FIFTEENTH ANNUAL REPORT

FEDERAL COMMUNICATIONS COMMISSION

FISCAL YEAR ENDED JUNE 30, 1949

(With notation of subsequent important developments)

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(as of December 1, 1949)

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(Term expires June 30, 1955)

LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington 25, D. C., December 30, 1949.

To the Congress of the United States:

Pursuant to section 4 (k) of the Communications Act, there is submitted herewith the Annual Report of the Federal Communications Commission for the fiscal year 1949.

Covering as it does the fifteenth year of operations by this Commission, the current report is particularly significant in reflecting the mushrooming growth of the nonbroadcast services, and the steps that have been taken by the Commission to provide for new or augmented safety and special radio facilities to better serve the public and industry. Broadcast activities are marked by the booming interest in television, and the attendant problems being dealt with by the Commission in order to meet the demand for video expansion and improvement. At the same time, the Commission's regulatory functioning has been taxed by events in the common carrier field.

The Commission is hard pressed to keep abreast of kaleidoscopic technical developments affecting both wire and radio communication, and its normal field operations have been curtailed to some extent by diverting manpower to projects with higher priority. In addition, the Commission has increased responsibilities with respect to United States participation in, and adherence to, international conferences and pacts looking toward uniform global communication practices.

Though its mounting administrative and regulatory work has necessarily suffered from personnel and other budgetary restrictions, the Commission's accomplishments in this year of unprecedented electrical communication progress constitute a fitting fifteenth anniversary record.

Respectfully,

WAYNE COY,
Chairman.

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INTRODUCTORY SUMMARY

1. HIGHLIGHTS OF THE FISCAL YEAR

GENERAL

The fifteenth year of operations by the Federal Communications Commission found radio more active than ever before. In addition to broadcast, radio was being used for an increasing number of public and private purposes, and was entering the common carrier field to an unprecedented degree.

When the Commission came into being in 1934, standard broadcast was the only form of radio program service, and nonbroadcast stations were few in number. Today the radio spectrum is crowded with about 50 different classes of stations engaged in radio communication. They represent more than 700,000 radio licenses and other authorizations, not including over 200,000 associated mobile units. Even with the advent of FM and television broadcasting, nonbroadcast stations outnumber program stations by about 36 to 1.

Radio use is fast expanding on the land, on the sea, and in the air. In the old days, protection of life and property was the major consideration. Today business requirements must also be considered. Such "war babies" as radar and microwave are having lusty growth, and radio relay links are being extended. These and other developments have brought many new and perplexing problems, many of which have international as well as domestic impact. At the same time, research and regulation are equally hard pressed to keep abreast of the mounting tempo of radio progress.

Technical improvements have made it possible to use more frequencies but, simultaneously, the number of people desiring to employ radio has grown even more rapidly. The result is that the demand for frequencies far exceeds the supply.

The development of FM and TV broadcasting, the rapid growth of land mobile communication, the inauguration of microwave links for general radio communication relaying, the increasing use of elec-

tronic aids to air and sea navigation, and the expansion of Government radio services have all contributed to problems of frequency allocation in the upper part of the radio spectrum.

And, as the ether becomes more congested, interference grows in seriousness. That is why mutual working arrangements are being put into effect, not only between services, but between nations.

The international aspect of radio has developed to such an extent that the primary allocation of frequencies must now be made by treaty or other agreement. This will permit maximum radio use with minimum interference. Most of this uniformity of purpose stems from the Atlantic City convention of 1947. In consequence, the Commission helped to arrange and participated in nearly a score of international meetings during the fiscal year, and 16 others were in prospect.

BROADCAST

In broadcasting matters the year was marked by such a rush for television facilities that action on applications for new TV stations was deferred pending proceedings looking toward extending TV operations into the ultra high frequencies, adopting a Nation-wide channel assignment plan covering commercial video broadcasting in both bands and, at the same time, inquiring into the possibility of color television. Even so, the year closed with 71 television stations serving 42 cities and metropolitan districts. In addition, more than 200 television stations were in experimental operation.

Though 150 additional frequency modulation stations went on the air during the year, the total number of FM authorizations decreased by 155. However, FM service was available over almost all of the eastern half of the United States, over most of the west coast area, and in a number of cities and adjacent rural areas in the West. Thus, more than 100 million people were within range of one or more FM stations. Also, this was the first year of facsimile operation on a commercial basis over FM stations.

Standard (AM) broadcast authorizations climbed to nearly 2,200. However, fewer AM stations were authorized than in 1948. Greater difficulty was experienced in wedging into this now very saturated band.

The 58 noncommercial educational stations represented a gain of 12. International broadcast stations continued at 37. The 10 categories of broadcast services together had more than 4,000 stations.

Aggregate AM broadcast income for the calendar year 1948 decreased over 10 percent from the previous year, while that of the 4 major networks dropped more than 5 percent. Of 593 AM licensees operating FM stations, 77 reported separate revenues from their FM operation, with only 4 of the latter showing income. Of 107 FM

stations with no AM connection, all but 3 of the 89 reporting stations showed a loss. The 4 TV networks and 50 TV stations on the air during the year all reported an operating loss.

A tabulation of AM, FM, and TV authorizations showed that Texas had more such grants collectively than any other State, closely followed by California, then Pennsylvania, New York, and North Carolina in that order. However, Pennsylvania had the most FM authorizations, while New York led the TV list. Chicago had more broadcast grants than any other city. New York and Los Angeles headed the FM and TV lists, respectively.

In June the Commission affirmed the right of broadcast licensees to editorialize as part of their presentation of public issues, but reiterated that such views may not be used to achieve a partisan or one-sided objective.

NONBROADCAST

Because developments have made it possible to move "upstairs" in the radio spectrum, the Commission is able to be more liberal regarding the general public use of radio. Results of experimental operations invited a complete revision of frequency allocations and rules for two-way radio communication by all types of land vehicles, which became generally effective July 1, 1949. Two new groups of services were established—Land Transportation and Industrial.

