

# SEVENTH ANNUAL REPORT

of the

# FEDERAL RADIO COMMISSION

to the

CONGRESS OF THE UNITED STATES

For the Fiscal Year

1933



## COMMISSIONERS

EUGENE O. SYKES, *Chairman*

THAD H. BROWN, *Vice Chairman*

JAMES H. HANLEY

HAROLD A. LAFOUNT

WILLIAM D. L. STARBUCK

---

HERBERT L. PETTEY, *Secretary*



UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON : 1933

# TABLE OF CONTENTS

---

	Page
I. Introduction.....	1
II. Report of the Secretary.....	3
A. Financial statement.....	3
B. License division.....	3
III. Legal division.....	7
A. Administrative section.....	7
B. Hearing section.....	8
C. Research and drafting section.....	8
IV. Engineering division.....	18
A. Broadcast section.....	18
1. Allocation of broadcast facilities.....	18
2. Developments in empirical standards for broadcast allo- location.....	19
3. Modification in empirical standards previously published.....	19
4. Antenna and radiation standards.....	24
B. Commercial communications section.....	29
1. Fixed service.....	29
2. Maritime.....	29
3. Police.....	30
4. Aviation.....	30
5. Experimental visual broadcasting.....	31
6. Experimental service.....	31
C. International and interdepartmental relations section.....	33
1. Madrid conferences.....	33
V. Examiners' division.....	34
VI. Division of field operations.....	35
1. Field activities.....	36
2. Detailed work.....	44
3. Operators licensed.....	44

# SEVENTH ANNUAL REPORT OF THE FEDERAL RADIO COMMISSION

FEDERAL RADIO COMMISSION,  
Washington, D.C., January 3, 1934.

To the Senate and House of Representatives of the United States of America in Congress assembled:

Herewith is submitted the Seventh Annual Report of the Federal Radio Commission covering the fiscal year ended June 30, 1933.

## PERSONNEL

On February 23, 1933, the term of Commissioner Eugene O. Sykes expired. He was reappointed on March 20, 1933. On April 1, 1933, James H. Hanley was appointed as a commissioner to succeed C. McK. Saltzman, resigned.

The personnel of the Commission is now as follows:

	Commissioner	Term expires
First zone.....	W. D. L. Starbuck.....	Feb. 23, 1934
Second zone.....	Thad H. Brown.....	Feb. 23, 1938
Third zone.....	Eugene O. Sykes.....	Feb. 23, 1939
Fourth zone.....	James H. Hanley.....	Feb. 23, 1936
Fifth zone.....	Harold A. Lafount.....	Feb. 23, 1935

and at the close of the fiscal year the staff included 237 employees, all of whom have a civil-service status except the secretary, the attorneys of the legal and examiners division.

## ORGANIZATION

Pursuant to the provisions of Public Law No. 212, Seventy-second Congress, approved June 30, 1932, and Executive Order 5892 issued July 20, 1932, the Radio Division of the Department of Commerce was transferred to the Federal Radio Commission. There was created a Division of Field Operations charged with the following duties: To inspect all transmitting apparatus to ascertain whether in construction and operation it conforms to the requirements of the Radio Act of 1927 as amended; the rules and regulations of the licensing authority, and the license under which it is constructed or operated; to make measurements of frequencies and to make field intensity measurements when required; to maintain records incident to the monitoring of radio stations; to conduct examinations for applicants for operators' licenses; to investigate and report to the Commission facts concerning alleged violations by station operators of such laws, treaties, and regulations as might result in the suspension of their licenses; to report to the Commission from time to time any violations of the Radio Act of 1927, the rules and regulations

or orders of the Commission or of the terms and conditions of any license; and to perform such other duties as may hereinafter be assigned. The continental United States was divided into 20 radio districts and certain personnel transfers were effected in order that the work in each office might be properly handled. There was also created an accounts and audit section to handle all matters pertaining to the settlement of international accounts except disbursements, audit travel and expense vouchers, and to perform all necessary accounting work.

#### VOLUME OF WORK

There has been a steady increase in the volume of business conducted by the Commission. During the fiscal year there were more than 41,000 formal matters requiring Commission action. The Commission held 111 formal meetings and sat en banc to hear the proceedings on 118 applications. In addition to this the Commission is called upon to prepare for international radio conferences. Four of the Commission's staff participated in the International Radio Conference in Madrid and preparations were started in connection with the North and Central American Regional Conference to be held in Mexico City.

E. O. SYKES, *Chairman.*

# REPORT OF THE SECRETARY

HERBERT L. PETTEY

For the fiscal year ending June 30, 1933, there was appropriated \$872,000. This sum is accounted for as follows:

## SALARIES AND EXPENSES

01 Personal services.....	\$724,300
02 Supplies and materials.....	12,000
0236 Gasoline and oil.....	611
04 Storage and care of vehicles.....	2,578
05 Communication service.....	7,706
06 Travel expenses.....	15,600
0610 Car fare.....	1,953
07 Transportation of things.....	940
082 Stenographic reporting.....	15,752
10 Heat, light, power, and water.....	3,182
11 Rents.....	17,683
12 Repairs and alterations.....	709
13 Special and miscellaneous.....	453
30 Equipment.....	12,259
Unobligated balance.....	40,274
Total.....	<u>856,000</u>

## PRINTING AND BINDING

02 Printed forms and letterheads.....	\$1,350
08 Printing and binding.....	7,496
Balance.....	7,154
Total.....	<u>16,000</u>

Detailed information on the work of the office of the secretary is given in all of the following reports made by chiefs of divisions.

## LICENSE DIVISION

WM. P. MASSING, *Chief of Division*

Although several changes in personnel of the License Division occurred during the past fiscal year, the basic organization remained the same. This division is charged with the receipt of all applications for radio facilities, the administrative examination thereof, the maintenance of records showing the Commission's action thereon, and the issuance of authorizations in conformity therewith.

There follows a detailed report arranged according to service, showing the number of new stations authorized, the number of stations deleted, and the total number of authorized radio stations as of June 30, 1933.

Nature of service and class of station	New stations authorized	Stations deleted	Total number of stations June 30, 1933
Agriculture: Point-to-point telegraph.....	0	0	0
Amateur: Amateur.....	14,796	4,720	41,565
Aviation:			
Aeronautical.....			130
Aeronautical point-to-point.....	21	32	31
Airport.....			30
Aircraft.....	158	80	434
Broadcast: Broadcast.....	15	22	509
Emergency:			
Police, municipal.....	39	6	111
Police, State.....	1	3	12
Marine fire.....	0	3	3
Special emergency.....	4	2	25
Experimental:			
General experimental.....	169	82	208
Special experimental.....			47
Experimental relay broadcasting.....	0	0	12
Experimental visual broadcasting.....	5	10	26
Fixed public:			
Point-to-point telegraph.....	40	40	347
Point-to-point telephone.....			79
Fixed public press: Point-to-point telegraph.....	70	10	100
Geophysical: Geophysical.....	8	17	107
Marine relay: Marine relay.....	3	4	42
Mobile press: Mobile press.....	0	0	3
Public coastal:			
Coastal telegraph.....			112
Coastal telephone.....	6	14	2
Coastal harbor.....			32
Private coastal:			
Coastal telegraph.....	0	0	6
Coastal harbor.....	0	0	1
Ships: Ships.....	84	98	1,997
Temporary:			
Broadcast pick-up.....	17	3	30
Forestry.....	0	2	0
Motion picture.....	1	5	2
Total.....	15,437	5,159	46,114

### AMATEUR SECTION

The work of the amateur section was materially increased during the past fiscal year as a result of the consolidation of the Radio Division with the Radio Commission and the subsequent reorganization of the field force.

In addition to an increase of more than 36 percent in the total number of licensed amateur stations, new duties were added which necessitated many changes in the routine of amateur licensing.

New duties assumed included (1) control and assignment of amateur-station call letters, (2) maintenance of a complete record of all licensed amateur operators, which number exceeded 30,000 on June 30, 1933, and (3) the complete review of amateur applications including substantial related correspondence.

There were received in the section during the past year 35,250 applications and 27,966 licenses were granted. Of the licenses granted, 14,796 were for new stations, 8,999 renewals of existing licenses, and 4,171 for modifications of licenses. Many of the applications were returned to the applicants as defective or retired to the files as unnecessary.

In order to solve a major problem of administration concerning the handling of applications for station licenses, the Commission on January 6, 1933, adopted a normal term of 3 years for amateur station

licenses and extended all outstanding valid licenses to give them a 3-year term. For purposes of effecting further economies and simplification, the Commission on June 23, 1933, adopted numerous other changes in the regulations governing amateur radio, to take effect for the most part on the following October 1. As the year closed, plans were being formulated to administer these changes in the most efficient manner.

### BROADCAST SECTION

TABLE I.—Comparison of applications received and authorizations issued during the fiscal years 1931, 1932, and 1933

	1931	1932	1933
Applications received.....	3,784	2,519	2,193
Authorizations issued.....	3,233	2,534	2,446

Applications received and instruments of authority issued comprised construction permits, licenses, modifications of construction permits and licenses, consent to voluntary or involuntary assignments of construction permits and licenses, extension of licenses, installation of automatic frequency-control equipment, special authorizations, and emergency authorizations.

In addition to the applications shown in table I there were received in the section 1,422 informal applications, which consisted of requests (1) for extension of equipment and program test periods, (2) extension of time in which to install an approved frequency monitor, (3) to operate for a limited period of time in a manner not set forth in a regular license or authorized by regulations, (4) to depart from hours of operation as authorized, and (5) to partially or wholly suspend operation of a station because of the economic condition of the past year, or other reasons. There were also issued 903 informal authorizations consisting of letters, telegrams, and deviations from time-sharing agreements.

TABLE II.—Comparison of the number of radio broadcast stations authorized, consolidated, and deleted during the fiscal years 1931, 1932, and 1933

	1931	1932	1933
New stations authorized.....	11	8	15
Stations consolidated.....	7	2	3
Stations deleted.....	13	12	19
Total authorized stations as of June 30.....	612	606	599

\* Includes 1 station which has not held valid license since May 18, 1933, but has not been officially deleted because of pending litigation.

Three complete lists of radio-broadcast stations authorized by the Federal Radio Commission, arranged (1) alphabetically by call signal, (2) alphabetically by State and city, and (3) numerically by frequency, were compiled and prepared for distribution in mimeograph form. Monthly supplements to these lists have been prepared for distribution to the general public.

## COMMERCIAL SECTION

This section functioned in much the same manner as during the past fiscal year; however, the following duties were added:

(1) The records formerly maintained solely with respect to commercially owned stations were extended to include all stations owned and operated by the United States Government.

(2) The preparation of the Radio Service Bulletin for publication. This bulletin is issued in mimeographed form, semimonthly, and contains in tabular form a complete record of all new assignments, changes, and deletions for all classes of commercial and governmental radio stations in the United States, its Territories, and possessions.

(3) The assignment of call letters to all commercial and governmental radio stations in the United States, its Territories, and possessions.

(4) The maintenance of records pertaining to commercial operators' licenses.

A comparison of the applications received and the authorizations issued in this section for the fiscal years 1931 to 1933, inclusive, is shown in the table below:

TABLE I.—Comparison of applications received and authorizations issued during the fiscal years 1931, 1932, and 1933

	1931	1932	1933
Applications received.....	6,245	5,515	15,828
Authorizations issued.....	5,395	6,053	6,917

: 82 applications covered 1,051 stations.

Applications and authorizations shown in the above table comprised construction permits, modification of construction permits, licenses, modification of licenses, renewal of licenses, and assignment of construction permits and licenses. In addition to the regular authorizations, this section issued 446 special authorizations covering requests, for varying periods of time, to operate in a manner other than authorized by existing license.

There were also received in the section approximately 8,420 applications for operators' licenses involving commercial first-class, radiotelephone first-class, radiotelephone second-class, radiotelephone third-class, radiotelegraph first-class, radiotelegraph second-class, and radiotelegraph third-class licenses.

As a result of the agreement reached at the International Conference held in Madrid, Spain, in 1932, the lists of radio stations submitted to the International Bureau of the Telegraph Union, Berne, Switzerland, for notification on behalf of the United States Government, have been further subdivided to include two new classifications, namely, aeronautical and coastal stations. In addition to the above, a report was submitted relative to ship and aircraft stations indicating the transmission power of each station. There was also prepared a list showing in detail special Government stations including direction finding, radiobeacon, notices to navigators, meteorological bulletins, and others.



# REPORT OF THE ACTING GENERAL COUNSEL

GEORGE B. PORTER

## I. ADMINISTRATIVE SECTION

### 1. APPLICATIONS

This section, which is responsible for the legal review of and recommendation upon all applications presented to the Commission, considered a total of 6,672 applications during the year, compared with 6,252 the preceding year. These cases included not only the more regular radiotelegraph and broadcasting services but an ever-increasing number of services to which radio is being applied. Emergencies have often compelled immediate consideration of an application. In the past year 393 applications of the total which were handled required the preparation of bills of particulars setting forth the issues to be tried at a formal hearing.

The applications handled by this section included 582 for construction permits for new radio stations and to change equipment of existing ones; 283 modification of construction permits; 1,092 licenses and modifications of licenses; and 3,284 renewals of licenses. There were also 1,431 applications of a formal and informal character covering such services as the following: Assignments of licenses, aeronautical, aircraft, coastal, experimental, geophysical, marine relay, point-to-point, police, relay, visual, as well as others.

### 2. COMPLAINTS AND INVESTIGATIONS

During the year various types of complaints concerning the services of licensed stations and their activities have been examined and proper disposition made or recommendations submitted thereon. Wherever the character of the complaint would permit, the matter was settled by correspondence or through the field force of the Commission. On the other hand, many complaints required a formal examination in hearing. The number of more serious complaints investigated amounted to 67, of which 11 were under consideration at the end of the year.

This section had charge of the preparation of new forms, revision of existing applications, and authorizations issued by the Commission.

### 3. CRIMINAL LITIGATION

The past year has shown an increase in the illegal operation of radio stations, particularly broadcasting stations. This has been occasioned, in part, by misinterpretation of section 1 of the Radio Act of 1927 which defines interstate commerce in radio transmission.

During the past few months violations have increased in the southwest section of the United States, particularly in the State of Texas where the State borders are far removed. This illegal operation is based on the claim that the radio transmission is not interstate or

does not interfere within the State with an interstate signal. Such claim is not borne out by facts obtained by investigation or by opinion of experts. In all cases reported to the Commission an investigation is made by a member of its field force and evidence secured for prosecution.

In many instances the owners and operators, after being confronted with evidence of their interstate transmission, have voluntarily ceased operation and dismantled their stations. However, there have been some who continued to operate in defiance of the law.

It is believed that the institution of prosecution against a number of violators and their successful termination will have the effect of deterring others who aspire to operate radio stations in violation of the Radio Act of 1927. Several such cases are now pending trial.

A member of the Commission's legal staff is assigned to assist the United States attorneys in the prosecution of cases.

Aside from several convictions had in the past year, a list of which appears in this report, there are now outstanding indictments against approximately 25 offenders, and investigations are being conducted of the illegal operation of over 50 others. Many of these investigations are now completed and prosecution will be started in the near future.

During the past year 95 violators of various sections of the Radio Act have been reported to the Commission from all sections of the United States. The Commission has stressed the importance of this work in order that regularly licensed stations may be fully protected at all times from unlawful interference.

Eleven criminal cases were terminated during the year, 10 of which were convictions or pleas of guilty.

At the end of the year 10 criminal cases were pending in various Federal district courts.

## II. HEARING SECTION

This section has charge of all hearings set by the Commission and is charged with the duty of bringing cases to trial, and preparing and presenting Commission evidence, seeing that an orderly procedure is had, and that all facts pertaining to any case are properly presented to the Commission for its determination.

During the year a greater number of cases were heard than during the preceding year. The Commission has participated in a greater number of cases than at any time since the inauguration of the examiner system. The report of the chief examiner indicates the number of hearings held.

