determine the proper height to use for a given frequency in order to give the maximum service range to the station and to determine the class of station to which such an antenna is best adapted. Some stations are so situated that improvement can be made in the service area by the use of directional antennas. This may be due to the distribution of the population to be served, the interference from other stations or the location of the transmitter with respect to the area desired to serve. One station has installed such an antenna and the results so far attained appear promising. Further tests are necessary before the usefulness of directional antennas can be finally determined.

To make it possible to deliver programs by wire lines with greater fidelity, a new type of cable circuit was developed with a practically flat frequency characteristic from 50 to 8,000 cycles, which permits the transmission of programs with practically no loss in quality in the tonal value of music, speech, or sound effect. The furnishing of program service by means of storm-proof cables also gives an added assurance against the possibility of interruptions to service. This new type of circuit owes its high efficiency to special loading and the use of special amplifiers. Facilities of this nature have been installed on parts of the broadcast networks and will be gradually extended to all cable networks.

There has also been much improvement in the design of microphones used in broadcast stations in order to provide a greater frequency response and to make them more flexible. This has permitted more faithful pick-up of the programs originating in studios and large auditoriums.

Broadcast station licensees have shown much interest in determining the actual area served by their stations. Such a survey is obtained by engineering measurements of the field intensities produced by the station and the amount of noise existing in the area. From these data and the data available from the Census Bureau, it is possible to determine the potential audience of the station. Some of these studies have disclosed that stations do not give satisfactory coverage of the areas they are intended to serve and indicated the reason. Certain stations have made minor changes of location, antenna design, etc., which have improved the service materially.

The regular use of the broadcast pick-up frequencies has made available a large number of events of interest that could not be broadcast by any other means. These frequencies have been used for purposes of giving description of field events, boat races, automobile races, parades, airplane flights, etc. The listening public expects that all such events will be broadcast no matter where they occur.

The broadcasting of programs from foreign countries has become a matter of routine and programs have been transmitted from practically all the major nations of the world to the United States and broadcast over the national networks.

DEVELOPMENTS IN EMPIRICAL STANDARDS FOR ALLOCATION OF FREQUENCIES TO BROADCAST STATIONS

In the fifth annual report there was set forth a discussion of the engineering standards used in the allocation of frequencies to broadcast stations. As was stated in that report, the standards must necessarily change with the development of the radio art and the accumulation and interpretation of antenna radiation, etc.

The standards presented in this report have been the subject of much discussion between engineers and at hearings, and much thought has been given to the basis used and the results obtained. There has been rather general agreement that on the average the standards are fair and represent a fair estimate of the average conditions throughout the United States.

It is recognized, however, that more accurate standards are desirable if data are available to justify greater accuracy or more detail. To determine this a very intensive study has been inaugurated as to the characteristics of the standards to be used in the allocation of frequencies to stations. This study involves the following:

(*a*) Large number of measurements of field intensity now available.

(*b*) Many complete field intensity surveys.

(*c*) Investigation of field intensity necessary for satisfactory service.

(*d*) Theory of propagation with special reference to the Sommerfeld theory.

(*e*) Average selectivity of receiving sets.

(*f*) Analysis of antenna characteristics.

(*g*) Data presented at hearings by engineers and experience of Commission engineers.

This study is not yet complete. The results will be published as soon as completed, and will make available the application of the latest developments in this field to the engineering problems of the commission.

LOCATION OF TRANSMITTERS OF BROADCAST STATIONS

The Federal Radio Commission has no rules or regulations concerning the location of transmitters of broadcast stations. Applicants desiring to obtain approval of sites for broadcast transmitters are required to supply the commission with extensive technical data concerning the proposed site. In determining whether or not a site is suitable the engineering division is guided by the data supplied by the applicant and what it considers good engineering practice. In some cases supervisors of radio supply supplemental data, and the applicants may be required to supply additional data if the case can not be decided from the data supplied in the application.

To insure uniformity several empirical standards on sites have been adopted based on the data available concerning the location of existing stations and all data available along this line.

It is only recently that the importance of selecting the proper site for broadcast transmitters has been fully realized. The success of

a broadcast station may in a large measure depend upon selecting the proper site for this may directly determine the efficiency of the antenna system and the coverage of the population desired to be served. Recent engineering surveys of transmitters reveal that the efficiency of radiating systems vary from approximately 5 to 60 per cent, the location of the transmitter being in a large measure responsible for this wide variation. Other conditions being the same, a 1-kilowatt station with an antenna 60 per cent efficient would be equivalent to a 12-kilowatt transmitter with 5 per cent antenna efficiency.

It has been found that certain low-power stations are much more successful in covering centers of population than high-power stations, due to the efficiency of the radiating system and the location of the transmitter. If data were available on the primary coverage of all broadcast stations and tabulated according to power, it would undoubtedly reveal that power alone is of minor importance in determining the coverage and that there are other factors which are more influential.

As a matter of fact, the percentage of modulation is more important than power, and the effectiveness of the site and efficiency of the radiating system are more important than either. The operating power of a station and the minimum percentage of modulation are fixed by the commission and every licensee of a broadcast station should select a site from which a maximum city and rural service may be had and the minimum amount of interference produced with other stations.

The three primary objectives to be attained in the selection of a site for the transmitter of a broadcast station are as follows:

1. To serve adequately the center of population in which the studio is located and give maximum coverage to adjacent areas.
2. To cause minimum cross-talk interference with other stations assigned to adjacent channels.
3. To pass requirements of Federal Radio Commission.

If a site is engineeringly correct, presumably it will pass the requirements of the Federal Radio Commission.

The following table is offered as a general guide to be used in determining the approximate site of broadcast transmitters; that is, from this table it may be determined whether or not the station should be located in the center of the city or at some distance from the city.

In case the power and the population of the city are such that it should be located at some distance from the center of the city, the approximate distance is given as well as the population of the so-called "blanket area." The "blanket area" of a broadcast station is defined as that area in which the average broadcast receiver would not be able to receive satisfactorily, without cross-talk, other stations operating on a frequency separated by 50 kilocycles or more. If the city under consideration is of irregular shape, the table may not apply but the general principles set out will still hold.

TABLE I

Power of station	Population of city or metropolitan area	Radius of blanket area 75 to 100 MV/M	Site-distance from center of city (business or geographical)	Maximum percentage of total population in blanket area
		Miles		
50 to 100 watts	5,000 to 50,000	0.3–0.4	1½ to 2 miles	0.50
50 to 100 watts	75,000 and up	.3– .4	Center of business section	
250 to 500 watts	5,000 to 150,000	.6– .9	1 to 3 miles	.75
250 to 500 watts	200, 000 and up	.6– .9	Center of business section	
1,000 watts	5,000 to 200,000	1.25	2 to 5 miles	.75
1,000 watts	250,000 and up	1.25	Center of business section	
5 to 10 kilowatts	All	2.7–3.75	7.5 to 10 miles	1.0
25 to 50 kilowatts	All	4.5–6.0	12.0 to 20 miles	1.0

Another factor to be considered is the relation of the site to airports and airways. There are no regulations or laws with respect to distance from airports and airways, but a distance of 3 miles from each is used as a guide. In case a suitable location is found at less distance than this, it may be satisfactory if the towers are suitably painted and lighted in conformity with Aeronautics Bulletin No. 9, of the Department of Commerce, or if the towers are not higher than the surrounding objects. The latter is poor radio engineering. In selecting a site the local aeronautical authorities should always be consulted if there is any question concerning erecting a hazard to aviation.

In selecting a site in the center of a city it is usually necessary to place the radiating system on the top of a building. This building should be large enough to permit the necessary spacing and height of towers. Great care must be taken to avoid selecting a building surrounded by taller buildings or any building higher than the antenna and in the direction which it is desired to serve. Such a building will tend to cast shadows which may materially reduce the coverage of the station.

If from Table I it is determined that a site should be selected removed from the city, then there are several general conditions to be followed in determining the exact site. The table gives the approximate distance from the center of the city. Three maps should be given consideration if available:

1. Map of the density of population and number of people by sections in the area.
2. Geographical contour map with contour intervals of 20 to 50 feet.
3. Map showing the type, nature, and depth of the soil in the area with special reference to the condition of the moisture throughout the year.

From these maps a site should be selected that is approximately the required distance from the city with a minimum population in the "blanket area" and with a minimum number of intervening hills between it and the center of the city. In general because of ground conditions it is better to select a site in a low area rather than on top of a hill, and the only condition under which a site on top of a hill should be selected is that it is only possible by this means to avoid a substantial number of hills between the site and the center of a city with consequent radio shadows.

If a compromise must be made between probable radio shadows from intervening hills and locating the transmitter on top of a hill, it is generally better to compromise in favor of the low area where

an efficient radiating system may be erected and take the losses due to shadows being caused by the hills if not too numerous or too high. Several transmitters have been located on top of hills, but so far as is known not a single installation has given the average efficiency of propagation and coverage.

The ideal location of a broadcast transmitter is in a low area of marshy or "crawfishy" soil or area which is damp the maximum percentage of time from which a clear view over the entire center of population may be had. The tallest buildings in the business section of the city should cast a shadow across the minimum residential area.

The type and condition of the soil or earth immediately around a site is very important. Important, but to a less extent, is the soil or earth between the site and the principal area to be served. Sandy soil is considered the worst type with glacial deposits and mineral ore areas next. Alluvial, marshy areas, and salt water bogs have been found to have the least absorption of the signal. One is fortunate to have available such an area and, if not available, the next best condition must be selected.

If a site is to be selected to serve a city which is on a general sloping area, it is generally better to select a site below the city than above the city.

Careful consideration must be given to selecting a site so that the number of people in the blanket area is a minimum. The last column of Table I gives the percentage of the total population of the city or metropolitan area that may be permitted in the "blanket area." In general broadcast transmitters operating with approximately the same power can be grouped in the same approximate area and thereby reduce the cross-talk interference between them.

Figure 1 shows how cross-talk interference may be alleviated between broadcast stations serving the same area by placing the transmitters within a short distance of each other rather than on opposite sides of the metropolitan area being served. By the commission policy, stations serving the same area must have a frequency separation of 50 kilocycles and this practice is observed in practically all cases. It is presumed that owners of any radio receiving sets would have no difficulty in separating signals separated in frequency by 50 or more kilocycles when the receiver is not located in the "blanket area" of either station. This is not strictly true, however, of some old receiving sets or any set in a poor state of repair, as they may not have the capability of separating stations operating on frequencies 50 or more kilocycles separated. This is true when the transmitters of the stations are so located that in certain areas there are large differences in the field intensities from the stations, and especially on the higher frequencies. If this condition could be alleviated without impairing the coverage of the stations and at the same time protect all receivers, this would be desirable.

Figure 1 shows the field intensity curves from three broadcast stations. The station giving curve A is assumed to be operating with the power of 1,000 watts and the stations giving curves B and C 500 watts. The transmitters of stations A and C are located in approximately the same area, while the transmitter of station B is located across the city or 8 miles away. The point "X" is selected where it is desired to tune all three stations. It is seen that the ratio of the signal from A and C is low at point "X" and this same rela-

tionship holds throughout the entire area and therefore there would be no difficulty in separating these stations on any receiver. The signals from stations A and C, however, are less than from station B at point " X," and there may be interference on certain receivers. If there is any tendency for the receiver to tune broadly, there would be a far greater probability of interference with reception of station C by B than from station A even though station B operates with half the power of station A. The same principle holds true at points near station A where it is desired to tune station B without interference from stations A or C. This simple diagram shows that the interference between stations in the same area may be practically eliminated by placing the transmitters in the same area.

In cases of several stations serving large cities, this principle could not be advantageously applied to all stations located in the area because generally any station has some radio shadow and accordingly may not well serve certain parts of the city. Another station with the transmitter across the city would serve this area well, so that between the two they would serve all the areas well.

The ideal arrangement would be to group the transmitters of the stations operating nearest in frequency and between which there may be some possibility of cross-talk interference.

If the city is of irregular shape, it is often possible to take advantage of this in selecting a suitable location that will give a maximum coverage and at the same time maintain a minimum of people within the blanket area. The maps giving the density of population will be a key to this. The map giving the elevation by contours will be a key to the obstructing hills between the site and city. The map of the soil conditions will assist in determining the efficiency of the radiating system that may be erected and the absorption of the signal encountered in the surrounding area.

In finally selecting the site, consideration must be given to the required space for erecting an efficient radiating system. It is the general practice to use direct grounds consisting of a radial buried wire system. If the area is such that it is not possible to get such a ground system in soil that remains moist throughout the year, it probably will be found better to erect a counterpoise. A counterpoise properly erected may be as efficient as the best possible ground, and, if it is not possible to secure an excellent ground, the counterpoise should always be given consideration. It, like the antenna itself, must of course be designed properly for the operating frequency and other local conditions.

It is always desirable, and whenever possible, a field intensity survey should be made to determine that the site selected will come up to the expectations and meet the requirements. Often two or more sites may be selected that appear to be of equal promise. It is only by means of field intensity surveys taken with a transmitter at the different sites that it can be determined which is more desirable. There are many considerations of inefficiency that can not be determined by any other method. An engineer with experience in selecting a site can generally do a good job by inspection, but he can never be certain without the survey.

The field survey should prove the following things:

1. A field intensity of 10 to 25 millivolts per meter will be obtained over the business area of the city.

2. A field intensity of 2 to 5 millivolts per meter will be obtained over the residential section.

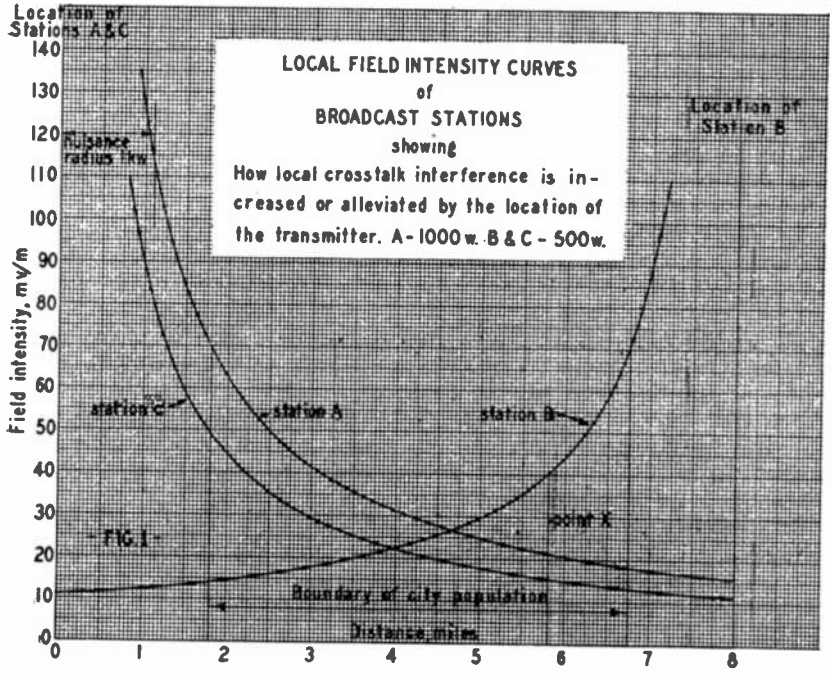
3. The absorption of the signal is the minimum of any obtainable sites in the area. As a guide in this respect the absorption of the signals from other stations in that area should be followed as well as the results of tests on other sites.

4. The field intensity at the outer limit of the blanket radius does not exceed 100 to 125 millivolts per meter.

In the absence of field surveys, the average conditions are presumed to prevail and field intensities may be determined under these conditions from the Fifth Annual Report of the Federal Radio Commission. It should, however, be borne in mind that the absorption of the signal across cities is generally greater than that which would be indicated by this figure. Usually this is also true of hilly country or very sandy soil. If a compromise must be made between sandy soil, high elevations, and intervening territory, a field intensity survey should be made from several sites.

There are now many stations licensed to operate with specific powers which could undoubtedly gain a better coverage of their primary areas by selecting more suitable sites and erecting efficient radiating systems than could be obtained by a one or two step increase in power.

In making the final determination of a site, it can not be stressed too much the need for a field intensity survey to establish the exact conditions. It is desirable to consider the results of such a survey not only with other sites in the same area but with other existing stations in the same and other areas. The selection of a proper site for a broadcast station is an important engineering problem and can only be done by experienced radio engineers.



COMMERCIAL COMMUNICATIONS SECTION

GENERAL

The one-tenth per cent frequency separation plan[1] was approved by the commission on September 3, 1931, and became effective for licensing purposes on February 1, 1932. This permitted licensees whose station frequencies were to be changed sufficient time to protest and be heard, if desired, and to arrange for technical changes in equipment.

Under the one-tenth per cent plan, 3,025 communication bands were made available, as compared with 1,846 bands which were available under the two-tenths per cent frequency separation plan previously in effect. The total number of communication bands refers to the number of bands available in the radio spectrum (10 to 28,000 kilocycles) for use by all countries. Obviously, therefore, all of these communication bands are not available for assignment in the United States. Stations throughout the world are working with closer frequency separation and more stations are being accommodated. In spite of the fact that it was necessary to change the frequency asssignments of several hundred stations, all licensees accepted the plan with the finest kind of cooperation and in no case was it necessary to hold a hearing.

With the large number of stations operating in the world there are instances where stations interfere or where stations of one class of service interfere with the service of another class of stations. In many cases the stations involved are able by cooperative effort to eliminate the interference without reporting it to the commission, while in other cases it is brought to the attention of the commission.

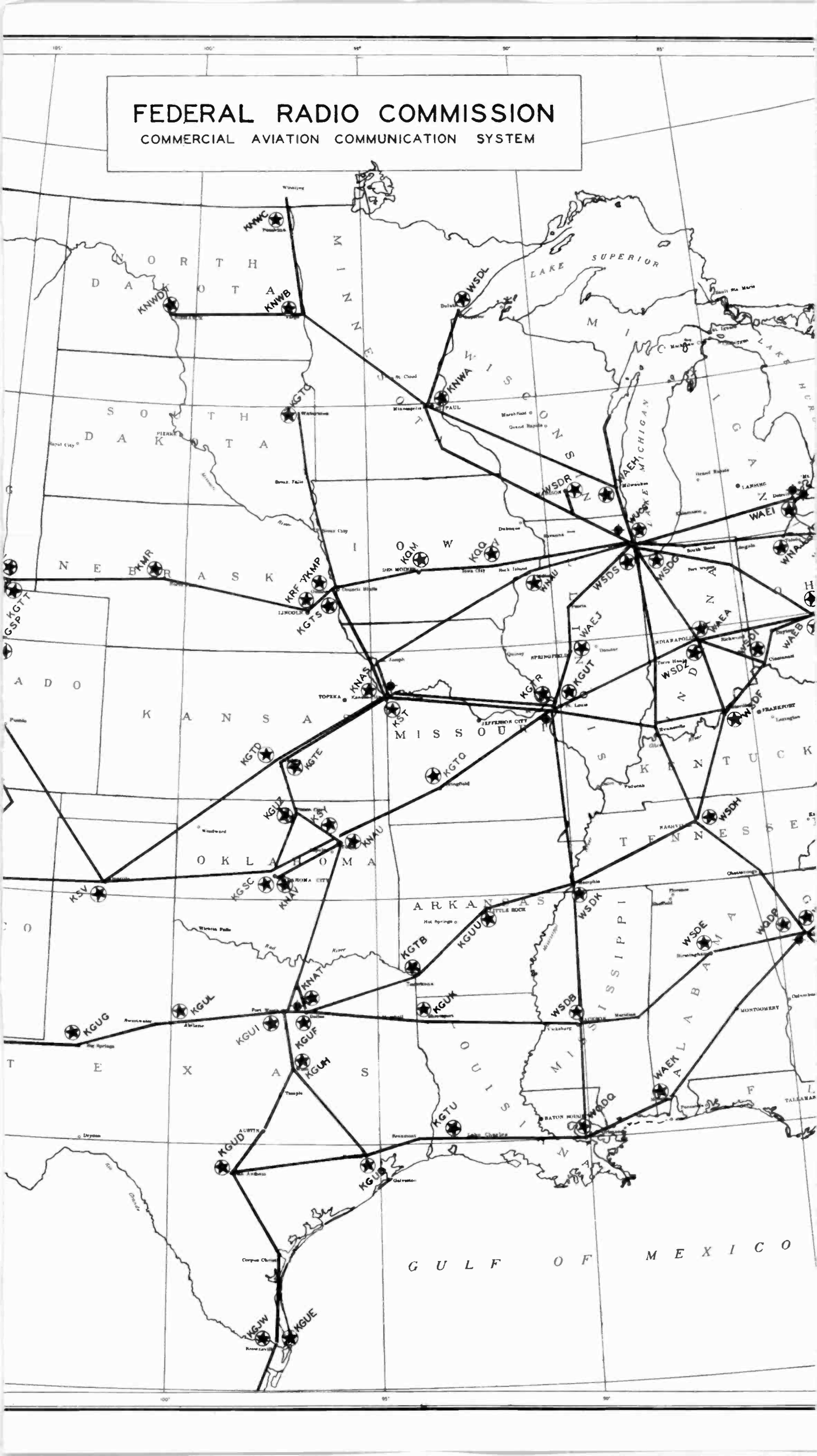
All cases of interference which are brought to the attention of the commission are thoroughly investigated. Interference may be caused either to stations in the United States, or by a United States station to a station in a foreign country.

