

SIXTH ANNUAL REPORT
of the
FEDERAL RADIO COMMISSION

to the
CONGRESS OF THE UNITED STATES

For the Fiscal Year
1932



COMMISSIONERS

C. McK. SALTEMAN, *Chairman*
EUGENE O. BYKER, *Vice Chairman*
THAD H. BROWN **HAROLD A. LAFOUNT**
WILLIAM D. L. STARBUCK

JAMES W. BALDWIN, *Secretary*



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1932

TABLE OF CONTENTS

	Page
I. Introduction.....	1
II. Report of the Secretary.....	5
A. Financial statement.....	5
B. License division.....	6
III. Legal division.....	11
A. Administrative section.....	11
B. Hearing section.....	16
C. Research and drafting section.....	17
IV. Engineering division.....	25
A. Broadcast section.....	25
1. Allocation of broadcast facilities.....	25
2. Technical improvements in broadcasting.....	28
3. Development in empirical standards for allocation of frequencies to broadcast stations.....	30
4. Location of transmitters of broadcast stations.....	30
B. Commercial communications section.....	36
1. Aviation.....	37
2. Fixed service.....	37
3. Maritime.....	39
4. Police.....	40
5. Experimental visual broadcasting.....	42
6. General and special experimental service.....	43
7. Temporary service.....	43
8. Amateur.....	44
C. International and interdepartmental relations section.....	46
1. International Technical Consulting Committee on Radio Communications.....	46
2. International Radio Conference.....	46
3. North American Broadcasting.....	47
4. Interdepartmental.....	47
V. Examiners division.....	49

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, 1933.
Third zone.....	Eugene O. Sykes.....	February 23, 1933.
Fourth zone.....	Charles McK. Saltzman ¹	February 23, 1934.
Fifth zone.....	Harold A. Lafont.....	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 10, 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.....	\$359,060.00
02 Supplies and materials.....	4,710.42
05 Communications.....	2,493.78
06 Travel expenses.....	4,511.44
07 Local transportation.....	10.51
08 Printing and binding.....	80,501.88
11 Rents.....	45,209.00
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	0
Amateur:			
Amateur.....	12,523	2,578	30,374
Aviation:			
Aircraft.....	177	112	385
Aeronautical.....			121
Aeronautical point-to-point.....	92	41	99
Airport.....			21
Broadcast:			
Broadcast.....	8	14	601
Emergency:			
Municipal police.....	11	1	75
State police.....			13
Marine fire.....	1	0	8
Special emergency.....	2	0	24
Experimental:			
General experimental.....	20	25	118
Special experimental.....	24	21	31
Experimental relay broadcasting.....	1	2	13
Experimental visual broadcasting.....	12	3	21
Fixed public:			
Point-to-point telegraph.....			1,355
Point-to-point telephone.....	223	61	1,727
Fixed public press:			
Point-to-point telegraph.....	0	0	41
Geophysical:			
Geophysical.....	8	0	116
Marine relay:			
Marine relay.....	11	4	43
Mobile press:			
Mobile press.....	0	0	3
Public coastal:			
Coastal telegraph.....			120
Coastal telephone.....			2
Coastal harbor.....			32
Private coastal:			
Coastal telegraph.....	38	20	7
Coastal harbor.....			1
Ships:			
Ships.....	30	262	2,011
Temporary:			
Broadcast pick-up.....	20	5	21
Motion picture.....	1	0	8
Portable (forestry).....	0	0	2
Total.....	18,256	3,189	34,741

¹ Separate call letters assigned to each international frequency Feb. 1, 1932 in accordance with Opinion No. 30 of the C. O. I. B.