## III. RESEARCH AND DRAFTING SECTION

During the period covered by this report this section of the Legal Division has continued to assume primary responsibility for furnishing the Commission with memoranda and opinions upon legal questions requiring research or involving an interpretation of laws and treaties; making a legal examination of the minutes and official records of the Commission; drafting proposed rules and regulations; examining and studying proposed legislation relating to the Commission and/or its functions.

In addition to the foregoing, this section prepared for the Commission's consideration statements of facts, grounds for decisions, and orders in 197 cases heard by the examiners of the Commission and the Commission. It has also had active charge of the conduct of all litigated cases, other than criminal, in which the Commission was interested as a party, compiling records, preparing pleadings and briefs, and actual presentation of the cases before the various courts.

On July 1, 1932, there were 21 cases pending in the Court of Appeals of the District of Columbia and 1 in the Supreme Court of the District of Columbia. All were disposed of during the current year as follows: Of those pending in the Court of Appeals of the District of Columbia, 11 were dismissed at the request of the appellants and 10 were decided by that Court. The case in the Supreme Court of the District of Columbia was dismissed upon motion of the Commission. Of the 10 decided cases in the Court of Appeals of the District of Columbia, 9 affirmed the Commission's decisions, and 1 was remanded to the Commission for further proceedings.

During the current fiscal year, in 3 of the cases decided by the Court of Appeals of the District of Columbia petitions for certiorari were filed in the Supreme Court of the United States, 2 of which were granted<sup>1</sup> and 1 of which was denied.<sup>2</sup> Twenty new cases were filed in the Court of Appeals of the District of Columbia, of which 7 are still pending, 6 were dismissed by the appellants, 3 were dismissed by the Court on application of the Commission, and 4 were decided by that court. Of these, 3 affirmed the decisions of the Commission appealed from and 1 was remanded for further proceedings.

The 14 cases decided by the Court of Appeals of the District of Columbia during the fiscal year and the 2 decided by the Supreme Court of the United States present, for the most part, matters of such importance as to warrant special consideration.

#### IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

##### THE NELSON BROTHERS BOND & MORTGAGE COMPANY AND THE NORTH SHORE CHURCH CASES

(62 F. (2d) 854)

These appeals were taken from a decision of the Commission granting the application of the Johnson-Kennedy Radio Corporation (Station WJKS) of Gary, Ind., for the use of 560 kilocycles then assigned to and shared by Nelson Brothers Bond & Mortgage Co. (Station WIBO) and the North Shore Church (Station WPCC), both of Chicago, Ill. All of the stations involved were in the fourth zone, which was over quota. The Commission found that the granting of the application of Station WJKS at Gary, Ind., and the deletion of Stations WIBO and WPCC at Chicago, Ill., would work a more equitable distribution of broadcasting facilities within the fourth zone, by increasing the service of an area in need of additional service and decreasing the service of an area where it had more than was needed, in accordance with the act of March 28, 1928, known as the "Davis Amendment" (45 Stat. 373).

The Court of Appeals, by a 3 to 2 decision, reversed the Commission. It stated the question to be whether the decision of the Com-

<sup>1</sup> Nelson Brothers Bond & Mortgage Co. and North Shore Church cases, p. 16.

<sup>2</sup> Radio Investment Co. v. Federal Radio Commission, p. 10.

mission assigning to the applicant station (WJKS) the frequency assigned to Stations WIBO and WPCC since 1928, and the subsequent forfeiture of those facilities and deletion of said stations, is a reasonable exercise of the regulatory power of the Commission or an arbitrary or capricious exercise of that power. It held that quota is no reason for deleting stations operating in the public interest; that the business of radio broadcasting, being a species of interstate commerce, is subject to reasonable regulation of Congress; that it would not be consistent with legislative policy to equalize broadcasting facilities of States or zones by unnecessarily injuring established stations rendering valuable service to their natural service areas; that stations not seeking a hearing cannot complain that the decision of the Commission was rendered without notice to them.

The dissent by Mr. Justice Groner, which was concurred in by Mr. Justice Hitz, states the question to be whether the Commission has the right and power in the public interest to refuse to renew the license of a station in an over-quota State and transfer its facilities to an applicant station in an under-quota State. In the opinion of the dissent, it has such a right.

Petitions for writs of certiorari to the Supreme Court of the United States were made by the Commission, which were granted. The opinion of the Supreme Court of the United States will be reviewed in detail under the appropriate heading in this report. (See p. 15.)

#### RADIO INVESTMENT CASE

(62 F. (2d) 381)

Station WHOM, owned and operated by the New Jersey Broadcasting Corporation, and sharing time with Stations WBMS, WNJ, and WKBO, filed an application for modification of license requesting full time. This application, together with the renewal application of the stations with which it shared time, were set for hearing simultaneously. The Commission granted the application of the New Jersey Broadcasting Corporation (WHOM) in accordance with the recommendation of the examiner. This appeal followed. The Court held that the decision of the Commission was supported by substantial evidence, was not arbitrary or capricious, and affirmed its decision.

A petition for a writ of certiorari to the Supreme Court of the United States was filed by the appellant and denied by that Court.

#### THE BEEBE CASE

(61 F. (2d) 914)

This is an appeal from a decision of the Commission denying the application of Joseph LeRoy Beebe (WMBA) for renewal of license. The application was designated for hearing upon charges of faulty and inadequate equipment, operation of station by an unlicensed operator, frequency deviation, and programs not in the public interest.

One contention of the applicant in the Court of Appeals was that the Commission erred in admitting evidence in violation of its established rules and regulations in that it accepted in evidence an unsworn letter attached to a supervisor's report made in the course of his official duties. The court held that the Commission is an administrative

body and is not bound by strict jury-trial rules of evidence which are applicable to court proceedings but that such bodies may, under reasonable rules and regulations, depart from such rules.

The court further affirmed its previous decisions to the effect that on application for renewal of license the applicant has the burden to establish that the renewal would be in the public interest.

At the hearing the applicant offered evidence intended to show that he had on file an application for construction permit to install new equipment. This was refused by the Commission, for which appellant claimed error. The court held that on a hearing to determine whether a license for use of old equipment in a broadcasting station should be renewed, evidence of the applicant's intention to procure a new transmitter in the form of an application for construction permit filed by him was not material. The decision of the Commission was affirmed.

#### TRINITY METHODIST CHURCH CASE

(62 F. (2d) 850)

This was an appeal from a denial of an application by the Trinity Methodist Church, South (KGEF), for renewal of license.

The application was designated for hearing because the Commission could not determine that the granting thereof was in the public interest; that the programs broadcast by its principal speaker were sensational rather than instructive and in two instances he had been convicted of attempting over the radio to obstruct orderly administration of public justice.

On appeal it was contended by appellant that the Commission's decision was unconstitutional in that it violated the guaranty of free speech and also that it deprived appellant of its property without due process of law contrary to the fifth amendment of the Constitution. It further insisted that the decision violated the Radio Act of 1927 because not supported by substantial evidence. It, therefore, was arbitrary and capricious.

The Court of Appeals of the District of Columbia affirmed the Commission's decision and held that, "Every free man has an undoubted right to lay what sentiments he pleases before the public; to forbid this is to destroy the freedom of the press; but if he publishes what is improper, mischievous, or illegal, he must take the consequences of his own temerity." But this does not mean that the Government, through agencies established by Congress, may not refuse a renewal license to one who has abused it to broadcast defamatory and untrue matter. In that case there is not a denial of the freedom of speech but merely the application of the regulatory power of Congress in a field within the scope of its legislative authority. See *KFKB Broadcasting Association v. F.R.C.*, 60 Appeals D.C. 79, 47 F. (2d) 670." It further held that the power of Congress to regulate commerce may be exercised without limitation other than prescribed in the Constitution and that the denial of an application for renewal of radio broadcasting station license is not in the public interest is not the "taking of property" without due process of law.

A petition for writ of certiorari to the Supreme Court of the United States was denied.

## THE UNITY SCHOOL OF CHRISTIANITY CASE

(64 F. (2d) 550)

This is an appeal from a decision of the Federal Radio Commission granting the application of Radio Station KFH Co., of Wichita, Kans., for modification of its license and terminating the existing license of the Unity School of Christianity (WOQ), Kansas City, Mo., which had been dividing time with KFH.

The application was heard before an examiner appointed by the Commission, who made his report recommending a denial thereof. Radio Station KFH Co. filed exceptions to this report and requested oral argument. No reply to the exceptions filed by KFH was filed by WOQ nor did it request oral argument. The Commission reversed the examiner and denied the application of KFH for oral argument. Its denial of the application was based on the following findings: (1) That the applicant, Radio Station KFH Co., delivers a meritorious broadcast service; (2) that the present service of this station would be materially improved through the use of full time; (3) that the residents of Wichita and vicinity have far less dependable broadcast service than the residents of Kansas City, Mo., and vicinity; (4) that the granting of the application for unlimited time of operation for Radio Station KFH and the consequent forfeiture of the broadcast service now allocated for the operation of WOQ would bring a more equitable distribution of broadcast facilities within the fourth zone as provided for in the Radio Act of 1927, as amended March 28, 1928; and (5) that public interest, convenience, and necessity would be served by the granting of the application of Radio Station KFH for unlimited hours of operation.

The Court of Appeals reversed the Commission and remanded the case to it with instructions to give Station WOQ an opportunity to file a reply to the exceptions filed by KFH Co. and also to hear oral argument on the ground that such proceeding was necessary to due process.

## THE BOSTON BROADCASTING COMPANY CASE

(Decided June 19, 1933; not yet reported)

This appeal arose from a denial of an application of the Boston Broadcasting Co. (WLOE) for renewal of license. The Commission's denial was based upon five findings, viz, (1) lack of showing of financial resources to insure proper operation of the station; (2) that applicant was not in fact the owner of the station as set forth in its sworn application; (3) failure of applicant to use its transmitting equipment so as to insure maximum use of facilities theretofore granted; (4) no showing of need for service in the Boston area; and (5) public interest, convenience, and necessity would not be served by the granting thereof.

The court reviewed the evidence, determined that it substantially supported the Commission's findings, and, therefore, affirmed its decision.

In support of the fourth finding that there was not a sufficient showing for need of service of WLOE in the Boston area, the Commission referred to a list of existing facilities in that area which is made a part of every record under paragraph 64 of the Rules and Regulations of the Commission. Appellant objected to this evidence and contended that it was no support for said fourth finding. The court held, however, that the Commission had a right to consider the list under rule 64.

The Boston Broadcasting Co. has requested a stay of mandate pending the filing of a petition for certiorari in the Supreme Court of the United States.

## THE GOSS CASE

(Decided June 19, 1933; not yet reported)

This is an appeal from a denial of the Federal Radio Commission of the application of Fred H. Goss for construction permit to erect a new station at Boston, Mass. The Commission's denial was based in part upon the grounds that Boston and vicinity already received good broadcast service from a number of existing stations located in and near that city and that there was no showing of any substantial need for additional service, that the granting of the Goss application would result in objectional interference in case of simultaneous operation of the proposed new station and existing stations already operating upon the requested frequency, and that no sufficient showing was made that the appellant possessed the financial ability to insure proper construction and operation of the proposed station.

The Commission moved to dismiss the appeal on the ground that no appeal from the denial of an application for construction permit was authorized under section 16 of the Radio Act of 1927, as amended.

The court denied the motion to dismiss and held that although denominated an application for "construction permit", it was in substance and effect an application for "station license" and, therefore, appealable under the act.

However, the court affirmed the Commission's decision on the ground that its findings were supported by substantial evidence and that the burden of proof was upon the appellant.

## THE POTE CASE

(Decided June 19, 1933; not yet reported)

This appeal arose upon a denial of the Federal Radio Commission of an application for involuntary assignment of license of Station WLOE from the Boston Broadcasting Co., licensee, to William S. Pote.

The Commission moved to dismiss the appeal on the ground that no appeal will lie from the denial of an application for involuntary assignment of license under section 16 of the Radio Act of 1927, as amended July 1, 1930 (46 Stat. 844).

The court deferred action on the motion to dismiss until consideration of the case on the merits, at which time it sustained that motion.

Mr. Justice Groner dissented, stating that, in his opinion, an application for "assignment of license" is an application for "station license" and therefore appealable.

The appellant has asked for a stay of mandate pending the filing of a writ of certiorari in the Supreme Court of the United States.

## THE CITY OF NEW YORK CASE

(84 F. (2d) 719)

This is an appeal from a decision of the Federal Radio Commission granting the application of the Knickerbocker Broadcasting Co. (WMCA) for renewal of license and the application of Eastern Broadcasters, Inc. (WPCH), for modification of license, so as to permit the

operation of stations WMCA and WPCH upon the frequency 570 kilocycles with 500 watts power, sharing time, and the granting of the application of the City of New York, Department of Plant and Structures (WNYC,) for renewal of license, so as to permit the operation of Station WNYC upon 810 kilocycles with 500 watts power and daytime hours, until sunset at Minneapolis.

Prior to the decision of the Commission, the City of New York had been operating upon 570 kilocycles with 500 watts power, sharing time with WMCA. The Commission's decision was based upon the following findings: That the service rendered by the applicant stations WMCA and WPCH is of high quality, well diversified, and of interest to the listening public. A large portion of the revenue obtained from the operation of these stations has been consistently expended for the general improvement of programs and equipment; that the Knickerbocker Broadcasting Co. and the Eastern Broadcasters, Inc., are financially well qualified to continue the operation of WMCA and WPCH and the large and well-organized operating staff which is maintained insures the efficient operation of both stations and the proper presentation of the programs broadcast; that the licensee corporations of WMCA and WPCH are controlled by the same interests, the two stations are operated under the same management and policies, and the operation of both stations upon the same frequency, allowing for all practical purposes the operation of one unlimited time station, will permit a more efficient use of existing broadcast facilities; that the transfer of the operating assignment formerly licensed to WPCH to WNYC will enable the latter station to operate 70 hours per week more than its present schedule allows and 22 hours per week more than the schedule proposed by the WNYC representatives, while permitting the licensee of WNYC to render any substantial service theretofore rendered or proposed to be rendered.

The court affirmed the Commission's decision, saying that the evidence amply sustained the Commission's findings.

THE WOODMEN OF THE WORLD, THE MONA MOTOR OIL COMPANY, AND OMAHA GRAIN EXCHANGE CASES

(65 F. (2d) 484)

The appeals were taken from a decision of the Federal Radio Commission granting the application of Red Oak Radio Corporation to move its station KICK from Red Oak to Carter Lake, Iowa.

A protest to the Commission's grant was filed by each of the appellants under paragraphs 45 and 46 of the Commission's revised rules and regulations, and in accordance therewith the grant was suspended and the application of Red Oak Radio Corporation designated for public hearing before an examiner, who made his report to the Commission, recommending that the original grant be affirmed.

From the evidence adduced at this hearing the Commission found that the removal of Station KICK to Carter Lake, Iowa, would enable the station to render service to a population many times larger than now receive service from that station and would not deprive the Red Oak area of good broadcast reception already being received from a number of stations located elsewhere. It also found that the unlimited time local service proposed by the Red Oak Co. was meritorious and designed to meet an existing need.



The Commission further found that the operation of KICK at Carter Lake would not so affect the interests and advertising revenues of any of appellant stations as to necessitate any curtailment of either quality or quantity of the service then rendered by them to the listening public.

The Commission denied the request of appellants for oral argument and this was objected to on appeal as error.

The court affirmed the Commission's decision holding that the report of the examiner of the Commission is analogous to that of auditor or special master, and has the same weight; that where there is substantial evidence to support findings of the Commission, they are conclusive upon the court. The court further held that the Commission's failure to grant oral argument where the appellants had a full hearing was not error.

#### THE TELEGRAPH HERALD CASE

(Decided June 26, 1933; not yet reported)

This was an appeal from an order of the Commission granting an application for the removal of Station WKBB from Joliet, Ill., to East Dubuque, Ill. The Telegraph Herald Co., a newspaper which was not a licensee nor an applicant for any instrument of authorization, filed a protest to the granting of this application. In accordance with paragraphs 45 and 46 of its Rules and Regulations, the Commission suspended the grant and designated the application for hearing upon the grounds stated in the protest. Thereafter the Commission found that the Telegraph Herald Co. had no interest sufficient to entitle it to maintain a protest, and that the affirmance of the original grant would serve public interest, convenience and necessity. Accordingly it affirmed its original grant.