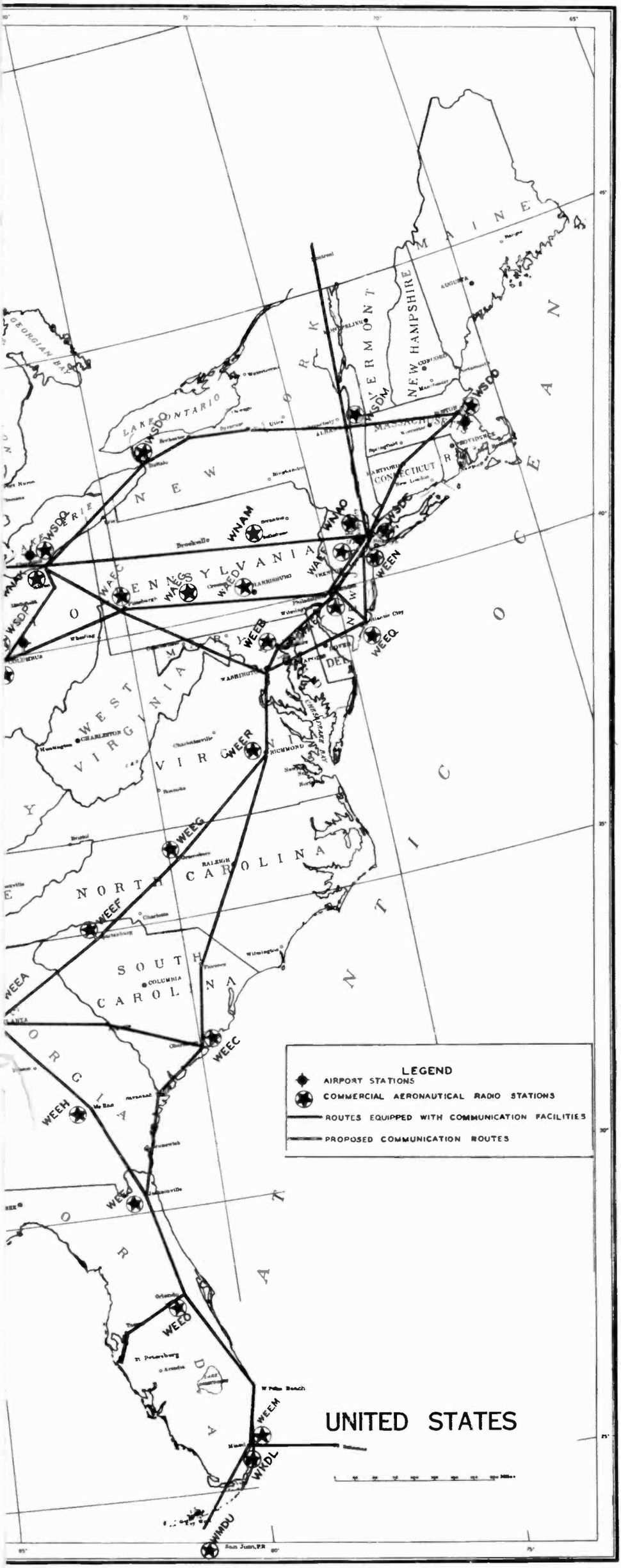
The engineering considerations are frequency separation, geographical separation, power, and type of emission being used, directivity factors of the respective antenna systems selectivity factors of the receivers being used, and the possibility of taking advantage of the distribution of daylight and darkness over the great circle path for the arrangement of time schedules and operation during which the interference may be avoided.

During the past year there have been 15 major cases of interference involving foreign stations, and 80 cases involving United States stations only. All have been settled satisfactorily through correspondence or by conferences with interested parties.

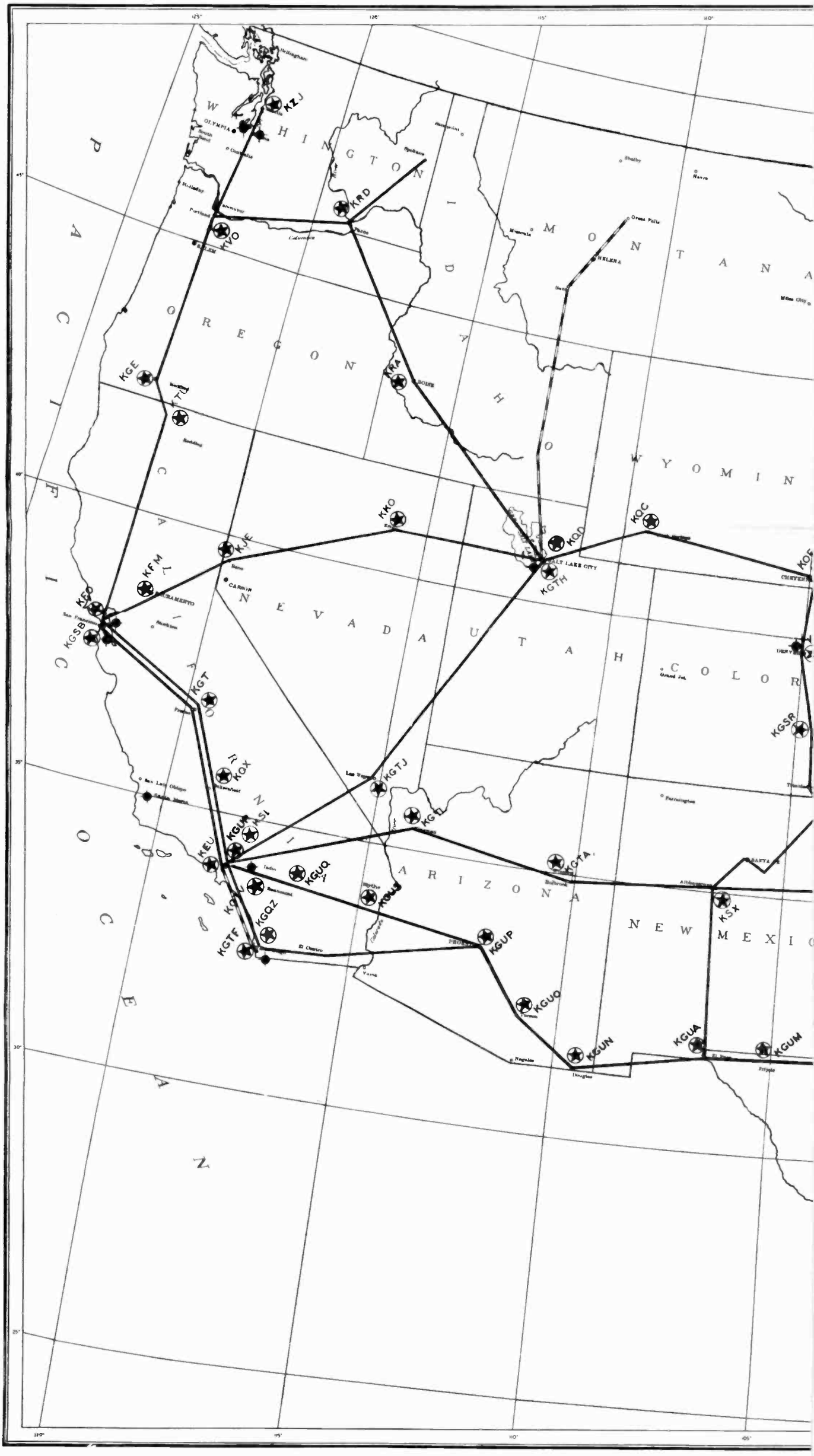
The development and expansion of all radio services and the elimination of many types of interference depend in the final analysis

[1] See Fifth Annual Report of the Federal Radio Commission, p. 41.


FEDERAL RADIO COMMISSION
COMMERCIAL AVIATION COMMUNICATION SYSTEM
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
MICHIGAN
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LAKE SUPERIOR
LAKE MICHIGAN
GULF OF MEXICO
KNWC
KNWD
KNWB
WSDL
KNWA
KGTO
KGTT
KGSP
KMR
KRF
KMP
KGTS
KOM
KQO
WSDR
WAEH
WAEI
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WSDG
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WAEA
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KNAS
KST
KGTR
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WSDZ
WSDF
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on the ability of radio stations to maintain operating frequencies within the limits specified by the commission. With the inauguration of the one-tenth per cent plan of allocation, stations were required to maintain their operating frequencies more closely to the assigned frequencies. The cooperation of the radio division, Department of Commerce, in making measurements for stations and reporting deviations to the commission has been of material assistance in making it possible for stations to maintain the assigned frequencies more accurately.

AVIATION

It is now recognized that radio communication between aircraft and ground is an indispensable adjunct to the operation of an extensive air-transport system. This is evidenced by the growth in the number of aeronautical radio stations, both land and aircraft, and by a marked increase in the efficiency of these stations. The increased safety in aviation and the increase in the reliability of air transportation are, in a very large measure, due to the radio communication between airplanes and ground.

There were on June 30, 1932, a total of 132 aeronautical stations, 69 aeronautical point-to-point stations, and 20 airport stations, either licensed or under construction. There were 335 transport and 20 itinerant aircraft licensed by the commission on that date. The main routes of the five major chains have not been changed during the past year. However, new feeders have been established to the main routes. The system as of July 1, 1932, is shown in the attached map.

Traffic reports submitted by licensees of air-transport companies show that the amount of radio message traffic handled during the past year is approximately three times that which was handled for the previous year, the average load per frequency being about 235 daily schedules.

An interesting example of the use being made of radio for emergency aircraft communication is shown by the following abstract:

On April 12, Pilot Freeburg with Co-Pilot Joe Kimm, departed from St. Paul, Minn., en route to Chicago. The plane carried eight passengers besides a load of mail. After leaving Minneapolis, while flying at an altitude of about 2,000 feet, the left outboard motor broke loose from its mounting and lodged on the left landing gear struts. The pilot altered his course to fly over the Mississippi River in order to shake the motor off the landing gear and drop it into the river if possible. He succeeded in maneuvering the plane so that the motor fell off. He then turned the plane around and proceeded to the Wabasha emergency landing field, about 25 miles east, and made a safe landing without any further damage. The incident had already been reported to the operating headquarters at St. Paul by radio at the time of occurrence and a relief ship was immediately dispatched to Wabasha where the passengers and mail continued the trip to Chicago. Pilot Freeburg was continually talking into his radiotelephone advising St. Paul of what had happened and outlining what he was attempting to do. Thus a complete record was immediately available to all concerned.

FIXED SERVICE

The service rendered by the communication companies of the United States has been constantly improved by adjusting frequency assignments to obtain better operating advantage and by maintain-

ing improved frequency stability. Transmitting equipment used for fixed service in the band between 6,000 and 23,000 kilocycles which was installed subsequent to September 3, 1931, is required by the commission to operate within 0.02 per cent of the assigned frequency and within 0.03 per cent for a frequency assigned in the band between 1,500 and 6,000 kilocycles. This regulation will tend to reduce interruptions to the service caused by interference between stations operating on adjacent frequencies and represents an important technical improvement over the frequency variations previously permitted.

The overseas transmission of facsimile material of photographs, drawings, documents, and facsimile signatures by radio is now a practical utility and is used by newspaper and magazine publishers, fashion houses, banks, police departments, and by other commercial and Government organizations. Satisfactory reproductions of photographs, documents, or drawings can be transmitted within 20 minutes of the time that the photographic material is placed on the machine.

A new type of service known as "Addressed program material" was introduced during the year for the point-to-point transmission of addressed program material intended for rebroadcasting. This service enables the organizer of a program for international broadcasting to secure the facilities normally used for the radiotelegraph service which has made programs available from countries not previously connected with radiotelephone circuits.

In the public press service, stations were licensed at two additional locations to begin operation during the year. One of these, at Honolulu, Hawaii, is used for radiotelegraph transmission to Los Angeles, Calif., of information intended for publication by newspapers and press agencies. The other, at Chicago, Ill., exchanges information of the same nature with a similar station at New York City and contemplates extending this service in the near future to a large number of automatic receiving radioteletype printers located at points throughout the United States.

Continued progress was made during the year in the further extension of international radiotelephone communication. Telephone service to Bermuda was inaugurated on December 21, 1931, through an additional transmitting station at Lawrenceville, N. J., licensed by the commission to operate on high frequencies. This station and the corresponding station at Hamilton, Bermuda, provide a method of interconnecting the telephone network of North America with the system of the Bermuda Telephone Co.

The extension of radiotelephone service from the United States to Hawaii was established on December 23, 1931, through new high-frequency transmitting stations at Dixon, Calif., and at Kahuku, Hawaii. This service is available to all telephones in the United States, Canada, Cuba, and Mexico, and to the network of the Mutual Telephone Co. of Hawaii.

The telephone network of the Hawaiian Islands consists of telephone wire lines on the four principal islands, linked by an interisland high frequency radio system, which in itself is an epochal radio development. This interisland telephone service which has been in successful operation since September 15, 1931, represents the

first commercial application of the ultra-high frequencies above 30,000 kilocycles and has served to demonstrate the practical communication value of these frequencies over distances up to approximately 200 miles.

Permits were granted for the installation of high-frequency equipment at Hialeah, Fla., in connection with the project to establish radiotelephone service to the Bahama Islands, the West Indies, Central America, and additional South American countries. This service has not yet been opened.

MARITIME

The changes which have taken place in the maritime radio services during the past year have been particularly noteworthy. Of outstanding importance is the organization of the assignment of frequencies and the establishment of various classes of marine stations.

Land stations which are licensed to communicate with ships, and aircraft in flight over the sea, have been divided into three separate classifications known as coastal telegraph stations, coastal telephone stations, and coastal harbor stations.

Under the new plan frequencies are assigned to ships according to the nature of message traffic to be handled. Ships which are equipped only with medium frequency apparatus are assigned definite groups of frequencies for radiotelegraph communication, whereas ships which have high frequency transmitting equipment may be licensed for either radiotelegraph or radiotelephone communication, or both.

In view of the technical limitations with respect to the operation of radio transmitting apparatus on board ship in so far as practicable blocks of frequencies are assigned to ship stations and such stations are permitted to use any frequency within a particular block. This plan was worked out in cooperation with representatives of marine operating companies and has also been recommended by our Government for adoption by other nations.

The 0.1 per cent frequency separation plan provides for a considerably larger number of assignable frequencies above 1,500 kilocycles for the maritime services and makes possible the future expansion of ship-to-shore and shore-to-ship public telephone and telegraph services.

Arrangements have been made by operating companies for public telephone communication with additional ocean-going vessels. This service is now available, through the high frequency coastal telephone stations at Ocean Gate, N. J., to the steamship *Leviathan* of the United States Lines, the steamship *Majestic*, steamship *Olympic*, and steamship *Homeric* of the White Star Line, the steamship *New York*, steamship *Bremen*, steamship *Albert Ballin*, steamship *Hamburg*, and steamship *Europa* of the North German Lloyd, the steamship *Deutchland* of the Hamburg American Line, the steamship *Empress of Britain* of the Canadian Pacific Line, and the *Monarch of Bermuda* of the Furness Bermuda Line. For the present, service is confined to ships on the Atlantic, although in the cases of certain of these ships arrangements were made to maintain circuits with them during cruises around the world. Recently there

has been established commercial telephone service between the station of the British General Post Office and several transatlantic liners.

A total of five coastal harbor stations are now licensed to use frequencies in the band 2,500–2,600 kilocycles for the purpose of rendering public telephone communication between telephone systems ashore and properly equipped harbor craft, or other vessels that employ relatively low power telephone transmitters of limited range. These stations are located at New York, Boston, Seattle, San Francisco, and Los Angeles. The apparatus installed aboard ship for harbor telephone service is usually small, compact, and capable of being operated by one of the regular crew who also holds the requisite radiotelephone operator's license. This service has not been in operation a sufficient length of time to indicate the extent of its probable use, but adequate arrangements have been made by the shore stations to handle communications with a large number of vessels.

It is expected that coastal harbor stations will be used to supplement the regular coastal telephone service now carried on with vessels on the high seas, providing communication to ocean-going ships when they are approaching or leaving port.

POLICE

The record of growth of the number of police radio stations shows an increase in these facilities of 30 stations during the past year, making a total of 92 stations either licensed or under construction on June 30, 1932.

The number of frequencies suitable for municipal or State police radio service is limited to a relatively small portion of the radio spectrum. Frequencies beginning at 3,000 kilocycles are useful for long-distance communication, and the higher frequencies above 5,000 kilocycles possess skip-distance characteristics which render them useless for short-range communication. The lower frequency bands below 1,500 kilocycles are used to full capacity by Government stations, ship and aircraft stations, and broadcast stations. The frequencies suitable for municipal and State police radio service fall within the band between 1,500 and 3,000 kilocycles. This band is further allocated for use also by maritime and aviation stations, amateurs, experimental visual broadcasting stations, and other minor services, such as geophysical stations, broadcast pick-up stations, motion picture stations, etc.

The specific frequencies available for exclusive use by police radio stations differ only slightly from those which were assigned a year ago. Under the new plan eight frequencies are assigned for use by municipal police radio stations and two by State police stations. Most of the police frequencies in use a year ago were separated from each other by only 6 kilocycles. This was considered as ample width for voice telephony, but did not allow sufficiently for deviation of the carrier frequency. Under the new plan, police frequency assignments are separated by 8 kilocycles, with the result that cross-talk and heterodyne interference has been practically eliminated.

There is belief on the part of some licensees that a separate frequency should be assigned to each municipality. Obviously, with only eight frequencies available such a system could not possibly be as efficient as the present zone system of allocation. For example, in

one metropolitan area there are 19 cities located in 80 districts, and nearly all of these cities are within 20 miles of the center of the city. If different frequencies were assigned to each of these municipalities, the adjacent police departments would not be notified of crimes committed in neighboring cities and there would be delay in the apprehension of criminals who made their escape to the adjacent municipalities. Furthermore, serious interference would result if several cities within the same area attempted to operate simultaneously and independently on frequencies separated by only 8 kilocycles. Cities in areas such as this have been encouraged to organize a metropolitan district type of radio service, with the result that about one-third of the licensees are now serving two or more contiguous municipalities.

In the interest of reduction of interzone interference, an allocation of power based on population was selected in preference to an allocation based on area to be served. Municipalities having large populations need more power than those of less populous areas because, due to building construction, there is greater attenuation of the radiated power. Furthermore, it has been determined that many of the small municipalities occupy greater geographical dimensions than some of the larger cities and they are not handicapped with the transmission difficulties usually present in the more populous districts.

The following information has been submitted in response to a questionnaire by licensees of municipal police radio stations with reference to their operation for the month of April, 1932:

Number of cities from which reports were received	50.
Total number of emergency calls transmitted	155,656.
Average time required to transmit 1 call	1 minute, 2 seconds.
Total number of arrests reported	12,676.
Amount of property recovered [2]	$386,953.
Total number of automobiles equipped with radio receivers	2,255.
Total population served	32,585,000.
Total area in square miles served	28,190.

Only a small number of cases of interference were reported and it is interesting to note that in only one case was the source of interference within the same zone as the reporting city. In this case it appears that the two adjacent cities involved have established no means of cooperative use of the frequency and the city having an emergency announcement is unable to interrupt routine announcements being transmitted by the other city. It is believed that proper cooperation such as is placed in effect by other cities sharing the use of a single frequency will completely eliminate this difficulty.

A study of the cases of interzone interference indicates that the receiving equipment furnished police cars is in some cases not up to modern engineering standards, inasmuch as stations 16 kilocycles from the assigned frequency are reported as causing interference. In view of the lack of availability of frequencies it will not be possible to provide for a greater separation between channels in the near future.

All cities reporting have included the hour 10 p. m. as a busy hour. The four hours prior to 10 p. m. are reported as busy hours by at least 50 per cent of the cities, while the same number of cities report only two busy hours after 10 p. m.

[2] Only about 50 per cent of the cities had information available as to the amount of property recovered.

One city reports specifically that through the use of radio, during the month of April, 15 persons were caught in the actual commission of crime. Another city believes that police radio could be better administered by the installation of small low powered transmitters in each precinct for the purpose of serving that precinct alone, while another has completely abolished all precinct stations and operates the entire system from the central headquarters. Still another reports that it connects the telephone system to the police transmitter during the reception of emergency calls in order that all cars may hear the actual conversation between the dispatcher and the citizen reporting the emergency.

It has been suggested that a two-way communication system should be provided to permit patrolmen in cars to transmit back to headquarters or to other cars information of general importance in combating crime. It is recognized that a two-way system of communication has some advantages and would permit greater flexibility in the handling of a motorized police force. However, no consideration can be given to the authorization of such a service until a sufficient number of frequencies becomes available.

EXPERIMENTAL VISUAL BROADCASTING

While no startling inventions have come to light in television during the past year, the progress that has been made has been marked by a steady improvement in the detail of pictures transmitted. This improvement has been made possible through increased attention to technical details in the optical pick-up system, in the photoelectric cell and amplifying systems, and in the actual modulation of the radio waves emitted. This development has in a general way paralleled the progress that was made in the early stages of sound broadcasting.

Much attention has been given to the part of the spectrum in which television emissions will best fit. Although there are at the present time four 100-kilocycle bands between 2,000 and 3,000 kilocycles assigned to television, it has been evident for a considerable time that this space is not sufficient to meet the requirements of this new and growing art to furnish entertainment to the public. The experimenters have turned to the unexplored regions above 30,000 kilocycles. The work at these frequencies has shown signs of real promise as a future locus for this service, and the Federal Radio Commission has assigned wide frequency bands in this region for experimental work in television. Proposals have been received by the commission from the industry to increase the space in this band in order to protect the future of television.

Although considerable progress has been made in scanning methods, using both the mechanical type of scanning and the electrical or so-called cathode-ray-type of scanning, it appears that many new developments must still be made before television can be accepted as a satisfactory entertainment service. While attempts have been made to broadcast scenes covering large areas, the majority of television stations have limited their transmissions to faces of one or two performers at most. This type of program, while of interest because of its novelty and usefulness for experimental work, has a very small amount of sustained "look-in" interest. Such

programs fall far short of what the public has been led to expect in the way of entertainment, considering especially the fact that the technical improvements made during the last few years in sight-and-sound motion picture technique have created in the mind of the public a desire for very high technical standards of performance.

GENERAL AND SPECIAL EXPERIMENTAL SERVICE

In addition to the advance in the art of experimental visual and relay broadcasting realized during the past year as a result of the activities of these stations, many contributions have been made by two other important experimental services, namely, general and special experimental services. The contributions of these services have been applicable not only to the needs of the older services such as fixed public radiotelegraph, maritime mobile radiotelegraph, and broadcasting, but have been directed toward the needs of the younger ones such as police, aviation, and ship-to-shore and shore-to-ship radiotelephone. Without the improvements in the design of receiving and transmitting equipment, and the increased knowledge of transmission phenomena in the frequency bands used by these services which has resulted from these experimental studies, the representative growth and development would not have been possible.

General and special experimental stations work almost continuously, collaborating with the design and research laboratories endeavoring to put into practice the results of their special studies. Their work is always in advance of the present state of the art, and their primary interest in future developments of all radio services.

During the past year experimental stations have been especially interested in the possibilities of communication utilizing the very high frequencies above 30,000 kilocycles. Light weight portable transmitters and receivers for use in these bands have been designed and many studies of the transmission characteristics of frequencies in this portion of the spectrum have been made. A great deal of interest has also been shown in the possibilities of frequency or phase modulated signals as compared to amplitude modulated signals now universally used and in the design of suitable transmitters and receivers for producing and receiving signals efficiently without causing undue interference to other services on neighboring channels.

The importance of experimental work is more fully realized when it is considered that the propagation characteristics of radio waves throughout the frequency spectrum are never the same from month to month, or from year to year because of the ever changing physical conditions in the medium through which they propagate. Not only must the experimental service provide the equipment for the developments of the future for all services, but it must also be able through its studies of transmission phenomena to predict the conditions which will make possible the use of such equipment.