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.....	17,824, approximately	52 per cent.
Modifications.....	8,176, approximately	10 per cent.
	<u>38,522</u>	<u>100 per cent.</u>

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, 1932
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. 18.	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. 23) Nov. 20, 1931. On motion of appellant dismissed by District Court of Appeals Apr. 30, 1932.) See also p. 24.	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. 10, 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. Braby, Long Island City, N. Y. (Application for renewal of license denied. (Decision May 22, 1931.) Decision affirmed by District Court of Appeals June 8, 1932.) See also page 21.	June 25, 1932
WMAK	Buffalo Broadcasting Corporation, Buffalo, N. Y. (Application for renewal of license denied. (Decision Dec. 15, 1931.) Violation of G. O. 11.)	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	Shertenburg & 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
KIOA	W. E. Whitmore, Clovis, N. Mex.	KMcycles 1,370	Watts 100	Shares with KQPL.
KIDW	The Southwest Broadcasting Co., Lamar, Colo.	1,420	100	
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.
WHEP	J. Niles Boyd Wholesale Grocery Co. J. O. Ashworth and J. R. Smithson, d/b as Attala Milling & Produce Co., Kosciusko, Miss.	1,600	100 250 L. S.	Unlimited.
WJED	Thirty-first Street Baptist Church, Morris H. Coers, pastor, Indianapolis, Ind.	600	250	Daytime.
WMA8	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 ship¹: Name of station, call sign, type of emission, fre-

¹Original 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).....	} Mar. 1.
(13) Mobile press.....	
(14) Aeronautical.....	
(15) Aeronautical, point-to-point.....	} Apr. 1.
(16) Airport.....	
(17) Aircraft.....	} May 1.
(18) Municipal police.....	
(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 8 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 police 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	53	11	30	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		2				
Unauthorized change in equipment.....	1		1				
Total.....	4		4				
AMATEURS							
Obtaining station by fraud.....	3	1			2		
Interference with other services.....	24	5	11	2		3	2
Unauthorized removal.....	12	2		2		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	8	3	1	11	2	8
Unlicensed operator.....	53		2			2	49
Log not kept.....	1			1			
Total.....	159	28	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.

2. 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. Dankford, 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 Borro, Brooklyn, N. Y.—Defendants to be reindicted. Case will be heard at later date.

U. S. v. H. W. Willis, Jas. Leo Pekley, and Phillip 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. Gen. 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 Edna Zukoski.—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.....	123	40	3	6	25	4
October.....	161	58	1	23	23	2
November.....	146	47	5	18	20	0
December.....	88	31	2	7	20	2
January.....	79	29	0	4	14	2
February.....	69	13	2	5	5	6
March.....	71	34	3	12	15	2
April.....	76	33	0	12	22	3
May.....	71	58	3	12	40	2
June.....	72	28	1	7	16	1
Total.....	1,035	363	20	106	319	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..... 106

Total cases decided..... 163

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 BIKER CASE

(W. E. Biker (Station KFQU) v. Federal Radio Commission, 80 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) 484)

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. 5481. *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 (WMBE) 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.....	581	677	606	518	612	604
Total simultaneous operations at night.....	555	514	400	416	430	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.....	81	126	127	294
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	.6	1	1
Specified hours.....	2.13	2	14.07	14.17	18.86	18.64	35.06	34.91
Total.....	81.13	49.26	311.49	184.59	179.45	170.23	472.07	404.06

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	138.4
Limited time.....	12.90	4.51					12.9	4.51
Daytime.....	6.26	.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.....	131.23	106.73	88.20	72.32	20.41	17.08	239.93	196.06

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	+0.01	+0
Rhode Island.....	1.91	1.40	-.51	-27
District of Columbia.....	1.35	1.30	-.05	-4
New Hampshire.....	1.29	.92	-.37	-28
Vermont.....	1.00	.45	-.55	-55
Delaware.....	.87	.70	-.08	-9
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.....	4.95	4.95	-.01	-0
Total.....	80.00	71.69	-7.31	-9