On appeal to the Court of Appeals of the District of Columbia, the appellant contended that the Commission was estopped to deny its interest because it had heard its protest. The Commission moved to dismiss the appeal on the ground that appellant had no appealable interest within the meaning of section 16 of the Radio Act of 1927, as amended July 1, 1930 (46 Stat. 844). The court sustained the Commission's motion and affirmed its decision, holding that one who was not a licensee or an applicant for any instrument of authorization was not "in contemplation of the law \* \* \* a corporation aggrieved or whose interests were adversely affected \* \* \*."

#### B. IN THE SUPREME COURT OF THE UNITED STATES

*Commission v. Nelson Bros. Bond & Mortgage Co.; Commission v. North Shore Church* (53 S.Ct. 627)

These cases arose upon the Federal Radio Commission's petitions for certiorari seeking a review of a 3-to-2 decision of the Court of Appeals of the District of Columbia, reversing its decision granting the application of Johnson-Kennedy Radio Corporation (WJKS) for increased facilities and deleting the facilities theretofore assigned to Nelson Bros. Bond & Mortgage Co. (WIBO) and the North Shore Church (WPCC). The facts and questions of law are fully stated under a review of these cases in the court below (see p. 9, this report) and need not be repeated here.

The Supreme Court reversed the Court of Appeals and sustaining the Commission's decision, held: (1) Whether the Commission exceeded its powers in a given case is a question appropriate for judicial decision and where the function to be exercised by the court is judicial, it may be exercised on authorized appeal from the decision of an administrative body; (2) that the requirement of fair and equitable allocation of licenses, wave lengths, time for operation and station power to each State within each zone, does not require equality between States with respect to every type of station, so that, where a radio station in an under-quota State asked for a change of frequency to one shared by 2 stations in an over-quota State, the fact that the State in which the petitioning station happened to be, had more regional station assignments than the other station, was not controlling; (3) that the Commission in making allocations of frequencies to States within a zone, has the power to license operation by a station in an under-quota State on a frequency theretofore assigned to a station in an over-quota State, provided it does not act arbitrarily; that in the exercise of its power to make fair and equitable allocation of licenses and wave lengths as provided by the Radio Act, the Commission may revoke temporary licenses issued to a radio station subject to action that might be taken on a hostile application; (4) that whereas the equities of existing radio stations should be considered by the Commission in the distribution of radio facilities, nevertheless, the weight of equities and all other pertinent facts, is for the Commission to decide; (5) that under the Radio Act of 1927 as amended, in passing on an application of a station in an under-quota State for a change of frequency to a frequency shared by 2 stations in an over-quota State, the Commission had a right to consider the reasonable advantages enjoyed by people of each State, services of respective stations, reasonable demands of under-quota States, and need of radio service in the city of the applicant, and that the Commission has the power to delete existing radio stations where necessary to fair and equitable allocation of licenses, wave lengths, time for operation and station power to each of the States within each zone; (6) that the fact that the Commission did not adopt recommendations of its examiner in a case is immaterial; (7) that parties who were heard by a Commission examiner but made no application for oral argument before the Commission cannot complain thereafter of such lack; and, (8) that General Order 102 is a rule of procedural convenience which does not derogate from the authority of the Commission.

The following cases, which were reported as pending in the Sixth Annual Report, were dismissed during the fiscal year as indicated:

IN THE COURT OF APPEALS OF THE DISTRICT OF COLUMBIA

- No. 5567. *National Broadcasting Company, Inc., and Radio Corporation of America (Station WJZ), appellants, v. Federal Radio Commission.*  
 No. 5568. *General Electric Company and National Broadcasting Company, Inc. (Station KGO), appellants, v. Federal Radio Commission.*  
 No. 5569. *The Tribune Company, appellant, v. Federal Radio Commission.*  
 No. 5570. *Stromberg-Carlson Telephone Mfg. Co. (Station WHAM), appellant, v. Federal Radio Commission.*  
 No. 5571. *WMAQ, Inc., and National Broadcasting Company v. Federal Radio Commission.*  
 No. 5647. *Clarence R. Cummins v. Federal Radio Commission.*

## IN THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

No. 51325. *Stromberg-Carlson Telephone Mfg. Co. v. Federal Radio Commission.*

The following cases which were filed during the fiscal year were dismissed prior to July 1, 1933, as indicated:

- No. 5743. *D. R. Wallace v. Federal Radio Commission.*
- No. 5774. *Intermountain Broadcasting Co. v. Federal Radio Commission.*
- No. 5821. *Waterloo Broadcasting Co. v. Federal Radio Commission.*
- No. 5847. *Waterloo Broadcasting Co. v. Federal Radio Commission.*
- No. 5881. *Erie Dispatch Broadcasting Corp. v. Federal Radio Commission.*
- No. 5882. *Commonwealth of Pennsylvania v. Federal Radio Commission.*
- No. 5897. *Hello World Broadcasting Corp. v. Federal Radio Commission.*
- No. 5905. *Alfred Frank Kleindeinst v. Federal Radio Commission.*
- No. 5912. *Mitchel Broadcasting Corp. v. Federal Radio Commission.*

Seven of the cases filed during the fiscal year were pending July 1, 1933, as indicated:

- No. 5848. *WREC, Inc. (WREC), v. Federal Radio Commission.*
- No. 5896. *WJJD, Inc., v. Federal Radio Commission.*
- No. 5897. *Hello World Broadcasting Corp. (KWEA) v. Federal Radio Commission.*
- No. 5917. *WJJD, Inc., v. Federal Radio Commission.*
- No. 5939. *WGN, Inc., v. Federal Radio Commission.*
- No. 5947. *St. Louis Truth Center, Inc. (KFWF), v. Federal Radio Commission.*
- No. 5989. *Laconia Radio Club, a corporation (WKAV), v. Federal Radio Commission.*

# REPORT OF THE CHIEF ENGINEER

Dr. C. B. JOLLIFFE

## BROADCAST SECTION

### ALLOCATION OF BROADCAST FACILITIES

The basic plan of allocation of broadcast facilities has remained unchanged. Changes have been made in station assignments from time to time upon applications from licensees and as the result of hearings.

A comparison of the number of broadcast stations in operation for the fiscal years 1927 to 1933 is given in table I.

TABLE I

	1927	1928	1929	1930	1931	1932	1933
Total number of stations.....	681	677	606	618	612	604	599
Total simultaneous operations at night.....	565	514	490	416	420	397	375

TABLE II.—Broadcast stations in operation June 30, 1933

#### A. CLASSIFICATION OF STATIONS AND FREQUENCIES

	Clear	Regional	Local	Total
Stations operating—				
Unlimited time.....	134	138	119	291
Limited time <sup>1</sup> .....	19			19
Daytime <sup>2</sup> .....	18	30	10	48
Shared time <sup>3</sup> .....	16	81	42	139
Part time <sup>4</sup> .....		1	1	2
Specified hours <sup>5</sup> .....	6	38	60	99
Total stations operating.....	93	273	232	598
Total frequencies used.....	40	44	6	90

<sup>1</sup> 2 stations operating unlimited time by synchronization.

<sup>2</sup> Operate during daylight at dominant station and at night when dominant station is not in operation. (See rule 77, rules and regulations of Federal Radio Commission.)

<sup>3</sup> Operate from 6 a.m. to sunset. (See rule 78.)

<sup>4</sup> 2 to 4 stations in same geographical location operate on same frequency at different hours. (See rule 79.)

<sup>5</sup> Operate portion of time, remainder of time on same frequency not allocated in same geographical area. (See rule 80.)

<sup>6</sup> Operate according to exact hours specified in license. (See rule 81.)

#### B. QUOTA UNITS ASSIGNED STATIONS OF DIFFERENT CLASSES

	Clear		Regional		Local		Total	
	Day	Night	Day	Night	Day	Night	Day	Night
Unlimited time.....	77.25	77.25	65	57.2	14.5	11.9	156.75	146.35
Limited time.....	13.8	5.02					13.8	5.02
Daytime.....	7.35	.35	5.75		1		14.1	.35
Shared time.....	30	20	13.48	11.03	2.22	2.03	45.68	23.08
Part time.....			.25	.25	.1	.06	.35	.3
Specified hours.....	5.12	5	6.62	5.26	3.69	2.29	14.43	12.55
Total.....	133.52	107.62	91.08	73.74	20.51	16.27	245.11	197.68

TABLE III.—Summary of quota units by zones<sup>1</sup> as of June 30, 1933

	Units due	Units assigned	Net amount over or under quota	
			Units	Percent
Zone I.....	80	75.44	-4.56	-8
Zone II.....	80	73.85	-6.35	-8
Zone III.....	80	96.37	+16.37	+20
Zone IV.....	80	101.11	+21.11	+26
Zone V.....	80	96.17	+16.17	+20
Total.....	400	442.74	+42.74	+11

<sup>1</sup> For details of quota units by States current lists should be obtained from the Federal Radio Commission.

### DEVELOPMENTS IN EMPIRICAL STANDARDS FOR BROADCAST ALLOCATION

In the Fifth Annual Report<sup>1</sup> there was set forth a discussion of the engineering standards used as a basis for the allocation of frequencies to broadcast stations. At that time it was predicted that the empirical standards would be added to and changed from time to time as the "constants" used as a basis change and as the broadcasting art progresses. Changes in these empirical standards have taken place during the past 2 years. The Engineering Division, therefore, has changed its bases which are used for making recommendations to the Commission and giving testimony at hearings before the Commission on applications concerning broadcast allocation in the frequency band from 550 to 1,500 kilocycles. These changes have been due to the advancement of the art and to greater familiarity with the phenomena of transmission and reception and the requirements of the average listener under present reception standards.<sup>2</sup>

Space in this report will not permit a complete discussion of the development and reasons for change of the empirical standards. The statements made are subject to proof, and it is expected that a complete paper will be published in the near future.

### MODIFICATIONS IN EMPIRICAL STANDARDS PREVIOUSLY PUBLISHED

Revisions in the field intensities for which it is considered necessary to render good service are divided into three classes, depending upon the noise level of the area to be served.

TABLE IV

Area	Signal intensity for good service
Business city.....	10 to 25 millivolts per meter (mv/m).
Residential city.....	2 to 5 millivolts per meter (mv/m).
Rural.....	0.1 <sup>3</sup> to 5 millivolts per meter (mv/m).

<sup>1</sup> The signal of 0.1 mv/m is only satisfactory for good rural service under conditions of no selective fading and the signal is of the value or greater 90 percent of the time.

<sup>2</sup> Fifth Annual Report of the Federal Radio Commission 1931, p. 29, Government Printing Office, Washington, D. C. Price, 20 cents. Published also in Proceedings of the Institute of Radio Engineers, April 1932, p. 611.

<sup>3</sup> See "Propagation of waves 150 to 2,000 kilocycles per second (2,000 to 150 meters) at distances between 60 and 2,000 kilometers", Van der Pol, Eckersley, Dellinger, and Le Corbeiller. Proceedings of the Institute of Radio Engineers, July 1933, p. 996.

Study of propagation of radio waves (120 to 1,700 kilocycles made by a committee, J. H. Dellinger, chairman) in preparation for North and Central American Radio Conference, Mexico City, 1933 (not published).

Also Proceedings of the Institute of Radio Engineers, March 1930, p. 391.

The value of the field intensity necessary to render good service is determined by the noise level produced by atmospheric disturbance (static), and man-made electrical interference.<sup>3</sup>

Revisions in the field intensity bounding the good or protected area of broadcast stations are given in table V. The night values are the same as previously given.

TABLE V.—Boundary of service area of stations of various classes

Class of station	Power (night)	Boundary service	
		Day	Night
	Watts	MV/M	MV/M
Local.....	100	2	2
Regional.....	250-1,000	.5	1
High-power regional.....	5,000-10,000	.5	1
Dominant clear.....	5,000-50,000	.1	.5

Limited time and day stations on clear channels take the same protected areas and service areas as regional stations.

The entire interference spectrum on the same channel and adjacent channels and the ratio of the desired to the undesired signals for operation throughout the interference range is set out in figure 1, which gives graphically the whole story of interference between broadcast stations.

The ratio of the desired to undesired signal has been revised<sup>4</sup> on the basis of the interference spectrum, as follows:

TABLE VI

Type of operation	Ratio of desired to undesired signals
Synchronous operation.....	4 to 1.
Matched frequency operation (maximum deviation 5 cycles).....	10 to 1.
50 cycles maximum deviation.....	20 to 1.
500 cycles maximum deviation.....	100 to 1.
1,000 cycles maximum deviation.....	200 to 1.
10 kilocycles difference in frequency.....	5 to 1 to 0.900 to 1.
20 kilocycles difference in frequency.....	1 to 1 to 0.200 to 1.
30 kilocycles difference in frequency.....	0.25 to 1 to 0.090 to 1.
40 kilocycles difference in frequency.....	0.085 to 1 to 0.033 to 1.

Above 40 kilocycles no protection with respect to interference is provided in the Commission's plan of allocation except that transmitters of broadcast stations must be so placed that the population of the so-called "blanket" area is held to a minimum and does not exceed specified percentages.<sup>5</sup>

In figure 1, the full black lines AEBC and DFBC represent the ratio of the average desired field intensity to the undesired field intensity for various types of operation and frequency separation. The exact ratio between AEB—BFD is determined by an allocation factor as explained below.

The dotted line DB in figure 1 gives the absolute ratio between the desired and undesired signal and should not be confused with the field intensity ratio necessary to prevent interference. If the average field intensity of an area is determined, this cannot be applied directly to the receiver characteristics for several reasons and must have an additional factor applied that has been termed

<sup>3</sup> "An Estimate of the Frequency Distribution of Atmospheric Noises", by R. K. Potter, Proceedings of the Institute of Radio Engineers, September 1932, p. 1512.

<sup>4</sup> Table VIII, Fifth Annual Report, Federal Radio Commission, p. 23.

<sup>5</sup> See Sixth Annual Report, Federal Radio Commission, p. 30.



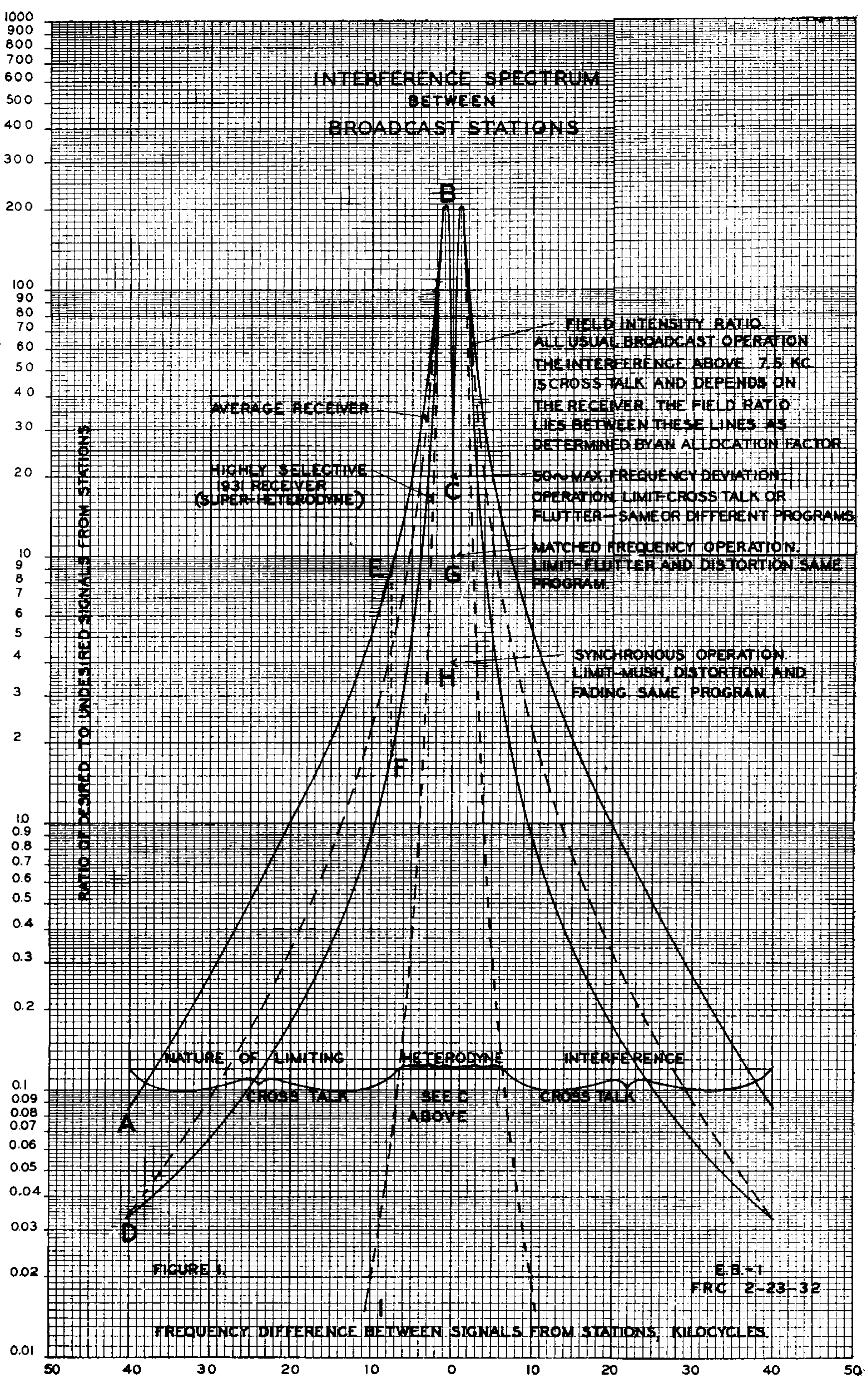


FIGURE 1.