TEMPORARY SERVICE

The term "temporary service" is defined in the commission's regulations as radio communication service that requires the use of radio for short periods at irregular intervals at locations where wire facilities are not available. Two classes of stations, namely,

"motion-picture stations" and "broadcast-pick-up stations" come under the temporary service classification.

Motion-picture stations are used in connection with the filming of motion pictures for communication between field production units or between headquarters and field production units while on location. Extensive use of this service has not yet been made.

Broadcast pick-up stations are used in connection with or for the transmission of items of public interest for pick-up and rebroadcast over one or more broadcast stations in the band 550 to 1,500 kilocycles. These stations have been used regularly in connection with the broadcasting of events from locations where wire facilities are not available. Portable transmitters of low power are used and are now recognized as an almost indispensable adjunct to the operation of many broadcast stations.

Among the broadcasts made possible through the use of this service were the transmission of programs from a moving train, from an airplane flying over New York City, and description of major events of all kinds where wire lines can not be used.

AMATEUR

The number of amateur stations on June 10, 1932, had increased to 30,640 as compared to 22,739 on June 30, 1931. A large number of these stations continue to cooperate with the Army, Navy, and Red Cross in handling emergency traffic and by practicing the use of established military and naval operating procedure which requires the full cooperation of the participants.

Many amateur stations, not affiliated with these organizations, are also available to the public for communication in times of emergency. During the month of March when the Middle West and Atlantic Seaboard States were in the grip of severe snow, sleet, and wind storms, amateur radio operators demonstrated their value by providing temporary emergency communication from isolated localities. Many emergency messages were transmitted during this period for power companies and other public utility organizations.

On Navy day, October 27, 1931, 406 amateur operators succeeded in copying messages from the Secretary of the Navy transmitted from the naval stations at Arlington, Va., and San Francisco, Calif., and from the naval reserve station at Hartford, Conn. This Navy day event, which has occurred annually since 1926, presents an opportunity for the amateurs to compete in receiving radiotelegraph signals. In 1926 only 41 operators of amateur stations participated, whereas in 1931 406 amateurs copied the Secretary's messages.

The third annual armistice day message from the Chief Signal Officer, United States Army, to members of the Army Amateur Radio System and all other radio amateurs was transmitted from Washington, D. C., by radiotelegraph on the night of November 9, 1931, and was copied and mailed to the Chief Signal Officer by 542 licensed amateurs. Ninety-two per cent of this number were members of the Army amateur reserve system. When the armistice day message to amateurs was inaugurated in 1929 only 125 amateurs mailed in copies of the transmission.

Several amateur stations in the United States were successful in exchanging messages with scientific expeditions, such as the Bartlett-

Narcron Expedition to Iceland and Greenland, and the 1931 Dickey Orinoco River Expedition in Venezuela. Communication was also maintained between the American yacht *Northern Light* while this vessel was in the southern part of the Indian Ocean, south of Australia, and with the United States naval training ship *Nantucket* when 1,500 miles east of Boston. On February 27, 1931, contact was established by amateur operators with the station of the department of terrestrial magnetism at their observatory at Huancayo, Peru, and important messages were exchanged between that point and its headquarters at Washington, D. C. Amateurs also handled emergency messages in September, 1931, with a radio station in Belize, British Honduras, when other communications were interrupted due to a hurricane.

The characteristics and possibilities of comparatively unexplored portions of the radio spectrum above 28,000 kilocycles are being actively investigated by many amateurs who have used these frequencies during recent months to demonstrate successful two-way telephone and telegraph communication between the ground and aeroplanes in flight, and between points on land at high elevations. Special equipment has to be developed by the amateurs for practical operation on these ultra-high frequencies and the reports of their experience show excellent results.

Because of increasing interest in amateur radiotelephone operation and the desire to improve operating conditions and reduce interference, the commission reallocated certain amateur frequency bands with respect to radiotelephony. These new regulations, which became effective April 1, 1932, limit the use of telephony in certain frequency bands to amateur stations operated only by those who demonstrate their technical ability to properly operate such stations by obtaining an unlimited amateur radiotelephone operator's license from the radio division, Department of Commerce. Other frequency bands were made available for telephone transmission by all amateur operators.

Previous allocation of the entire 1,715–2,000 kilocycle amateur band for telephony was changed to provide for this type of transmission only on frequencies between 1,875 and 2,000 kilocycles. With the changing characteristics of the high-frequency spectrum, it is believed that many amateurs who have heretofore not operated their radiotelegraph stations on frequencies below 3,500 kilocycles will revert or have reverted to use of the 1,715–2,000 kilocycle band, and to avoid undue interference among the amateurs themselves it was desirable to reallocate this band into two parts, one for each of the two types of stations.

INTERNATIONAL AND INTERDEPARTMENTAL RELATIONS SECTION

INTERNATIONAL TECHNICAL CONSULTING COMMITTEE ON RADIO COMMUNICATIONS

At the conclusion of the second meeting of the International Technical Consulting Committee on Radio Communications (C. C. I. R.), held in Copenhagen, Denmark, in 1931, 14 questions remained to be studied in preparation for the third meeting of the C. C. I. R. The centralizing administrations were requested to complete the work on these questions before the meeting of the International Radio Conference at Madrid in the fall of 1932. The United States agreed to collaborate in the study of all questions.

At the request of the Department of State the Federal Radio Commission assumed the responsibility for preparing the material to be sent to the centralizing administrations concerning these questions. Representatives of the various Government departments interested in radio, and commercial communication companies assisted in this work. The group considered in detail each of the 14 questions and a final report concerning each one of the 14 questions was adopted. The material submitted by the United States on these questions was then transmitted by the Department of State to the International Bureau of the Telegraph Union, Berne, Switzerland, for distribution to the various nations which centralized the study of the questions.

The third meeting of the C. C. I. R. is to be held at Lisbon, Portugal, at a date to be determined later.

INTERNATIONAL RADIO CONFERENCE

An invitation has been issued by the Spanish Government for the fourth International Radio Conference to be held in Madrid, Spain, beginning September 3, 1932. The first three international radio conferences, each of which resulted in an international radio treaty, were held respectively in Berlin in 1906, in London in 1912, and in Washington in 1927.

The fourth International Radio Conference will be undoubtedly the most important radio conference yet held, and its results will be reflected in the national radio legislation of the United States as well as other nations of the world. Among the important questions to be considered at the Madrid conference is the possible unification of the Radio and Telegraph Conventions into a joint communication convention, which would be supplemented by general regulations affecting the radio, the telegraph, and the telephone services. Other problems of a highly controversial nature include the reallocation of radio frequencies to services, including the strongly expressed desire for more broadcasting channels in Europe.

The Federal Radio Commission was requested by the Department of State to assume the leadership in the study of the proposals on technical matters for the Madrid conference. A number of conferences were held during the year to consider the proposals of the other nations of the world, and to go over again the proposals of the United States for this conference, which were submitted to the Berne Bureau in August, 1931.

In general, it was found that the position of the United States had remained substantially unchanged since the formal proposals were sent to the Berne Bureau, and consequently no additional technical proposals were submitted prior to the conference by the United States.

NORTH AMERICAN BROADCASTING

A new arrangement for the use of broadcasting frequencies as between the United States and Canada was signed May 5, 1932.[1] This arrangement definitely sets forth the frequencies to be used by Canada for broadcast service to that country and replaces an informal agreement made with Canada several years previous.

INTERDEPARTMENTAL

Through representation on the Interdepartment Radio Advisory Committee, representatives of the Federal Radio Commission have participated in the drafting of a new Executive order for the allocation of radio frequencies to Government stations. In accordance with the action taken by the Federal Radio Commission in the reallocation of commercial communication frequencies on a 0.1 per cent frequency separation basis rather than on a 0.2 per cent frequency separation basis, a large number of Government frequencies were also reallocated to agree with the new plan. This reallocation to Government stations became effective with the issuance of Executive Order No. 5855 on June 6, 1932.

GENERAL

Applications.—This work requires extensive study and often presents very difficult technical questions. Each application must be carefully reviewed and a written report made as a matter of advice and record for future action by the commission.

Hearings.—Many cases are designated for hearing and the engineers must assist in these hearings. They not only assist in the preparation of the cases but also appear as expert witnesses. In cases that are appealed to the courts, the engineering division must assist in the formulation of the technical basis for the argument and briefs.

Research.—Owing to the rapid development of the radio art, new demands and new services are constantly being pressed in growing numbers. Each requires extended research into the need of the service, its requirements, and the availability of facilities which

[1] "Arrangement between the United States of America and the Dominion of Canada, Effected by Exchange of Notes Signed May 5, 1932," publication of the Department of State, Executive Agreement Series No. 34, Publication No. 328, obtainable from the Government Printing Office, Washington, D. C.

might be used. Each presents a different problem and perhaps the exploration of an unknown field where the research may continue over long periods.

A typical example is aviation communication. Within three years it has grown from nothing to a communication network which covers the United States and which gives a high factor of safety of life and property for aircraft in flight. Special conditions of transmission and reception had to be studied, new requirements for operators devised, and each extension of the system required individual study.

A similar development is ship-to-shore and ship-to-ship telephony, which was nonexistent three years ago.

Engineers of the broadcast section are continuously engaged in a study of technical developments and research problems in connection with the allocation of facilities and possible shifts of frequency and hours of operation of broadcast stations, together with design of equipment, antenna structures, efficiency of propagation, frequency stability, etc. The broadcast section maintains the official quota register concerning the allocation of broadcast facilities and maintains statistical records such as frequency maps, questionnaires, and maintains a service for the correction of maps and lists pertinent to broadcasting, for commissioners and other divisions and offices of the commission.

Statistical records.—These consist of radio spectrum charts showing each frequency, service charts and maps, frequency charts, lists, etc. These show the technical information which is required in connection with the study and reports made on applications for commission action, and cases which are designated for hearing. Separate records are maintained under the following subjects: Technical standards of allocation, service allocation of frequencies, complex antenna structures, frequency stabilizing equipment, location of stations according to services together with technical details regarding power, and time when stations may be operated. These all must be maintained up to date. All information necessary for the registration of United States frequencies at the International Bureau of the Telegraph Union, Berne, Switzerland, is checked by these records.

Miscellaneous.—In addition to the foregoing the personnel of the engineering division devotes a considerable portion of its time to th following important matters: (1) Collaboration in the preparation of Rules and Regulations of the Federal Radio Commission and the revision thereof; (2) collaboration in the preparation of the Annual Report of the Federal Radio Commission to Congress; (3) preparation of special engineering reports as required by Congress and the commission from time to time; (4) supervisory duties in connection with the registration of radio station facilities in the International Bureau of the Telegraph Union, Berne, Switzerland; (5) special investigations which usually necessitate travel by the engineers; and (6) engineering advisory duties at commission meetings.

REPORT OF THE CHIEF EXAMINER

ELLIS A. YOST

The commission's staff of four examiners, remaining intact during the fiscal year 1932, conducted hearings involving 239 applications and orders as compared with 317 during the preceding year. The decrease in the number of cases, however, did not result in a smaller amount of work, in view of the fact that the issues presented became increasingly complex and difficult, involving as they did orders revoking existing licenses as well as applications for new construction and additional facilities. Precedents established by decisions of the courts and the commission eliminated from the hearings many applications which would otherwise have been heard.

The following table discloses the volume of work handled by the division:

Cases heard but not reported, as of July 1, 1931	57
Cases heard during fiscal year	239
	296
Cases reported during fiscal year	260
Cases heard and unreported, as of June 30, 1932	36

Recommendations of the examiners were followed by the commission in approximately 86 per cent of the cases.

○

SEVENTH ANNUAL REPORT

of the

FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

For the Fiscal Year 1933

▼

COMMISSIONERS

EUGENE O. SYKES, *Chairman*
THAD H. BROWN, *Vice Chairman*
JAMES H. HANLEY HAROLD A. LAFOUNT
WILLIAM D. L. STARBUCK

HERBERT L. PETTEY, *Secretary*



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

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SEVENTH ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION

FEDERAL RADIO COMMISSION,
Washington, D.C., January 3, 1934.

To the Senate and House of Representatives of the United States of America in Congress assembled:

Herewith is submitted the Seventh Annual Report of the Federal Radio Commission covering the fiscal year ended June 30, 1933.

PERSONNEL

On February 23, 1933, the term of Commissioner Eugene O. Sykes expired. He was reappointed on March 20, 1933. On April 1, 1933, James H. Hanley was appointed as a commissioner to succeed C. McK. Saltzman, resigned.

The personnel of the Commission is now as follows:

	Commissioner	*Term expires*
First zone	W. D. L. Starbuck	Feb. 23, 1934
Second zone	Thad H. Brown	Feb. 23, 1938
Third zone	Eugene O. Sykes	Feb. 23, 1939
Fourth zone	James H. Hanley	Feb. 23, 1936
Fifth zone	Harold A. Lafount	Feb. 23, 1935

and at the close of the fiscal year the staff included 237 employees, all of whom have a civil-service status except the secretary, the attorneys of the legal and examiners division.

ORGANIZATION

Pursuant to the provisions of Public Law No. 212, Seventy-second Congress, approved June 30, 1932, and Executive Order 5892 issued July 20, 1932, the Radio Division of the Department of Commerce was transferred to the Federal Radio Commission. There was created a Division of Field Operations charged with the following duties: To inspect all transmitting apparatus to ascertain whether in construction and operation it conforms to the requirements of the Radio Act of 1927 as amended; the rules and regulations of the licensing authority, and the license under which it is constructed or operated; to make measurements of frequencies and to make field intensity measurements when required; to maintain records incident to the monitoring of radio stations; to conduct examinations for applicants for operators' licenses; to investigate and report to the Commission facts concerning alleged violations by station operators of such laws, treaties, and regulations as might result in the suspension of their licenses; to report to the Commission from time to time any violations of the Radio Act of 1927, the rules and regulations

or orders of the Commission or of the terms and conditions of any license; and to perform such other duties as may hereinafter be assigned. The continental United States was divided into 20 radio districts and certain personnel transfers were effected in order that the work in each office might be properly handled. There was also created an accounts and audit section to handle all matters pertaining to the settlement of international accounts except disbursements, audit travel and expense vouchers, and to perform all necessary accounting work.

VOLUME OF WORK

There has been a steady increase in the volume of business conducted by the Commission. During the fiscal year there were more than 41,000 formal matters requiring Commission action. The Commission held 111 formal meetings and sat en banc to hear the proceedings on 118 applications. In addition to this the Commission is called upon to prepare for international radio conferences. Four of the Commission's staff participated in the International Radio Conference in Madrid and preparations were started in connection with the North and Central American Regional Conference to be held in Mexico City.

E. O. SYKES, *Chairman.*

REPORT OF THE SECRETARY

HERBERT L. PETTEY

For the fiscal year ending June 30, 1933, there was appropriated $872,000. This sum is accounted for as follows:

SALARIES AND EXPENSES

01	Personal services	$724,300
02	Supplies and materials	12,000
0236	Gasoline and oil	611
04	Storage and care of vehicles	2,578
05	Communication service	7,706
06	Travel expenses	15,600
0610	Car fare	1,953
07	Transportation of things	940
082	Stenographic reporting	15,752
10	Heat, light, power, and water	3,182
11	Rents	17,683
12	Repairs and alterations	709
13	Special and miscellaneous	453
30	Equipment	12,259
	Unobligated balance	40,274
	Total	856,000

PRINTING AND BINDING

02	Printed forms and letterheads	$1,350
08	Printing and binding	7,496
	Balance	7,154
	Total	16,000

Detailed information on the work of the office of the secretary is given in all of the following reports made by chiefs of divisions.

LICENSE DIVISION

WM. P. MASSING, *Chief of Division*

Although several changes in personnel of the License Division occurred during the past fiscal year, the basic organization remained the same. This division is charged with the receipt of all applications for radio facilities, the administrative examination thereof, the maintenance of records showing the Commission's action thereon, and the issuance of authorizations in conformity therewith.

There follows a detailed report arranged according to service, showing the number of new stations authorized, the number of stations deleted, and the total number of authorized radio stations as of June 30, 1933.

Nature of service and class of station	New stations authorized	Stations deleted	Total number of stations June 30, 1933
Agriculture: Point-to-point telegraph	0	0	9
Amateur: Amateur	14,796	4,720	41,555
Aviation:			
Aeronautical			139
Aeronautical point-to-point	21	32	51
Airport			20
Aircraft	158	80	436
Broadcast: Broadcast	15	22	599
Emergency:			
Police, municipal	39	6	111
Police, State	1	3	12
Marine fire	0	3	3
Special emergency	4	2	26
Experimental:			
General experimental	169	82	208
Special experimental			47
Experimental relay broadcasting	0	0	12
Experimental visual broadcasting	5	10	26
Fixed public:			
Point-to-point telegraph	40	40	347
Point-to-point telephone			79
Fixed public press: Point-to-point telegraph	70	10	100
Geophysical: Geophysical	8	17	107
Marine relay: Marine relay	3	4	42
Mobile press: Mobile press	0	0	3
Public coastal:			
Coastal telegraph	6	14	112
Coastal telephone			2
Coastal harbor			32
Private coastal:			
Coastal telegraph	0	0	6
Coastal harbor	0	0	1
Ships: Ships	84	98	1,997
Temporary:			
Broadcast pick-up	17	8	30
Forestry	0	2	0
Motion picture	1	5	2
Total	15,437	5,158	46,114

AMATEUR SECTION

The work of the amateur section was materially increased during the past fiscal year as a result of the consolidation of the Radio Division with the Radio Commission and the subsequent reorganization of the field force.

In addition to an increase of more than 36 percent in the total number of licensed amateur stations, new duties were added which necessitated many changes in the routine of amateur licensing.

New duties assumed included (1) control and assignment of amateur-station call letters, (2) maintenance of a complete record of all licensed amateur operators, which number exceeded 30,000 on June 30, 1933, and (3) the complete review of amateur applications including substantial related correspondence.

There were received in the section during the past year 35,250 applications and 27,966 licenses were granted. Of the licenses granted, 14,796 were for new stations, 8,999 renewals of existing licenses, and 4,171 for modifications of licenses. Many of the applications were returned to the applicants as defective or retired to the files as unnecessary.

In order to solve a major problem of administration concerning the handling of applications for station licenses, the Commission on January 6, 1933, adopted a normal term of 3 years for amateur station

licenses and extended all outstanding valid licenses to give them a 3-year term. For purposes of effecting further economies and simplification, the Commission on June 23, 1933, adopted numerous other changes in the regulations governing amateur radio, to take effect for the most part on the following October 1. As the year closed, plans were being formulated to administer these changes in the most efficient manner.

BROADCAST SECTION

TABLE I.—*Comparison of applications received and authorizations issued during the fiscal years 1931, 1932, and 1933*

	1931	1932	1933
Applications received	3,784	2,519	2,193
Authorizations issued	3,233	2,534	2,446

Applications received and instruments of authority issued comprised construction permits, licenses, modifications of construction permits and licenses, consent to voluntary or involuntary assignments of construction permits and licenses, extension of licenses, installation of automatic frequency-control equipment, special authorizations, and emergency authorizations.

In addition to the applications shown in table I there were received in the section 1,422 informal applications, which consisted of requests (1) for extension of equipment and program test periods, (2) extension of time in which to install an approved frequency monitor, (3) to operate for a limited period of time in a manner not set forth in a regular license or authorized by regulations, (4) to depart from hours of operation as authorized, and (5) to partially or wholly suspend operation of a station because of the economic condition of the past year, or other reasons. There were also issued 903 informal authorizations consisting of letters, telegrams, and deviations from time-sharing agreements.

TABLE II.—*Comparison of the number of radio broadcast stations authorized, consolidated, and deleted during the fiscal years 1931, 1932, and 1933*

	1931	1932	1933
New stations authorized	11	8	15
Stations consolidated	7	2	3
Stations deleted	13	12	19
Total authorized stations as of June 30	612	606	[1] 599

[1] Includes 1 station which has not held valid license since May 18, 1933, but has not been officially deleted because of pending litigation.

Three complete lists of radio-broadcast stations authorized by the Federal Radio Commission, arranged (1) alphabetically by call signal, (2) alphabetically by State and city, and (3) numerically by frequency, were compiled and prepared for distribution in mimeograph form. Monthly supplements to these lists have been prepared for distribution to the general public.

COMMERCIAL SECTION

This section functioned in much the same manner as during the past fiscal year; however, the following duties were added:

(1) The records formerly maintained solely with respect to commercially owned stations were extended to include all stations owned and operated by the United States Government.

(2) The preparation of the Radio Service Bulletin for publication. This bulletin is issued in mimeographed form, semimonthly, and contains in tabular form a complete record of all new assignments, changes, and deletions for all classes of commercial and governmental radio stations in the United States, its Territories, and possessions.

(3) The assignment of call letters to all commercial and governmental radio stations in the United States, its Territories, and possessions.

(4) The maintenance of records pertaining to commercial operators' licenses.

A comparison of the applications received and the authorizations issued in this section for the fiscal years 1931 to 1933, inclusive, is shown in the table below:

TABLE I.—*Comparison of applications received and authorizations issued during the fiscal years 1931, 1932, and 1933*

	1931	1932	1933
Applications received	6,246	5,515	[1] 5,868
Authorizations issued	5,395	6,053	6,617

[1] 82 applications covered 1,051 stations.

Applications and authorizations shown in the above table comprised construction permits, modification of construction permits, licenses, modification of licenses, renewal of licenses, and assignment of construction permits and licenses. In addition to the regular authorizations, this section issued 446 special authorizations covering requests, for varying periods of time, to operate in a manner other than authorized by existing license.

There were also received in the section approximately 8,420 applications for operators' licenses involving commercial first-class, radiotelephone first-class, radiotelephone second-class, radiotelephone third-class, radiotelegraph first-class, radiotelegraph second-class, and radiotelegraph third-class licenses.

As a result of the agreement reached at the International Conference held in Madrid, Spain, in 1932, the lists of radio stations submitted to the International Bureau of the Telegraph Union, Berne, Switzerland, for notification on behalf of the United States Government, have been further subdivided to include two new classifications, namely, aeronautical and coastal stations. In addition to the above, a report was submitted relative to ship and aircraft stations indicating the transmission power of each station. There was also prepared a list showing in detail special Government stations including direction finding, radiobeacon, notices to navigators, meteorological bulletins, and others.