ZONE 3

Texas.....	18.22	21.67	+3.45	+40
North Carolina.....	8.82	8.15	-.67	-8
Georgia.....	8.10	8.10	0	0
Alabama.....	7.27	6.22	-1.15	-16
Tennessee.....	7.29	12.83	+5.54	+76
Oklahoma.....	6.67	8.00	+1.33	+20
Louisiana.....	6.85	8.39	+1.54	+22
Mississippi.....	6.60	2.41	-4.19	-63
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	34.96	+12.44	+55
Missouri.....	10.71	11.73	+1.02	+10
Indiana.....	9.55	7.70	-1.85	-19
Wisconsin.....	8.67	7.86	-.81	-9
Minnesota.....	7.57	9.06	+1.49	+20
Iowa.....	7.80	11.50	+3.70	+48
Kansas.....	6.55	5.09	-1.46	-22
Nebraska.....	4.06	7.30	+3.24	+80
South Dakota.....	2.05	2.92	+0.87	+43
North Dakota.....	2.01	2.99	+0.98	+49
Total.....	80.00	100.63	+20.63	+26

ZONE 5

California.....	36.86	36.44	-.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	+0.16	+5
Utah.....	2.30	6.00	+3.70	+160
Idaho.....	2.89	3.00	+0.11	+4
Arizona.....	2.63	2.35	-.28	-11
New Mexico.....	2.75	4.03	+1.28	+47