The nonbroadcast services (exclusive of operators), which had less than 10,000 authorized stations in 1940, increased to more than 61,000, not counting their associated mobile units. These services fall into two general categories: (1) those devoted to safety, and (2) those used by commerce, industry, and science.

The largest single group is composed of more than 27,000 aeronautical stations, followed by 20,000 stations in the marine services. They added some 6,400 and 5,000 new stations, respectively, during the year.

Land public-safety stations added about 800 stations, bringing their total to some 5,700, including 4,800 police stations, 124 fire, 600 forestry, 200 highway maintenance, and 100 special emergency.

Industrial authorizations neared 4,300—2,700 power, 800 petroleum, 150 forest products, and over 600 others.

Land transportation stations exceeded 3,500—334 railroad, 80 transit utility, 30 bus and truck systems, and over 3,100 taxicab systems.

Experimental authorizations approximated 500.

These figures do not include associated mobile units, which number more than 43,000 police, 24,000 aeronautical, 17,000 fire, 7,000 forestry, 27,000 industrial, 3,700 railroad, transit, highway, etc.; and 74,000 experimental. The latter embrace 46,000 individual taxicabs, 600 trucks and buses, and 24,000 vehicles in common carrier service.

COMMON CARRIERS

Telephone facilities continued to expand, and the telegraph system pushed its mechanization program. The former extended its coaxial cable network, and both were engaged in microwave operation. The number of fixed radio stations handling general public communications traffic exceeded 1,000, but 24 times that many experimental mobile units were linked to the telephone system.

On June 1, 1949, the Commission invited comment and proposals on the question of whether rules should be adopted with respect to protecting telegraph or telephone employees in connection with the discontinuance or reduction of service.

Telephone and telegraph tariffs now include a provision that these facilities will not be used for unlawful purposes and, further, will not be furnished if local law-enforcement agencies determine that such service is being or will be used in violation of law.

Telephone business ran about 10 percent ahead of last year. New facilities were added at the rate of more than 3 million dollars a day. More than 39 million telephones were in domestic service and the Bell system, which operated about 82 percent of this total, handled over 42 billion calls during the year. Bell's rural telephones increased to nearly 2½ million. Dial systems were on the increase.

On January 11, 1949, the eastern and midwestern coaxial networks were connected. Microwave links were being added or proposed. These facilities were made available for television relay as well as for other communication. However, questions of rates and interconnection were raised in their TV operation.

Common carrier mobile radiotelephone service was especially active. Telephone companies and nontelephone companies were serving vehicles in 146 and 64 cities, respectively. There has been such a demand for this service that the Commission prescribed an order of precedence for carriers to serve new customers.

In the international field, radiotelephone service was opened with 7 additional countries, making 81 countries outside of North America so served—53 with direct circuits. Nearly 600,000 calls were handled in 1948.

Telegraph activities were marked by Western Union proceeding with its 72 million-dollar modernization program, its continued use of a microwave circuit connecting New York, Washington, and Pittsburgh, and the establishment of a microwave circuit between New York and Philadelphia for TV transmission. The Commission granted more than 900 requests for discontinuance or reduction in hours of telegraph offices, mostly small offices in places where other service was available.

On the urgent plea of overseas telegraph carriers for additional revenue, the Commission authorized, effective February 2, 1949, increased rates estimated to produce over $3,100,000 annually. Direct

radiotelegraph service was established with 4 additional countries, making such service available to 69 overseas points, as well as other places having connections with foreign carriers. International cable and radiotelegraph carriers handled more than 562 million paid words, of which 282 million were outgoing.

RADIO OPERATORS

Rules to enable citizens to use two-way personalized radio when approved sets are available became effective June 1, 1949. Other radio operator authorizations increased more than 61,000, making an existing total in excess of 645,000. Of this number, over 378,000 were commercial operators and more than 80,000 were amateurs. The latter operated over 81,000 stations. Special radiotelephone authorizations to operators of private aircraft exceeded 100,000.

FIELD

Though its normal functioning was affected by budgetary and higher priority matters, the field staff made about 23,500 inspections, including 11,000 ships and 12,500 land stations, and served 10,000 violation notices as a result. It also handled over 28,000 monitoring cases, in which it served over 11,000 notices; made 8,200 other investigations; inquired into 7,600 cases of interference; located 155 unlicensed radio operations, and responded to nearly 150 requests to help locate lost aircraft. In addition, it gave 41,200 operator examinations, and issued nearly 100,000 operator authorizations.

TECHNICAL

Radio's growth and other developments emphasized the work of the technical staff in advising the Commission on frequency behavior, service ranges, interference, channel separations, power limitations, and other highly complicated matters that are fundamental to frequency allocation and the promulgation of rules and standards. This was particularly marked in questions affecting television, new nonbroadcast services, and interference problems. Certain new manufactured equipment was tested and type approved at the Commission's laboratory before being placed on the market.

MISCELLANEOUS

The only change in the complexion of the Commission during the year was the addition of its first woman member—Frieda B. Hennock. The Commission functioned with a personnel of less than 1,400, about one-third of whom were in the field. Its fiscal 1949 appropriation was $6,717,000.

2. SUBSEQUENT EVENTS

Broadcast.—On August 19, 1949, the Commission announced the adoption of rules affecting lotteries and "give-away" programs in the

light of the ban on these programs in section 1304 of the United States Code. The rules are substantially the same as those proposed August 5, 1948 (Docket 9113), mentioned elsewhere in this report. They were scheduled to become effective October 1, 1949 but, in view of court actions in Illinois and New York, the Commission on September 21, 1949 postponed the effective date of the rules until final court determination.

Acting on requests for continuance, the Commission on July 28, 1949 postponed to September 26 the commencement of hearing in the general television proceedings (Dockets 8736 et al.). Previously, on July 20, 1949, it requested holders of experimental TV authorizations to furnish research and experimentation data in this connection. On the same date it denied request by the Television Broadcasters Association for a partial lifting of the "freeze". There were special filings on color television. Various experimental demonstrations of color transmission over regular TV broadcast facilities, for reception on special receivers, took place in the summer and fall. The general hearing started September 26 with testimony on the color phase.