"allocation factor for broadcast stations." The amount by which the selectivity characteristics of the receiver must be multiplied to get the ratio between the average field intensity from the desired and undesired station is set out in figure 2, which gives the multiplying factor versus the nuisance range of stations under consideration. The value and basis of this allocation factor are determined from a number of factors and are given in figure 2.

The field intensity versus distance curve was not changed by an appreciable amount from that given in the previous report<sup>6</sup> and is not reproduced here.

TABLE VII.—Average night separation between broadcast stations recommended by engineering division, Federal Radio Commission, based on frequency maintenance of  $\pm 50$  cycles<sup>1</sup>, analysis of July 1932

Classification and power	Frequency differential in kilocycles	Local		Regional			High-power regional		Clear			
		50 w	100 w	250 w	500 w	1 kw	5 kw	10 kw	5 kw	10 kw	25 kw	50 kw
Local:	0	130	185									
	10	40	50	82	90	107	160	220	180	220	290	345
	20	15	18	41	49	57	85	100	130	147	175	197
	30	8	12	30	38	44	74	89	110	124	155	178
50 watts...	40	8	11	28	35	44	72	87	105	123	150	173
	0	185	185									
	10	50	53	98	106	114	183	225	220	257	293	350
	20	18	21	48	54	62	90	106	138	156	183	206
100 watts...	30	12	13	32	40	48	76	91	113	131	158	181
	40	11	11	28	36	44	72	87	106	124	151	174
	0			640	800	1,000						
	10	82	98	126	153	185	290	345	290	345	425	605
250 watts...	20	41	46	55	65	78	110	145	155	172	200	226
	30	30	32	35	43	51	79	94	118	136	163	186
	40	28	28	31	37	45	73	88	108	126	153	176
	0			600	800	1,000						
500 watts...	10	90	100	133	160	190	300	365	300	355	435	605
	20	49	54	65	74	85	127	150	170	188	216	235
	30	38	40	43	46	54	82	97	124	142	169	192
	40	32	30	37	39	47	75	90	110	128	155	178
1 kilowatt...	0			1,000	1,000	1,000						
	10	107	114	185	190	200	305	360	350	370	440	510
	20	57	62	78	85	94	135	160	187	205	232	255
	30	46	48	61	64	68	102	100	132	150	177	200
High-power regional:	40	44	44	65	47	48	76	91	113	131	158	181
	0						1,000	2,000				
	10	180	183	290	300	305	535	590	490	500	630	650
	20	85	90	110	127	135	183	187	250	268	295	320
5 kilowatts...	30	74	76	79	82	86	102	117	158	175	205	225
	40	72	72	73	75	76	83	98	125	143	170	193
	0						2,000	2,000				
	10	220	225	345	355	360	590	605	550	570	665	620
10 kilowatts...	20	100	105	145	150	160	167	203	287	305	325	350
	30	89	91	94	97	100	117	128	175	192	220	243
	40	87	87	88	90	91	96	102	133	150	178	200
	0											
Clear:	10	180	220	290	300	360	480	550	480	550	645	720
	20	130	138	155	170	187	250	287	250	287	350	400
	30	110	113	118	124	132	158	175	158	175	205	230
	40	105	106	108	110	113	125	133	125	143	170	193
5 kilowatts...	0											
	10	220	237	345	355	370	500	570	550	570	665	750
	20	147	156	172	188	205	268	306	287	306	370	420
	30	128	131	136	142	150	175	192	175	192	220	247
10 kilowatts...	40	123	124	126	128	131	143	150	143	150	178	20
	0											
	10	200	203	425	435	440	530	595	645	655	695	780
	20	176	183	200	215	232	295	325	350	370	395	450
25 kilowatts...	30	156	168	183	189	177	205	220	205	220	247	276
	40	150	151	153	155	158	170	178	170	178	192	215
	0											
	10	345	350	495	505	510	550	620	730	750	780	800
50 kilowatts...	20	197	206	225	235	255	320	350	400	420	450	470
	30	178	181	186	192	200	226	243	230	247	275	297
	40	173	174	176	178	181	193	200	193	200	215	218

<sup>1</sup> These separations are calculated to minimize objectionable interference in the good service areas of stations about 90 percent of the time.

<sup>6</sup> Figure 2, p. 39, Fifth Annual Report, Federal Radio Commission.



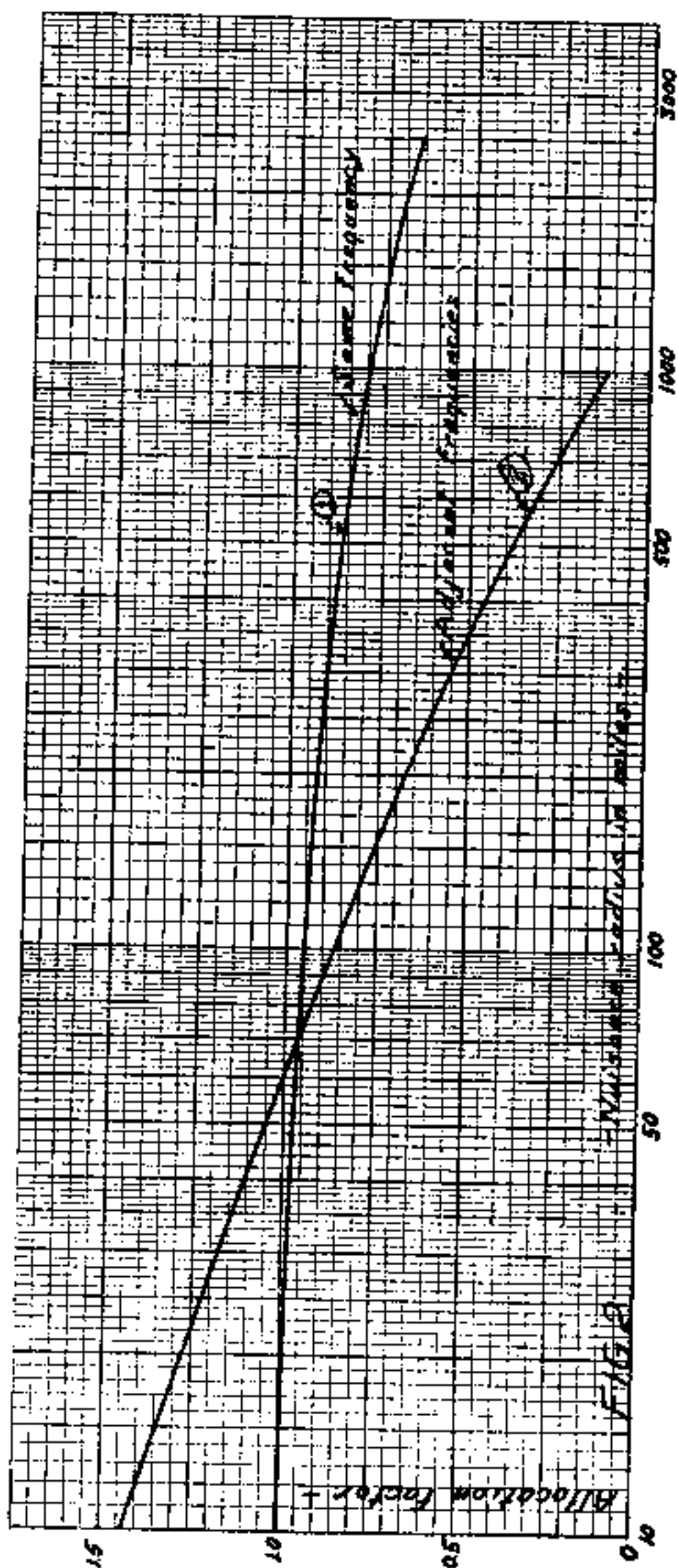


FIGURE 2

TABLE VIII.—Average day separation between broadcast stations recommended by engineering division, Federal radio commission, based on frequency maintenance of  $\pm 50$  cycles<sup>1</sup> analysis of July 1932

Classification and power	Frequency differential in kilocycles	Regional, limited time and day										Clear						
		50 w	100 w	250 w	500 w	1 kw	2.5 kw	5 kw	10 kw	5 kw	10 kw	25 kw	50 kw					
Local:	0	65	80	100														
40 watts	10	25	30	35	65	95	106	128	145	163	145	163	190	218				
	20	12	13	20	37	67	80	100	117	135	117	135	162	185				
	30	8	11	15	47	57	70	90	107	125	107	125	152	175				
	40	7	10	15	41	54	67	87	104	122	104	122	149	172				
100 watts	0	80	80	100														
	10	30	34	41	93	109	118	146	153	171	153	171	198	220				
	20	15	16	21	61	71	84	104	121	139	121	139	166	190				
	30	11	12	17	48	58	71	91	108	128	108	128	153	174				
250 watts	0	100	100	100														
	10	38	41	46	106	115	128	148	165	183	165	183	210	233				
	20	20	21	24	69	79	92	112	129	147	129	147	174	197				
	30	16	17	18	51	61	74	94	111	129	111	129	156	179				
Regional, limited time and day: 250 watts	0	15	16	16	45	55	68	88	103	123	103	123	150	173				
	10	85	93	105	230	260	300	350	400	450	700	800	900	1,000				
	20	57	61	69	81	91	104	124	141	159	141	159	186	210				
	30	47	48	51	58	68	81	100	118	136	118	136	163	185				
500 watts	0	41	44	45	48	58	71	91	108	126	108	126	153	174				
	10	95	103	115	260	260	300	350	400	450	700	800	900	1,000				
	20	67	71	79	91	100	112	132	150	167	150	167	194	217				
	30	57	58	61	68	74	85	105	122	140	122	140	167	190				
1 kilowatt	0	54	54	55	58	60	74	94	111	129	111	129	156	179				
	10	108	110	128	300	300	300	350	400	450	700	800	900	1,000				
	20	80	84	92	104	112	120	140	157	175	157	175	200	225				
	30	70	71	74	81	85	91	111	128	146	128	146	173	196				
2.5 kilowatts	0	67	67	68	71	74	78	98	113	131	113	131	158	181				
	10	128	146	148	174	185	197	218	235	255	235	255	285	310				
	20	100	104	112	124	132	140	153	170	188	170	188	215	238				
	30	90	91	94	100	105	111	119	130	154	130	154	181	204				
5 kilowatts	0	87	87	88	91	94	96	100	119	137	119	137	164	187				
	10	145	153	165	400	400	400	400	400	450	700	800	900	1,000				
	20	117	121	129	141	150	157	170	182	200	182	200	227	250				
	30	107	108	111	118	122	129	136	143	161	143	161	188	211				
10 kilowatts	0	104	104	105	108	111	113	119	123	141	123	141	168	191				
	10	163	171	183	450	450	450	450	450	450	700	800	900	1,000				
	20	135	139	147	159	167	175	188	200	213	200	213	240	263				
	30	125	126	129	136	140	146	154	161	170	161	170	196	219				
Clear:	0	122	122	123	126	129	131	137	141	147	141	147	174	197				
	10	145	153	165	700	700	700	700	700	700	700	700	700	700				
	20	117	121	129	142	150	157	170	182	200	182	200	227	250				
	30	107	108	111	118	122	129	136	143	161	143	161	188	211				
10 kilowatts	0	104	104	105	108	111	113	119	123	141	123	141	168	191				
	10	163	171	183	450	450	450	450	450	450	700	800	900	1,000				
	20	135	139	147	159	167	175	188	200	213	200	213	240	263				
	30	125	126	129	136	140	146	154	161	170	161	170	196	219				
25 kilowatts	0	122	122	123	126	129	131	137	141	147	141	147	174	197				
	10	190	198	210	900	900	900	900	900	900	900	900	900	900				
	20	162	168	174	240	250	265	285	300	320	300	320	345	370				
	30	152	153	156	163	167	173	181	188	200	188	200	228	251				
50 kilowatts	0	149	149	150	163	158	158	164	168	174	168	174	182	205				
	10	213	220	233	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000				
	20	185	190	197	265	277	290	310	325	345	325	345	370	395				
	30	175	175	179	185	190	196	204	211	219	211	219	231	242				
	40	172	172	173	176	179	181	187	191	197	191	197	205	212				

<sup>1</sup> These separations are calculated to minimize objectionable interference in the good service areas of stations about 90 percent of the time.

New mileage separation tables for various classes of stations and powers were prepared from data given in figures 1 and 2 and the field intensity curves previously published with the protection to the field intensities as given in table V. These tables do not have any radical changes in mileage separation from those previously published.

## ANTENNA AND RADIATION STANDARDS

It has been found by measurements that the field intensity at 1 mile from the antenna varies from about 50 millivolts per meter to 200 millivolts per meter. This variation is what has actually been encountered in regularly licensed operating broadcast stations. This represents a vast difference in the radiated power even though the antenna input power is the same. Field intensities of 50 millivolts per meter and 200 millivolts per meter with the same antenna input power represent a difference in antenna efficiency of 16 times. The field intensity of 50 millivolts per meter at 1 mile was only encountered in stations located in cities with antennas located on buildings where absorption is very high.

It has become necessary in the consideration of engineering allocation of broadcast frequencies to analyze the radiating systems of broadcast stations. The following equations have been made use of to express the characteristics of the field intensity at 1 mile produced by various antennas.

The fundamental equation for the total power radiated from an antenna in terms of the total unattenuated field intensity is—

$$P_r = KA\rho^2 \quad (1)$$

Where

$P_r$  is the total power radiated in kilowatts passing through area  $A$ .

$K$  is a constant =  $2.65 \times 10^{-12}$ .

$A$  is the area through which the field passes, measured in square meters.

$\rho$  is the vector field over the area  $A$  measured in millivolts per meter.

In addition the following antenna equations are used:

antenna efficiency:

$$A_{eff} = \frac{F^2 \times 100}{265^2 \times P} \quad (2)$$

Directivity of an antenna:

$$D = \frac{E_m}{F} \quad (3)$$

Equivalent power in any direction:

$$P_e = \frac{E^2}{125^2} \quad (4)$$

$P$  is the power input to the antenna or licensed power in kilowatts determined by the direct method. (See rules 92, 94, 134, and 142.)