Hawaii.....	2.39	1.84	-.55	-23
Wyoming.....	1.45	.60	-.85	-59
Nevada.....	.59	.80	+0.21	+36
Alaska.....	.38	.57	+0.19	+50
Total.....	80.00	93.81	+13.81	+17

SUMMARY

Zone 1.....	80.00	75.26	-4.74	-6
Zone 2.....	80.00	71.69	-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	430.01	+30.01	+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-

grassed 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 cannot 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
50 to 100 watts	5,000 to 50,000	Miles 0.3-0.4	1 1/4 to 2 miles	0.5%
50 to 100 watts	75,000 and up	.8-.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	1.5

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. 3, 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.

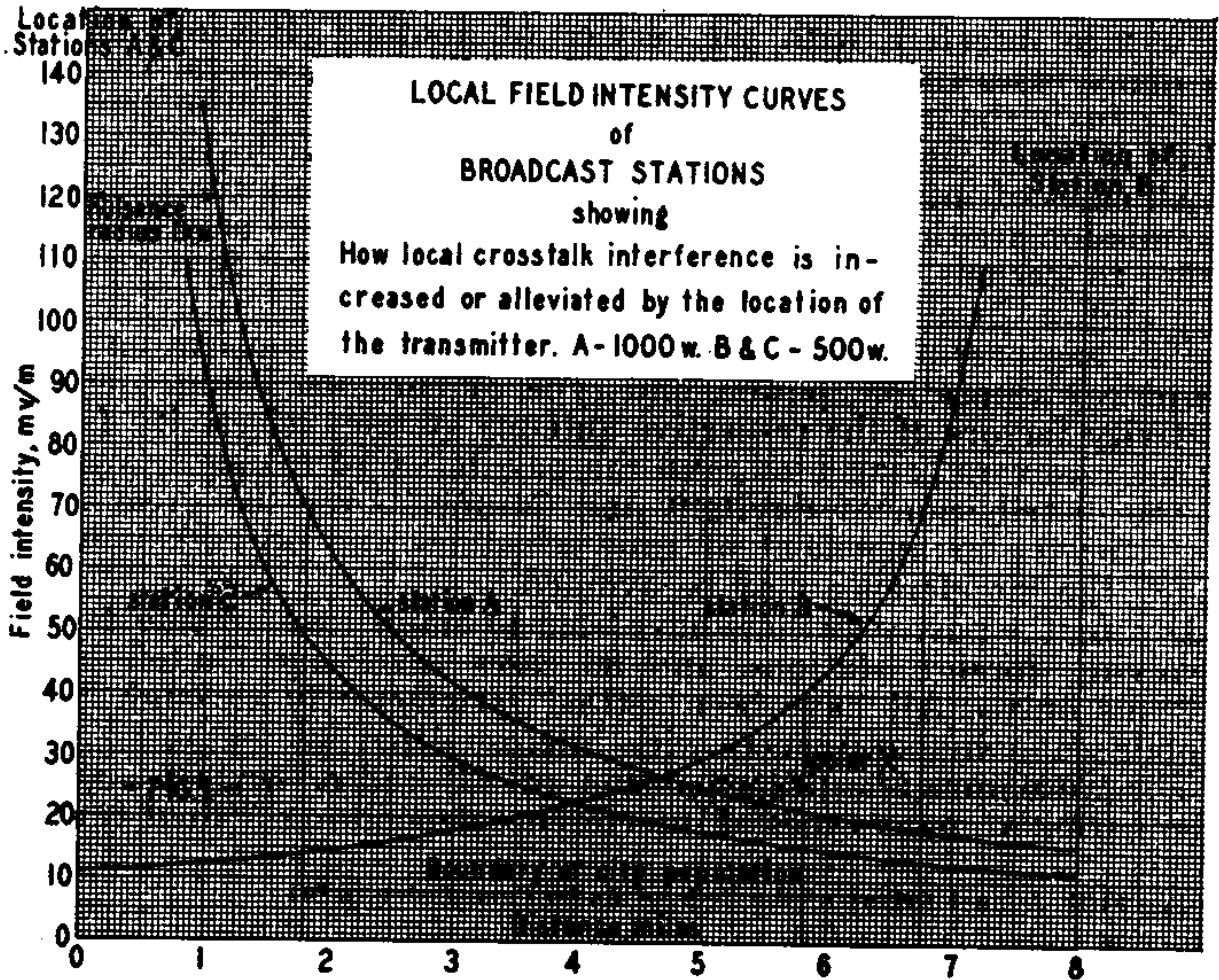
4. The field intensity at the outer limit of the blanket radius does not exceed 100 to 125 millivolts per meter.