At the turn of the fiscal year the Commission addressed letters to certain motion picture interests and obtained replies concerning their plans and views with respect to theatre television. Since 1945, certain frequencies have been available on an experimental basis for the development of theatre television. The latter is not involved in the general TV proceedings previously referred to.

By late fall, more than 3 million TV receivers were estimated to be in use, and TV network facilities linked 24 cities.

Because of economic problems affecting FM broadcasting, the Commission on August 4, 1949 proposed to liberalize certain FM rules regarding radiated power and antenna height. On August 24, 1949, it scheduled hearing for December 12 thereafter to determine whether a suitable multiplex FM system has been developed which will not degrade the full tone range of which FM is capable. Multiplexing concerns the simultaneous broadcast of facsimile and FM aural programs on the same channel.

At the instance of FM broadcasters, rules to increase the minimum operating schedule of such stations were proposed by the Commission on November 16, 1949. Amended pick-up broadcast station rules became effective October 24, 1949. On November 17 the Commission announced that it would grant no further authorizations for point-to-point relay of TV programs for nonexperimental exhibition purposes.

The first broadcast station authorization to the Virgin Islands was made September 7, 1949, when a construction permit was issued for an AM station at Charlotte Amalie, St. Thomas.

Nonbroadcast.—At a meeting of representatives of interested companies and government agencies on August 9, 1949, a joint industry-government group was established to study various problems in connection with rules proposed for incidental radiation devices.

Rules to exempt operators of approved diathermy and industrial heating devices from being required to eliminate a certain type of interference to inadequately shielded television receivers were adopted by the Commission, effective December 1, 1949 (Docket 9386).

On August 4, 1949 the licenses of all provisional radio stations expiring in the period July 1–November 1, 1949, were extended to the latter date to enable them to apply for reclassification in the new services which supplant the provisional type station.

Common carrier.—During July the Commission requested telephone and telegraph companies to furnish information on present and planned coaxial cable and microwave facilities intended for television relay purposes. In August a similar request went to authorized TV stations with respect to existing wireline connections with their transmitters.

On September 8, 1949 the Commission issued a proposed report in Docket 8963 in which it concluded, among other things, that tariff regulations of the American Telephone and Telegraph Co. are unjust and unreasonable to the extent that they permit the Bell system not to furnish intercity television transmission connections with private facilities of TV broadcasters until such time as common carriers can provide an adequate video relay system. The rate aspect, and the refusal of the Bell system to interconnect its TV transmission facilities with those of Western Union, are involved in further proceedings.

On August 10, 1949 the Commission authorized new microwave circuits, estimated to cost 17 million dollars, to be used for telephone and TV transmission between Pittsburgh–Chicago, Chicago–Des Moines, Albany–Syracuse, Richmond–Norfolk, and Milwaukee–Madison. A new Bell coaxial cable, which will carry hundreds of additional telephone conversations and three more television channels, was placed in service between New York and Philadelphia September 1, 1949.

On August 4, 1949 the Commission ordered hearing to be held October 4, 1949 on the joint application of various telephone companies to acquire certain telephone properties of Western Union (Docket 9235), mentioned in the chapter on Common Carriers.

The Western Union Telegraph Co. was granted 1 year extension of time, from September 27, 1949, to divest itself of international telegraph operations as required by section 222 (c) (2) of the Communications Act, as amended, and pursuant to Commission order of Sep-

tember 27, 1943 (Docket 6517) approving merger of Postal Telegraph with Western Union.

Commission Chairman Coy, as chairman of the United States delegation to the International Telegraph and Telephone Conference (Paris, May–August 1949), on October 31, 1949, transmitted to the Department of State a report on the conference, which was released by that department on November 4. Meanwhile, on October 21, the Commission ordered a further hearing, to be held December 5 thereafter, to determine what changes, if any, should be made in international telegraph rates as a result of the Paris and London conferences.

An initial decision looking toward a grant of Mackay Radio and Telegraph Co.'s applications for authority to communicate with Portugal and The Netherlands and denial of its application to communicate with Surinam (Docket 8777) was issued July 29, 1949.

Operators.—The Commission on July 27, 1949, designated October 10, 1949 as the date of an informal conference to discuss proposed amendments to the amateur rules (Docket 9295), referred to in the chapter on radio operators.

On August 24, 1949 the Commission proposed to establish a new nontechnical commercial radio operator authorization to be known as "Radiotelephone third class operator permit" (Docket 9424). Temporary waiver of operator requirements for ship radar stations was extended from November 15, 1949 to May 15, 1950.

Miscellaneous.—By actions of March 9 and September 16, 1949, the Commission made available to the Bureau of Labor Statistics labor data relating to common carriers and broadcast stations for processing and publication by the Department of Labor.

On October 21, 1949, the Commission established a consolidated Amateur, Citizens Radio and Operator License Branch in its License Division, and changed the name of the Technical Information Division, Bureau of Engineering, to Technical Research Division.

As of October 31, 1949, outstanding radio authorizations exceeded 737,000, an increase of more than 25,000 in the four months since the close of the fiscal year. Comparative figures for services and groups follow:

Service	June 30, 1949	Oct. 31, 1949	Increase or (decrease)
Broadcast:			
Standard (AM)	2,179	2,229	50
Frequency modulation (FM)	865	815	(−50)
Television (TV)	117	112	(−5)
Television (experimental)	205	217	12
Noncommercial educational	58	66	8
International	37	37	0
Facsimile	2	0	(−2)
Remote pick-up	580	589	9
Studio transmitter (ST)	28	29	1
Developmental	14	11	(−3)
Total broadcast services	4,085	4,105	20

Service	June 30, 1949	Oct. 31, 1949	Increase or (decrease)
Nonbroadcast:			
Aeronautical	27,227	29,247	2,020
Marine	20,004	22,256	2,252
Public safety	5,700	6,124	424
Industrial	[1] 4,268	4,852	584
Land transportation	[1] 3,586	3,462	(−124)
Experimental	455	454	(−1)
Miscellaneous	46	43	(−3)
Total nonbroadcast services	61,286	66,438	5,152
Common carrier:			
Fixed public telephone	26	26	0
Fixed public telegraph	57	58	1
Land mobile	795	733	(−62)
Experimental	174	180	6
Total common carrier services	1,052	997	(−55)
Radio operators:			
Commercial	378,500	389,366	10,866
Aircraft radiotelephone	104,569	110,655	6,086
Amateur operators	80,721	82,412	1,691
Amateur stations	81,675	83,485	1,810
Citizens	122	194	72
Total	645,587	666,112	20,525
Grand total	712,010	737,652	25,642

[1] Revised figures.