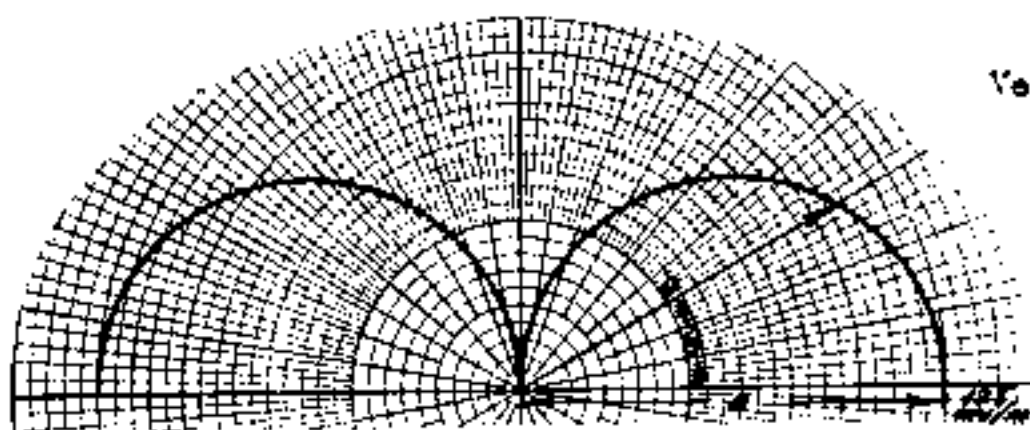
$P_e$  is the equivalent radiated power in any direction from the antenna, in kilowatts, which may be used directly in the mileage separation table.

$F$  is the effective field <sup>7</sup> at 1 mile from the antenna in the horizontal plane without attenuation measured in millivolts per meter (mv/m).

$E_m$  is the field intensity in any direction from the antenna at 1 mile without attenuation, measured in millivolts per meter.

<sup>7</sup> "Effective field" should not be confused with effective voltage at any point, as they are two entirely different terms.

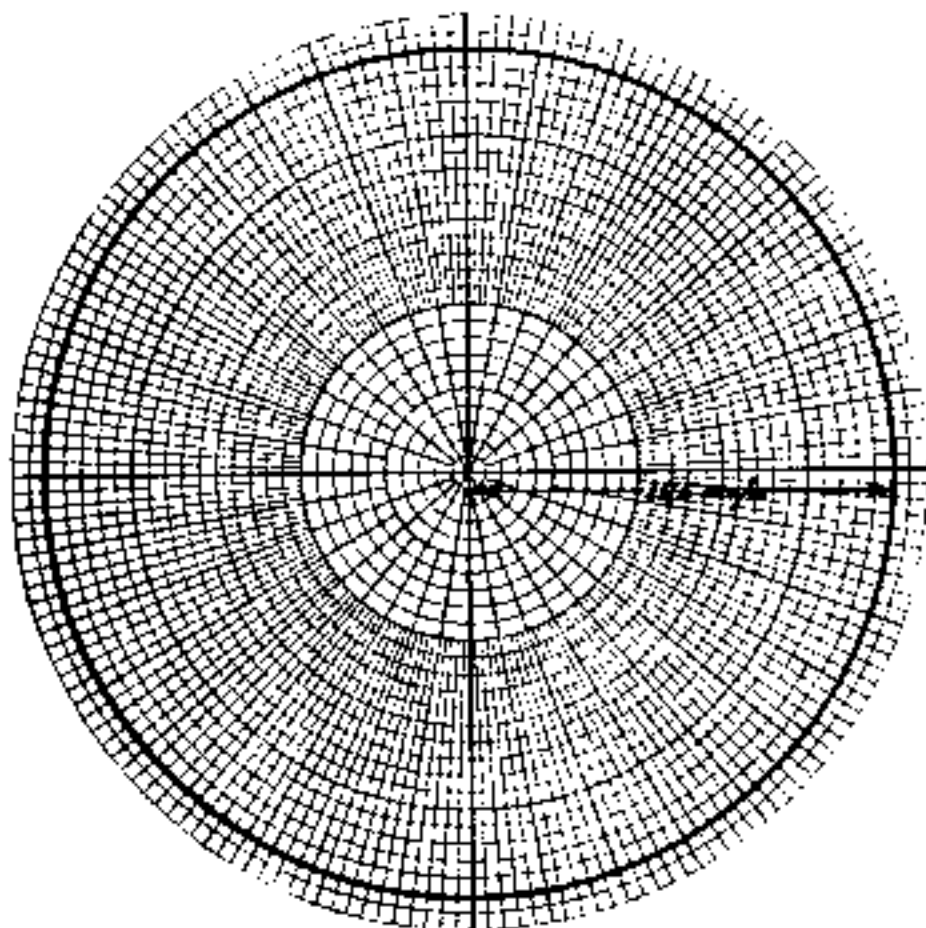
STANDARD RADIATION PATTERNS  
 used as  
 BASIS OF MILEAGE SEPARATION TABLES



Power input to antenna, 1 kw  
 Power radiated - 450 w  
 Radiating eff. - 45%  
 Antenna eff. 22.5%

$$\rho = a \cos \theta$$

1/2 lobe



(a)

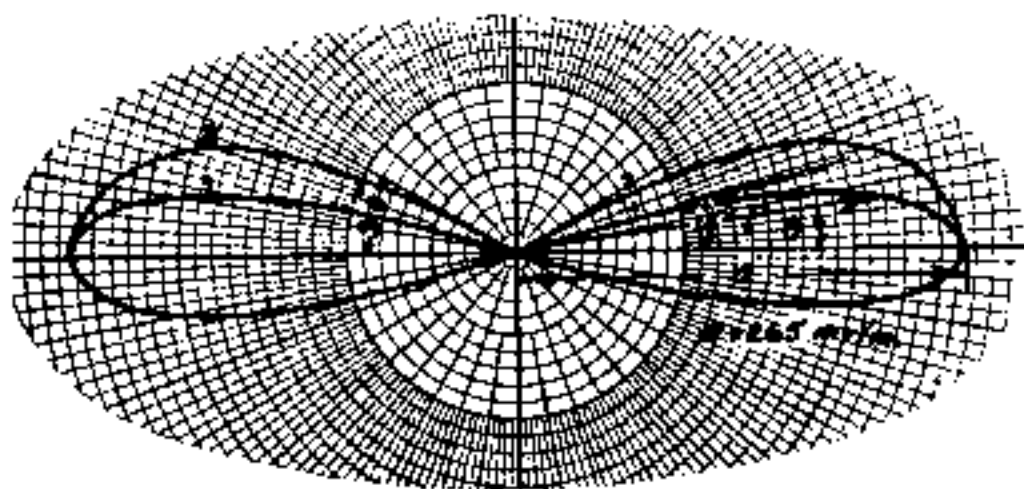
COMPARATIVE RADIATION PATTERN  
 for  
 ANTENNA EFFICIENCY IN HORIZONTAL PLANE

Power radiated - 1 kw  
 Antenna eff. 100%

1.  $\rho = a \cos^2 60$  (space pattern)  
 One lobe pattern  
 Antenna above the earth.

(b)

2.  $\rho = a \cos^2 30$  (space pattern)  
 $\frac{1}{2}$  lobe  
 Antenna on the earth.



The root mean square value of all the field intensities at 1 mile from the antenna in the horizontal plane without attenuation is termed the "effective field" (F).<sup>7</sup> "Effective field" of any broadcast station may be obtained by measuring the field intensities on a sufficient number of radials at short distances from the station and from this determine the product of the field intensity and distance which does not include attenuation. No readings should be taken closer than two wave lengths from the antenna.

It is seldom found that this field is uniform in all directions and in such cases the effective field is the root mean square value of the field at 1 mile at all horizontal directions. This may be determined from a polar diagram with field intensity at a mile plotted as radii, the area bounded by field intensity at 1 mile is measured, and the radius of the circle with the equivalent area calculated. This radius is the root mean square value or "effective field."

There is no known practical method of measuring the pattern of an antenna in the vertical plane.<sup>8</sup> This must be calculated or estimated from the constants of the radiating system. An approximate or exact equation for  $\rho$  is determined and then the power through any differential area is set up in equation (1). This is then integrated throughout the entire area under consideration (hemisphere in case of quarter-wave antenna) to give the total radiated power. By this means the "effective field" from a quarter-wave antenna radiating 1 kilowatt power is found to be 187 millivolts per meter.

It can be shown that as the radiation at high angles is reduced the amount of power necessary to maintain the same "effective field" is reduced. Consequently, the service area of a station can be improved for a given power radiated by an antenna which is designed to give low-angle radiation.

Equation (2) is used for calculating the antenna efficiency of any radiating system. At first it may appear that the "antenna efficiency" should be the total radiated power divided by the antenna input power, and truly that is the "radiating efficiency", but the valuable radiation from a broadcast station is the part restricted through a small angle with the horizontal, and, indeed, not only is the radiation at higher angles wasted power but also may be harmful (cause fading at close range). The quarter-wave antenna, figure 3 (a), is by no means the most efficient antenna that may be erected and, therefore, it should not be used as a standard. It was assumed that to set up a standard for efficiency it was desirable to consider a pattern of excellent radiation characteristics which is better than can be obtained in practice but to which the patterns of all other antennas could be compared with respects to antenna efficiency so as to have a common comparison.

To this end the pattern in figure 3 (b) was adopted as a comparative radiation pattern for determining the efficiency of the radiating systems in the horizontal plane. This pattern may be termed the ideal radiation pattern. This antenna is considered an approach to the ideal with respects to all external effects.

Equation (3) is used to determine the directivity of an antenna.

<sup>7</sup> "Effective field" should not be confused with effective voltage at any point, as they are two entirely different terms.

<sup>8</sup> A limited number of measurements have been made by means of airplanes and captive balloons, but these amounts of only rough check.

Equation (4) is used for the purpose of determining the equivalent power in any direction from directional antennas and antennas that have a pattern in the vertical plane different from that of the quarter-wave antenna. The power as determined by this equation may be used directly in the mileage separations given in tables VII and VIII.

Since the sky-wave radiation changes with the angle  $\theta$ , the proper angle must be used to determine the field intensity which will cause interference at any given separation between transmitter and receiver. The curvature of the earth must be taken into consideration.

Federal Radio Commission Rules and Regulations, rule 138, provides for the determining of the operating power of broadcast stations computed from field-intensity measurements. While no licensees of broadcast stations have exercised the right to compute the power by this method, the values in figure 3 (a) would be the standard for this purpose; that is, the operating power would be determined by the equation

$$P = \frac{F^2}{125^2} \quad (5)$$

where  $P$  and  $F$  are the same as used in equation (2).

This formula applies to all antennas, irrespective of patterns, except that the pattern in the vertical plane shall not exceed that in figure 3 (a).

Most of such formulas<sup>9</sup> for calculating the field intensity at a distance from a station may be simplified and divided into three parts, as follows:

$$E = \frac{F}{d} \times A \quad (6)$$

Where  $E$  is the day or ground-wave field intensity at any distance from the station in millivolts per meter (mv/m)

$F$  is the effective field<sup>10</sup> in mv/m

$d$  is the distance in miles between transmitting antenna and receiver, and

$A$  is the absorption or attenuation factor.

$F$  is the term "effective field" discussed above and can be evaluated to give the usual terms which appear in transmission formulas.<sup>11</sup>

In any actual case the value of the effective field ( $F$ ) is dependent on antenna efficiency (not radiating efficiency) and the power put into the antenna. So in terms used previously

$$F = 265 \sqrt{P \cdot A_{eff}} \quad (7)$$

where  $P$  is input power.

The antenna efficiency is dependent on the design of the radiating system and the radiating efficiency which in turn is dependent on the various power losses. The antenna efficiency has been found to vary widely between broadcast stations as follows:

	<i>Percent</i>
Maximum of any broadcast station measured.....	A <sub>eff</sub> = 57.0
Average of all broadcast stations measured.....	A <sub>eff</sub> = 5.7
Quarter-wave antenna, radiating efficiency.....	A <sub>eff</sub> = 50.0
Empirical value here adopted for the average antenna and conditions (125 mv/m at 1 mile).....	A <sub>eff</sub> = 22.5

<sup>9</sup> See Proceedings of the Institute of Radio Engineers, April 1932, pp. 612 and 613, for several such formulas

<sup>10</sup> See equation (2) above.

<sup>11</sup> See Fifth Annual Report, Federal Radio Commission, p. 27.



For a properly designed antenna in the broadcast spectrum the operating frequency does not affect the value of  $F$  to any substantial extent and is not taken into account.

The second term in equation (6) is the distance  $d$  between transmitting antenna and the point of reception. This term gives the equation the inverse distance characteristic.

The third term or absorption or attenuation factor  $A$  is more moot than the first term, but all authorities agree that  $A$  is a function of (1) the frequency, (2) the distance ( $d$ ), and (3) the constants of the intervening media. However, this is about the extent to which the agreement goes. From formula (6) it is seen that  $A$  is the factor by which field intensity obtained by the inverse distance law is multiplied to obtain the actual field intensity. In several formulas the attenuation factor is the exponential type. Field investigations revealed that the exponential equations neither gave the correct shape for the absorption curve nor the value for different frequencies.

In view of these inaccuracies, attention was given to the formulas by Rolf<sup>12</sup> which had been investigated by the Bureau of Standards.

By the Rolf graphs, the conductivity ( $\sigma$ ) and inductivity or dielectric constant ( $\epsilon$ ) of the path are determined. While actual complete ground-wave surveys on many stations reveal that the absorption varies widely from mile to mile, city to rural area, coastal areas, mountainous areas, etc., it appears that the average or general conductivity and dielectric constant over any limited homogeneous area of the United States are sufficiently uniform to warrant application to the prediction of the radius of the various field intensity contours of a proposed station or existing stations in said areas, if the effective field ( $F$ ) is known. If the average conductivity and dielectric constant are known over an area, it can be predicted with reasonable accuracy what change in field intensity will result from a change in frequency if the effective field ( $F$ ) for each is known.

In general, where the signal was transmitted over terrain of approximately uniform electrical characteristics, it was found that the attenuation curves of Rolf were well adapted to predicting the soil constants, although necessarily some variation was found between the various stations transmitting signals over the observed path. In some few instances it was found that the constants of the conducting medium varied so widely that it was impossible to determine an average constant.

The results of all surveys analyzed are available and may be obtained upon request.

Table H indicates the values of inductivity and conductivity which it is recommended be used for various types of country in the absence of surveys over the particular area involved. Naturally, values obtained from the use of these figures will be only approximate and should, if possible, be replaced by a measurement in the area under consideration.

<sup>12</sup> Graphs to Professor Sommerfeld's Attenuation Formula for Radio Waves, by Bruno Rolf, Proceedings of the Institute of Radio Engineers, March 1930, p. 391.

TABLE H

Type of terrain		Attenuation factor at 50 miles, 1,000 kilocycles <sup>1</sup>	
Sea water, minimum attenuation <sup>2</sup> .....	81	$6.64 \times 10^{-11}$	1.0
Pastoral, low hills, rich soil, typical of Dallas, Tex., area.....	20	$3 \times 10^{-10}$	.59
Pastoral, low hills, rich soil, typical of Ohio and Illinois.....	14	$10^{-10}$	.21
Flat country, marshy, densely wooded, typical of Louisiana near Mississippi River.....	12	$7.5 \times 10^{-10}$	.13
Pastoral, medium hills, and forestation, typical of Maryland, Pennsylvania, New York, exclusive of mountainous territory and sea coasts.....	13	$6 \times 10^{-10}$	.10
Pastoral, medium hills and forestation, heavy clay soil, typical of central Virginia.....	15	$4 \times 10^{-10}$	.66
Rocky soil, steep hills, typical of New England.....	14	$2 \times 10^{-10}$	.826
Sandy, dry, flat, typical of coastal country.....	10	$2 \times 10^{-10}$	.024
City, industrial areas, average attenuation.....	8	$10^{-10}$	.071
City, industrial areas, maximum attenuation.....	8	$10^{-10}$	.008

<sup>1</sup> This figure is stated for comparison purposes in order to indicate at a glance which values of conductivity and inductivity represent the higher attenuation. This figure is the ratio between field intensity with the soil constants stated and with zero attenuation.