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.

LOCAL FIELD INTENSITY CURVES
of
BROADCAST STATIONS
showing
How local crosstalk interference is in-
creased or alleviated by the location of
the transmitter. A - 1000w. B & C - 500w.



COMMERCIAL COMMUNICATIONS SECTION

GENERAL

The one-tenth per cent frequency separation plan¹ 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 assignments 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.

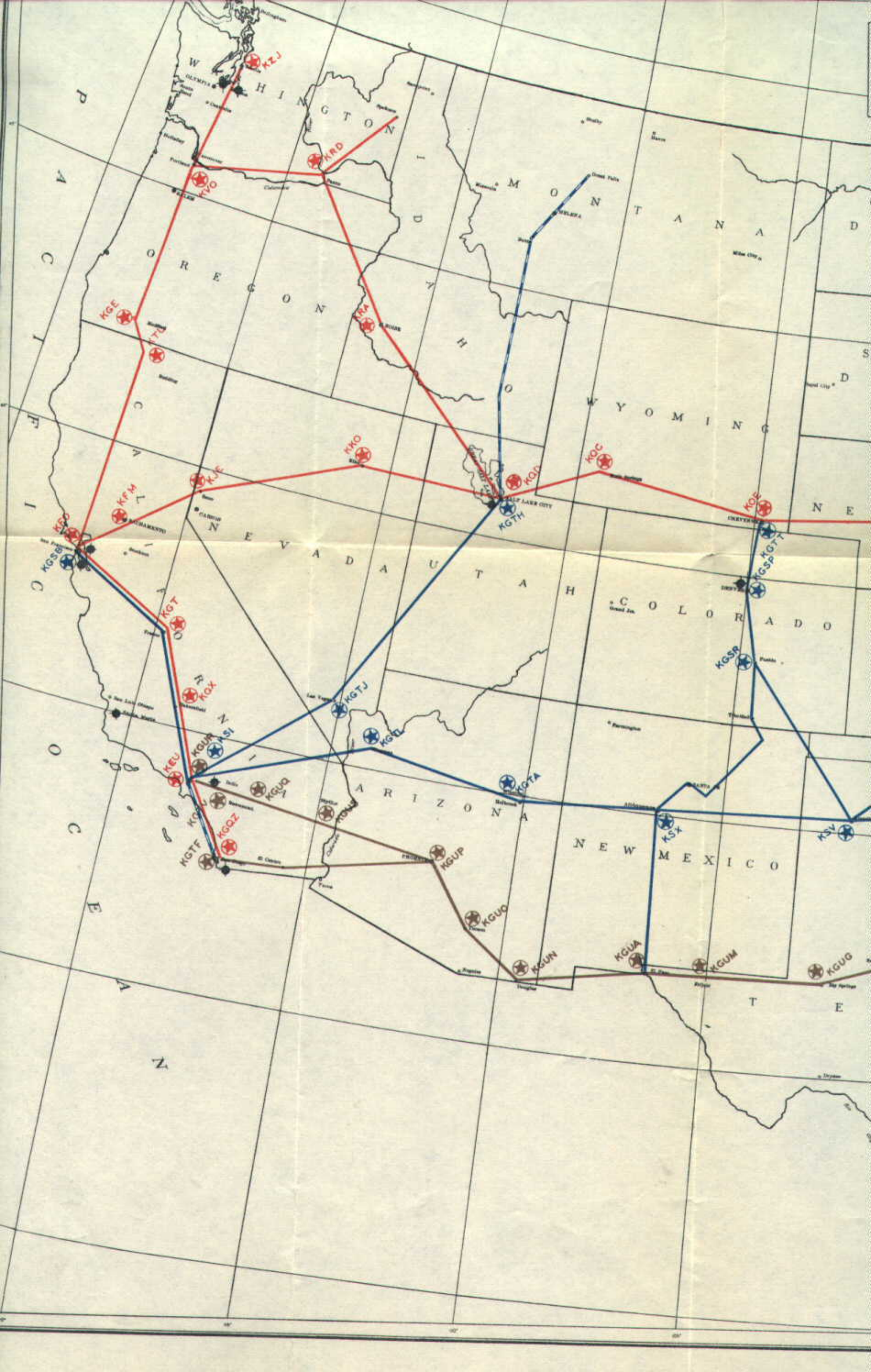
All cases of interference which are brought to the attention of the commission are thoroughly investigated. Interference may be caused either to stations in the United States, or by a United States station to a station in a foreign country.

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.