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CHAPTER I. GENERAL

1. FIFTEENTH ANNIVERSARY

The fiscal year 1949 marked the fifteenth year of operation of the Federal Communications Commission.

It was on June 19, 1934, that the Communications Act was signed. This law established the Federal Communications Commission to regulate interstate and international communication by means of telegraph and telephone, also all radio transmission to the inclusion of broadcast. Besides unifying tasks previously performed by several Federal agencies, the act gave the Commission broader supervisory powers in this field.

2. FUNCTIONS

In general, the Commission's duties include supervision of common carrier land wire, ocean cable and radio services; allocation of radio frequencies, and licensing of radio stations and radio operators; encouraging new uses for radio, particularly in promoting safety of life and property on the land, on the sea, and in the air; participation in formulating and domestically administering wire and radio provisions of treaties and other international agreements to which the United States is a party; and assistance in coordinating the use of the many forms of electrical communication with the national security program.

The tremendous expansion in scope and extent of the communications industry has added to the problems and workload of the Com-

mission. Besides being required to participate in an increasing number of international conferences, the Commission's regulatory duties must provide rules and regulations, engineering standards, and over-all policy determinations to meet new developments and, at the same time, minimize the administrative problems involved in regulation. In so doing, it must conform to the Administrative Procedure Act which prescribes a definite procedure for Federal agencies to follow in rule-making.

The Commission exacts no fee or other charge in connection with its application, licensing, and other functions.

3. COMMISSION

The Commission is an independent Federal establishment created by Congress and, as such, reports directly to Congress. It is administered by seven Commissioners appointed by the President, subject to confirmation of the Senate. The President also designates the chairman. Commissioners hold office normally for 7 years. Not more than four Commissioners may be members of the same political party.

In 1949 the Commission continued to function as a unit, directly supervising all activities, with delegations of responsibility to boards and committees of Commissioners, individual Commissioners, and the staff. Policy determinations were made by the Commission as a whole.

The only change in the complexion of the Commission during the year was the addition of Miss Frieda B. Hennock, who took office July 6, 1948, for seven years, succeeding Clifford J. Durr. On May 4, 1949, Commissioner Edward M. Webster was renominated for a seven-year term. He was confirmed by the Senate on July 20, for the period from June 30, 1949. (The Commission's 1948 annual report inadvertently omitted mention that Commissioner George E. Sterling took office on January 2, 1948, under a recess appointment to succeed Ewell K. Jett, resigned as of December 31, 1947, whose term expires June 30, 1950.)

4. STAFF ORGANIZATION

As of June 2, 1949, the chairman was made responsible for the general administration of the internal affairs of the Commission, with the duty of keeping the Commission advised of his actions taken under this delegation of authority. This abolished the Bureau of Administration as an entity under the Commission and, in its stead, established an Office of Administration under the chairman.

In consequence, there are now four bureaus—Engineering, Accounting, Law, and Secretary—augmented by a Hearing Division, a Special Legal and Technical Group, an Office of Information, and the new Office of Administration. The Bureaus of Engineering, Accounting

and Law are, in effect, broken down into comparable divisions for coordinated operation.

Organization of these bureaus and the Office of Administration follows:

Bureau of Engineering.—FM Broadcast, Television Broadcast, Standard Broadcast, Common Carrier, Aviation, Radio Operator and Amateur, Marine Radio and Safety, Field Engineering and Monitoring, Technical Information, Public Safety and Special Services, Laboratory, and Frequency Allocation and Treaty Divisions.

Bureau of Accounting.—Economics and Statistics Division (Common Carrier, Broadcast, and Special Studies Branches); Broadcast Division (Applications, Renewals and Annual Reports, and Hearings Branches); Rates Division (Tariffs and Telephone Rates, and Telegraph Rates Branches); Accounting Regulation Division (Development and Compliance, and Original Cost and Depreciation Branches); and Field Division.

Bureau of Law.—Safety and Special Services Division (Aviation and General Mobile, Marine Operator and Amateur, and Emergency, Experimental and Miscellaneous Branches); Broadcast Division (AM, FM, TV, Renewals and Revocations, and Transfer Branches); Litigation and Administration Division (Litigation, and Administration Branches); Common Carrier Division (Rate, International, Domestic Wire, and Domestic Radio Branches).

Bureau of the Secretary.—License, Service, and Records Divisions, and Minute and Library Branches.

Office of Administration.—Budget and Fiscal Division, Organization and Methods Division, and Personnel Division.

As of June 2, 1949, the Commission removed staff members engaged in hearing and opinion work from supervision by officials having prosecutory or investigatory functions by placing the former under the immediate direction of the Commission. This resulted in a number of special legal and technical assistants being detailed to work on hearing matters for the Commissioners as a body.

Administrative rule changes, made effective at the same time, authorized initial decisions to be issued by hearing examiners or Commissioners presiding at hearings, and motions formerly handled by the Motions Commissioner, with certain exceptions, to be acted upon by hearing examiners. One result is that initial decisions have supplanted proposed decisions of the Commission.