REPORT OF THE ACTING GENERAL COUNSEL

GEORGE B. PORTER

I. ADMINISTRATIVE SECTION

1. APPLICATIONS

This section, which is responsible for the legal review of and recommendation upon all applications presented to the Commission, considered a total of 6,672 applications during the year, compared with 6,252 the preceding year. These cases included not only the more regular radiotelegraph and broadcasting services but an ever-increasing number of services to which radio is being applied. Emergencies have often compelled immediate consideration of an application. In the past year 393 applications of the total which were handled required the preparation of bills of particulars setting forth the issues to be tried at a formal hearing.

The applications handled by this section included 582 for construction permits for new radio stations and to change equipment of existing ones; 283 modification of construction permits; 1,092 licenses and modifications of licenses; and 3,284 renewals of licenses. There were also 1,431 applications of a formal and informal character covering such services as the following: Assignments of licenses, aeronautical, aircraft, coastal, experimental, geophysical, marine relay, point-to-point, police, relay, visual, as well as others.

2. COMPLAINTS AND INVESTIGATIONS

During the year various types of complaints concerning the services of licensed stations and their activities have been examined and proper disposition made or recommendations submitted thereon. Wherever the character of the complaint would permit, the matter was settled by correspondence or through the field force of the Commission. On the other hand, many complaints required a formal examination in hearing. The number of more serious complaints investigated amounted to 67, of which 11 were under consideration at the end of the year.

This section had charge of the preparation of new forms, revision of existing applications, and authorizations issued by the Commission.

3. CRIMINAL LITIGATION

The past year has shown an increase in the illegal operation of radio stations, particularly broadcasting stations. This has been occasioned, in part, by misinterpretation of section 1 of the Radio Act of 1927 which defines interstate commerce in radio transmission.

During the past few months violations have increased in the southwest section of the United States, particularly in the State of Texas where the State borders are far removed. This illegal operation is based on the claim that the radio transmission is not interstate or

does not interfere within the State with an interstate signal. Such claim is not borne out by facts obtained by investigation or by opinion of experts. In all cases reported to the Commission an investigation is made by a member of its field force and evidence secured for prosecution.

In many instances the owners and operators, after being confronted with evidence of their interstate transmission, have voluntarily ceased operation and dismantled their stations. However, there have been some who continued to operate in defiance of the law.

It is believed that the institution of prosecution against a number of violators and their successful termination will have the effect of deterring others who aspire to operate radio stations in violation of the Radio Act of 1927. Several such cases are now pending trial.

A member of the Commission's legal staff is assigned to assist the United States attorneys in the prosecution of cases.

Aside from several convictions had in the past year, a list of which appears in this report, there are now outstanding indictments against approximately 25 offenders, and investigations are being conducted of the illegal operation of over 50 others. Many of these investigations are now completed and prosecution will be started in the near future.

During the past year 95 violators of various sections of the Radio Act have been reported to the Commission from all sections of the United States. The Commission has stressed the importance of this work in order that regularly licensed stations may be fully protected at all times from unlawful interference.

Eleven criminal cases were terminated during the year, 10 of which were convictions or pleas of guilty.

At the end of the year 10 criminal cases were pending in various Federal district courts.

II. HEARING SECTION

This section has charge of all hearings set by the Commission and is charged with the duty of bringing cases to trial, and preparing and presenting Commission evidence, seeing that an orderly procedure is had, and that all facts pertaining to any case are properly presented to the Commission for its determination.

During the year a greater number of cases were heard than during the preceding year. The Commission has participated in a greater number of cases than at any time since the inauguration of the examiner system. The report of the chief examiner indicates the number of hearings held.

III. RESEARCH AND DRAFTING SECTION

During the period covered by this report this section of the Legal Division has continued to assume primary responsibility for furnishing the Commission with memoranda and opinions upon legal questions requiring research or involving an interpretation of laws and treaties; making a legal examination of the minutes and official records of the Commission; drafting proposed rules and regulations; examining and studying proposed legislation relating to the Commission and/or its functions.

In addition to the foregoing, this section prepared for the Commission's consideration statements of facts, grounds for decisions, and orders in 197 cases heard by the examiners of the Commission and the Commission. It has also had active charge of the conduct of all litigated cases, other than criminal, in which the Commission was interested as a party, compiling records, preparing pleadings and briefs, and actual presentation of the cases before the various courts.

On July 1, 1932, there were 21 cases pending in the Court of Appeals of the District of Columbia and 1 in the Supreme Court of the District of Columbia. All were disposed of during the current year as follows: Of those pending in the Court of Appeals of the District of Columbia, 11 were dismissed at the request of the appellants and 10 were decided by that Court. The case in the Supreme Court of the District of Columbia was dismissed upon motion of the Commission. Of the 10 decided cases in the Court of Appeals of the District of Columbia, 9 affirmed the Commission's decisions, and 1 was remanded to the Commission for further proceedings.

During the current fiscal year, in 3 of the cases decided by the Court of Appeals of the District of Columbia petitions for certiorari were filed in the Supreme Court of the United States, 2 of which were granted [1] and 1 of which was denied.[2] Twenty new cases were filed in the Court of Appeals of the District of Columbia, of which 7 are still pending, 6 were dismissed by the appellants, 3 were dismissed by the Court on application of the Commission, and 4 were decided by that court. Of these, 3 affirmed the decisions of the Commission appealed from and 1 was remanded for further proceedings.

The 14 cases decided by the Court of Appeals of the District of Columbia during the fiscal year and the 2 decided by the Supreme Court of the United States present, for the most part, matters of such importance as to warrant special consideration.

In the Court of Appeals of the District of Columbia

The Nelson Brothers Bond & Mortgage Company and the North Shore Church cases

(62 F. (2d) 854)

These appeals were taken from a decision of the Commission granting the application of the Johnson-Kennedy Radio Corporation (Station WJKS) of Gary, Ind., for the use of 560 kilocycles then assigned to and shared by Nelson Brothers Bond & Mortgage Co. (Station WIBO) and the North Shore Church (Station WPCC), both of Chicago, Ill. All of the stations involved were in the fourth zone, which was over quota. The Commission found that the granting of the application of Station WJKS at Gary, Ind., and the deletion of Stations WIBO and WPCC at Chicago, Ill., would work a more equitable distribution of broadcasting facilities within the fourth zone, by increasing the service of an area in need of additional service and decreasing the service of an area where it had more than was needed, in accordance with the act of March 28, 1928, known as the "Davis Amendment" (45 Stat. 373).

The Court of Appeals, by a 3 to 2 decision, reversed the Commission. It stated the question to be whether the decision of the Com-

[1] Nelson Brothers Bond & Mortgage Co. and North Shore Church cases, p. 15.
[2] *Radio Investment Co.* v. *Federal Radio Commission*, p. 10.

mission assigning to the applicant station (WJKS) the frequency assigned to Stations WIBO and WPCC since 1928, and the subsequent forfeiture of those facilities and deletion of said stations, is a reasonable exercise of the regulatory power of the Commission or an arbitrary or capricious exercise of that power. It held that quota is no reason for deleting stations operating in the public interest; that the business of radio broadcasting, being a species of interstate commerce, is subject to reasonable regulation of Congress; that it would not be consistent with legislative policy to equalize broadcasting facilities of States or zones by unnecessarily injuring established stations rendering valuable service to their natural service areas; that stations not seeking a hearing cannot complain that the decision of the Commission was rendered without notice to them.

The dissent by Mr. Justice Groner, which was concurred in by Mr. Justice Hitz, states the question to be whether the Commission has the right and power in the public interest to refuse to renew the license of a station in an over-quota State and transfer its facilities to an applicant station in an under-quota State. In the opinion of the dissent, it has such a right.

Petitions for writs of certiorari to the Supreme Court of the United States were made by the Commission, which were granted. The opinion of the Supreme Court of the United States will be reviewed in detail under the appropriate heading in this report. (See p. 15.)

RADIO INVESTMENT CASE

(62 F. (2d) 381)

Station WHOM, owned and operated by the New Jersey Broadcasting Corporation, and sharing time with Stations WBMS, WNJ, and WKBO, filed an application for modification of license requesting full time. This application, together with the renewal application of the stations with which it shared time, were set for hearing simultaneously. The Commission granted the application of the New Jersey Broadcasting Corporation (WHOM) in accordance with the recommendation of the examiner. This appeal followed. Th Court held that the decision of the Commission was supported by substantial evidence, was not arbitrary or capricious, and affirmed its decision.

A petition for a writ of certiorari to the Supreme Court of the United States was filed by the appellant and denied by that Court.

THE BEEBE CASE

(61 F. (2d) 914)

This is an appeal from a decision of the Commission denying the application of Joseph LeRoy Beebe (WMBA) for renewal of license. The application was designated for hearing upon charges of faulty and inadequate equipment, operation of station by an unlicensed operator, frequency deviation, and programs not in the public interest.

One contention of the applicant in the Court of Appeals was that the Commission erred in admitting evidence in violation of its established rules and regulations in that it accepted in evidence an unsworn letter attached to a supervisor's report made in the course of his official duties. The court held that the Commission is an administrative

body and is not bound by strict jury-trial rules of evidence which are applicable to court proceedings but that such bodies may, under reasonable rules and regulations, depart from such rules.

The court further affirmed its previous decisions to the effect that on application for renewal of license the applicant has the burden to establish that the renewal would be in the public interest.

At the hearing the applicant offered evidence intended to show that he had on file an application for construction permit to install new equipment. This was refused by the Commission, for which appellant claimed error. The court held that on a hearing to determine whether a license for use of old equipment in a broadcasting station should be renewed, evidence of the applicant's intention to procure a new transmitter in the form of an application for construction permit filed by him was not material. The decision of the Commission was affirmed.

TRINITY METHODIST CHURCH CASE

(62 F. (2d) 850)

This was an appeal from a denial of an application by the Trinity Methodist Church, South (KGEF), for renewal of license.

The application was designated for hearing because the Commission could not determine that the granting thereof was in the public interest; that the programs broadcast by its principal speaker were sensational rather than instructive and in two instances he had been convicted of attempting over the radio to obstruct orderly administration of public justice.

On appeal it was contended by appellant that the Commission's decision was unconstitutional in that it violated the guaranty of free speech and also that it deprived appellant of its property without due process of law contrary to the fifth amendment of the Constitution. It further insisted that the decision violated the Radio Act of 1927 because not supported by substantial evidence. It, therefore, was arbitrary and capricious.

The Court of Appeals of the District of Columbia affirmed the Commission's decision and held that, "'Every free man has an undoubted right to lay what sentiments he pleases before the public; to forbid this is to destroy the freedom of the press; but if he publishes what is improper, mischievous, or illegal, he must take the consequences of his own temerity.' But this does not mean that the Government, through agencies established by Congress, may not refuse a renewal license to one who has abused it to broadcast defamatory and untrue matter. In that case there is not a denial of the freedom of speech but merely the application of the regulatory power of Congress in a field within the scope of its legislative authority. See *KFKB Broadcasting Association* v. *F.R.C.*, 60 Appeals D.C. 79, 47 F. (2d) 670." It further held that the power of Congress to regulate commerce may be exercised without limitation other than prescribed in the Constitution and that the denial of an application for renewal of radio broadcasting station license as not in the public interest is not the "taking of property" without due process of law.

A petition for writ of certiorari to the Supreme Court of the United States was denied.

THE UNITY SCHOOL OF CHRISTIANITY CASE

(64 F. (2d) 550)

This is an appeal from a decision of the Federal Radio Commission granting the application of Radio Station KFH Co., of Wichita, Kans., for modification of its license and terminating the existing license of the Unity School of Christianity (WOQ), Kansas City, Mo., which had been dividing time with KFH.

The application was heard before an examiner appointed by the Commission, who made his report recommending a denial thereof. Radio Station KFH Co. filed exceptions to this report and requested oral argument. No reply to the exceptions filed by KFH was filed by WOQ nor did it request oral argument. The Commission reversed the examiner and denied the application of KFH for oral argument. Its denial of the application was based on the following findings: (1) That the applicant, Radio Station KFH Co., delivers a meritorious broadcast service; (2) that the present service of this station would be materially improved through the use of full time; (3) that the residents of Wichita and vicinity have far less dependable broadcast service than the residents of Kansas City, Mo., and vicinity; (4) that the granting of the application for unlimited time of operation for Radio Station KFH and the consequent forfeiture of the broadcast service now allocated for the operation of WOQ would bring a more equitable distribution of broadcast facilities within the fourth zone as provided for in the Radio Act of 1927, as amended March 28, 1928; and (5) that public interest, convenience, and necessity would be served by the granting of the application of Radio Station KFH for unlimited hours of operation.

The Court of Appeals reversed the Commission and remanded the case to it with instructions to give Station WOQ an opportunity to file a reply to the exceptions filed by KFH Co. and also to hear oral argument on the ground that such proceeding was necessary to due process.

THE BOSTON BROADCASTING COMPANY CASE

(Decided June 19, 1933; not yet reported)

This appeal arose from a denial of an application of the Boston Broadcasting Co. (WLOE) for renewal of license. The Commission's denial was based upon five findings, viz, (1) lack of showing of financial resources to insure proper operation of the station; (2) that applicant was not in fact the owner of the station as set forth in its sworn application; (3) failure of applicant to use its transmitting equipment so as to insure maximum use of facilities theretofore granted; (4) no showing of need for service in the Boston area; and (5) public interest, convenience, and necessity would not be served by the granting thereof.

The court reviewed the evidence, determined that it substantially supported the Commission's findings, and, therefore, affirmed its decision.

In support of the fourth finding that there was not a sufficient showing for need of service of WLOE in the Boston area, the Commission referred to a list of existing facilities in that area which is made a part of every record under paragraph 64 of the Rules and Regulations of the Commission. Appellant objected to this evidence and contended that it was no support for said fourth finding. The court held, however, that the Commission had a right to consider the list under rule 64.

The Boston Broadcasting Co. has requested a stay of mandate pending the filing of a petition for certiorari in the Supreme Court of the United States.

THE GOSS CASE

(Decided June 19, 1933; not yet reported)

This is an appeal from a denial of the Federal Radio Commission of the application of Fred H. Goss for construction permit to erect a new station at Boston, Mass. The Commission's denial was based in part upon the grounds that Boston and vicinity already received good broadcast service from a number of existing stations located in and near that city and that there was no showing of any substantial need for additional service, that the granting of the Goss application would result in objectional interference in case of simultaneous operation of the proposed new station and existing stations already operating upon the requested frequency, and that no sufficient showing was made that the appellant possessed the financial ability to insure proper construction and operation of the proposed station.

The Commission moved to dismiss the appeal on the ground that no appeal from the denial of an application for construction permit was authorized under section 16 of the Radio Act of 1927, as amended.

The court denied the motion to dismiss and held that although denominated an application for "construction permit", it was in substance and effect an application for "station license" and, therefore, appealable under the act.

However, the court affirmed the Commission's decision on the ground that its findings were supported by substantial evidence and that the burden of proof was upon the appellant.

THE POTE CASE

(Decided June 19, 1933; not yet reported)

This appeal arose upon a denial of the Federal Radio Commission of an application for involuntary assignment of license of Station WLOE from the Boston Broadcasting Co., licensee, to William S. Pote.

The Commission moved to dismiss the appeal on the ground that no appeal will lie from the denial of an application for involuntary assignment of license under section 16 of the Radio Act of 1927, as amended July 1, 1930 (46 Stat. 844).

The court deferred action on the motion to dismiss until consideration of the case on the merits, at which time it sustained that motion.

Mr. Justice Groner dissented, stating that, in his opinion, an application for "assignment of license" is an application for "station license" and therefore appealable.

The appellant has asked for a stay of mandate pending the filing of a writ of certiorari in the Supreme Court of the United States.

THE CITY OF NEW YORK CASE

(64 F. (2d) 719)

This is an appeal from a decision of the Federal Radio Commission granting the application of the Knickerbocker Broadcasting Co. (WMCA) for renewal of license and the application of Eastern Broadcasters, Inc. (WPCH), for modification of license, so as to permit the

operation of stations WMCA and WPCH upon the frequency 570 kilocycles with 500 watts power, sharing time, and the granting of the application of the City of New York, Department of Plant and Structures (WNYC,) for renewal of license, so as to permit the operation of Station WNYC upon 810 kilocycles with 500 watts power and daytime hours, until sunset at Minneapolis.

Prior to the decision of the Commission, the City of New York had been operating upon 570 kilocycles with 500 watts power, sharing time with WMCA. The Commission's decision was based upon the following findings: That the service rendered by the applicant stations WMCA and WPCH is of high quality, well diversified, and of interest to the listening public. A large portion of the revenue obtained from the operation of these stations has been consistently expended for the general improvement of programs and equipment; that the Knickerbocker Broadcasting Co. and the Eastern Broadcasters, Inc., are financially well qualified to continue the operation of WMCA and WPCH and the large and well-organized operating staff which is maintained insures the efficient operation of both stations and the proper presentation of the programs broadcast; that the licensee corporations of WMCA and WPCH are controlled by the same interests, the two stations are operated under the same management and policies, and the operation of both stations upon the same frequency, allowing for all practical purposes the operation of one unlimited time station, will permit a more efficient use of existing broadcast facilities; that the transfer of the operating assignment formerly licensed to WPCH to WNYC will enable the latter station to operate 70 hours per week more than its present schedule allows and 22 hours per week more than the schedule proposed by the WNYC representatives, while permitting the licensee of WNYC to render any substantial service theretofore rendered or proposed to be rendered.

The court affirmed the Commission's decision, saying that the evidence amply sustained the Commission's findings.

THE WOODMEN OF THE WORLD, THE MONA MOTOR OIL COMPANY, AND OMAHA GRAIN EXCHANGE CASES

(65 F. (2d) 484)

The appeals were taken from a decision of the Federal Radio Commission granting the application of Red Oak Radio Corporation to move its station KICK from Red Oak to Carter Lake, Iowa.

A protest to the Commission's grant was filed by each of the appellants under paragraphs 45 and 46 of the Commission's revised rules and regulations, and in accordance therewith the grant was suspended and the application of Red Oak Radio Corporation designated for public hearing before an examiner, who made his report to the Commission, recommending that the original grant be affirmed.

From the evidence adduced at this hearing the Commission found that the removal of Station KICK to Carter Lake, Iowa, would enable the station to render service to a population many times larger than now receive service from that station and would not deprive the Red Oak area of good broadcast reception already being received from a number of stations located elsewhere. It also found that the unlimited time local service proposed by the Red Oak Co. was meritorious and designed to meet an existing need.

The Commission further found that the operation of KICK at Carter Lake would not so affect the interests and advertising revenues of any of appellant stations as to necessitate any curtailment of either quality or quantity of the service then rendered by them to the listening public.

The Commission denied the request of appellants for oral argument and this was objected to on appeal as error.

The court affirmed the Commission's decision holding that the report of the examiner of the Commission is analogous to that of auditor or special master, and has the same weight; that where there is substantial evidence to support findings of the Commission, they are conclusive upon the court. The court further held that the Commission's failure to grant oral argument where the appellants had a full hearing was not error.

The Telegraph Herald Case

(Decided June 26, 1933; not yet reported)

This was an appeal from an order of the Commission granting an application for the removal of Station WKBB from Joilet, Ill., to East Dubuque, Ill. The Telegraph Herald Co., a newspaper which was not a licensee nor an applicant for any instrument of authorization, filed a protest to the granting of this application. In accordance with paragraphs 45 and 46 of its Rules and Regulations, the Commission suspended the grant and designated the application for hearhearing upon the grounds stated in the protest. Thereafter the Commission found that the Telegraph Herald Co. had no interest sufficient to entitle it to maintain a protest, and that the affirmance of the original grant would serve public interest, convenience and necessity. Accordingly it affirmed its original grant.

On appeal to the Court of Appeals of the District of Columbia, the appellant contended that the Commission was estopped to deny its interest because it had heard its protest. The Commission moved to dismiss the appeal on the ground that appellant had no appealable interest within the meaning of section 16 of the Radio Act of 1927, as amended July 1, 1930 (46 Stat. 844). The court sustained the Commission's motion and affirmed its decision, holding that one who was not a licensee or an applicant for any instrument of authorization was not "in contemplation of the law * * * a corporation aggrieved or whose interests were adversely affected * * *."

B. In the Supreme Court of the United States

Commission v. *Nelson Bros. Bond & Mortgage Co.; Commission* v. *North Shore Church* (53 S.Ct. 627)

These cases arose upon the Federal Radio Commission's petitions for certiorari seeking a review of a 3-to-2 decision of the Court of Appeals of the District of Columbia, reversing its decision granting the application of Johnson-Kennedy Radio Corporation (WJKS) for increased facilities and deleting the facilities theretofore assigned to Nelson Bros. Bond & Mortgage Co. (WIBO) and the North Shore Church (WPCC). The facts and questions of law are fully stated under a review of these cases in the court below (see p. 9, this report) and need not be repeated here.

The Supreme Court reversed the Court of Appeals and sustaining the Commission's decision, held: (1) Whether the Commission exceeded its powers in a given case is a question appropriate for judicial decision and where the function to be exercised by the court is judicial, it may be exercised on authorized appeal from the decision of an administrative body; (2) that the requirement of fair and equitable allocation of licenses, wave lengths, time for operation and station power to each State within each zone, does not require equality between States with respect to every type of station, so that, where a radio station in an under-quota State asked for a change of frequency to one shared by 2 stations in an over-quota State, the fact that the State in which the petitioning station happened to be, had more regional station assignments than the other station, was not controlling; (3) that the Commission in making allocations of frequencies to States within a zone, has the power to license operation by a station in an under-quota State on a frequency theretofore assigned to a station in an over-quota State, provided it does not act arbitrarily; that in the exercise of its power to make fair and equitable allocation of licenses and wave lengths as provided by the Radio Act, the Commission may revoke temporary licenses issued to a radio station subject to action that might be taken on a hostile application; (4) that whereas the equities of existing radio stations should be considered by the Commission in the distribution of radio facilities, nevertheless, the weight of equities and all other pertinent facts, is for the Commission to decide; (5) that under the Radio Act of 1927 as amended, in passing on an application of a station in an under-quota State for a change of frequency to a frequency shared by 2 stations in an over-quota State, the Commission had a right to consider the reasonable advantages enjoyed by people of each State, services of respective stations, reasonable demands of under-quota States, and need of radio service in the city of the applicant, and that the Commission has the power to delete existing radio stations where necessary to fair and equitable allocation of licenses, wave lengths, time for operation and station power to each of the States within each zone; (6) that the fact that the Commission did not adopt recommendations of its examiner in a case is immaterial; (7) that parties who were heard by a Commission examiner but made no application for oral argument before the Commission cannot complain thereafter of such lack; and, (8) that General Order 102 is a rule of procedural convenience which does not derogate from the authority of the Commission.