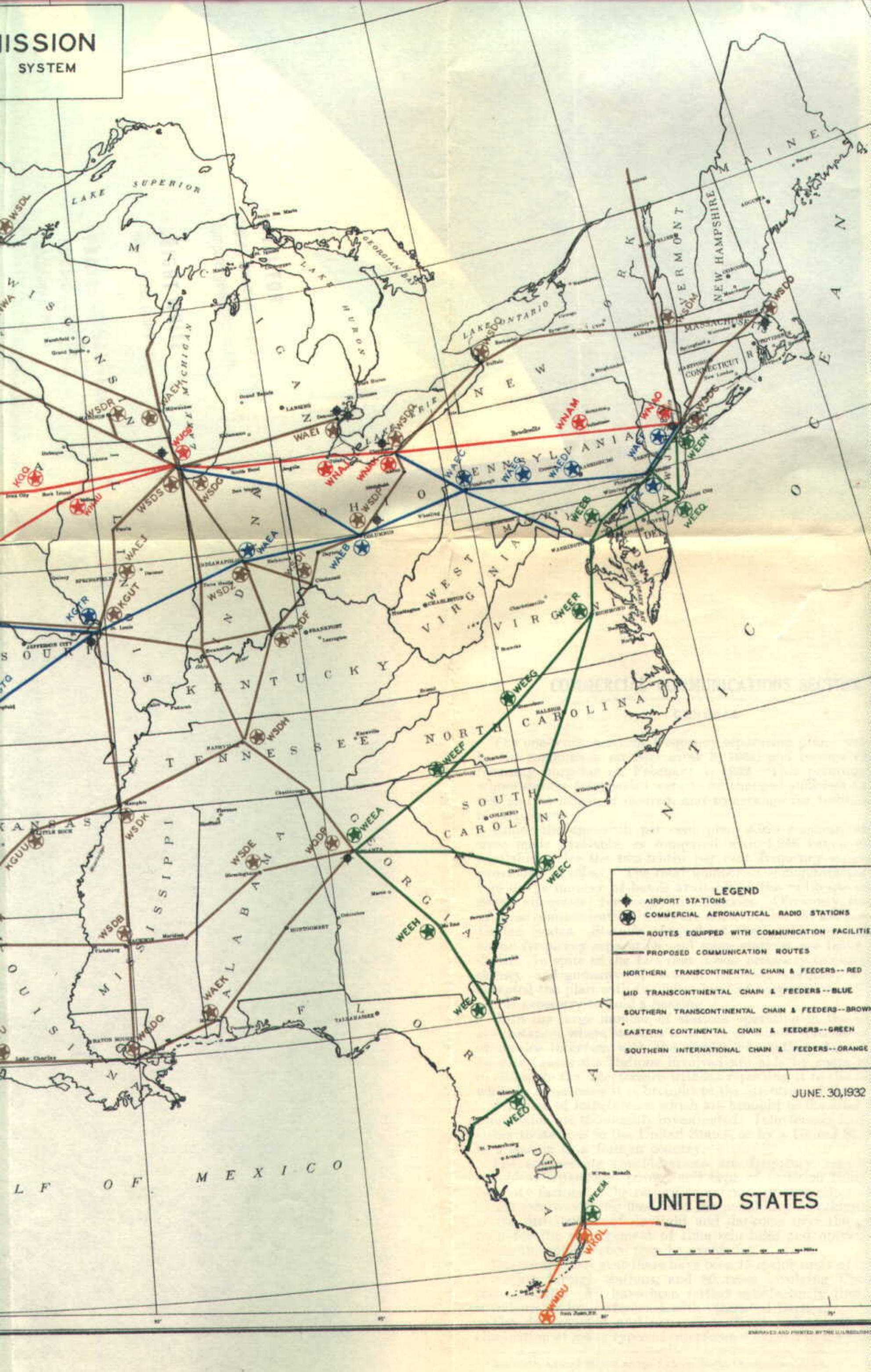
During the past year there have been 15 major cases of interference involving foreign stations, and 80 cases involving United States stations only. All have been settled satisfactorily through correspondence or by conferences with interested parties.

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.



MISSION SYSTEM



LEGEND

- ◆ AIRPORT STATIONS
- ⊙ COMMERCIAL AERONAUTICAL RADIO STATIONS
- ROUTES EQUIPPED WITH COMMUNICATION FACILITIES
- - - PROPOSED COMMUNICATION ROUTES
- NORTHERN TRANSCONTINENTAL CHAIN & FEEDERS--RED
- MID TRANSCONTINENTAL CHAIN & FEEDERS--BLUE
- SOUTHERN TRANSCONTINENTAL CHAIN & FEEDERS--BROWN
- EASTERN CONTINENTAL CHAIN & FEEDERS--GREEN
- SOUTHERN INTERNATIONAL CHAIN & FEEDERS--ORANGE

JUNE 30, 1932

UNITED STATES



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 28,000 kilocycles which was installed subsequent to September 8, 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 inter-island 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 *Deutschland* 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 ³	\$386,953.
Total number of automobiles equipped with radio receivers.....	2,265.
Total population served.....	82,585,000.
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.

³ Only about 60 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 8,000 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.

X 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-

Narcon 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 8,500 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 the 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
	<hr/>
	296
Cases reported during fiscal year.....	260
	<hr/>
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.