5. PERSONNEL

On June 30, 1949, a total of 1,340 persons were employed by the Commission. This is a reduction of 40 during the year. Personnel distribution was:

Bureau	Washington	Field	Total
Engineering	296	424	720
Law	102	4	106
Accounting	119	36	155
Secretary	259	0	259
Administrative	100	0	100
Total	876	464	1,340

6. APPROPRIATIONS

A break-down of the Commission's appropriations and expenditures for the fiscal year 1949 follows:

Appropriations		*Expenditures*	
Regular appropriations (salaries and expenses)	$6,310,000	Personal services	$5,990,627
Deficiency—P. L. 900	367,000	Travel	74,982
Printing and binding	40,000	Transportation of things	22,404
		Communications	146,279
Total funds available	6,717,000	Rents and utilities	63,567
		Printing and binding	38,898
		Other contractual services	71,040
		Supplies and materials	130,439
		Equipment	173,023
		Total obligations	6,711,259
		Transfer to public health	2,230
		Savings, unobligated balance	3,511
		Total	6,717,000

7. LEGISLATION

During the fiscal year 1949, no substantive changes were made in the Communications Act and no laws were enacted which directly affected the Commission's functions or jurisdiction. However, numerous bills were introduced and considered by Congress which did, directly or indirectly, concern the Commission.

The most important of these were S. 1973, introduced by Senator McFarland, which would make substantial changes in the Communications Act, and would extensively revise the organization and procedures of the Commission in several major respects; H. R. 2915, introduced by Congressman Hobbs, which would revise the procedure for handling appeals to the courts from Commission decisions; S. 238, introduced by Senator Johnson, which would authorize the Interstate Commerce Commission to require railroad common carriers to install and maintain communication systems; and H. R. 3644, H. R. 4048 and H. R. 4124, all of which would amend section 605 of the Communications Act which deals with the unauthorized interception of communications. Congressional committee hearings were held on all but the

last three of these bills and the Commission appeared and presented extensive testimony. In addition, the Commission prepared comments on more than 50 other proposed bills containing provisions having a bearing on the Commission's activities.

8. LITIGATION

Section 401 of the Communications Act confers upon the district courts of the United States jurisdiction to enforce the Communications Act and orders of the Commission. Judicial review of Commission actions is provided for in section 402 of the act. Section 402 (a) gives jurisdiction to the district courts over suits to enforce, enjoin, set aside, annul, or suspend any order of the Commission (with certain exceptions); section 402 (b) provides for appeal from other decisions of the Commission to the United States Court of Appeals for the District of Columbia. The great majority of cases involving review of Commission action is instituted in the latter court.

During the fiscal year, there were 31 cases involving the Commission in the Federal courts. Of this total, 17 cases were instituted in the Court of Appeals, 3 in district courts, and three were in the United States Supreme Court. The other 8 cases were pending at the start of the fiscal year.

The Supreme Court upheld the Commission in the three cases brought before it. The Court of Appeals upheld the Commission in nine cases but in six cases the Commission's decision was reversed by that court. However, in two of these latter cases which were taken to the Supreme Court by the Commission, the decision of the Court of Appeals was reversed. In the district courts, two cases were decided, both in favor of the Commission.

At the close of the fiscal year 12 cases were pending in the Court of Appeals for the District of Columbia and 1 pending in the United States District Court for the Northern District of Illinois.

The following cases decided during the fiscal year were of particular interest:

1. In *Federal Communications Commission* v. *WJR, the Goodwill Station, Inc.* (337 U. S. 265, 69 Sup. Ct. 1007), WJR contended it would suffer electrical interference from the grant of a new station on the same frequency during daytime hours only in an area where its signal was of an average intensity of 32 mv/m. The Commission had denied a petition to set aside the grant to the new station on the grounds that the alleged interference occurred outside the protected contour of WJR. The Commission took this action on the basis of the written pleadings filed by WJR and the new station which presented no disagreement as to the facts. By a divided court, the Court of Appeals reversed the action of the Commission on the grounds that

WJR, as a matter of constitutional law, was entitled to a hearing, at least by way of oral argument, before the petition could be denied. Upon review by the Supreme Court, the decision of the Court of Appeals was reversed, the Supreme Court holding unanimously that under the circumstances of the case neither the Constitution nor the Communications Act required that WJR be afforded a hearing before its petition could properly be denied. The Supreme Court remanded the proceedings to the Court of Appeals for a decision as to whether or not the Commission was correct in its disposition of the WJR petition on the merits. The case now awaits further proceedings in the Court of Appeals.

2. In *Federal Communications Commission* v. *Broadcasting Service Organization, Inc.* (*WORL*) (337 U. S. 901, 69 Sup. Ct. 1047), the Supreme Court in a *per curiam* decision on May 16, 1949 reversed the Court of Appeals for the District of Columbia and upheld the Commission's determination that a renewal of a station license would not be in the public interest where the licensee had on a number of occasions submitted false information to the Commission concerning the ownership of its stock and its financial status, and had withheld other information it was obliged to report under the Communications Act and the Commission's Rules and Regulations. The Commission had found in its decision that these derelictions were the result of either a willful deception or at least reckless indifference to the responsibilities of a licensee. The Supreme Court sustained the Commission's contention that it could infer such willfulness or recklessness from substantial evidence reasonably supporting the inference despite the alleged absence of direct evidence of intent to deceive and of motive.

3. In *Carlson* v. *Federal Communications Commission* (172 F. 2d 766), the Court of Appeals for the District of Columbia similarly affirmed a decision of the Commission denying an application for renewal of a station license on the grounds that the applicant had persistently violated the Commission's Rules and Regulations and Standards of Good Engineering Practice. The Supreme Court denied a petition for certiorari on June 13, 1949 (337 U. S. 930, 69 Sup. Ct. 1494).

4. In three cases decided by the Court of Appeals, *Bay State Beacon, Inc.* v. *Federal Communications Commission* (App. D. C., 171 F. 2d 826), *Kentucky Broadcasting Co.* v. *Federal Communications Commission* (App. D. C., 174 F. 2d 38), and *Johnston Broadcasting Co.* v. *Federal Communications Commission* (App. D. C., May 4, 1949), the court recognized and upheld the Commission's authority to examine the proposed program plans of competing applicants. In the *Bay State Beacon* case, the Commission's authority to consider the

proportion of time devoted to sustaining and commercial programs as a relevant factor in passing on competing applications was upheld. In the *Kentucky Broadcasting Co.* case, the Commission's authority to consider past program structure of an applicant with respect to the amount of time devoted to locally originated programs was upheld. In the *Johnston* case, the Commission's decision was reversed by the court because the successful applicant had signed and sworn to his application prior to the completion of the necessary attached engineering report. However, the court expressly upheld the right of the Commission, in comparative cases, to consider as one important factor in choosing between competing applicants the fact that one applicant proposed to present a relatively large number of programs devoted to consideration of controversial issues and other public affairs of interest to the community to be served, whereas the competing applicant proposed to devote a substantially lesser percentage of his time to such programming.