The following cases, which were reported as pending in the Sixth Annual Report, were dismissed during the fiscal year as indicated:

IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

No. 5567. *National Broadcasting Company, Inc., and Radio Corporation of America (Station WJZ), appellants,* v. *Federal Radio Commission.*
No. 5568. *General Electric Company and National Broadcasting Company, Inc. (Station KGO), appellants,* v. *Federal Radio Commission.*
No. 5569. *The Tribune Company, appellant,* v. *Federal Radio Commission.*
No. 5570. *Stromberg-Carlson Telephone Mfg. Co. (Station WHAM), appellant,* v. *Federal Radio Commission.*
No. 5571. *WMAQ, Inc., and National Broadcasting Company* v. *Federal Radio Commission.*
No. 5647. *Clarence R. Cummins* v. *Federal Radio Commission.*

IN THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

No. 51325. *Stromberg-Carlson Telephone Mfg. Co.* v. *Federal Radio Commission.*

The following cases which were filed during the fiscal year were dismissed prior to July 1, 1933, as indicated:

No. 5743. *D. R. Wallace* v. *Federal Radio Commission.*
No. 5774. *Intermountain Broadcasting Co.* v. *Federal Radio Commission.*
No. 5821. *Waterloo Broadcasting Co.* v. *Federal Radio Commission.*
No. 5847. *Waterloo Broadcasting Co.* v. *Federal Radio Commission.*
No. 5881. *Erie Dispatch Broadcasting Corp.* v. *Federal Radio Commission.*
No. 5882. *Commonwealth of Pennsylvania* v. *Federal Radio Commission.*
No. 5897. *Hello World Broadcasting Corp.* v. *Federal Radio Commission.*
No. 5905. *Alfred Frank Kleindeinst* v. *Federal Radio Commission.*
No. 5912. *Mitchel Broadcasting Corp.* v. *Federal Radio Commission.*

Seven of the cases filed during the fiscal year were pending July 1, 1933, as indicated:

No. 5846. *WREC, Inc.* (*WREC*), v. *Federal Radio Commission.*
No. 5896. *WJJD, Inc.*, v. *Federal Radio Commission.*
No. 5897. *Hello World Broadcasting Corp.* (*KWEA*) v. *Federal Radio Commission.*
No. 5917. *WJJD, Inc.*, v. *Federal Radio Commission.*
No. 5939. *WGN, Inc.*, v. *Federal Radio Commission.*
No. 5947. *St. Louis Truth Center, Inc.* (*KFWF*), v. *Federal Radio Commission.*
No. 5989. *Laconia Radio Club, a corporation* (*WKAV*), v. *Federal Radio Commission.*

REPORT OF THE CHIEF ENGINEER

Dr. C. B. JOLLIFFE

BROADCAST SECTION

ALLOCATION OF BROADCAST FACILITIES

The basic plan of allocation of broadcast facilities has remained unchanged. Changes have been made in station assignments from time to time upon applications from licensees and as the result of hearings.

A comparison of the number of broadcast stations in operation for the fiscal years 1927 to 1933 is given in table I.

TABLE I

	1927	1928	1929	1930	1931	1932	1933
Total number of stations	681	677	606	618	612	604	598
Total simultaneous operations at night	565	514	409	416	420	397	376

TABLE II.—*Broadcast stations in operation June 30, 1933*

A. CLASSIFICATION OF STATIONS AND FREQUENCIES

	Clear	Regional	Local	Total
Stations operating—				
Unlimited time	[1] 34	138	119	291
Limited time [2]	19			19
Daytime [3]	18	20	10	48
Shared time [4]	16	81	42	139
Part time [5]		1	1	2
Specified hours [6]	6	33	60	99
Total stations operating	93	273	232	598
Total frequencies used	40	44	6	90

[1] 2 stations operating unlimited time by synchronization.
[2] Operate during daylight at dominant station and at night when dominant station is not in operation. (See rule 77, rules and regulations of Federal Radio Commission.)
[3] Operate from 6 a.m. to sunset. (See rule 78.)
[4] 2 to 4 stations in same geographical location operate on same frequency at different hours. (See rule 79.)
[5] Operate portion of time, remainder of time on same frequency not allocated in same geographical area. (See rule 80.)
[6] Operate according to exact hours specified in license. (See rule 81.)

B. QUOTA UNITS ASSIGNED STATIONS OF DIFFERENT CLASSES

	Clear		Regional		Local		Total	
	Day	Night	Day	Night	Day	Night	Day	Night
Unlimited time	77.25	77.25	65	57.2	14.5	11.9	156.75	146.35
Limited time	13.8	5.02					13.8	5.02
Daytime	7.35	.35	5.75		1		14.1	.35
Shared time	30	20	13.46	11.03	2.22	2.03	45.68	33.06
Part time			.25	.25	.1	.05	.35	.3
Specified hours	5.12	5	6.62	5.26	2.69	2.29	14.43	12.55
Total	133.52	107.62	91.08	73.74	20.51	16.27	245.11	197.63

TABLE III.—*Summary of quota units by zones* [1] *as of June 30, 1933*

	Units due	Units assigned	Net amount over or under quota	
			Units	Percent
Zone I	80	75.44	−4.56	−6
Zone II	80	73.65	−6.35	−8
Zone III	80	96.37	+16.37	+20
Zone IV	80	101.11	+21.11	+26
Zone V	80	96.17	+16.17	+20
Total	400	442.74	+42.74	+11

[1] For details of quota units by States current lists should be obtained from the Federal Radio Commission.

DEVELOPMENTS IN EMPIRICAL STANDARDS FOR BROADCAST ALLOCATION

In the Fifth Annual Report [1] there was set forth a discussion of the engineering standards used as a basis for the allocation of frequencies to broadcast stations. At that time it was predicted that the empirical standards would be added to and changed from time to time as the "constants" used as a basis change and as the broadcasting art progresses. Changes in these empirical standards have taken place during the past 2 years. The Engineering Division, therefore, has changed its bases which are used for making recommendations to the Commission and giving testimony at hearings before the Commission on applications concerning broadcast allocation in the frequency band from 550 to 1,500 kilocycles. These changes have been due to the advancement of the art and to greater familiarity with the phenomena of transmission and reception and the requirements of the average listener under present reception standards.[2]

Space in this report will not permit a complete discussion of the development and reasons for change of the empirical standards. The statements made are subject to proof, and it is expected that a complete paper will be published in the near future.

MODIFICATIONS IN EMPIRICAL STANDARDS PREVIOUSLY PUBLISHED

Revisions in the field intensities for which it is considered necessary to render good service are divided into three classes, depending upon the noise level of the area to be served.

TABLE IV

Area	Signal intensity for good service
Business city	10 to 25 millivolts per meter (mv/m).
Residential city	2 to 5 millivolts per meter (mv/m).
Rural	0.1 [1] to 5 millivolts per meter (mv/m).

[1] The signal of 0.1 mv/m is only satisfactory for good rural service under conditions of no selective fading and the signal is of the value or greater 90 percent of the time.

[1] Fifth Annual Report of the Federal Radio Commission 1931, p. 29, Government Printing Office, Washington, D.C. Price, 20 cents. Published also in Proceedings of the Institute of Radio Engineers, April 1932, p. 611.

[2] See "Propagation of waves 150 to 2,000 kilocycles per second (2,000 to 150 meters) at distances between 50 and 2,000 kilometers", Van der Pol, Eckersley, Dellinger, and Le Corbeiller. Proceedings of the Institute of Radio Engineers, July 1933, p. 996.

Study of propagation of radio waves (120 to 1,700 kilocycles made by a committee, J. H. Dellinger, chairman) in preparation for North and Central American Radio Conference, Mexico City, 1933 (not published).

Also Proceedings of the Institute of Radio Engineers, March 1930, p. 391.

The value of the field intensity necessary to render good service is determined by the noise level produced by atmospheric disturbance (static), and man-made electrical interference.[3]

Revisions in the field intensity bounding the good or protected area of broadcast stations are given in table V. The night values are the same as previously given.

TABLE V.—*Boundary of service area of stations of various classes*

Class of station	Power (night)	Boundary service	
		Day	Night
	Watts	*MV/M*	*MV/M*
Local	100	2	2
Regional	250–1,000	.5	1
High-power regional	5,000–10,000	.5	1
Dominant clear	5,000–50,000	.1	.5

Limited time and day stations on clear channels take the same protected areas and service areas as regional stations.

The entire interference spectrum on the same channel and adjacent channels and the ratio of the desired to the undesired signals for operation throughout the interference range is set out in figure 1, which gives graphically the whole story of interference between broadcast stations.

The ratio of the desired to undesired signal has been revised[4] on the basis of the interference spectrum, as follows:

TABLE VI

Type of operation	Ratio of desired to undesired signals
Synchronous operation	4 to 1.
Matched frequency operation (maximum deviation 5 cycles)	10 to 1.
50 cycles maximum deviation	20 to 1.
500 cycles maximum deviation	100 to 1.
1,000 cycles maximum deviation	200 to 1.
10 kilocycles difference in frequency	5 to 1 to 0.900 to 1.
20 kilocycles difference in frequency	1 to 1 to 0.200 to 1.
30 kilocycles difference in frequency	0.25 to 1 to 0.090 to 1.
40 kilocycles difference in frequency	0.085 to 1 to 0.033 to 1.

Above 40 kilocycles no protection with respect to interference is provided in the Commission's plan of allocation except that transmitters of broadcast stations must be so placed that the population of the so-called "blanket" area is held to a minimum and does not exceed specified percentages.[5]

In figure 1, the full black lines AEBC and DFBC represent the ratio of the average desired field intensity to the undesired field intensity for various types of operation and frequency separation. The exact ratio between AEB—BFD is determined by an allocation factor as explained below.

The dotted line DB in figure 1 gives the absolute ratio between the desired and undesired signal and should not be confused with the field intensity ratio necessary to prevent interference. If the average field intensity of an area is determined, this cannot be applied directly to the receiver characteristics for several reasons and must have an additional factor applied that has been termed

[3] "An Estimate of the Frequency Distribution of Atmospheric Noises", by R. K. Potter, Proceedings of the Institute of Radio Engineers, September 1932, p. 1512.
[4] Table VIII, Fifth Annual Report, Federal Radio Commission, p. 33.
[5] See Sixth Annual Report, Federal Radio Commission, p. 30.

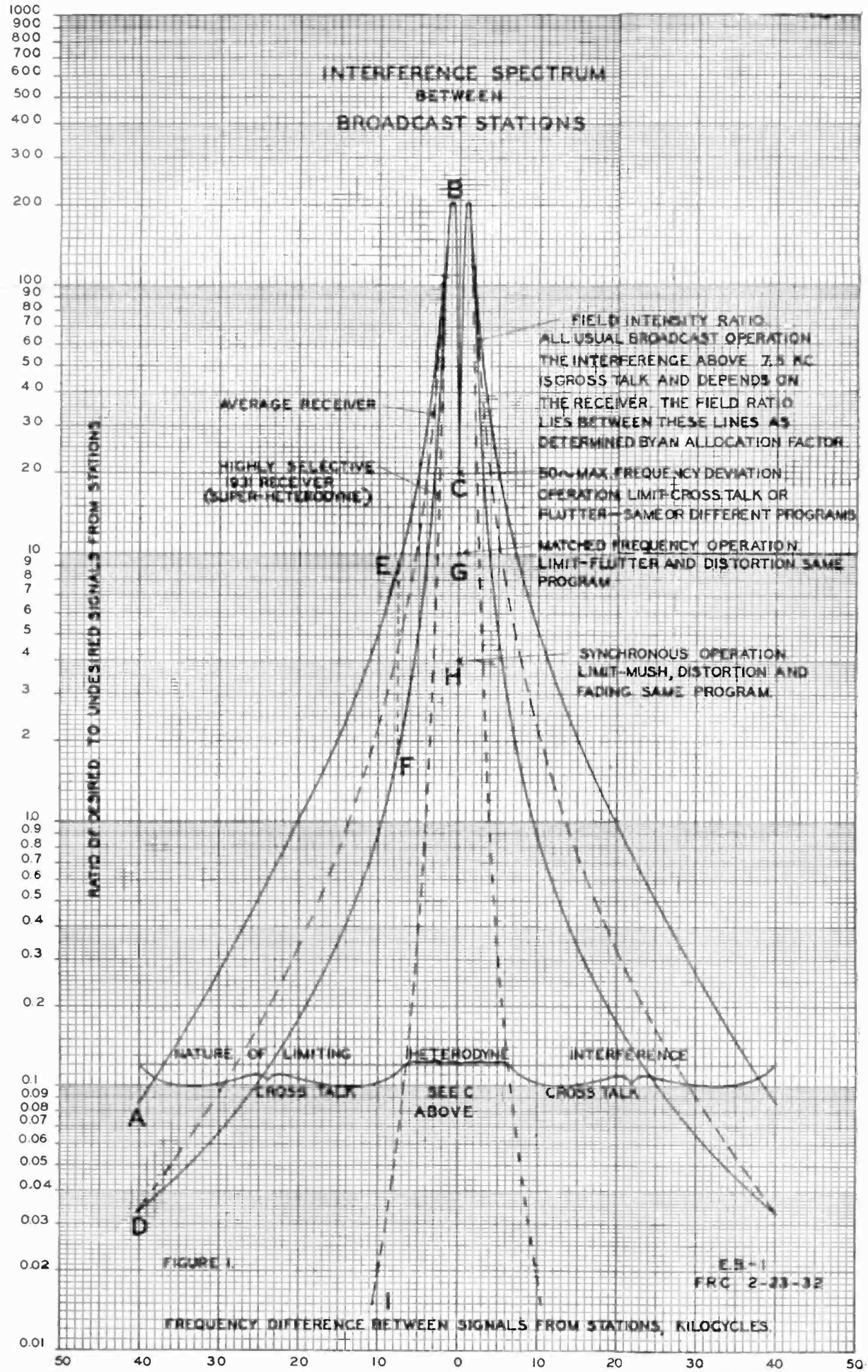


FIGURE 1.

17823—33. (Face p. 20)

"allocation factor for broadcast stations." The amount by which the selectivity characteristics of the receiver must be multiplied to get the ratio between the average field intensity from the desired and undesired station is set out in figure 2, which gives the multiplying factor versus the nuisance range of stations under consideration. The value and basis of this allocation factor are determined from a number of factors and are given in figure 2.

The field intensity versus distance curve was not changed by an appreciable amount from that given in the previous report [6] and is not reproduced here.

TABLE VII.—*Average night separation between broadcast stations recommended by engineering division, Federal Radio Commission, based on frequency maintenance of ± 50 cycles* [1], *analysis of July 1932*

Classification and power	Frequency differential in kilocycles	Local		Regional			High-power regional		Clear			
		50 w	100 w	250 w	500 w	1 kw	5 kw	10 kw	5 kw	10 kw	25 kw	50 kw
Local:	0	130	185									
	10	40	50	82	90	107	180	220	180	220	290	345
50 watts	20	15	18	41	49	57	85	100	130	147	175	197
	30	9	12	30	38	46	74	89	110	128	155	178
	40	8	11	28	36	44	72	87	105	123	150	173
	0	185	185									
	10	50	53	98	106	114	183	225	220	237	293	350
100 watts	20	18	21	46	54	62	90	105	138	156	183	206
	30	12	13	32	40	48	76	91	113	131	158	181
	40	11	11	28	36	44	72	87	106	124	151	174
Regional:	0			640	800	1,000						
	10	82	98	126	153	185	290	345	290	345	425	495
250 watts	20	41	46	55	65	78	110	145	155	172	200	225
	30	30	32	35	43	51	79	94	118	136	163	186
	40	28	28	29	37	45	73	88	108	126	153	176
	0			800	800	1,000						
	10	90	106	153	160	190	300	355	300	355	435	505
500 watts	20	49	54	65	74	85	127	150	170	188	215	235
	30	38	40	43	46	54	82	97	124	142	169	192
	40	36	36	37	39	47	75	90	110	128	155	178
	0			1,000	1,000	1,000						
	10	107	114	185	190	200	305	360	350	370	440	510
1 kilowatt	20	57	62	78	85	94	135	160	187	205	232	255
	30	46	48	51	54	58	86	100	132	150	177	200
	40	44	44	45	47	48	76	91	113	131	158	181
High-power regional:	0						1,600	2,000				
	10	180	183	290	300	305	335	390	480	500	530	550
5 kilowatts	20	85	90	110	127	135	163	187	250	268	295	320
	30	74	76	79	82	86	102	117	158	175	205	225
	40	72	72	73	75	76	83	98	125	143	170	193
	0						2,000	2,000				
	10	220	225	345	355	360	390	405	550	570	595	620
10 kilowatts	20	100	105	145	150	160	187	203	287	305	325	350
	30	89	91	94	97	100	117	128	175	192	220	243
	40	87	87	88	90	91	98	102	133	150	178	200
Clear:	0											
	10	180	220	290	300	350	480	550	480	550	645	730
5 kilowatts	20	130	138	155	170	187	250	287	250	287	350	400
	30	110	113	118	124	132	158	175	158	175	205	230
	40	105	106	108	110	113	125	133	125	143	170	193
	0											
	10	220	237	345	355	370	500	570	550	570	665	750
10 kilowatts	20	147	156	172	188	205	268	305	287	305	370	420
	30	128	131	136	142	150	175	192	175	192	220	247
	40	123	124	126	128	131	143	150	143	150	178	20
	0											
	10	290	293	425	435	440	530	595	645	665	695	780
25 kilowatts	20	175	183	200	215	232	295	325	350	370	395	450
	30	155	158	163	169	177	205	220	205	220	247	275
	40	150	151	153	155	158	170	178	170	178	192	215
	0											
	10	345	350	495	505	510	550	620	730	750	780	800
50 kilowatts	20	197	206	225	235	255	320	350	400	420	450	470
	30	178	181	186	192	200	225	243	230	247	275	297
	40	173	174	176	178	181	193	200	193	200	215	218

[1] These separations are calculated to minimize objectionable interference in the good service areas of stations about 90 percent of the time.

[6] Figure 2, p. 39, Fifth Annual Report, Federal Radio Commission.

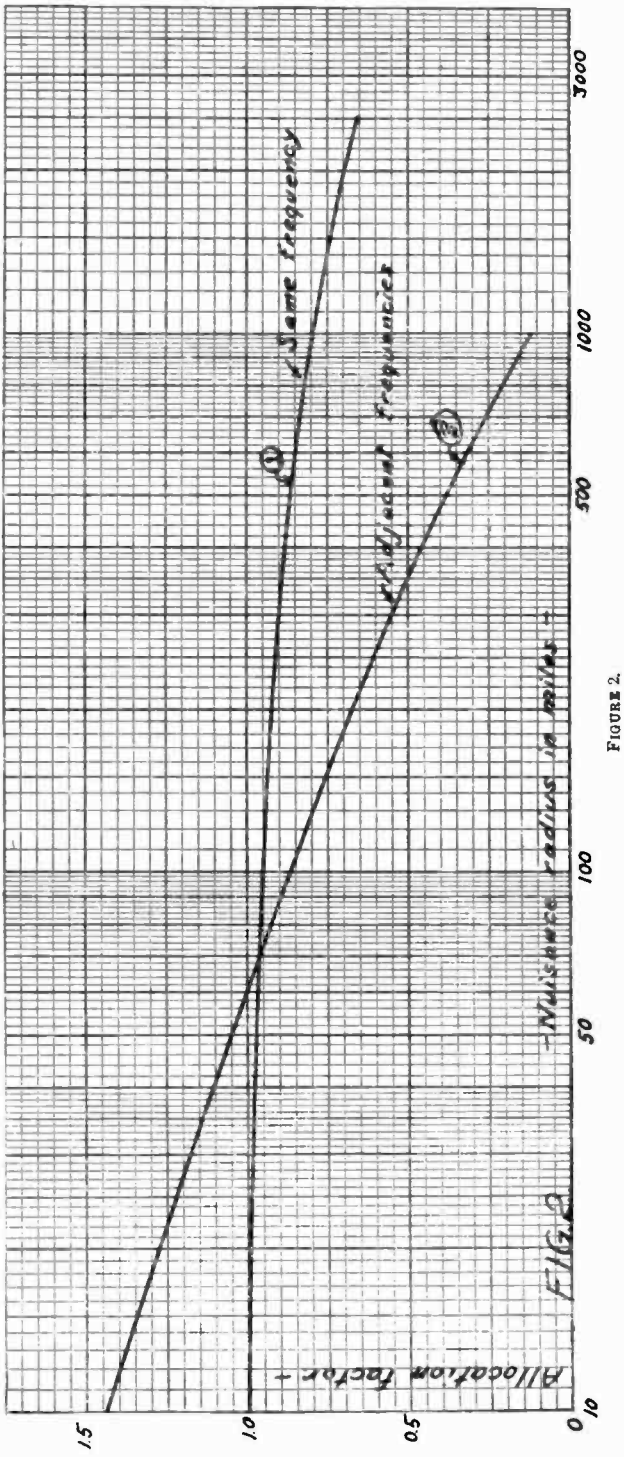

Same frequency
Adjacent frequencies
Allocation factor +
Miles per statute
Distance in miles
0
0.5
1.0
1.5
10
50
100
500
1000
3000

FIGURE 2.