<sup>2</sup> Figures stated for sea water, determined by Stratton & Ohlin, Proceedings of the Institute of Radio Engineers, December 1942, p. 1900.

Several comparisons were made in predicting the change in field strength due to a change of frequency only. Where the signal was transmitted over terrain having uniform electrical characteristics, it was found that Rolf's graphs gave good agreement with the observed results.

The data are not complete and will be supplemented as further study is made. As stated in previous reports, this development of empirical standards must change from time to time as conditions change and as more data become available.



# COMMERCIAL COMMUNICATIONS SECTION

## GENERAL

As in broadcasting the frequency spectrum available for other services is severely limited. In addition, the natural characteristics of frequencies suitable for these services require that we share the spectrum with the rest of the world. The problem then is to make the most efficient use of this frequency space.

In the past year many new assignments were made to stations in all parts of the world, and the problem of finding adequate space in the needed portions of the spectrum for the United States was more difficult than at any time before.

The new frequency plan referred to in the last annual report as the one tenth percent system involving a reallocation of many station assignments has proved to be of material assistance in providing for the needs of the United States. Many cases of international interference have been solved by means of cooperation through the various administrations, and through the use of new apparatus.

## FIXED SERVICE

The radio communication companies have continued to improve and extend their services to give radiotelegraph and radiotelephone connections to practically all the countries of the world. There are now 310 point-to-point telegraph stations at 28 locations, and 34 point-to-point telephone stations at 6 locations which are licensed by the Commission to render fixed public service, including press, over international circuits. These stations are operated by 11 companies licensed to provide direct communication between the United States and 71 foreign points.

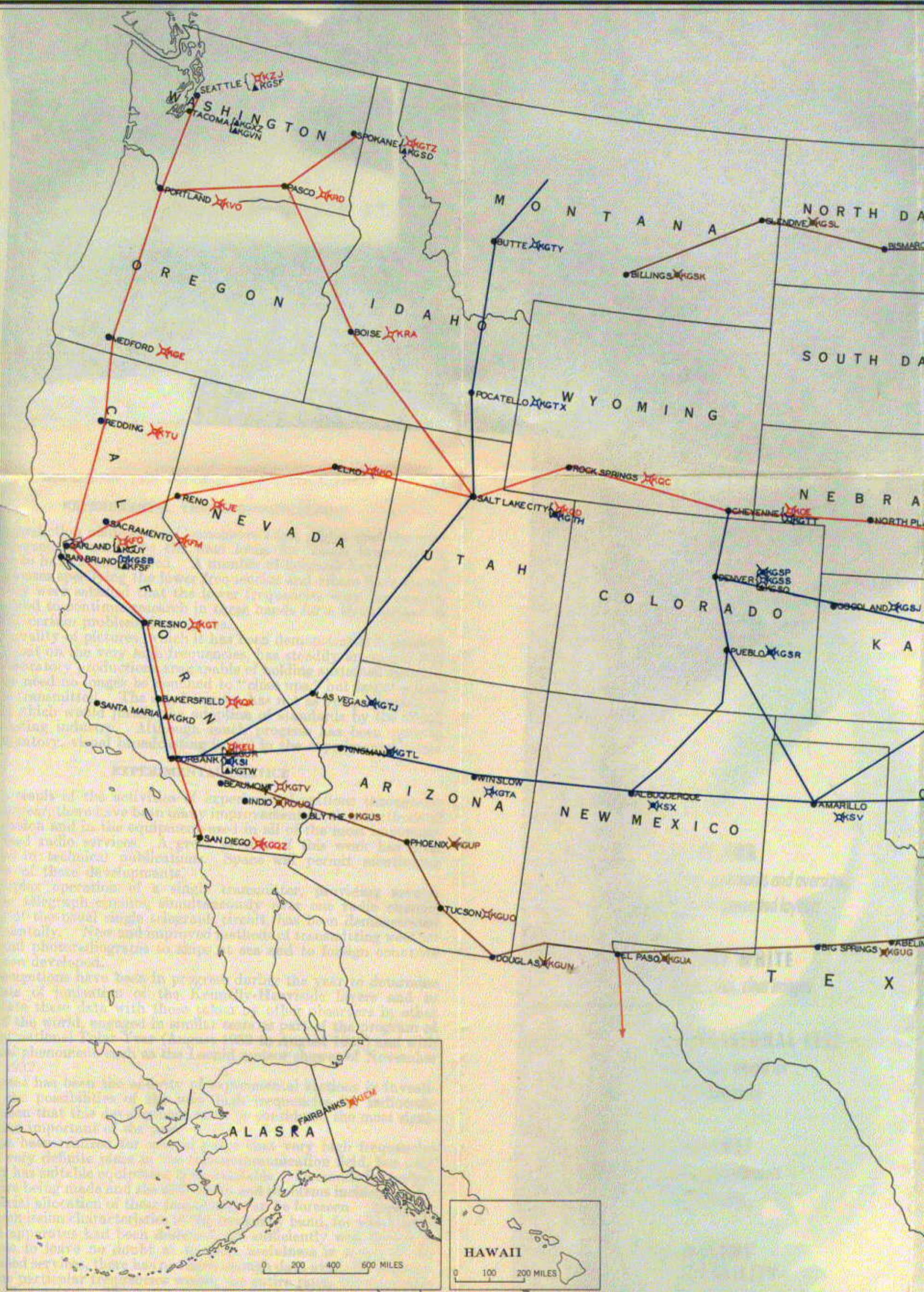
Communication between the United States and 53 foreign countries is possible by means of radiotelephone stations and wire-line extensions which provide facilities for the interconnection of 92 percent of the telephones of the world.

## MARITIME

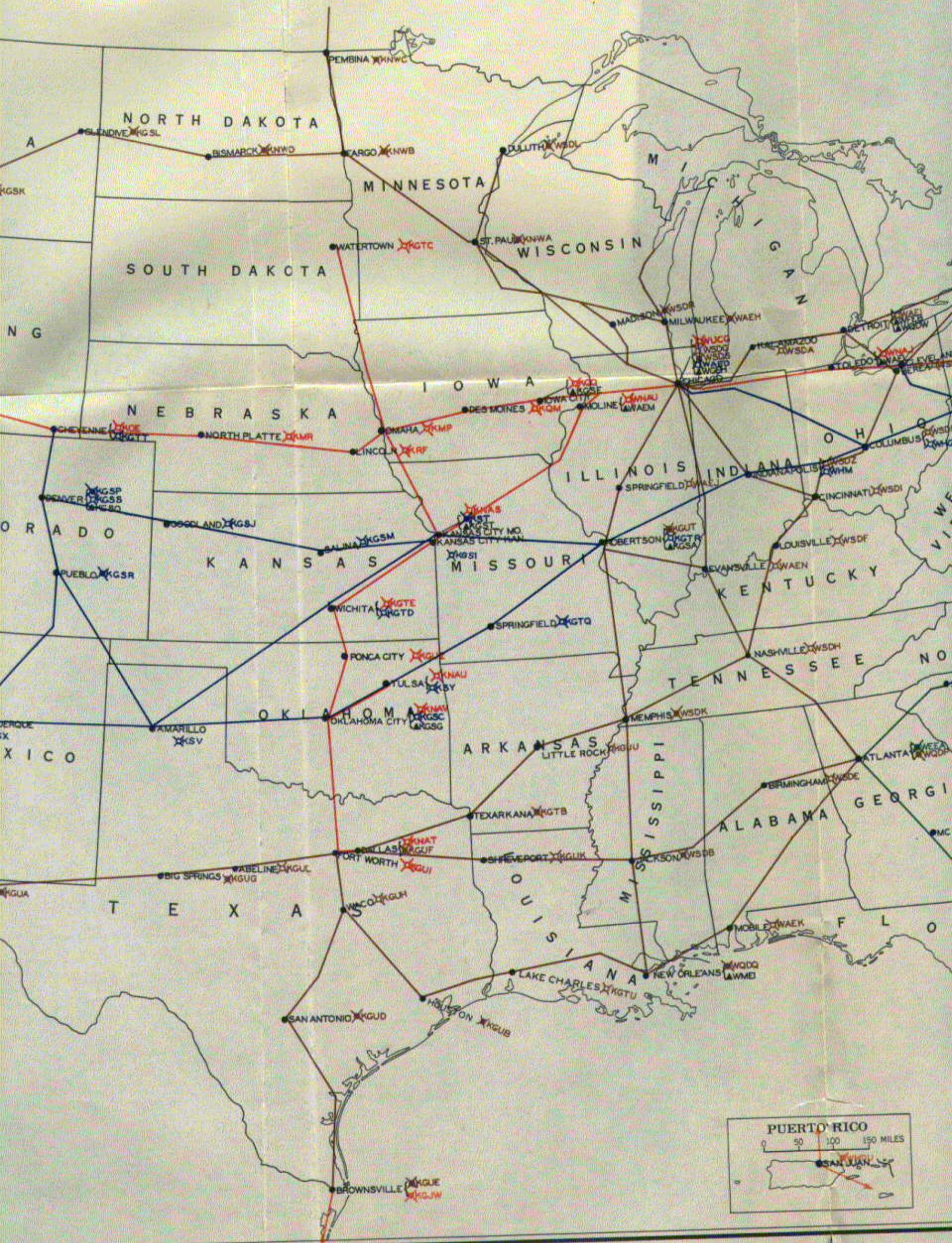
On June 30, 1932, there were 1,997 ship stations licensed by the Commission aboard vessels of United States registry, including 199 vessels which operate on the Great Lakes. Approximately 273 ships are compulsorily equipped with radiotelegraph apparatus, and the remainder are voluntarily equipped. Since ships of all countries intercommunicate on the high seas, all communications are international in character and the assignment of frequencies and methods of procedure are regulated by international regulations.<sup>13</sup> The public coastal telephone station at Ocean Gate, N.J., was providing service

<sup>13</sup> International Radiotelegraph Convention signed at Washington Nov. 25, 1927; International Telecommunication Convention signed at Madrid Dec. 9, 1932, to be effective Jan. 1, 1934.

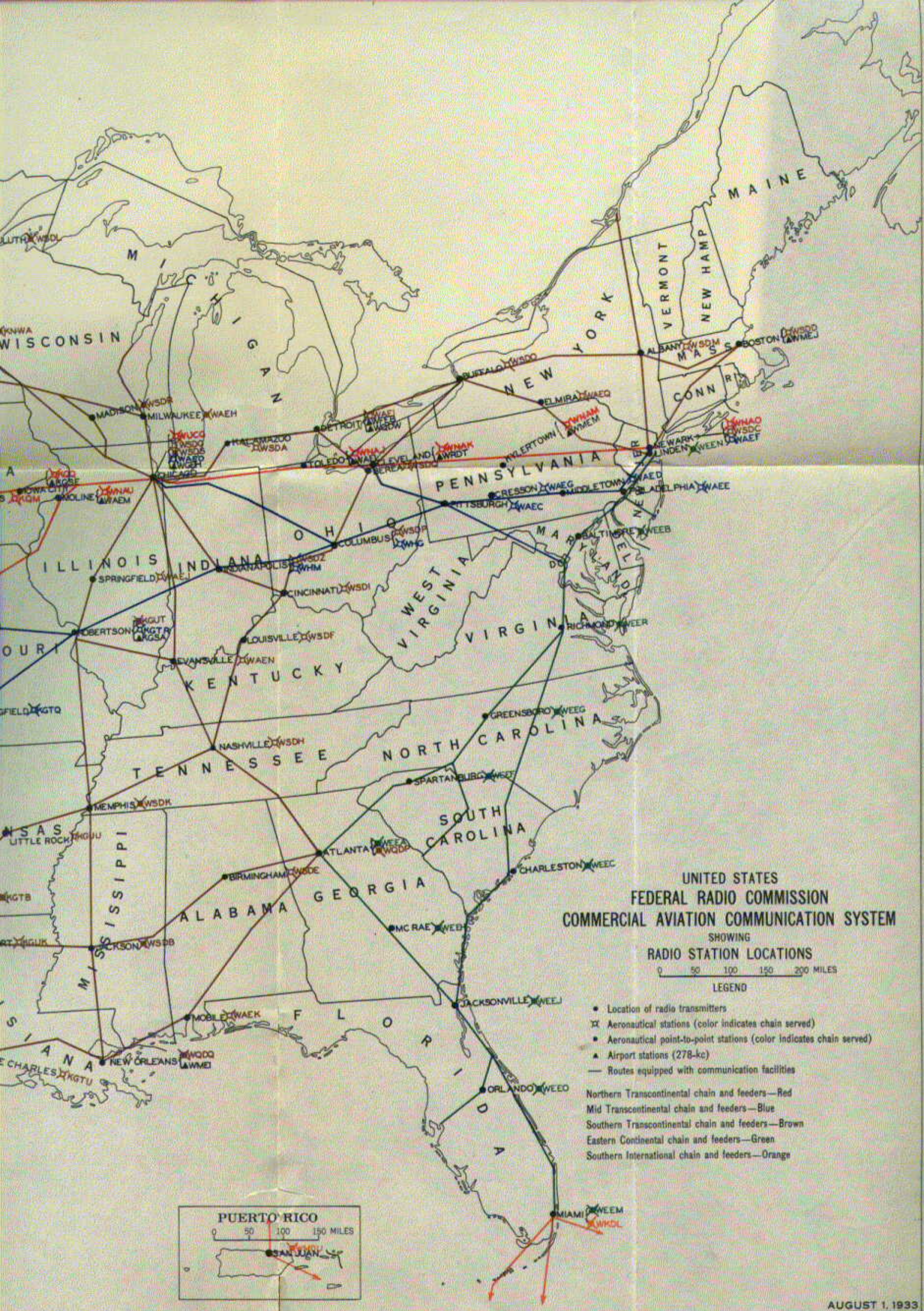








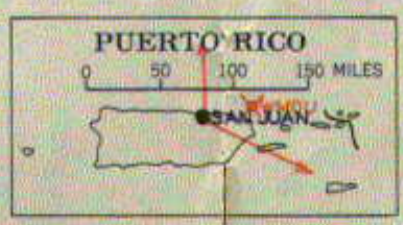




**UNITED STATES  
FEDERAL RADIO COMMISSION  
COMMERCIAL AVIATION COMMUNICATION SYSTEM  
SHOWING  
RADIO STATION LOCATIONS**

0 50 100 150 200 MILES

- LEGEND**
- Location of radio transmitters
  - ✕ Aeronautical stations (color indicates chain served)
  - Aeronautical point-to-point stations (color indicates chain served)
  - ▲ Airport stations (278-kc)
  - Routes equipped with communication facilities
- Northern Transcontinental chain and feeders—Red  
 Mid Transcontinental chain and feeders—Blue  
 Southern Transcontinental chain and feeders—Brown  
 Eastern Continental chain and feeders—Green  
 Southern International chain and feeders—Orange





## EXPERIMENTAL VISUAL BROADCASTING

The prediction made in the Commission's last report that the very high frequencies would be the final locus for visual broadcasting appears to have been justified. A number of licensees have given up their licenses specifying the lower frequencies and others have stated that they were satisfied that the lower frequencies were unsuitable, but desired to continue research in these bands for a short period to complete certain problems in progress.

The quality of pictures, which it has been demonstrated is possible to transmit on the very high frequencies, has steadily increased, and some laboratory productions are capable of holding sustained interest. Pictures need no longer be confined to "close ups," but larger scenes may be transmitted. The art, however, has not as yet progressed to a stage which would justify the adoption of standards by the visual broadcasting industry. Although much progress has been made in the laboratory, visual broadcasting is still in the experimental stage.

## EXPERIMENTAL SERVICE

As a result of the activities of experimental stations throughout the past year, there have been many improvements both in methods of transmission and in the equipment used in all of the most important authorized radio services. A great portion of this work has been reported in technical publications. Space will permit mentioning but few of these developments.

Multiplex operation of a single transmitter, providing several separate telegraph circuits, simultaneously over one radio channel instead of the usual single telegraph circuit, has been demonstrated experimentally. New and improved methods of transmitting weather maps and photoradiograms to ships at sea and to foreign countries have been developed.