5. In *Plains Radio Broadcasting Co.* v. *Federal Communications Commission* (App. D. C., May 4, 1949), the Court of Appeals reversed a decision of the Commission on the ground that the findings of fact in its decision were insufficient to support the Commission's conclusions granting the application of one of two competing applicants for radio facilities. In its opinion, however, the court expressly affirmed the authority of the Commission to consider the newspaper ownership of or control over a given applicant, or the fact that such applicant also owned or controlled other stations serving a substantial percentage of the area to be served by the proposed new station, in determining which of the two applications would best serve the public interest, convenience or necessity.

6. In *Easton Publishing Co.* v. *Federal Communications Commission* (App. D. C., May 4, 1949), decided the same day, the court, in reversing a decision of the Commission because of the insufficiency of its findings and conclusions, affirmed the Commission's holding that in determining the amount of existing radio service available to various communities in choosing between mutually exclusive applicants for stations in such communities, it could consider AM and FM stations as being in separate categories to be independently evaluated according to the particular circumstances of each case.

7. In *Mansfield Journal Co.* v. *Federal Communications Commission* (App. D. C. 173 F. 2d 646) and *KFAB Broadcasting Co.* v. *Federal Communications Commission* (App. D. C., June 13, 1949), the Court of Appeals handed down decisions to the effect that the Commission was not required to consider upon a comparative basis pending applications for facilities in the same community where, at the time of Commission action, there were sufficient channels or facilities

available to enable the Commission to grant any one of the pending applications without adversely affecting the possibility of granting any of the other applications pending at the time of the action taken.

9. HEARINGS

Under provisions of the Communications Act, an application cannot be denied or an existing authorization modified arbitrarily without affording an opportunity for a hearing. The bulk of the Commission's hearings involve determination of which of several applications for the same or conflicting broadcast facilities should be granted, and whether the facilities applied for would interfere with the operations of stations already authorized.

Docket summaries for the fiscal year follow:

	Pending July 1, 1948	Designated for hearing	Disposed of without hearing	Disposed of following hearing	Pending June 30, 1949
Broadcast	718	334	290	163	599
Safety and special	29	12	17	5	19
Common carrier	21	25	11	7	28
Other	3	12	2	4	9
Total	771	383	320	179	655

10. LICENSES AND OTHER AUTHORIZATIONS

As of June 30, 1949, the Commission had more than 700,000 outstanding licenses and other authorizations. Of this number, some 4,000 were in the broadcast services, and nearly 145,000 in the nonbroadcast services, exclusive of operators who approximated 564,000. The figures on station authorizations do not include more than 200,000 transmitters on associated mobile units.

The Communications Act extends the license privilege only to citizens of the United States. It is denied to corporations in which any officer or director is an alien or of which more than one-fifth of the capital stock is owned by aliens or foreign interests.

11. APPLICATIONS AND OTHER FILINGS

Nearly 225,000 applications of all kinds were received by the Commission during the year. The broadcast services accounted for almost 6,300 of these, while those in the nonbroadcast radio services amounted to more than 86,000, including over 33,000 for amateurs. Commercial radio operator applications topped the 100,000 mark, while requests for special aircraft authorizations exceeded 26,000. Common carrier applications totaled nearly 3,200. Tariff and other common carrier filings, not included in the foregoing figures, aggregated 32,000, of which number about 25,000 were tariff schedules and the remainder were monthly and annual reports which also required analysis.

12. CORRESPONDENCE, RELEASES, AND PUBLICATIONS

Almost 1,150,000 communications in the form of letters and telegrams were handled by the Commission in the 12-month period. Of this total, more than 800,000 were incoming messages and nearly 350,000 were outgoing.

Public notices, orders, decisions, and opinions issued during the year required nearly 60,000 stencils, over 8,000,000 sheets of paper, and more than 12,000,000 mimeographed impressions.

The Commission's printed publications are processed at the Government Printing Office and are sold by the Superintendent of Documents. A list of those currently available appears in the appendix.

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CHAPTER II. RADIO FREQUENCIES

1. ALLOCATION OF FREQUENCIES

It is a fundamental duty of the Commission to allocate the radio spectrum to the various radio services and to write the rules and regulations to govern the operation of these services on the respective frequencies that are assigned to them. This is basic to all other radio activities of the Commission and is designed to protect the public interest by assuring an equitable distribution of frequency space among the various radio services.

The primary obstacle to greater and greater use of radio communication facilities is the relative unavailability of channels. Technical developments have made it possible to use more frequencies and to use them more efficiently but, simultaneously, the number of people desiring to employ radio has grown even more rapidly. The result is that the demand for frequencies far exceeds the supply. And the demand is increasing faster than advances in the radio art can enable additional radio needs to be accommodated.

Radio developed in the lower part of the radio spectrum. As the number of stations and possible uses increased, the available low frequencies were either exhausted or were found to be unsuited for particular purposes, and higher and higher frequencies were explored and opened to use. This has added to the engineering difficulties in making frequency allocations and station assignments as well as to the problems in connection with manufacturing suitable equipment.

Frequency allocation is a very complex subject. There is a difference between frequency "assignment" and frequency "allocation." The former pertains to assigning a particular frequency for use by a particular station, while "allocation" refers to the setting up of bands of frequencies for the use of the various radio services.

Frequency allocation, briefly, may be likened to building communication highways in the ether. In ordinary road building there is a wide choice of routes. However, in frequency allocation most of the usable lanes are already well filled and, unlike land traffic, radio transmissions cannot be routed by underpasses and overpasses. Neither do they obey traffic signals to allow other traffic to pass, or go just to the point where they are to be heard. They spread out to thousands of other points as well, crossing political and geographical boundary lines in all directions.