TABLE VIII.—*Average day separation between broadcast stations recommended by engineering division, Federal radio commission, based on frequency maintenance of ±50 cycles [1] analysis of July 1932*

Classification and power	Frequency differential in kilocycles	Local			Regional, limited time and day						Clear			
		50 w	100 w	250 w	250 w	500 w	1 kw	2.5 kw	5 kw	10 kw	5 kw	10 kw	25 kw	50 kw
Local:	0	65	80	100										
50 watts	10	25	30	38	85	95	108	128	145	163	145	163	190	213
	20	12	15	20	57	67	80	100	117	135	117	135	162	185
	30	8	11	16	47	57	70	90	107	125	107	125	152	175
	40	7	10	15	44	54	67	87	104	122	104	122	149	172
	0	80	80	100										
100 watts	10	30	34	41	93	103	116	146	153	171	153	171	198	220
	20	15	16	21	61	71	84	104	121	139	121	139	166	190
	30	11	12	17	48	58	71	91	108	126	108	126	153	176
	40	10	11	16	44	54	67	87	104	122	104	122	149	172
	0	100	100	100										
250 watts	10	38	41	46	105	115	128	148	165	183	165	183	210	233
	20	20	21	24	69	79	92	112	129	147	129	147	174	197
	30	16	17	18	51	61	74	94	111	129	111	129	156	179
	40	15	16	16	45	55	68	88	105	123	105	123	150	173
Regional, limited time and day:	0				230	260	300	350	400	450	700	800	900	1,000
250 watts	10	85	93	105	125	140	153	174	192	212	192	212	240	265
	20	57	61	69	81	91	104	124	141	159	141	159	186	210
	30	47	48	54	58	68	81	100	118	136	118	136	163	185
	40	44	44	45	48	58	71	91	108	126	108	126	153	176
	0				260	260	300	350	400	450	700	800	900	1,000
500 watts	10	95	103	115	140	150	162	185	200	220	200	220	250	277
	20	67	71	79	91	100	112	132	150	167	150	167	194	217
	30	57	58	61	68	72	85	105	122	140	122	140	167	190
	40	54	54	55	58	60	74	94	111	129	111	129	156	179
	0				300	300	300	350	400	450	700	800	900	1,000
1 kilowatt	10	108	116	128	153	162	175	197	215	235	215	235	265	290
	20	80	84	92	104	112	120	140	157	175	157	175	200	225
	30	70	71	74	81	85	91	111	128	146	128	146	173	196
	40	67	67	68	71	74	76	96	113	131	113	131	158	181
	0				350	350	350	350	400	450	700	800	900	1,000
2.5 kilowatts	10	128	146	148	174	185	197	218	235	255	235	255	285	310
	20	100	104	112	124	132	140	153	170	188	170	188	215	238
	30	90	91	94	100	105	111	119	136	154	136	154	181	204
	40	87	87	88	91	94	96	100	119	137	119	137	164	187
	0				400	400	400	400	400	450	700	800	900	1,000
5 kilowatts	10	145	153	165	192	200	215	235	250	270	250	270	300	325
	20	117	121	129	141	150	157	170	182	200	182	200	227	250
	30	107	108	111	118	122	128	136	143	161	143	161	188	211
	40	104	104	105	108	111	113	119	123	141	123	141	168	191
	0				450	450	450	450	450	450	700	800	900	1,000
10 kilowatts	10	163	171	183	212	220	235	255	270	290	270	290	320	345
	20	135	139	147	159	167	175	188	200	213	200	213	240	263
	30	125	126	129	136	140	146	154	161	170	161	170	196	219
	40	122	122	123	126	129	131	137	141	147	141	147	174	197
Clear:	0				700	700	700	700	700	700				
5 kilowatts	10	145	153	165	192	200	215	235	250	270	250	270	300	325
	20	117	121	129	141	150	157	170	182	200	182	200	227	250
	30	107	108	111	118	122	128	136	143	161	143	161	188	211
	40	104	104	105	108	111	113	119	123	141	123	141	168	191
	0				800	800	800	800	800	800				
10 kilowatts	10	163	171	183	212	220	235	255	270	290	270	290	320	345
	20	135	139	147	159	167	175	188	200	213	200	213	240	263
	30	125	126	129	136	140	146	154	161	170	161	170	196	219
	40	122	122	123	126	129	131	137	141	147	141	147	174	197
	0				900	900	900	900	900	900				
25 kilowatts	10	190	198	210	240	250	265	285	300	320	300	320	345	370
	20	162	166	174	186	194	200	215	227	240	227	240	260	280
	30	152	153	156	163	167	173	181	188	196	188	196	208	231
	40	149	149	150	153	156	158	164	168	174	168	174	182	205
	0				1,000	1,000	1,000	1,000	1,000	1,000				
50 kilowatts	10	213	220	233	265	277	290	310	325	345	325	345	370	395
	20	185	190	197	210	217	225	238	250	263	250	263	280	300
	30	175	176	179	185	190	196	204	211	219	211	219	231	242
	40	172	172	173	176	179	181	187	191	197	191	197	205	212

[1] These separations are calculated to minimize objectionable interference in the good service areas of stations about 90 percent of the time.

New mileage separation tables for various classes of stations and powers were prepared from data given in figures 1 and 2 and the field intensity curves previously published with the protection to the field intensities as given in table V. These tables do not have any radical changes in mileage separation from those previously published.

ANTENNA AND RADIATION STANDARDS

It has been found by measurements that the field intensity at 1 mile from the antenna varies from about 50 millivolts per meter to 200 millivolts per meter. This variation is what has actually been encountered in regularly licensed operating broadcast stations. This represents a vast difference in the radiated power even though the antenna input power is the same. Field intensities of 50 millivolts per meter and 200 millivolts per meter with the same antenna input power represent a difference in antenna efficiency of 16 times. The field intensity of 50 millivolts per meter at 1 mile was only encountered in stations located in cities with antennas located on buildings where absorption is very high.

It has become necessary in the consideration of engineering allocation of broadcast frequencies to analyze the radiating systems of broadcast stations. The following equations have been made use of to express the characteristics of the field intensity at 1 mile produced by various antennas.

The fundamental equation for the total power radiated from an antenna in terms of the total unattenuated field intensity is—

$$P_r = KA\rho^2 \tag{1}$$

Where

P_r is the total power radiated in kilowatts passing through area A.

K is a constant $= 2.65 \times 10^{-12}$

A is the area through which the field passes, measured in square meters.

ρ is the vector field over the area A measured in millivolts per meter.

In addition the following antenna equations are used:

ntenna efficiency:

$$Aeff = \frac{F^2 \times 100}{265^2 \times P} \tag{2}$$

Directivity of an antenna:

$$D = \frac{E_m}{F} \tag{3}$$

Equivalent power in any direction:

$$P_e = \frac{E^2{}_m}{125^2} \tag{4}$$

P is the power input to the antenna or licensed power in kilowatts determined by the direct method. (See rules 92, 94, 134, and 142.)

P_e is the equivalent radiated power in any direction from the antenna, in kilowatts, which may be used directly in the mileage separation table.

F is the effective field [7] at 1 mile from the antenna in the horizontal plane without attenuation measured in millivolts per meter (mv/m).

E_m is the field intensity in any direction from the antenna at 1 mile without attenuation, measured in millivolts per meter.

[7] "Effective field" should not be confused with effective voltage at any point, as they are two entirely different terms.

input to antenna, 1 kw
radiated - 450 w
ting eff. - 45%
na eff. 22.5%

= a cos θ
1/2 lobe

ne

'LANE

radiated - 1 kw
na eff. 100%

= a $\cos^{\frac{1}{2}} 6\theta$ (space
One lobe pattern)
itenna above the earth.

= a $\cos^{\frac{1}{2}} 3\theta$ (space
$\frac{1}{2}$ lobe pattern)
Antenna on the earth.

The root mean square value of all the field intensities at 1 mile from the antenna in the horizontal plane without attenuation is termed the "effective field" (F).[7] "Effective field" of any broadcast station may be obtained by measuring the field intensities on a sufficient number of radials at short distances from the station and from this determine the product of the field intensity and distance which does not include attenuation. No readings should be taken closer than two wave lengths from the antenna.

It is seldom found that this field is uniform in all directions and in such cases the effective field is the root mean square value of the field at 1 mile at all horizontal directions. This may be determined from a polar diagram with field intensity at a mile plotted as radii, the area bounded by field intensity at 1 mile is measured, and the radius of the circle with the equivalent area calculated. This radius is the root mean square value or "effective field."

There is no known practical method of measuring the pattern of an antenna in the vertical plane.[8] This must be calculated or estimated from the constants of the radiating system. An approximate or exact equation for ρ is determined and then the power through any differential area is set up in equation (1). This is then integrated throughout the entire area under consideration (hemisphere in case of quarter-wave antenna) to give the total radiated power. By this means the "effective field" from a quarter-wave antenna radiating 1 kilowatt power is found to be 187 millivolts per meter.

It can be shown that as the radiation at high angles is reduced the amount of power necessary to maintain the same "effective field" is reduced. Consequently, the service area of a station can be improved for a given power radiated by an antenna which is designed to give low-angle radiation.

Equation (2) is used for calculating the antenna efficiency of any radiating system. At first it may appear that the "antenna efficiency" should be the total radiated power divided by the antenna input power, and truly that is the "radiating efficiency", but the valuable radiation from a broadcast station is the part restricted through a small angle with the horizontal, and, indeed, not only is the radiation at higher angles wasted power but also may be harmful (cause fading at close range). The quarter-wave antenna, figure 3 (a), is by no means the most efficient antenna that may be erected and, therefore, it should not be used as a standard. It was assumed that to set up a standard for efficiency it was desirable to consider a pattern of excellent radiation characteristics which is better than can be obtained in practice but to which the patterns of all other antennas could be compared with respects to antenna efficiency so as to have a common comparison.

To this end the pattern in figure 3 (b) was adopted as a comparative radiation pattern for determining the efficiency of the radiating systems in the horizontal plane. This pattern may be termed the ideal radiation pattern. This antenna is considered an approach to the ideal with respects to all external effects.

Equation (3) is used to determine the directivity of an antenna.

[7] "Effective field" should not be confused with effective voltage at any point, as they are two entirely different terms.

[8] A limited number of measurements have been made by means of airplanes and captive balloons, but these permit of only rough check.

Equation (4) is used for the purpose of determining the equivalent power in any direction from directional antennas and antennas that have a pattern in the vertical plane different from that of the quarter-wave antenna. The power as determined by this equation may be used directly in the mileage separations given in tables VII and VIII.

Since the sky-wave radiation changes with the angle θ, the proper angle must be used to determine the field intensity which will cause interference at any given separation between transmitter and receiver. The curvature of the earth must be taken into consideration.

Federal Radio Commission Rules and Regulations, rule 138, provides for the determining of the operating power of broadcast stations computed from field-intensity measurements. While no licensees of broadcast stations have exercised the right to compute the power by this method, the values in figure 3 (a) would be the standard for this purpose; that is, the operating power would be determined by the equation

$$P=\frac{F^2}{125^2} \tag{5}$$

where P and F are the same as used in equation (2).

This formula applies to all antennas, irrespective of patterns, except that the pattern in the vertical plane shall not exceed that in figure 3 (a).

Most of such formulas [9] for calculating the field intensity at a distance from a station may be simplified and divided into three parts, as follows:

$$E=\frac{F}{d}\times A \tag{6}$$

Where E is the day or ground-wave field intensity at any distance from the station in millivolts per meter (mv/m)
F is the effective field [10] in mv/m
d is the distance in miles between transmitting antenna and receiver, and
A is the absorption or attenuation factor.
F is the term "effective field" discussed above and can be evaluated to give the usual terms which appear in transmission formulas.[11]

In any actual case the value of the effective field (F) is dependent on antenna efficiency (not radiating efficiency) and the power put into the antenna. So in terms used previously

$$F=265\sqrt{P\cdot Aeff} \tag{7}$$

where P is input power.

The antenna efficiency is dependent on the design of the radiating system and the radiating efficiency which in turn is dependent on the various power losses. The antenna efficiency has been found to vary widely between broadcast stations as follows:

	Percent
Maximum of any broadcast station measured	Aeff=57.0
Average of all broadcast stations measured	Aeff= 5.7
Quarter-wave antenna, radiating efficiency	Aeff=50.0
Empirical value here adopted for the average antenna and conditions (125 mv/m at 1 mile)	Aeff=22.5

[9] See Proceedings of the Institute of Radio Engineers, April 1932, pp. 612 and 613, for several such formulas
[10] See equation (2) above.
[11] See Fifth Annual Report, Federal Radio Commission, p. 37.

For a properly designed antenna in the broadcast spectrum the operating frequency does not affect the value of F to any substantial extent and is not taken into account.

The second term in equation (6) is the distance d between transmitting antenna and the point of reception. This term gives the equation the inverse distance characteristic.

The third term or absorption or attenuation factor A is more moot than the first term, but all authorities agree that A is a function of (1) the frequency, (2) the distance (d), and (3) the constants of the intervening media. However, this is about the extent to which the agreement goes. From formula (6) it is seen that A is the factor by which field intensity obtained by the inverse distance law is multiplied to obtain the actual field intensity. In several formulas the attenuation factor is the exponential type. Field investigations revealed that the exponential equations neither gave the correct shape for the absorption curve nor the value for different frequencies.

In view of these inaccuracies, attention was given to the formulas by Rolf [12] which had been investigated by the Bureau of Standards.

By the Rolf graphs, the conductivity (σ) and inductivity or dielectric constant (ϵ) of the path are determined. While actual complete ground-wave surveys on many stations reveal that the absorption varies widely from mile to mile, city to rural area, coastal areas, mountainous areas, etc., it appears that the average or general conductivity and dielectric constant over any limited homogeneous area of the United States are sufficiently uniform to warrant application to the prediction of the radius of the various field intensity contours of a proposed station or existing stations in said areas, if the effective field (F) is known. If the average conductivity and dielectric constant are known over an area, it can be predicted with reasonable accuracy what change in field intensity will result from a change in frequency if the effective field (F) for each is known.

In general, where the signal was transmitted over terrain of approximately uniform electrical characteristics, it was found that the attenuation curves of Rolf were well adapted to predicting the soil constants, although necessarily some variation was found between the various stations transmitting signals over the observed path. In some few instances it was found that the constants of the conducting medium varied so widely that it was impossible to determine an average constant.

The results of all surveys analyzed are available and may be obtained upon request.

Table H indicates the values of inductivity and conductivity which it is recommended be used for various types of country in the absence of surveys over the particular area involved. Naturally, values obtained from the use of these figures will be only approximate and should, if possible, be replaced by a measurement in the area under consideration.

[12] Graphs to Professor Sommerfeld's Attenuation Formula for Radio Waves, by Bruno Rolf, Proceedings of the Institute of Radio Engineers, March 1930, p. 391.

TABLE H

Type of terrain			Attenuation factor at 50 miles, 1,000 kilocycles [1]
Sea water, minimum attenuation [2]	81	4.64×10^{-11}	1.0
Pastoral, low hills, rich soil, typical of Dallas, Tex., area	20	3×10^{-13}	.53
Pastoral, low hills, rich soil, typical of Ohio and Illinois	14	10^{-13}	.21
Flat country, marshy, densely wooded, typical of Louisiana near Mississippi River	12	7.5×10^{-14}	.13
Pastoral, medium hills, and forestation, typical of Maryland, Pennsylvania, New York, exclusive of mountainous territory and sea coasts	13	6×10^{-14}	.10
Pastoral, medium hills and forestation, heavy clay soil, typical of central Virginia	13	4×10^{-14}	.06
Rocky soil, steep hills, typical of New England	14	2×10^{-14}	.025
Sandy, dry, flat, typical of coastal country	10	2×10^{-14}	.024
City, industrial areas, average attenuation	5	10^{-14}	.011
City, industrial areas, maximum attenuation	3	10^{-15}	.003

[1] This figure is stated for comparison purposes in order to indicate at a glance which values of conductivity and inductivity represent the higher attenuation. This figure is the ratio between field intensity with the soil constants stated and with zero attenuation.

[2] Figures stated for sea water, determined by Stratton & Chinn, Proceedings of the Institute of Radio Engineers, December 1932, p. 1900.

Several comparisons were made in predicting the change in field strength due to a change of frequency only. Where the signal was transmitted over terrain having uniform electrical characteristics, it was found that Rolf's graphs gave good agreement with the observed results.

The data are not complete and will be supplemented as further study is made. As stated in previous reports, this development of empirical standards must change from time to time as conditions change and as more data become available.

COMMERCIAL COMMUNICATIONS SECTION

GENERAL

As in broadcasting the frequency spectrum available for other services is severely limited. In addition, the natural characteristics of frequencies suitable for these services require that we share the spectrum with the rest of the world. The problem then is to make the most efficient use of this frequency space.

In the past year many new assignments were made to stations in all parts of the world, and the problem of finding adequate space in the needed portions of the spectrum for the United States was more difficult than at any time before.

The new frequency plan referred to in the last annual report as the one tenth percent system involving a reallocation of many station assignments has proved to be of material assistance in providing for the needs of the United States. Many cases of international interference have been solved by means of cooperation through the various administrations, and through the use of new apparatus.

FIXED SERVICE

The radio communication companies have continued to improve and extend their services to give radiotelegraph and radiotelephone connections to practically all the countries of the world. There are now 310 point-to-point telegraph stations at 28 locations, and 34 point-to-point telephone stations at 6 locations which are licensed by the Commission to render fixed public service, including press, over international circuits. These stations are operated by 11 companies licensed to provide direct communication between the United States and 71 foreign points.

Communication between the United States and 53 foreign countries is possible by means of radiotelephone stations and wire-line extensions which provide facilities for the interconnection of 92 percent of the telephones of the world.

MARITIME

On June 30, 1932, there were 1,997 ship stations licensed by the Commission aboard vessels of United States registry, including 199 vessels which operate on the Great Lakes. Approximately 273 ships are compulsorily equipped with radiotelegraph apparatus, and the remainder are voluntarily equipped. Since ships of all countries intercommunicate on the high seas, all communications are international in character and the assignment of frequencies and methods of procedure are regulated by international regulations.[13] The public coastal telephone station at Ocean Gate, N.J., was providing service

[13] International Radiotelegraph Convention signed at Washington Nov. 25, 1927; International Telecommunication Convention signed at Madrid Dec. 9, 1932, to be effective Jan. 1, 1934.

on June 30, 1933, to 19 foreign vessels as compared with 11 vessels as of June 30, 1932.

An informal agreement concerning frequency assignments to coastal telegraph stations serving ships in the North Atlantic, signed in 1927 by a communication company, was revised at Madrid on December 2, 1932. The purpose of this agreement was the allocation of the primary use of coastal telegraph frequencies in the band 100 to 160 kilocycles to minimize interference between important public coastal stations of Germany, France, Great Britain, Norway, Holland, Sweden, Canada, and the United States. The necessary frequency adjustments have been made by the American operating companies, and operating conditions improved in the maritime mobile service of the North Atlantic.

In order to reduce interference in the ship service which existed between certain coastal stations of the United States on the Atlantic coast, several changes were made in frequency assignments of stations in the band 100 to 550 kilocycles.

POLICE

The cities using radio as an adjunct to police service have demonstrated conclusively the usefulness of this service and its value in providing greater safety to life and property. Several new stations have been established and many existing stations have extended service to neighboring communities. On June 30 there were 123 stations licensed or under construction.

In response to a questionnaire the following information has been submitted by licensees of municipal police stations with reference to their operation for the month of May 1933:

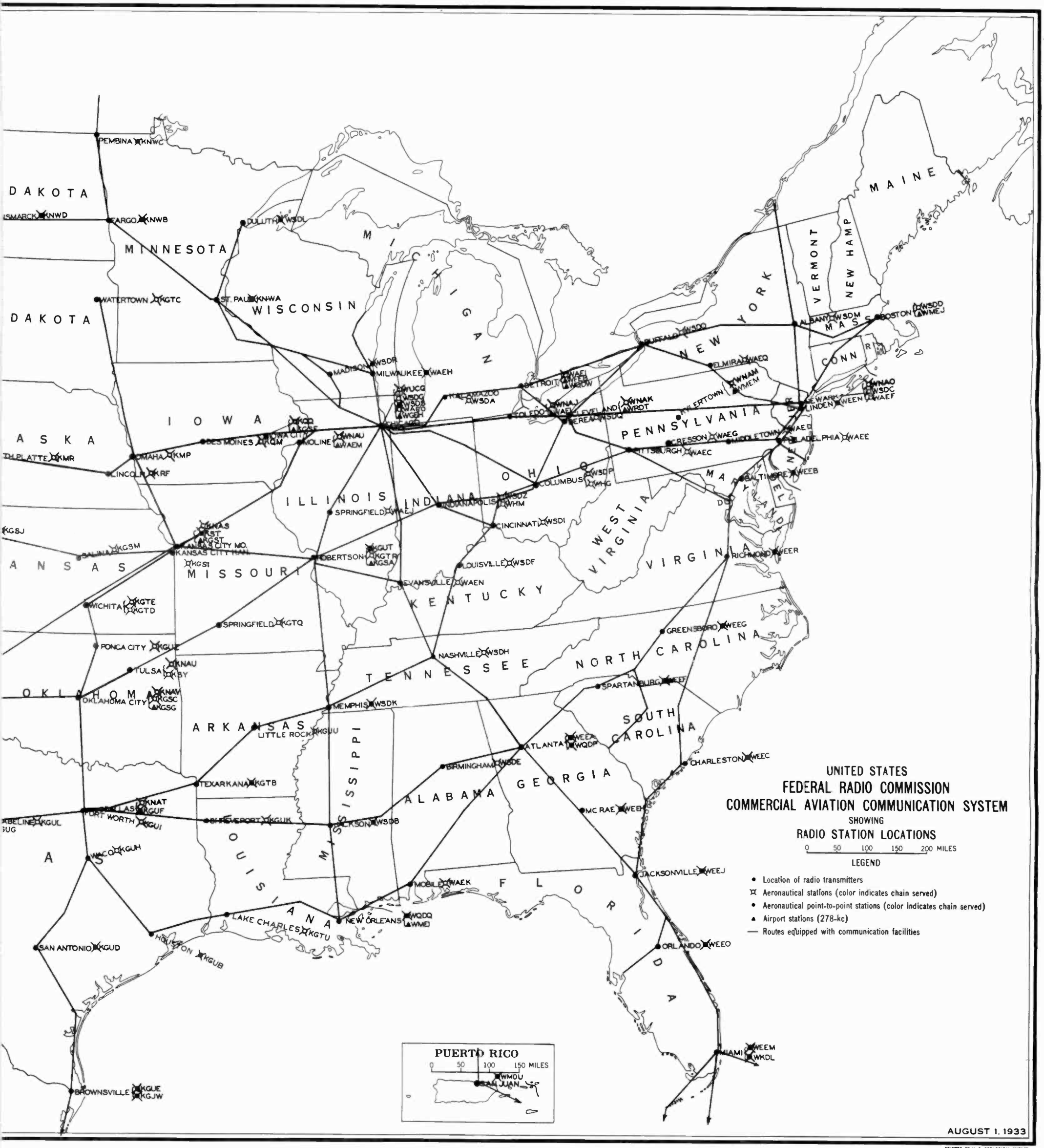
Number of stations from which reports were received	76
Total number of emergency calls transmitted	232, 838
Total number of arrests reported (56 cities reporting)	15, 604
Amount of property recovered (excluding automobiles—29 cities reporting)	$223, 689
Number of automobiles recovered (47 stations reporting on this item)	2, 483
Total number of automobiles equipped with radio receivers	3, 628
Total population served by these stations	40, 521, 000
Total area served in square miles	61, 011
The average time required for a police officer to appear upon the scene after a broadcast was reported as	2¼ minutes