Investigations have been in progress during the year to determine the state of ionization of the Kennelly-Heaviside layers and to coordinate these data with those taken by other observers in other parts of the world, engaged in similar tests as part of the program of the International Polar Year (August 1932 to August 1933) and with terrestrial phenomena such as the Leonid meteor shower of November 15-16, 1932.

So great has been the activity of experimental stations in investigating the possibilities of the very high frequencies for radiocommunication that this development must be considered the most significant and important of the year.

It has been realized for several years that very high frequencies have a very definite place in the radiocommunication field, but only recently has suitable equipment been available. Demands for assignments are being made and the difficulties and problems incident to the commercial allocation of these frequencies can be foreseen. Although the transmission characteristics of the frequency band, for which commercial apparatus had been designed, are sufficiently well known at this time to leave no doubt as to their usefulness in many of the established services, there has not been enough data available to determine the particular frequencies within the entire range most suitable for specific services. These data must be obtained before any plan of

allocation could be considered. They were obtainable from no other source than licensees experimenting in this field. A policy was therefore adopted, the purpose of which was to encourage experimental work of this kind to obtain the required data and at the same time to retain absolute control of the frequencies by conserving their experimental status until such time as they could be allocated in such manner as to best meet the needs of all services.

Under the Commission's general policy, in order to obtain authority to operate radio stations in the experimental service, the primary requirement which all must meet is that the program of research outlined must give promise of contributing substantially toward the progress of the radio art. Applicants must be qualified technically and financially to undertake the experimental work. In the case of the very high frequencies it was apparent that in order to formulate any sound allocation plan, it was necessary not only to obtain all possible information as to the physical properties of the frequencies but also to differentiate as to their usefulness and practicability for communication in many different services, the particular requirements of which were all very different.

No authority to operate on other than an experimental basis has been granted, and none of the frequencies above 30,000 kilocycles has been authorized for use in the continental United States on a commercial basis.

There were licensed on June 30 of this year 232 general and 51 special experimental stations. These stations were being operated by 135 different licensees. Of these, 87 licensees were operating 169 experimental stations, utilizing the very high frequencies, which is illustrative of the tremendous interest being shown in this new development.

# INTERNATIONAL AND INTERDEPARTMENTAL RELATIONS SECTION

## MADRID RADIO CONFERENCE

The Fourth International Radio Conference was held in Madrid from September 3, 1932, to December 10, 1932. This conference, which was the most important radio conference which has yet been held, completely revised the International Radio Convention and Regulations signed at Washington in 1927.

There was held concurrently with the Radio Conference an International Telegraph Conference which met for the purpose of revising the St. Petersburg Telegraph Convention of 1875, and the General Regulations of Brussels of 1928. As a result of previous arrangements the purpose of holding the two conferences simultaneously at Madrid was to see whether or not a fusion was possible for the two conventions and, if so, to bring this about. After nearly 4 months of protracted discussion this step was taken, with the result that the world's first Telecommunication Convention came into being.

Annexed to the Telecommunication Convention, which it is hoped will remain unchanged for many years, are three separate sets of regulations dealing with telegraphy, telephony, and radio, respectively. These are to be revised at 5-year intervals by administrative conferences.

The radio regulations themselves are divided into the General Radio Regulations and the Additional Radio Regulations. The United States was signatory to the Convention and to the General Radio Regulations only. While the Telecommunication Convention and General Radio Regulations deal primarily with international regulations of a general character of interest to Governments in their administrative capacity, the Telegraph and Telephone Regulations and the Additional Radio Regulations cover detailed managerial points which could not be accepted by the United States. They are for the most part matters of private arrangements made by the private operating companies concerned.

The delegation of the United States consisted of 4 delegates and 7 technical advisors, with Judge Eugene O. Sykes, chairman of the delegation. Dr. C. B. Jolliffe, chief engineer of the Commission, was one of the delegates, and Mr. Gerald C. Gross, engineer of the Commission, was a technical advisor.

# REPORT OF THE CHIEF EXAMINER

ELLIS A. YOST

The numerous decisions of the courts establishing principles of law applicable to the administration of radio law and regulations is reflected in a diminution of the number of cases heard before examiners. During the fiscal year 1933 a total of 204 cases were heard, as compared with 239 during the preceding year. However, the result of prior decisions was to eliminate from the hearing docket substantially all of those cases which clearly could not be granted under established precedents. The complexity of issues in the cases heard necessitated generally the devotion of a greater amount of time and study to each case.

Applicants seeking authority to construct new broadcast stations were in the minority, the larger percentage of the cases concerning this service involving increases of the facilities assigned to existing stations, the moving of stations from one locality to another, the assignment of licenses, and proposals to experiment with recent developments of the radio art, such as directional antennae systems. A considerable number of cases involved services other than broadcast, including television, general experimental, amateur, coastal, and aeronautical.

In addition to applications the hearings involved revocation proceedings and protest cases.

A summary of the work of the division is disclosed by the following table:

Cases heard but not reported as of July 1, 1932.....	36
Cases heard during fiscal year.....	204
	<hr/>
	240
Case granted by Commission after hearing (no report).....	1
	<hr/>
	239
Case continued for further hearing.....	1
	<hr/>
	238
Cases reported during fiscal year.....	209
	<hr/>
Cases unreported as of June 30, 1933.....	29

The first changes in the examiner personnel since the establishment of the division occurred in the latter part of the fiscal year, Elmer W. Pratt, examiner, and Ellis A. Yost, chief examiner, resigning, their resignations being effective June 1, 1933, and June 30, 1933, respectively. Upon the tender of their resignations and on May 17, 1933, Ralph L. Walker, examiner, was relieved of his duties in the Legal Division where he had been on detail since August 2, 1932. On June 16, 1933, Rosel H. Hyde, examiner, was transferred to the Legal Division, and George H. Hill, then a member of the legal staff, became an examiner. Thus, at the close of business June 30, 1933, the number of examiners was reduced to two.



# REPORT OF THE DIVISION OF FIELD OPERATIONS

W. D. TERRELL, *Chief*

The Division of Field Operations, which was created upon the transfer of the Radio Division from the Department of Commerce to the Federal Radio Commission, is charged in brief with the inspection of all transmitting apparatus to determine whether in construction and operation it conforms to the requirements of the Radio Act of 1927, the rules and regulations of the licensing authority and the license under which it is constructed or operated, to make measurements of frequencies and field intensity measurements, to maintain records incident to the monitoring of radio stations and all infractions, to conduct examinations for applicants for radio-operators' licenses, to investigate alleged violations by station operators of such laws, treaties, and regulations as might result in the suspension of their licenses.

For the purpose of performing these duties the United States is divided into 20 radio inspection districts with headquarters at the following points:

Inspector in charge:

Customhouse, Boston, Mass.  
Subtreasury Building, New York, N. Y.  
35 South Ninth St., Philadelphia, Pa.  
Fort McHenry, Baltimore, Md.  
Customhouse, Norfolk, Va.  
528 Post Office Building, Atlanta, Ga.  
228 Federal Building, Miami, Fla.  
Customhouse, New Orleans, La.  
209 Prudential Building, Galveston, Tex.  
464 Federal Building, Dallas, Tex.  
1105 Rives-Strong Building, Los Angeles, Calif.  
Customhouse, San Francisco, Calif.  
207 New Courthouse Building, Portland, Oreg.  
808 Federal Office Building, Seattle, Wash.  
538 Customhouse, Denver, Colo.  
413 Federal Building, St. Paul, Minn.  
410 Federal Building, Kansas City, Mo.  
2022 Engineering Building, Chicago, Ill.  
2909 David-Stott Building, Detroit, Mich.  
514 Federal Building, Buffalo, N. Y.

Manager, central monitoring station, post-office box 788, Grand Island, Nebr.  
Manager, monitoring station, Radio Station Building, Naval Training Station, Great Lakes, Ill.

There are maintained seven monitoring stations at the following points:

Boston, Mass.  
Baltimore, Md.  
Atlanta, Ga.  
San Pedro, Calif.  
Portland, Oreg.  
Great Lakes, Ill.  
Grand Island, Nebr.

There are eight radio test cars equipped with field-intensity apparatus in use throughout the United States.

The following statistical tables give comparative information as to the scope of activity of this service during the past year:

## FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection (city or town)	Stations inspected										Frequency measurements									
	Ship, under net	Ship, voluntary equipment	Ship, license	Land	Broadcast	Aircraft	Aircraft	United States broadcast			United States other than broadcast			Foreign						
								Messages	Stations deviating	Deviations	Messages	Stations deviating	Deviations	Messages	Stations deviating	Deviations				
																	Measurements	Stations deviating	Deviations	
<b>First district:</b>																				
Boston, Mass.	700	246	172	2	6	15	0	4,076	21	39	822	208	408	182	196					
Outside	0	0	0	16	36	9	0	0	0	0	0	0	0	0	0					
Total, 1933	700	246	172	18	42	24	0	4,076	21	39	822	208	408	182	196					
Total, 1932	1,186	212	180	17	43	48	1	10,559	43	93	400	464	361	114	123					
<b>Second district:</b>																				
New York, N. Y.	2,414	396	333	51	193	95	5	0	0	0	0	0	0	0	0					
Outside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Total, 1933	2,414	396	333	51	193	95	5	0	0	0	0	0	0	0	0					
Total, 1932	4,065	372	396	56	246	147	1	0	0	0	0	0	0	0	0					
<b>Third district:</b>																				
Philadelphia, Pa.	277	96	38	3	27	17	9	0	0	0	0	0	0	0	0					
Outside	19	4	1	11	27	24	1	0	0	0	0	0	0	0	0					
Total, 1933	296	100	39	14	54	41	1	0	0	0	0	0	0	0	0					
Total, 1932	457	62	13	14	79	48	0	0	0	0	0	0	0	0	0					
<b>Fourth district:</b>																				
Baltimore, Md.	247	138	99	3	10	5	0	2,447	92	229	213	292	389	168	171					
Outside	0	9	0	6	21	5	0	0	0	0	0	0	0	0	0					
Total, 1933	247	147	99	9	31	10	0	2,447	92	229	213	292	389	168	171					
Total, 1932	406	24	18	7	43	45	2	3,326	39	177	20	26	114	59	66					

REPORT OF THE FEDERAL RADIO COMMISSION

Fifth district:														
Norfolk, Va.														
435	0	64	0	18	13	0	0	0	0	0	0	0	0	0
Outside														
425	80	0	3	31	3	0	0	0	0	0	0	0	0	0
780	117	64	3	47	15	0	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Sixth district:														
Atlanta, Ga.														
0	0	0	0	6	2	24	3,307	78	446	24	25	57	8	7
Outside														
0	0	0	23	42	7	1	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Seventh district:														
Miami, Fla.														
153	14	0	12	16	34	22	0	0	0	0	0	0	0	0
Outside														
0	1	0	22	8	0	0	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Eighth district:														
New Orleans, La.														
304	168	96	9	19	2	3	1,341	40	184	26	27	27	5	5
Outside														
1	5	5	15	20	23	2	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Ninth district:														
Galveston, Tex.														
23	78	78	2	4	1	1	0	0	0	0	0	0	0	0
Outside														
0	11	11	9	10	5	2	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Tenth district:														
Dallas, Tex.														
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Outside														
0	0	0	25	64	7	0	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Eleventh district:														
Los Angeles, Calif.														
604	252	60	17	29	24	0	2,937	35	1,219	184	204	194	57	57
Outside														
0	2	1	32	31	12	0	0	0	0	0	0	0	0	0
Total, 1933														
Total, 1932														
Twelfth district:														
San Francisco, Calif.														
604	244	61	29	60	30	0	2,937	25	1,219	194	204	194	57	57
Outside														
784	185	36	43	60	14	0	4,465	15	1,489	288	377	217	38	39
Total, 1933														
Total, 1932														

1 Measurements discontinued during year.

2 Office established in 1933.



REPORT OF THE FEDERAL RADIO COMMISSION

Eighteenth district:															
Chicago, Ill.	60	13	42	28	6	4	21,039	15	30	186	5	6	3	0	0
Outside	98	23	46	106	4	0	0	0	0	0	0	0	0	0	0
Total, 1932	158	36	88	134	10	4	1,039	15	30	185	5	6	3	0	0
Total, 1933	429	23	151	245	28	26	5,728	30	67	513	20	26	31	1	1
Nineteenth district:															
Detroit, Mich.	296	7	38	33	4	0	2,328	28	72	622	40	40	103	34	30
Outside	0	14	68	78	17	2	0	0	0	0	0	0	0	0	0
Total, 1932	296	21	106	111	21	2	2,328	28	72	622	40	40	103	34	30
Total, 1933	915	15	138	162	56	15	4,479	33	69	777	38	56	249	95	89
Twentieth district:															
Buffalo, N. Y.	116	3	20	35	13	10	0	0	0	0	0	0	0	0	0
Outside	0	0	14	32	3	0	0	0	0	0	0	0	0	0	0
Total, 1932	116	3	34	71	14	10	0	0	0	0	0	0	0	0	0
Total, 1933	98	6	43	109	30	6	8,718	102	144	8,714	1,078	1,165	10,752	1,161	1,229
Grand Island, Nebr.:															
Total, 1932	0	0	0	0	0	0	16,585	120	258	10,825	1,136	1,260	7,082	1,161	1,229
Total, 1933	0	0	0	0	0	0	8,718	102	144	8,714	1,078	1,165	10,752	1,161	1,229
Summary by districts:															
First	790	172	16	44	24	0	4,070	21	39	8,213	822	908	468	182	196
Second	8,414	333	51	163	95	6	0	0	0	0	0	0	0	0	0
Third	396	39	14	54	41	1	0	0	0	0	0	0	0	0	0
Fourth	347	69	12	31	10	0	2,447	92	229	1,480	213	292	380	168	171
Fifth	435	54	3	47	15	0	0	0	0	0	0	0	0	0	0
Sixth	0	0	31	48	9	25	3,397	33	78	446	24	25	57	8	7
Seventh	153	0	35	18	24	22	0	0	0	0	0	0	0	0	0
Eighth	395	100	24	48	24	3	1,341	22	60	194	20	27	27	5	5
Ninth	23	89	11	14	4	3	0	0	0	0	0	0	0	0	0
Tenth	0	0	26	04	7	0	0	0	0	0	0	0	0	0	0
Eleventh	604	61	39	60	35	0	2,937	25	70	1,319	184	208	194	57	57
Twelfth	895	299	70	91	24	17	3,172	10	25	1,187	118	126	324	94	92
Thirteenth	145	28	40	57	12	11	8,086	43	125	2,794	298	304	932	306	308
Fourteenth	463	104	65	36	27	15	0	0	0	0	0	0	0	0	0
Fifteenth	0	0	25	45	5	6	0	0	0	0	0	0	0	0	0
Sixteenth	0	0	49	53	10	0	0	0	0	0	0	0	0	0	0
Seventeenth	0	0	41	57	2	0	0	0	0	0	0	0	0	0	0
Eighteenth	78	35	88	134	10	4	1,039	16	30	185	5	6	3	0	0
Nineteenth	296	23	104	111	23	2	2,328	28	72	622	40	40	103	34	36
Twentieth	116	3	34	71	14	10	0	0	0	0	0	0	0	0	0
Grand Island	0	0	0	0	0	0	14,685	120	258	10,825	1,136	1,260	7,082	1,161	1,229
Grand total, 1932	8,456	1,394	783	1,829	418	127	43,406	409	966	21,335	2,907	3,199	9,480	2,005	2,098
Grand total, 1933	11,125	1,275	1,181	1,993	606	169	69,895	491	951	17,738	2,138	2,377	12,978	2,395	2,625

\* Measurements discontinued during year.