The theoretically usable radio spectrum extends from 10 to 30 million kilocycles, but for practical purposes the present ceiling for commercial utilization is around 10 million kilocycles.

It is customary to speak of the allocation of spectrum space to the various radio services as the allocation of "bands" of frequencies to specified services, meaning the designation of groups of frequencies in a particular region of the spectrum for the use of specified services. The bands assigned to a particular service are broken down into "channels" which are, in effect, the ether traffic lanes. Within these channels, each station operates on a designated "frequency." Thus, for example, in the medium-wave region of the spectrum the frequencies 550 to 1600 kilocycles are allocated as the standard broadcasting band. This band is divided into 106 channels, each 10 kilocycles in width. Individual stations are assigned to frequencies at the center of each channel, such as 550 kilocycles, 560 kilocycles, etc.

Not all channels are the same width. Some types of transmission require wider paths than others. In broadcasting, for example, though a standard (AM) station uses a channel 10 kilocycles wide, an FM station needs one 20 times wider, while a television station requires about 600 times the spectrum space occupied by one AM station. In the nonbroadcast field, too, channel widths differ according to the requirements of the particular services.

By the same token, the nature of a service is an important factor in determining its position in the radio spectrum. Each band has inherent characteristics which must be taken into account in determining the kind of stations permitted to use it. Thus, at the lower part of the spectrum are radio aids to air and sea navigation. Further up, in turn, are AM broadcasting, long-distance communication, FM and television broadcasting, developmental services, radar, and experimental operation. Sandwiched in between are segments for various government and miscellaneous nongovernment services.

In the early days of radio regulation a few kilocycles one way or another was of little importance. Later, with the filling of the spectrum, the problems of interference between stations became more

pronounced, and it became necessary to define more precisely channel boundaries, engineering standards, etc.

So, in order to plan the use of a frequency intelligently the Commission must take into account many intricate factors. Among these may be mentioned the kinds of communication to be handled, the distances involved, the type of operation, the locations of the transmitting and receiving points with respect to land mass and bodies of water, the presence of other radio stations in the vicinity or operating on the same frequency elsewhere, and many other things. It must know the behavior of the radio waves upon that frequency for various hours of the day, seasons of the year, and phases of the sunspot cycle and during atmospheric disturbances. There is still much to learn about the propagation characteristics, particularly in higher portions of the radio spectrum, now that radio must continue to move "upstairs." There is also much to learn concerning equipment capabilities, particularly in higher portions of the spectrum, since this, too, is essential information in laying a firm foundation for sound frequency allocation.

The development of FM and TV broadcasting, the rapid growth of land mobile communication, the inauguration of microwave links for general radiocommunication relaying, the increasing use of electronic aids to air and sea navigation, and the expansion of government radio services are some of the factors that have contributed towards making the current problems of frequency allocations, particularly in the "upper" radio spectrum, i. e., that portion above 30,000 kilocycles, an exceedingly complicated matter.

As the spectrum becomes more congested, interference grows in seriousness. It can come not only from domestic stations but also from the many thousands of foreign stations which can be heard in this country. That is why mutual working arrangements between nations to handle radio's expanded usage is imperative.

2. INTERNATIONAL CONFERENCES

Regulation of radio is necessary because transmissions know no state or national boundaries and must be controlled among the users to prevent interference and waste of frequencies. The international aspect of radio has developed to such an extent that almost no major frequency allocation can be met properly without considering international usage. Hence, the primary allocation of frequencies is now made by international treaty or other agreement.

The Atlantic City Telecommunications and Radio Conferences of 1947 produced a new international table of frequency allocations to supersede that agreed upon in previous international conferences.

The Atlantic City session also recognized that effective implementation of the allocation table would require taking the allocations, band by band, and dealing with them in terms of the specific frequency assignments to individual stations that might be accommodated in those bands. As a result, this conference did the spade work on an over-all design of frequency use intended to take account of postwar developments and set up certain rules and regulations which if adhered to by the participating nations would go far towards achieving maximum use of the radio spectrum, with minimum interference, through coordinated action.

The conference also provided for certain future conferences of a more limited nature, both regional and world wide, to complete the work started at Atlantic City by formulating detailed station assignment lists covering the various bands and services. Because of the great demand for radio facilities, this job of providing for the needs of the various countries within the allocated bands is particularly difficult. However, not all of these international sessions deal with radio. Some of them concern operations and practices of telegraph and telephone common carriers engaged in international service. Many conferences have already been held; others are in prospect. It is the Commission's job to prepare for and participate in these sessions, held under Department of State auspices, and to put the conference decisions into effect as they pertain to radio services in the United States and its possessions.

During the fiscal year the Commission helped arrange for or participated in nearly a score of international conferences and other sessions as compared with 15 the year previous. They included:

Provisional Frequency Board, Geneva, has been sitting since January 1948 to draft a frequency list.

International Radio Consultative Committee (CCIR), Stockholm, July 1948.

European Maritime Regional Radio Conference, Copenhagen, June–September 1948.

Planning Committee on High Frequency Broadcasting, Mexico City, October 1948.

International Administrative Radio Conference on High Frequency Broadcasting, Mexico City, October 1948–April 1949.

Committee on Revision of International Telegraph Regulations, Geneva, January 1949.

Special Loran Conference, Geneva, January 1949.

International Telecommunications Union Region II and Fourth Inter-American Radio Conference, Washington, April–July 1949.

CCIF Technical Study Groups, The Hague, April 1949.

International Administrative Telegraph and Telephone Conference (ITU), Paris, May–August 1949.

Technical Planning Group (preparing for 1950 Rome High Frequency Broadcasting Conference) Paris, June 1949.

European Conference for Study of Bands 1605–2850, 3155–3400 and 2500–3900 kilocycles, Oslo, June 1949.

CCIF Meeting, Paris, July 1949.

International Civil Aviation Organization (ICAO); North Atlantic Regional Air Navigation Meeting, Paris; North Pacific Regional Air Navigation Meeting, Seattle; African-Indian Ocean Regional Air Navigation Meeting, London; Communications Division Meeting, Montreal.

Region I and III Radio Conference, Geneva, close of fiscal 1949.