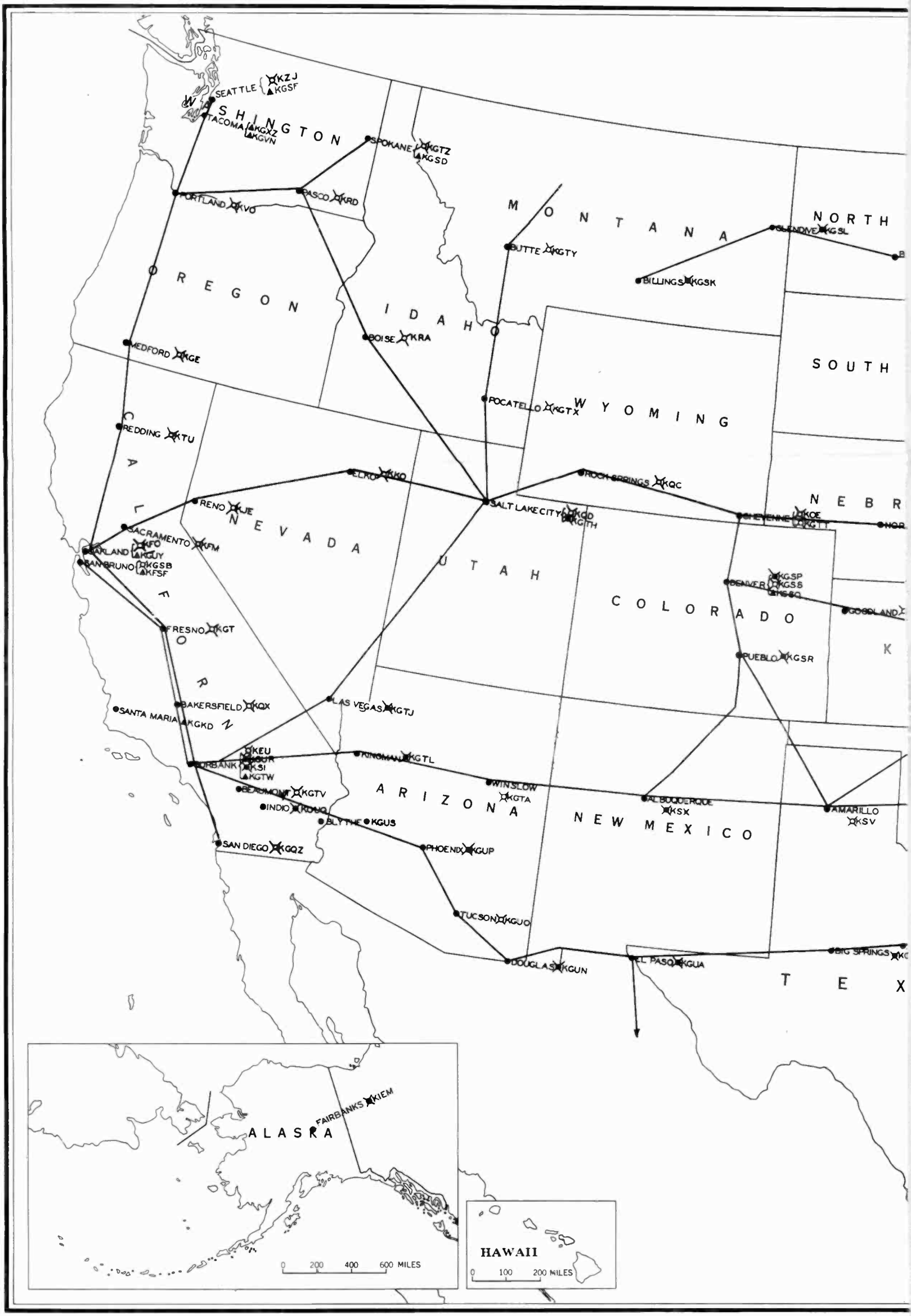
Four States—Michigan, Massachusetts, Iowa, and Pennsylvania—have police radio stations installed for use in connection with the activities of State police officers.

AVIATION

On June 30, 1933, there were 436 aircraft stations (407 transport aircraft and 29 itinerant), 139 aeronautical stations, 51 aeronautical point-to-point, and 20 airport stations licensed or under construction.

The system as of August 1, 1933, is shown on the attached map. From the point of view of technical equipment, apparatus has steadily improved. Advances have been made in operating technique which expedite the handling of traffic so that at the present time approximately 95 percent of communications initiated are completed.


PEMBINA KNWC
DAKOTA
ISMARCK KNWD
FARGO KNWB
DULUTH WSDL
MINNESOTA
WATERTOWN KGTC
ST. PAUL KNWA
DAKOTA
WISCONSIN
MICHIGAN
MADISON WSDR
MILWAUKEE WAEH
WUCG
WSDG
WSDS
WAEO
WGBH
KALAMAZOO WSDA
DETROIT WAEL WWJ WGDW
TOLEDO WNAJ
CLEVELAND WNAK WRDT
AKRON WSDQ
NEW YORK
BUFFALO WSDD
ELMIRA WAEQ
WATERTOWN WNAM WMEM
ALBANY WSDM
BOSTON WSDD WMEJ
VERMONT
NEW HAMP
MAINE
MASS
CONN
R I
NEWARK WAED
LINDEN WEEN
WNAO
WSDC
WAEF
I O W A
DES MOINES KQM
IOWA CITY KGCX
MOLINE WNAU WAEM
A S K A
TH PLATTE KMR
OMAHA KMP
LINCOLN KRF
PENNSYLVANIA
CRESSON WAEG
MIDDLETOWN
PHILADELPHIA WAEE
PITTSBURGH WAEC
OHIO
COLUMBUS WSDP WHG
BALTIMORE WEEB
MARYLAND
DEL
ILLINOIS
INDIANA
SPRINGFIELD WAEJ
INDIANAPOLIS WSDZ WHM
CINCINNATI WSDI
WEST VIRGINIA
VIRGINIA
RICHMOND WEER
KGSJ
SALINA KGSM
KANSAS CITY MO. KNAS KFKX KGST
KANSAS CITY KAN. KGSI
ROBERTSON KGUT KGKT KGSA
LOUISVILLE WSDF
EVANSVILLE WAEN
KENTUCKY
A N S A S
MISSOURI
WICHITA KGTE KGTD
SPRINGFIELD KGTQ
PONCA CITY KGUL
TULSA KNAU KBY
OKLAHOMA KNAV
OKLAHOMA CITY KGSC KGSG
NASHVILLE WSDH
TENNESSEE
NORTH CAROLINA
GREENSBORO WEEG
SPARTANBURG WEEF
MEMPHIS WSDK
ARKANSAS
LITTLE ROCK KGUU
SOUTH CAROLINA
ATLANTA WEEA WQDP
CHARLESTON WEEC
BIRMINGHAM WSDE
TEXARKANA KGTB
MISSISSIPPI
ALABAMA
GEORGIA
MC RAE WEEH
DALLAS KNAT KGUF
FORT WORTH KGUI
BEAUMONT KGUK
JACKSON WSDB
KBELINE KGUL
BUG
WACO KGUH
A
LOUISIANA
MOBILE WAEK
JACKSONVILLE WEEJ
FLORIDA
LAKE CHARLES KGTU
NEW ORLEANS WQDQ WMEI
HOUSTON KGUB
SAN ANTONIO KGUD
ORLANDO WEEO
MIAMI WEEM WKDL
BROWNSVILLE KGUE KGJW
PUERTO RICO
0 50 100 150 MILES
WMDU
SAN JUAN
UNITED STATES
FEDERAL RADIO COMMISSION
COMMERCIAL AVIATION COMMUNICATION SYSTEM
SHOWING
RADIO STATION LOCATIONS
0 50 100 150 200 MILES
LEGEND
Location of radio transmitters
Aeronautical stations (color indicates chain served)
Aeronautical point-to-point stations (color indicates chain served)
Airport stations (278-kc)
Routes equipped with communication facilities
AUGUST 1, 1933
PRINTED BY U. S. GEOLOGICAL SURVEY


SEATTLE
KZJ
KGSF
TACOMA
KGXZ
KGVN
WASHINGTON
SPOKANE
KGTZ
KGSD
PASCO
KRD
PORTLAND
KVO
OREGON
MONTANA
BUTTE
KGTY
BILLINGS
KGSK
GLENDIVE
KGSL
NORTH
IDAHO
BOISE
KRA
MEDFORD
KGE
POCATELLO
KGTX
WYOMING
SOUTH
REDDING
KTU
CALIFORNIA
ELKO
KKO
ROCK SPRINGS
KQC
RENO
KJE
NEVADA
SALT LAKE CITY
KQD
KGTH
CHEYENNE
KOE
KGTT
NEBR
SACRAMENTO
KFM
OAKLAND
KFO
KGUY
SAN BRUNO
KGSB
KFSF
UTAH
KGSP
DENVER
KGSS
KGSQ
COLORADO
GOODLAND
FRESNO
KGT
PUEBLO
KGSR
BAKERSFIELD
KQX
SANTA MARIA
KGKD
LAS VEGAS
KGTJ
KEU
KGUR
BURBANK
KSI
KGTW
KINGMAN
KGTL
WINSLOW
KGTA
BEAUMONT
KGTV
INDIO
KQUQ
ARIZONA
ALBUQUERQUE
KSX
NEW MEXICO
AMARILLO
KSV
BLYTHE
KGUS
SAN DIEGO
KGQZ
PHOENIX
KGUP
TUCSON
KGJO
DOUGLAS
KGUN
EL PASO
KGUA
BIG SPRINGS
TEXAS
FAIRBANKS
KIEM
ALASKA
0 200 400 600 MILES
HAWAII
0 100 200 MILES

EXPERIMENTAL VISUAL BROADCASTING

The prediction made in the Commission's last report that the very high frequencies would be the final locus for visual broadcasting appears to have been justified. A number of licensees have given up their licenses specifying the lower frequencies and others have stated that they were satisfied that the lower frequencies were unsuitable, but desired to continue research in these bands for a short period to complete certain problems in progress.

The quality of pictures, which it has been demonstrated is possible to transmit on the very high frequencies, has steadily increased, and some laboratory productions are capable of holding sustained interest. Pictures need no longer be confined to "close ups," but larger scenes may be transmitted. The art, however, has not as yet progressed to a stage which would justify the adoption of standards by the visual broadcasting industry. Although much progress has been made in the laboratory, visual broadcasting is still in the experimental stage.

EXPERIMENTAL SERVICE

As a result of the activities of experimental stations throughout the past year, there have been many improvements both in methods of transmission and in the equipment used in all of the most important authorized radio services. A great portion of this work has been reported in technical publications. Space will permit mentioning but few of these developments.

Multiplex operation of a single transmitter, providing several separate telegraph circuits, simultaneously over one radio channel instead of the usual single telegraph circuit, has been demonstrated experimentally. New and improved methods of transmitting weather maps and photoradiograms to ships at sea and to foreign countries have been developed.

Investigations have been in progress during the year to determine the state of ionization of the Kennelly-Heaviside layers and to coordinate these data with those taken by other observers in other parts of the world, engaged in similar tests as part of the program of the International Polar Year (August 1932 to August 1933) and with terrestial phenomena such as the Leonid meteor shower of November 15–16, 1932.

So great has been the activity of experimental stations in investigating the possibilities of the very high frequencies for radiocommunication that this development must be considered the most significant and important of the year.

It has been realized for several years that very high frequencies have a very definite place in the radiocommunication field, but only recently has suitable equipment been available. Demands for assignments are being made and the difficulties and problems incident to the commercial allocation of these frequencies can be foreseen. Although the transmission characteristics of the frequency band, for which commercial apparatus had been designed, are sufficiently well known at this time to leave no doubt as to their usefulness in many of the established services, there has not been enough data available to determine the particular frequencies within the entire range most suitable for specific services. These data must be obtained before any plan of

allocation could be considered. They were obtainable from no other source than licensees experimenting in this field. A policy was therefore adopted, the purpose of which was to encourage experimental work of this kind to obtain the required data and at the same time to retain absolute control of the frequencies by conserving their experimental status until such time as they could be allocated in such manner as to best meet the needs of all services.

Under the Commission's general policy, in order to obtain authority to operate radio stations in the experimental service, the primary requirement which all must meet is that the program of research outlined must give promise of contributing substantially toward the progress of the radio art. Applicants must be qualified technically and financially to undertake the experimental work. In the case of the very high frequencies it was apparent that in order to formulate any sound allocation plan, it was necessary not only to obtain all possible information as to the physical properties of the frequencies but also to differentiate as to their usefulness and practicability for communication in many different services, the particular requirements of which were all very different.

No authority to operate on other than an experimental basis has been granted, and none of the frequencies above 30,000 kilocycles has been authorized for use in the continental United States on a commercial basis.

There were licensed on June 30 of this year 232 general and 51 special experimental stations. These stations were being operated by 135 different licensees. Of these, 87 licensees were operating 169 experimental stations, utilizing the very high frequencies, which is illustrative of the tremendous interest being shown in this new development.

INTERNATIONAL AND INTERDEPARTMENTAL RELATIONS SECTION

MADRID RADIO CONFERENCE

The Fourth International Radio Conference was held in Madrid from September 3, 1932, to December 10, 1932. This conference, which was the most important radio conference which has yet been held, completely revised the International Radio Convention and Regulations signed at Washington in 1927.

There was held concurrently with the Radio Conference an International Telegraph Conference which met for the purpose of revising the St. Petersburg Telegraph Convention of 1875, and the General Regulations of Brussels of 1928. As a result of previous arrangements the purpose of holding the two conferences simultaneously at Madrid was to see whether or not a fusion was possible for the two conventions and, if so, to bring this about. After nearly 4 months of protracted discussion this step was taken, with the result that the world's first Telecommunication Convention came into being.

Annexed to the Telecommunication Convention, which it is hoped will remain unchanged for many years, are three separate sets of regulations dealing with telegraphy, telephony, and radio, respectively. These are to be revised at 5-year intervals by administrative conferences.

The radio regulations themselves are divided into the General Radio Regulations and the Additional Radio Regulations. The United States was signatory to the Convention and to the General Radio Regulations only. While the Telecommunication Convention and General Radio Regulations deal primarily with international regulations of a general character of interest to Governments in their administrative capacity, the Telegraph and Telephone Regulations and the Additional Radio Regulations cover detailed managerial points which could not be accepted by the United States. They are for the most part matters of private arrangements made by the private operating companies concerned.

The delegation of the United States consisted of 4 delegates and 7 technical advisors, with Judge Eugene O. Sykes, chairman of the delegation. Dr. C. B. Joiliffe, chief engineer of the Commission, was one of the delegates, and Mr. Gerald C. Gross, engineer of the Commission, was a technical advisor.

REPORT OF THE CHIEF EXAMINER

ELLIS A. YOST

The numerous decisions of the courts establishing principles of law applicable to the administration of radio law and regulations is reflected in a diminution of the number of cases heard before examiners. During the fiscal year 1933 a total of 204 cases were heard, as compared with 239 during the preceding year. However, the result of prior decisions was to eliminate from the hearing docket substantially all of those cases which clearly could not be granted under established precedents. The complexity of issues in the cases heard necessitated generally the devotion of a greater amount of time and study to each case.

Applicants seeking authority to construct new broadcast stations were in the minority, the larger percentage of the cases concerning this service involving increases of the facilities assigned to existing stations, the moving of stations from one locality to another, the assignment of licenses, and proposals to experiment with recent developments of the radio art, such as directional antennae systems. A considerable number of cases involved services other than broadcast, including television, general experimental, amateur, coastal, and aeronautical.

In addition to applications the hearings involved revocation proceedings and protest cases.

A summary of the work of the division is disclosed by the following table:

Cases heard but not reported as of July 1, 1932	36
Cases heard during fiscal year	204
	240
Case granted by Commission after hearing (no report)	1
	239
Case continued for further hearing	1
	238
Cases reported during fiscal year	209
Cases unreported as of June 30, 1933	29

The first changes in the examiner personnel since the establishment of the division occurred in the latter part of the fiscal year, Elmer W. Pratt, examiner, and Ellis A. Yost, chief examiner, resigning, their resignations being effective June 1, 1933, and June 30, 1933, respectively. Upon the tender of their resignations and on May 17, 1933, Ralph L. Walker, examiner, was relieved of his duties in the Legal Division where he had been on detail since August 2, 1932. On June 16, 1933, Rosel H. Hyde, examiner, was transferred to the Legal Division, and George H. Hill, then a member of the legal staff, became an examiner. Thus, at the close of business June 30, 1933, the number of examiners was reduced to two.

REPORT OF THE DIVISION OF FIELD OPERATIONS

W. D. TERRELL, *Chief*

The Division of Field Operations, which was created upon the transfer of the Radio Division from the Department of Commerce to the Federal Radio Commission, is charged in brief with the inspection of all transmitting apparatus to determine whether in construction and operation it conforms to the requirements of the Radio Act of 1927, the rules and regulations of the licensing authority and the license under which it is constructed or operated, to make measurements of frequencies and field intensity measurements, to maintain records incident to the monitoring of radio stations and all infractions, to conduct examinations for applicants for radio-operators' licenses, to investigate alleged violations by station operators of such laws, treaties, and regulations as might result in the suspension of their licenses.

For the purpose of performing these duties the United States is divided into 20 radio inspection districts with headquarters at the following points:

Inspector in charge:
Customhouse, Boston, Mass.
Subtreasury Building, New York, N.Y.
35 South Ninth St., Philadelphia, Pa.
Fort McHenry, Baltimore, Md.
Customhouse, Norfolk, Va.
528 Post Office Building, Atlanta, Ga.
228 Federal Building, Miami, Fla.
Customhouse, New Orleans, La.
209 Prudential Building, Galveston, Tex.
464 Federal Building, Dallas, Tex.
1105 Rives-Strong Building, Los Angeles, Calif.
Customhouse, San Francisco, Calif.
207 New Courthouse Building, Portland, Oreg.
808 Federal Office Building, Seattle, Wash.
538 Customhouse, Denver, Colo.
413 Federal Building, St. Paul, Minn.
410 Federal Building, Kansas City, Mo.
2022 Engineering Building, Chicago, Ill.
2909 David-Stott Building, Detroit, Mich.
514 Federal Building, Buffalo, N.Y.
Manager, central monitoring station, post-office box 788, Grand Island, Nebr.
Manager, monitoring station, Radio Station Building, Naval Training Station, Great Lakes, Ill.

There are maintained seven monitoring stations at the following points:

Boston, Mass.
Baltimore, Md.
Atlanta, Ga.
San Pedro, Calif.
Portland, Oreg.
Great Lakes, Ill.
Grand Island, Nebr.

There are eight radio test cars equipped with field-intensity apparatus in use throughout the United States.

The following statistical tables give comparative information as to the scope of activity of this service during the past year:

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection (city or town)	Stations inspected							Frequency measurements								
								United States broadcast			United States other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land	Broadcast	Amateur	Aircraft	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
First district:																
Boston, Mass.	790	248	172	2	6	15	0	4,076	21	39	3,213	823	903	458	182	196
Outside	0	0	0	16	38	9	0	0	0	0	0	0	0	0	0	0
Total, 1933	790	248	172	18	44	24	0	4,076	21	39	3,213	823	903	458	182	196
Total, 1932	1,185	212	180	17	42	48	1	10,559	43	93	2,360	400	464	361	114	128
Second district:																
New York, N.Y.	3,414	395	333	51	193	95	6	0	0	0	0	0	0	0	0	0
Outside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	3,414	395	333	51	193	95	6	0	0	0	0	0	0	0	0	0
Total, 1932	4,095	372	395	58	246	147	1	0	0	0	0	0	0	0	0	0
Third district:																
Philadelphia, Pa.	277	96	38	3	27	17	0	0	0	0	0	0	0	0	0	0
Outside	19	4	1	11	27	24	1	0	0	0	0	0	0	0	0	0
Total, 1933	296	100	39	14	54	41	1	0	0	0	0	0	0	0	0	0
Total, 1932	457	62	18	14	78	48	0	0	0	0	0	0	0	0	0	0
Fourth district:																
Baltimore, Md.	347	188	69	3	10	5	0	2,447	92	229	1,460	213	292	380	168	171
Outside	0	0	0	9	21	5	0	0	0	0	0	0	0	0	0	0
Total, 1933	347	188	69	12	31	10	0	2,447	92	229	1,460	213	292	380	168	171
Total, 1932	405	24	18	7	43	45	2	3,326	89	177	712	20	26	119	59	65

Fifth district:																
Norfolk, Va.	435	80	54	0	16	13	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	3	31	2	0	0	0	0	0	0	0	0	0	0
Total, 1933	435	80	54	3	47	15	0	0	0	0	0	0	0	0	0	0
Total, 1932	780	117	39	2	34	17	1	0	0	0	0	0	0	0	0	0
Sixth district:																
Atlanta, Ga.	0	0	0	9	6	2	24	3,397	33	78	446	24	25	57	8	7
Outside	0	0	0	22	42	7	1	0	0	0	0	0	0	0	0	0
Total, 1933	0	0	0	31	48	9	25	3,397	33	78	446	24	25	57	8	7
Total, 1932	0	0	0	68	80	18	9	2,110	31	71	247	5	14	41	2	3
Seventh district:																
Miami, Fla.	153	14	0	13	10	24	22	0	0	0	0	0	0	0	0	0
Outside	0	1	0	22	8	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	153	15	0	35	18	24	22	0	0	0	0	0	0	0	0	0
Total, 1932	187	23	1	16	12	25	14	0	0	0	0	0	0	0	0	0
Eighth district:																
New Orleans, La.	394	148	95	9	19	2	3	[2] 1,341	22	40	184	26	27	27	5	5
Outside	1	5	5	15	29	22	2	0	0	0	0	0	0	0	0	0
Total, 1933	395	153	100	24	48	24	5	1,341	22	40	184	26	27	27	5	5
Total, 1932	526	181	110	50	127	33	10	6,521	19	34	762	34	35	142	24	24
Ninth district:																
Galveston, Tex.	23	78	78	2	4	1	1	0	0	0	0	0	0	0	0	0
Outside	0	11	11	9	10	5	2	0	0	0	0	0	0	0	0	0
Total, 1933	23	89	89	11	14	6	3	0	0	0	0	0	0	0	0	0
Total, 1932 [1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tenth district:																
Dallas, Tex.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	25	64	7	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	0	0	26	64	7	0	0	0	0	0	0	0	0	0	0
Total, 1932	0	0	0	22	93	13	0	288	0	0	15	0	0	0	0	0
Eleventh district:																
Los Angeles, Calif.	604	282	60	17	29	24	0	2,937	25	70	1,219	184	204	194	57	57
Outside	0	2	1	22	31	12	0	0	0	0	0	0	0	0	0	0
Total, 1933	604	284	61	39	60	36	0	2,937	25	70	1,219	184	204	194	57	57
Total, 1932	734	185	36	42	60	14	0	4,466	15	33	1,489	238	277	217	38	39

[1] Office established in 1933.