Place of examination (city or town)	Operators examined										Operators licensed											
	Commercial					Amateur					Commercial								Amateur			
	Extra first tele	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone	Aeronautical	Extra first	Print	Unlimited phone	Extra first tele	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone	Aeronautical	Extra first	Print	Temporary
First district: Boston, Mass	0	34	317	14	93	20	52	6	8	1,002	106	2	131	165	10	72	6	54	6	47	2,156	168
Outside	0	0	0	0	0	0	0	0	13	359	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	34	217	14	93	20	52	6	21	1,361	106	2	131	165	10	72	6	54	6	47	2,156	168
Total, 1932	0	96	353	6	163	28	0	1	20	832	0	1	181	205	3	67	27	0	1	21	1,214	951
Second district: New York, N.Y.	0	58	161	23	116	37	31	30	19	1,559	142	3	343	216	15	114	21	50	0	30	1,944	45
Outside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	58	161	23	116	37	31	30	19	1,559	142	3	343	216	15	114	21	50	0	30	1,944	45
Total, 1932	2	155	290	12	80	34	0	10	25	1,311	0	10	502	333	6	64	34	0	6	26	1,511	167
Third district: Philadelphia, Pa.	0	19	35	4	65	6	29	1	5	484	36	1	64	70	4	57	6	28	1	15	785	0
Outside	0	0	4	3	8	1	3	1	4	205	30	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	19	39	7	73	7	32	2	12	760	66	1	64	70	4	57	6	28	1	15	785	0
Total, 1932	0	10	117	6	32	0	0	1	10	468	0	0	77	104	1	22	0	0	0	7	370	0
Fourth district: Baltimore, Md.	0	0	26	6	52	14	0	2	4	183	10	0	76	37	0	16	11	0	0	4	262	17
Outside	0	5	5	1	17	6	28	0	2	100	14	2	24	12	1	20	4	23	0	2	62	0
Total, 1933	0	5	33	7	69	20	28	2	10	293	24	2	100	49	1	36	19	23	0	6	374	17
Total, 1932	1	21	61	3	36	23	0	3	6	322	0	0	110	91	0	32	23	0	2	20	650	224
Fifth district: Norfolk, Va.	0	1	6	3	6	1	0	2	4	80	12	1	25	20	2	22	1	1	1	10	317	19
Outside	0	0	0	0	15	2	1	0	11	304	23	0	0	0	0	0	0	0	0	0	0	0
Total, 1933	0	1	6	3	21	3	1	2	15	384	44	1	25	20	2	22	1	1	1	10	317	19
Total, 1932	1	8	19	1	8	0	0	3	2	67	0	0	41	24	0	8	0	0	2	2	72	0

## REPORT OF THE FEDERAL RADIO COMMISSION

Sixth district: Atlanta, Ga. Outside	0	1	10	4	46	28	21	1	4	140	4	1	25	261	0	0	17	23	4	21	655	81
Total, 1933	0	4	25	7	41	8	1	0	19	504	19	0	0	0	0	0	0	0	0	0	0	0
Seventh district: Miami, Fla. Outside	0	5	35	15	89	26	22	1	23	708	23	1	25	50	9	96	17	23	4	21	633	81
Total, 1933	0	8	70	3	63	27	0	36	15	808	15	0	48	99	3	32	31	0	26	7	200	828
Eighth district: New Orleans, La. Outside	0	6	23	7	6	9	9	1	1	66	1	0	46	62	4	9	4	6	0	8	182	12
Total, 1933	0	8	10	2	15	3	0	0	7	81	7	0	0	0	0	0	0	0	0	0	0	0
Ninth district: Galveston, Tex. Outside	0	13	60	0	26	9	11	0	10	86	10	4	137	101	4	83	8	11	2	26	413	321
Total, 1933	0	23	244	14	85	15	0	23	20	303	20	0	232	257	8	67	15	0	2	27	357	1,020
Tenth district: Dallas, Tex. Outside	0	4	11	2	15	10	6	1	8	68	8	0	30	40	4	17	6	7	2	6	158	11
Total, 1933	0	5	18	6	21	12	7	2	6	97	6	0	20	40	4	17	6	7	2	8	158	11
Eleventh district: Los Angeles, Calif. Outside	0	3	63	4	97	44	6	17	8	196	8	6	22	90	5	102	40	33	21	30	574	162
Total, 1933	0	9	179	1	112	61	0	74	19	430	19	0	18	155	1	77	59	0	14	19	263	162
Twelfth district: San Francisco, Calif. Outside	0	20	106	9	123	30	26	42	21	609	21	2	101	155	6	106	9	76	23	34	1,204	65
Total, 1933	0	28	114	13	138	22	61	48	28	1,117	48	2	101	155	6	106	9	76	23	34	1,204	65
Total, 1932	0	80	193	6	60	29	0	11	16	707	9	0	124	189	4	37	44	0	0	17	736	60
Thirteenth district: San Francisco, Calif. Outside	1	44	99	19	25	14	57	72	11	732	11	4	192	146	12	49	14	81	56	22	1,286	162
Total, 1933	1	6	225	25	78	72	0	9	20	778	20	6	336	224	20	64	97	0	11	68	1,286	162
Total, 1932	1	106	225	25	78	72	0	9	20	778	20	6	336	224	20	64	97	0	11	68	1,286	162

Established in 1935.

## REPORT OF THE FEDERAL RADIO COMMISSION

Place of examination (city or town)	Operators examined										Operators licensed													
	Commercial					Amateur					Commercial				Amateur									
	Extra first class	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone	Aeronautical	Extra first	First	Unlimited phone	Extra first tele-	First telegraph	Second telegraph	Third telegraph	First telephone	Second telephone	Third telephone	Aeronautical	Extra first	First	Temporary		
Thirteenth district: Portland, Oreg. Outside	1	4	50	4	28	25	4	0	10	222	28	0	31	67	1	41	22	16	3	17	347	79	0	
Total 1932	1	4	51	6	45	26	4	1	22	353	56	0	31	67	1	41	22	16	3	17	347	79	0	
Total 1933	1	17	75	3	29	9	0	3	1	198	0	0	44	68	2	13	9	0	2	2	184	0	0	
Fourteenth district: Seattle, Wash. Outside	0	23	45	28	29	15	29	0	11	312	39	0	76	90	18	48	28	58	0	25	787	212	0	
Total 1932	0	23	45	28	29	15	29	0	11	312	39	0	76	90	18	48	28	58	0	25	787	212	0	
Total 1933	0	24	57	37	47	30	44	0	20	787	108	0	78	90	13	48	26	66	0	25	767	212	517	
Fifteenth district: Denver, Colo. Outside	0	0	6	2	23	7	17	10	4	167	10	0	9	16	1	42	13	20	18	5	256	79	0	
Total 1932	0	0	6	2	23	7	17	10	4	167	10	0	9	16	1	42	13	20	18	5	256	79	0	
Total 1933	0	2	16	1	24	25	0	7	2	104	0	0	8	19	0	32	31	0	0	2	108	0	0	
Sixteenth district: St. Paul, Minn. Outside	0	2	6	0	30	8	6	12	6	262	36	0	12	26	0	46	11	9	0	14	609	57	0	
Total 1932	0	2	6	0	30	8	6	12	6	262	36	0	12	26	0	46	11	9	0	14	609	57	0	
Total 1933	0	8	26	0	56	19	0	8	12	269	0	0	12	24	0	46	11	9	0	7	409	57	0	
Seventeenth district: Kansas City, Mo. Outside	0	0	11	6	93	38	31	26	13	361	23	0	19	68	2	112	34	39	14	40	942	167	0	
Total 1932	0	0	11	6	93	38	31	26	13	361	23	0	19	68	2	112	34	39	14	40	942	167	0	
Total 1933	0	4	7	0	49	31	2	5	30	702	68	0	0	0	0	9	0	0	0	0	0	942	167	0
Total 1933	0	4	7	0	49	31	2	5	30	702	68	0	0	0	0	9	0	0	0	0	0	942	167	0
Total 1933	0	4	7	0	49	31	2	5	30	702	68	0	0	0	0	9	0	0	0	0	0	942	167	0
Total 1933	0	4	7	0	49	31	2	5	30	702	68	0	0	0	0	9	0	0	0	0	0	942	167	0
Total 1933	0	4	7	0	49	31	2	5	30	702	68	0	0	0	0	9	0	0	0	0	0	942	167	0



REPORT OF THE FEDERAL RADIO COMMISSION

Eighteenth district:	0	15	127	15	273	104	99	49	29	3,017	91	171	6	178	32	141	16	49	2,146	628
Chicago, Ill.....	0	0	16	2	20	3	5	2	31	261	81	2	0	4	0	1	0	1	42	0
Outside.....	0	19	143	15	302	106	101	44	54	1,908	172	173	5	180	52	142	16	47	2,188	628
Total 1932.....	0	38	406	17	228	79	0	222	83	1,346	0	421	6	140	109	0	14	58	1,967	2,108
Nineteenth district:	0	5	49	11	76	17	51	12	7	438	23	147	12	175	45	90	0	70	1,790	566
Detroit, Mich.....	0	0	75	11	108	26	16	6	55	2,074	119	0	0	0	0	0	0	0	0	0
Outside.....	0	5	49	11	76	17	51	12	7	438	23	147	12	175	45	90	0	70	1,790	566
Total 1932.....	0	22	121	22	182	43	67	19	62	2,442	142	147	12	175	45	90	0	70	1,790	626
Total 1933.....	0	35	218	19	169	79	0	24	31	1,256	0	179	15	105	76	0	8	32	1,210	2,137
Twentieth district:	0	2	32	3	26	4	4	4	4	246	26	63	1	53	6	7	6	22	861	78
Buffalo, N.Y.....	0	0	26	0	29	6	4	1	10	675	55	0	0	0	0	0	0	0	0	0
Outside.....	0	2	32	3	26	4	4	4	4	246	26	63	1	53	6	7	6	22	861	78
Total 1932.....	0	4	61	3	44	10	8	5	14	928	81	63	1	53	6	7	6	22	861	203
Total 1933.....	0	6	68	3	65	10	8	5	14	928	81	63	1	53	6	7	6	22	861	203
Summary by districts:																				
First.....	0	34	217	14	98	20	52	6	21	1,845	106	165	10	72	5	54	6	47	2,165	168
Second.....	0	58	151	28	116	37	31	20	10	1,099	143	216	15	114	24	50	0	30	1,944	45
Third.....	0	19	39	7	78	7	22	2	12	790	59	70	4	57	5	28	1	15	755	9
Fourth.....	0	5	33	1	39	19	23	2	10	288	24	49	1	35	10	25	0	6	374	17
Fifth.....	0	1	8	3	24	3	1	2	2	284	44	20	2	22	1	1	4	10	317	19
Sixth.....	0	5	25	15	50	26	22	2	23	733	35	60	9	96	17	23	4	21	633	81
Seventh.....	0	14	43	9	21	12	9	1	8	147	25	52	4	9	4	6	0	8	182	12
Eighth.....	0	13	67	6	108	18	11	0	30	392	35	101	4	53	6	11	2	28	412	321
Ninth.....	0	6	18	8	21	12	7	2	8	190	9	40	4	17	0	7	2	8	108	11
Tenth.....	0	3	85	5	124	60	6	19	40	624	68	90	5	102	40	33	2	30	674	162
Eleventh.....	0	23	114	12	128	22	61	45	28	1,117	107	155	5	105	9	76	23	34	1,204	86
Twelfth.....	1	47	90	20	70	15	64	90	16	924	70	145	12	49	14	81	66	22	1,286	162
Thirteenth.....	1	4	51	6	45	26	4	1	22	253	55	57	1	41	22	18	3	17	247	79
Fourteenth.....	0	20	57	37	47	30	44	0	20	757	102	90	13	48	26	58	18	25	737	213
Fifteenth.....	0	0	10	8	41	21	21	10	4	301	23	16	0	42	13	29	0	5	258	79
Sixteenth.....	0	4	7	0	34	3	9	0	0	501	58	26	0	46	11	9	0	14	409	57
Seventeenth.....	0	0	18	6	142	54	53	31	43	943	90	86	2	112	34	39	14	40	942	167
Eighteenth.....	0	19	143	18	302	106	101	44	54	1,908	172	173	5	180	52	142	16	47	2,188	628
Nineteenth.....	0	23	121	22	182	43	67	19	62	2,442	142	147	12	175	45	90	0	70	1,790	566
Twentieth.....	0	5	56	3	65	10	8	5	14	928	81	63	1	53	6	7	6	22	861	78
Grand total, 1932.....	2	308	1,374	209	1,779	654	606	351	465	17,086	1,468	1,791	110	1,401	300	783	183	498	17,628	2,929
Grand total, 1933.....	7	652	2,756	159	334	561	600	540	534	9,981	0	2,616	87	902	648	0	99	333	11,686	3,687

1 Office established in 1933.

## DETAILED WORK

The following statement shows the details of the work performed during the past fiscal year compared with 1932:

Work of service	1932	1933
Clearances of American and foreign vessels required by law to be equipped with radio.....	14, 709	13, 531
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio.....	11, 125	8, 456
Inspections of radio equipment on voluntarily equipped vessels.....	3, 352	2, 776
American ship radio stations inspected for license.....	1, 975	1, 996
Land stations inspected.....	1, 184	733
Broadcasting stations inspected.....	1, 109	1, 239
Aircraft stations inspected.....	168	137
Amateur stations inspected.....	696	413
Frequency measurements of American and foreign stations.....	97, 611	74, 798
Commercial operators examined.....	5, 949	5, 101
Commercial operators licensed.....	6, 555	6, 239
Amateur operators examined.....	10, 315	15, 949
Amateur operators licensed.....	20, 656	21, 000
Defects found upon inspection of ship radio stations where clearance would have been in violation of law.....	265	310
Inspections of automatic alarm signal devices on foreign vessels entering American ports.....	708	397
False alarms recorded.....	500	317

<sup>1</sup> According to information furnished our inspectors only 2 actual distress alarms recorded during past year.

## OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past 2 years:

Class	1932	1933
Commercial:		
Extra first telegraph.....	18	21
First telegraph.....	2, 088	1, 481
Second telegraph.....	2, 615	1, 791
Third telegraph.....	87	119
First telephone.....	902	1, 461
Second telephone.....	845	300
Third telephone.....	0	733
Aeronautical.....	69	133
Amateur:		
Extra Class.....	333	69
First.....	11, 680	17, 622
Temporary.....	3, 637	2, 920
Total.....	27, 111	27, 270

<sup>1</sup> New class established 1933.

The following table shows the inspection and licensing work performed yearly from 1923 to 1933, inclusive, and the number of persons employed in the field force:

June 30—	Amer- ican vessels equipped with radio	Inspections of American and foreign vessels		Fre- quency measure- ments of Amer- ican and foreign stations	Licenses issued		Total field force
		Volun- tary equip- ment	Compul- sory equip- ment		Com- mercial operators	Amateur operators	
1923.....	2, 723	1, 134	6, 833		2, 800	9, 908	23
1924.....	2, 741	1, 577	7, 727		3, 370	9, 545	63
1925.....	1, 901	1, 339	8, 803		3, 215	8, 293	62
1926.....	1, 954	1, 563	9, 197		3, 398	8, 140	66
1927.....	2, 002	1, 405	9, 830		3, 468	7, 375	66
1928.....	2, 158	1, 669	9, 093		3, 815	8, 309	78
1929.....	2, 213	2, 520	10, 716	23, 480	2, 795	9, 490	95
1930.....	2, 178	3, 026	11, 334	45, 695	5, 256	11, 841	131
1931.....	2, 281	3, 719	11, 433	76, 447	5, 506	15, 197	149
1932.....	2, 160	3, 352	11, 125	97, 611	6, 555	20, 656	199
1933.....	2, 000	2, 776	8, 456	74, 798	6, 239	21, 000	117

The following table gives information not heretofore tabulated and as totaled from the annual reports of all field offices for the fiscal year 1933:

Number of field trips made by all district offices.....	399
Number of miles traveled.....	174, 166
Number of pieces of mail received.....	1 1 203, 697
Number of pieces of mail sent out.....	1 1 223, 093
Number of complaints received.....	1 1 2, 868
Number of complaints on hand at end of fiscal year.....	249
Unlicensed broadcast station investigations.....	92
Investigations of other classes of unlicensed stations.....	52
<u>Economies effected other than salary cuts and personnel decreases..</u>	<u>1 1 \$16, 564. 69</u>

<sup>1</sup> Contains some estimated figures.

<sup>2</sup> Incomplete, not all offices reporting.