[2] Measurements discontinued during year.

Place of inspection (city or town)	Stations inspected							Frequency measurements								
								United States broadcast			United States other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land	Broadcast	Amateur	Aircraft	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
Twelfth district:																
San Francisco, Calif.	894	387	273	3	25	13	0	3,172	10	25	1,187	118	126	234	84	92
Outside	1	16	16	67	36	11	17	0	0	0	0	0	0	0	0	0
Total, 1933	895	403	289	70	61	24	17	3,172	10	25	1,187	118	126	234	84	92
Total, 1932	1,361	325	258	194	164	30	2	5,361	66	131	926	91	97	172	57	57
Thirteenth district:																
Portland, Oreg.	145	98	26	34	47	8	11	8,086	43	125	2,794	298	304	932	306	308
Outside	0	0	0	6	10	4	0	0	0	0	0	0	0	0	0	0
Total, 1933	145	98	26	40	57	12	11	8,086	43	125	2,794	298	304	932	306	308
Total, 1932	225	244	12	57	90	14	9	13,979	52	134	1,573	202	204	880	209	222
Fourteenth district:																
Seattle, Wash.	483	456	104	27	47	20	11	0	0	0	0	0	0	0	0	0
Outside	0	0	0	38	39	7	4	0	0	0	0	0	0	0	0	0
Total, 1933	483	456	104	65	86	27	15	0	0	0	0	0	0	0	0	0
Total, 1932	610	1,078	162	164	153	32	51	0	0	0	0	0	0	0	0	0
Fifteenth district:																
Denver, Colo.	0	0	0	18	19	0	6	0	0	0	0	0	0	0	0	0
Outside	0	0	0	8	29	5	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	0	0	26	48	5	6	0	0	0	0	0	0	0	0	0
Total, 1932	0	0	0	28	78	29	3	228	3	14	147	12	14	3	0	0
Sixteenth district:																
St. Paul, Minn.	0	0	0	17	3	0	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	32	50	10	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	0	0	49	53	10	0	0	0	0	0	0	0	0	0	0
Total, 1932	0	2	2	65	96	49	6	1,132	2	4	3	0	0	11	5	5
Seventeenth district:																
Kansas City, Mo.	0	0	0	17	18	0	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	24	69	2	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	0	0	41	87	2	0	0	0	0	0	0	0	0	0	0
Total, 1932	0	0	0	45	104	10	0	0	0	0	0	0	0	0	0	0

Eighteenth district:																
Chicago, Ill.	60	60	12	42	28	6	4	[3] 1,039	15	30	185	5	5	3	0	0
Outside	16	98	23	46	106	4	0	0	0	0	0	0	0	0	0	0
Total, 1933	76	158	35	88	134	10	4	1,039	15	30	185	5	5	3	0	0
Total, 1932	147	429	23	151	225	38	36	5,728	36	67	513	20	26	31	1	1
Nineteenth district:																
Detroit, Mich.	286	7	8	38	33	6	0	[3] 2,328	28	72	622	40	49	103	34	36
Outside	0	30	14	68	78	17	2	0	0	0	0	0	0	0	0	0
Total, 1933	286	37	22	106	111	23	2	2,328	28	72	622	40	49	103	34	36
Total, 1932	315	17	15	138	162	56	15	4,479	33	49	277	38	55	249	86	89
Twentieth district:																
Buffalo, N.Y.	116	72	3	20	38	12	10	0	0	0	0	0	0	0	0	0
Outside	0	0	0	14	33	2	0	0	0	0	0	0	0	0	0	0
Total, 1933	116	72	3	34	71	14	10	0	0	0	0	0	0	0	0	0
Total, 1932	98	81	6	43	106	30	6	0	0	0	0	0	0	0	0	0
Grand Island, Nebr.:																
Total, 1933	0	0	0	0	0	0	0	14,585	120	258	10,625	1,136	1,260	7,062	1,161	1,226
Total, 1932	0	0	0	0	0	0	0	8,718	102	144	8,714	1,078	1,165	10,752	1,803	1,992
Summary by districts:																
First	790	248	172	18	44	24	0	4,076	21	39	3,213	823	903	458	182	196
Second	3,414	395	333	51	193	95	6	0	0	0	0	0	0	0	0	0
Third	296	100	39	14	54	41	1	0	0	0	0	0	0	0	0	0
Fourth	347	188	69	12	31	10	0	2,447	92	229	1,460	213	292	380	168	171
Fifth	435	80	54	3	47	15	0	0	0	0	0	0	0	0	0	0
Sixth	0	0	0	31	48	9	25	3,397	33	78	446	24	25	57	8	7
Seventh	153	15	0	35	18	24	22	0	0	0	0	0	0	0	0	0
Eighth	395	153	100	24	48	24	5	1,341	22	40	184	26	27	27	5	5
Ninth	23	89	89	11	14	6	3	0	0	0	0	0	0	0	0	0
Tenth	0	0	0	26	64	7	0	0	0	0	0	0	0	0	0	0
Eleventh	604	284	61	39	60	36	0	2,937	25	70	1,219	184	208	194	57	57
Twelfth	895	403	289	70	61	24	17	3,172	10	25	1,187	118	126	234	84	92
Thirteenth	145	98	26	40	57	12	11	8,086	43	125	2,794	298	304	932	306	306
Fourteenth	483	456	104	65	86	27	15	0	0	0	0	0	0	0	0	0
Fifteenth	0	0	0	26	48	5	6	0	0	0	0	0	0	0	0	0
Sixteenth	0	0	0	49	53	10	0	0	0	0	0	0	0	0	0	0
Seventeenth	0	0	0	41	87	2	0	0	0	0	0	0	0	0	0	0
Eighteenth	76	158	35	88	134	10	4	1,039	15	30	185	5	5	3	0	0
Nineteenth	286	37	22	106	111	23	2	2,328	28	72	622	40	49	103	34	36
Twentieth	116	72	3	34	71	14	10	0	0	0	0	0	0	0	0	0
Grand Island	0	0	0	0	0	0	0	14,585	120	258	10,625	1,136	1,260	7,062	1,161	1,226
Grand total, 1933	8,458	2,776	1,396	783	1,329	418	127	43,408	409	906	21,935	2,867	3,199	9,450	2,005	2,098
Grand total, 1932	11,125	3,352	1,275	1,181	1,993	696	166	66,895	491	951	17,738	2,138	2,377	12,978	2,398	2,625

[3] Measurements discontinued during year.

Place of examination (city or town)	Operators examined											Operators licensed										
	Commercial								Amateur			Commercial								Amateur		
	Extra first telegraph	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone [1]	Aeronautical	Extra first	First	Unlimited phone [1]	Extra first telegraph	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone [1]	Aeronautical	Extra first	First	Temporary
First district:																						
Boston, Mass	0	34	217	14	93	20	52	6	8	1,002	105	2	131	165	10	72	6	54	6	47	2,156	168
Outside	0	0	0	0	0	0	0	0	13	853	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	34	217	14	93	20	52	6	21	1,855	105	2	131	165	10	72	6	54	6	47	2,156	168
Total, 1932	0	96	352	6	88	23	0	1	20	832	0	1	181	208	3	67	27	0	1	21	1,214	951
Second district:																						
New York, N.Y	0	58	151	23	116	37	31	30	19	1,559	142	3	343	216	15	114	24	50	0	30	1,944	45
Outside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	58	151	23	116	37	31	30	19	1,559	142	3	343	216	15	114	24	50	0	30	1,944	45
Total, 1932	2	155	289	13	80	34	0	10	25	1,211	0	10	502	333	6	64	34	0	5	26	1,511	167
Third district:																						
Philadelphia, Pa	0	19	35	4	65	6	29	1	8	484	39	1	64	70	4	57	5	28	1	15	755	0
Outside	0	0	4	3	8	1	3	1	4	266	20	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	19	39	7	73	7	32	2	12	750	59	1	64	70	4	57	5	28	1	15	755	0
Total, 1932	0	16	117	6	32	0	0	1	10	468	0	0	77	104	1	22	0	0	0	7	370	0
Fourth district:																						
Baltimore, Md	0	0	28	0	22	14	0	2	8	133	10	0	76	37	0	16	11	0	0	4	282	17
Outside	0	5	5	1	17	5	23	0	2	160	14	2	24	12	1	20	8	23	0	2	92	0
Total, 1933	0	5	33	1	39	19	23	2	10	293	24	2	100	49	1	36	19	23	0	6	374	17
Total, 1932	1	21	61	3	36	35	0	3	6	323	0	0	110	91	0	32	33	0	2	20	650	224
Fifth district:																						
Norfolk, Va	0	1	8	3	6	1	0	2	4	80	12	1	25	20	2	22	1	1	1	10	317	19
Outside	0	0	0	0	18	2	1	0	11	304	32	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	1	8	3	24	3	1	2	15	384	44	1	25	20	2	22	1	1	1	10	317	19
Total, 1932	1	8	19	1	8	0	0	3	2	87	0	0	41	24	0	8	0	0	0	2	72	0

Sixth district:																						
Atlanta, Ga	0	1	10	8	45	28	21	1	4	190	4	1	25	50	9	98	17	23	4	21	633	81
Outside	0	4	25	7	44	8	1	0	19	504	31	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	5	35	15	89	36	22	1	23	703	35	1	25	50	9	98	17	23	4	21	633	81
Total, 1932	0	8	70	3	63	27	0	86	15	368	0	0	48	99	3	52	31	0	26	7	260	828
Seventh district:																						
Miami, Fla	0	6	33	7	6	9	9	1	1	66	9	0	46	52	4	9	4	6	0	8	182	12
Outside	0	8	10	2	15	3	0	0	7	81	19	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	14	43	9	21	12	9	1	8	147	28	0	46	52	4	9	4	6	0	8	182	12
Total, 1932	0	8	21	16	0	0	0	3	2	54	0	0	32	27	11	0	0	0	0	2	45	0
Eighth district:																						
New Orleans, La	0	13	50	0	38	9	11	0	10	86	11	4	137	101	4	83	6	11	2	28	413	321
Outside	0	0	17	6	65	4	0	0	20	306	24	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	13	67	6	103	13	11	0	30	392	35	4	137	101	4	83	6	11	2	28	413	321
Total, 1932	1	23	244	14	85	15	0	23	30	303	0	0	233	257	8	67	15	0	2	27	337	1,020
Ninth district:																						
Galveston, Tex	0	4	11	2	15	10	6	1	3	63	5	0	30	40	4	17	6	7	2	8	158	11
Outside	0	1	7	6	6	2	1	1	5	97	4	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	5	18	8	21	12	7	2	8	160	9	0	30	40	4	17	6	7	2	8	158	11
Total, 1932 [1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tenth district:																						
Dallas, Tex	0	3	63	4	97	44	6	17	8	195	6	0	22	90	5	102	40	33	21	30	574	152
Outside	0	0	22	1	37	16	0	2	32	429	60	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	3	85	5	134	60	6	19	40	624	66	0	22	90	5	102	40	33	21	30	574	152
Total, 1932	0	9	179	1	113	61	0	74	19	248	0	0	18	155	1	77	59	0	14	19	243	0
Eleventh district:																						
Los Angeles, Calif	0	20	105	9	123	20	59	42	21	899	81	2	101	155	5	105	9	76	23	34	1,254	65
Outside	0	3	9	4	15	2	2	3	7	218	26	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	23	114	13	138	22	61	45	28	1,117	107	2	101	155	5	105	9	76	23	34	1,254	65
Total, 1932	0	60	183	6	66	29	0	11	15	707	0	0	124	159	4	37	44	0	0	17	736	0
Twelfth district:																						
San Francisco, Calif	1	44	99	19	55	14	57	72	11	702	63	4	192	145	12	49	14	81	66	22	1,286	152
Outside	0	3	0	1	15	1	7	18	5	222	7	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	1	47	99	20	70	15	64	90	16	924	70	4	192	145	12	49	14	81	66	22	1,286	152
Total, 1932	1	106	225	26	78	72	0	9	29	778	0	5	325	224	20	54	97	0	11	34	1,195	394

[1] Established in 1933.

Place of examination (city or town)	Operators examined											Operators licensed										
	Commercial								Amateur			Commercial								Amateur		
	Extra first telegraph	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone	Aeronautical	Extra first	First	Unlimited phone	Extra first telegraph	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone	Aeronautical	Extra first	First	Temporary
Thirteenth district:																						
Portland, Oreg.	1	4	50	4	38	25	4	0	10	222	38	0	31	57	1	41	22	16	3	17	347	79
Outside	0	0	1	2	7	1	0	1	12	131	17	0	0	0	0	0	0	0	0	0	0	0
Total 1933	1	4	51	6	45	26	4	1	22	353	55	0	31	57	1	41	22	16	3	17	347	79
Total 1932	1	17	75	3	29	9	0	3	1	198	0	0	44	58	2	18	9	0	3	2	184	0
Fourteenth district:																						
Seattle, Wash.	0	23	45	23	29	15	39	0	11	312	39	0	76	90	13	48	26	58	0	25	787	213
Outside	0	3	12	4	18	15	5	0	9	445	64	0	0	0	0	0	0	0	0	0	0	0
Total 1933	0	26	57	27	47	30	44	0	20	757	103	0	76	90	13	48	26	58	0	25	787	213
Total 1932	0	34	114	8	33	29	0	6	26	498	0	0	129	131	3	41	28	0	4	23	587	617
Fifteenth district:																						
Denver, Colo.	0	0	6	2	22	7	17	10	4	157	10	0	9	16	1	42	13	29	18	5	256	79
Outside	0	0	4	1	19	14	4	9	0	144	13	0	0	0	0	0	0	0	0	0	0	0
Total 1933	0	0	10	3	41	21	21	19	4	301	23	0	9	16	1	42	13	29	18	5	256	79
Total 1932	0	2	16	1	24	25	0	7	2	106	0	0	8	19	0	32	31	0	0	2	108	0
Sixteenth district:																						
St. Paul, Minn.	0	2	6	0	30	8	8	12	6	262	35	0	12	26	0	46	11	9	0	14	409	57
Outside	0	2	1	0	4	0	1	0	10	239	23	0	0	0	0	0	0	0	0	0	0	0
Total 1933	0	4	7	0	34	8	9	12	16	501	58	0	12	26	0	46	11	9	0	14	409	57
Total 1932	0	8	25	0	35	19	0	8	12	269	0	0	12	24	0	14	19	0	4	7	132	0
Seventeenth district:																						
Kansas City, Mo.	0	0	11	6	93	33	31	26	13	241	22	0	19	66	2	112	34	39	14	40	942	167
Outside	0	0	7	0	49	21	2	5	30	702	68	0	0	0	0	0	0	0	0	0	0	0
Total 1933	0	0	18	6	142	54	33	31	43	943	90	0	19	66	2	112	34	39	14	40	942	167
Total 1932	0	4	92	11	95	22	0	12	21	443	0	0	27	57	3	43	36	0	5	17	411	0

Eighteenth district:																					
Chicago, Ill	0	18	127	15	273	104	96	42	23	1,017	91	1	51	171	5	176	82	141	16	46	2,146	628
Outside	0	1	16	3	29	2	5	2	31	891	81	0	2	2	0	4	0	1	0	1	42	0
Total 1933	0	19	143	18	302	106	101	44	54	1,908	172	1	53	173	5	180	82	142	16	47	2,188	628
Total 1932	0	38	405	17	228	79	0	222	53	1,346	0	0	84	421	6	140	109	0	14	59	1,967	2,106
Nineteenth district:																					
Detroit, Mich	0	5	46	11	76	17	51	13	7	438	23	0	51	147	12	175	45	90	0	70	1,796	585
Outside	0	18	75	11	106	26	16	6	55	2,004	119	0	0	0	0	0	0	0	0	0	0	0
Total 1933	0	23	121	22	182	43	67	19	62	2,442	142	0	51	147	12	175	45	90	0	70	1,796	585
Total 1932	0	35	218	19	169	79	0	24	31	1,256	0	0	75	179	15	105	76	0	8	32	1,210	2,127
Twentieth district:																					
Buffalo, N.Y	0	3	32	3	36	4	4	4	4	248	26	0	14	63	1	53	6	7	6	22	851	78
Outside	0	2	26	0	29	6	4	1	10	675	55	0	0	0	0	0	0	0	0	0	0	0
Total 1933	0	5	58	3	65	10	8	5	14	923	81	0	14	63	1	53	6	7	6	22	851	78
Total 1932	0	4	51	2	44	0	0	4	15	486	0	0	18	45	1	29	0	0	0	9	454	203
Summary by districts:																					
First	0	34	217	14	93	20	52	6	21	1,855	105	2	131	165	10	72	6	54	6	47	2,156	168
Second	0	58	151	23	116	37	31	30	19	1,559	142	3	343	216	15	114	24	50	0	30	1,944	45
Third	0	19	39	7	73	7	32	2	12	750	59	1	64	70	4	57	5	28	1	15	755	0
Fourth	0	5	33	1	39	19	23	2	10	293	24	2	100	49	1	36	19	23	0	6	374	17
Fifth	0	1	8	3	24	3	1	2	15	384	44	1	25	20	2	22	1	1	1	10	317	19
Sixth	0	5	35	15	89	36	22	1	23	703	35	1	25	50	9	98	17	23	4	21	633	81
Seventh	0	14	43	9	21	12	9	1	8	147	28	0	46	52	4	9	4	6	0	8	182	12
Eighth	0	13	67	6	103	13	11	0	30	392	35	4	137	101	4	83	6	11	2	28	413	321
Ninth [1]	0	5	18	8	21	12	7	2	8	160	9	0	30	40	4	17	6	7	2	8	158	11
Tenth	0	3	85	5	134	60	6	19	40	624	66	0	22	90	5	102	40	33	21	30	574	152
Eleventh	0	23	114	13	138	22	61	45	28	1,117	107	2	101	155	5	105	9	76	23	34	1,254	65
Twelfth	1	47	99	20	70	15	64	90	16	924	70	4	192	145	12	49	14	81	66	22	1,286	152
Thirteenth	1	4	51	6	45	26	4	1	22	353	55	0	31	57	1	41	22	16	3	17	347	79
Fourteenth	0	26	57	27	47	30	44	0	20	757	103	0	76	90	13	48	26	58	0	25	787	213
Fifteenth	0	0	10	3	41	21	21	19	4	301	23	0	9	16	1	42	13	29	18	5	256	79
Sixteenth	0	4	7	0	34	8	9	12	16	501	58	0	12	26	0	46	11	9	0	14	409	57
Seventeenth	0	0	18	6	142	54	33	31	43	943	90	0	19	66	2	112	34	39	14	40	942	167
Eighteenth	0	19	143	18	302	106	101	44	54	1,908	172	1	53	173	5	180	82	142	16	47	2,188	628
Nineteenth	0	23	121	22	182	43	67	19	62	2,442	142	0	51	147	12	175	45	90	0	70	1,796	585
Twentieth	0	5	58	3	65	10	8	5	14	923	81	0	14	63	1	53	6	7	6	22	851	78
Grand total, 1933	2	308	1,374	209	1,779	554	606	331	465	17,036	1,448	21	1,481	1,791	110	1,461	390	783	183	499	17,622	2,929
Grand total, 1932	7	653	2,756	156	1,306	561	000	510	334	9,981	0	16	2,088	2,615	87	902	648	0	99	333	11,686	8,637

[1] Office established in 1933.

DETAILED WORK

The following statement shows the details of the work performed during the past fiscal year compared with 1932:

Work of service	1932	1933
Clearances of American and foreign vessels required by law to be equipped with radio	14,708	13,521
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	11,125	8,458
Inspections of radio equipment on voluntarily equipped vessels	3,352	2,776
American ship radio stations inspected for license	1,275	1,396
Land stations inspected	1,184	783
Broadcasting stations inspected	1,193	1,329
Aircraft stations inspected	166	127
Amateur stations inspected	696	418
Frequency measurements of American and foreign stations	97,611	74,793
Commercial operators examined	5,949	5,163
Commercial operators licensed	6,555	6,220
Amateur operators examined	10,315	18,949
Amateur operators licensed	20,656	21,050
Defects found upon inspection of ship radio stations where clearance would have been in violation of law	265	310
Inspections of automatic alarm signal devices on foreign vessels entering American ports	708	397
False alarms recorded [1]	599	237

[1] According to information furnished our inspectors only 2 actual distress alarms recorded during past year.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past 2 years:

Class	1932	1933
Commercial:		
Extra first telegraph	16	21
First telegraph	2,088	1,481
Second telegraph	2,615	1,791
Third telegraph	87	110
First telephone	902	1,461
Second telephone	648	390
Third telephone [1]	0	783
Aeronautical	99	183
Amateur:		
Extra first	333	499
First	11,686	17,622
Temporary	8,637	2,929
Total	27,111	27,270

[1] New class established 1933.

The following table shows the inspection and licensing work performed yearly from 1923 to 1933, inclusive, and the number of persons employed in the field force:

June 30—	American vessels equipped with radio	Inspections of American and foreign vessels		Frequency measurements of American and foreign stations	Licenses issued		Total field force
		Voluntary equipment	Compulsory equipment		Commercial operators	Amateur operators	
1923	2,723	1,124	6,933	----------	2,860	9,908	53
1924	2,741	1,577	7,727	----------	3,370	9,545	53
1925	1,901	1,339	8,603	----------	3,215	8,293	62
1926	1,954	1,583	9,197	----------	3,398	8,140	65
1927	2,092	1,405	9,330	----------	3,463	7,275	63
1928	2,166	1,659	9,093	----------	3,816	8,369	78
1929	2,213	2,520	10,715	22,450	3,798	9,490	95
1930	2,173	3,026	11,334	45,695	5,255	11,541	131
1931	2,261	3,719	11,433	76,447	5,506	15,197	140
1932	2,160	3,352	11,125	97,611	6,555	20,656	159
1933	2,000	2,776	8,458	74,793	6,220	21,050	117

The following table gives information not heretofore tabulated and as totaled from the annual reports of all field offices for the fiscal year 1933:

Number of field trips made by all district offices	399
Number of miles traveled	174, 166
Number of pieces of mail received	[1] [2] 203, 697
Number of pieces of mail sent out	[1] [2] 223, 093
Number of complaints received	[1] [2] 2, 368
Number of complaints on hand at end of fiscal year	249
Unlicensed broadcast station investigations	92
Investigations of other classes of unlicensed stations	52
Economies effected other than salary cuts and personnel decreases	[2] $16, 564. 69

[1] Contains some estimated figures.
[2] Incomplete, not all offices reporting.

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