The Commission was also at work on 16 other scheduled conferences, namely:

Second Session of International Administrative Aeronautical Radio Conference, Geneva, July 1949.

Conference on Revision of Bermuda Telecommunications Agreement, London, August 1949.

Television Congress, Milan, September 1949.

Conference with Canada on Ship Safety Requirements for the Great Lakes, Ottawa, November 1949.

Third North American Regional Broadcasting Agreement (NARBA) Conference, Montreal, September 1949.

Special Administrative Radio Conference for Approval of New International Frequency List, Geneva, October 1949.

International Civil Aviation Organization (ICAO), Search and Rescue Division Conference, Montreal, November 1949.

Intergovernment Maritime Consultative Organization (IMCO) Meeting, London, 1950.

High Frequency Broadcasting Conference, Rome, spring of 1950.

International Civil Aviation Organization (ICAO): South Pacific, Middle East, South Atlantic and South American Regional Air Navigation Meetings, at places to be determined, 1950.

International Radio Consultative Committee (CCIR), Prague, spring of 1951.

International Telegraph Consultative Committee (CCIT), The Netherlands, 1951.

International Plenary Telecommunications Conference, Administrative Telegraph and Telephone Conference, and Administrative Radio Conference of ITU, Buenos Aires, 1952.

The importance of several of the conferences held during the past fiscal year requires particular mention:

The International Telecommunications Union Region II and Fourth Inter-American Radio Conference at Washington considered revision of agreements made at the Santiago and Rio de Janeiro Inter-American Radio Conferences. It resulted in the adoption of a procedure for the submission of regional frequency assignment plans for the nations of the Western hemisphere. The procedure adopted covers assignments of bands to aeronautical, marine, broadcasting, amateur and other services in that part of the radio spectrum from 10 to 4000 kilocycles.

The High Frequency Broadcasting Conference at Mexico City drafted part of a list for use of high-frequency broadcasting stations which was accepted by the conference (56 nations) but was not indorsed by 14 nations including the United States and the U. S. S. R. It is the basis of work now being done by the Technical Planning Committee. The entire plan was expected to be ready for consideration at another conference tentatively scheduled for Rome in the spring of 1950.

The International Administrative Telephone and Telegraph Conference in Paris, which extended over the close of the fiscal year, had for its purpose revising the existing Cairo regulations of 1938, which apply to international operation and rates in these two fields. The United States has heretofore not been a party to either the telephone or telegraph regulations.

The Provisional Frequency Board (PFB) continued its efforts, begun in January 1948, to construct a frequency assignment plan for the spectrum between approximately 4 to 27.5 megacycles (a megacycle is 1000 kilocycles). This project has required the maintenance of a delegation to the PFB as well as a special government and industry group in Washington for liaison purposes. The PFB was expected to make a special report to the Administrative Council of the International Telecommunications Union (ITU) in the fall of 1949.

3. DOMESTIC FREQUENCY CHANGES

During the fiscal year a dozen separate and distinct steps relative to domestic frequency allocations were taken by the Commission. These are discussed under reference to particular services elsewhere in this report, but a summary here may be helpful.

The frequency band 960–2100 megacycles was reallocated to the various government and nongovernment services in order to provide space in the vicinity of 1000 megacycles for the development of an integrated system of electronic aids to air navigation and traffic con-

trol. This required certain adjustments in the band 1000–13200 megacycles with respect to allocations to other services.

The 9800–9900 megacycle band was allocated to the nongovernment services.

Of importance to the expanding mobile radio services was the outcome of proceedings with respect to allocations of the bands 25–30, 44–50, 72–76, 152–162, and 450–460 megacycles. The Commission also suballocated frequencies to the various mobile users such as police, industrial, railroads, taxicabs, and others.

The band 1750–1800 kilocycles was allocated to the fixed and mobile services, to become available when a coordinated emergency communication system can be worked out. Meanwhile, this band was made usable temporarily to assist in locating oil deposits in the Gulf of Mexico pending consideration of the advisability of establishing a radiolocation service on a permanent basis.

Because of serious interference between ship stations on the Great Lakes and ship stations on other inland and coastal waters on the common intership frequency 2738 kilocycles, the Commission proposed the use of 2203 kilocycles for intership use in the Great Lakes area.

Radio amateurs were allocated the band 220–225 megacycles on a permanent basis in lieu of their former allocation of 235–240 megacycles. The 1800–2000 kilocycle band was restored to the amateurs, subject to protecting the use of loran in the radionavigation service.

4. INTERDEPARTMENT RADIO ADVISORY COMMITTEE

The Commission does not license United States Government radio stations or assign their frequencies. Such frequency assignments are made by the President upon recommendation of the Interdepartment Radio Advisory Committee (IRAC), composed of Federal agencies which use radio. The Commission furnishes the secretariat of the IRAC.

During the fiscal year the IRAC approved 5,140 new and deleted 848 regular assignments, bringing the total number of outstanding regular assignments to 56,451. In addition, it approved 262 changes in assignments, 2,323 temporary assignments, and 555 deletions of temporary assignments.

5. TREATY AND INTERFERENCE CASES

Between 500 and 600 cases of treaty infractions, as observed by the Commission's monitoring stations, are processed each month. They involve foreign and our own Government stations. Most of these infractions are caused by spurious emissions, harmonic radiations, off-frequency operation, and other faulty techniques. Notice is served,

through channels, on the foreign and domestic administrations responsible.

The above figures do not include more than 300 international interference cases which were handled during the year.

6. ALLOCATION AND TREATY RULES

The Commission adopted a new Part 2, *Rules Governing Frequency* Allocations and Radio Treaty Matters, in its General Rules and Regulations. It defines the various radio services and lists their frequency assignments in conformity with the Atlantic City agreements, and also lists international treaties and other agreements in force with respect to radio operation. Reference to those international treaties and agreements will be found in the appendix to this report.

7. FREQUENCY AND STATION RECORDS

For the purpose of notifying the Bureau of International Telecommunication Union, Geneva, for registration and publication in frequency and station lists issued by that bureau, the Commission maintained a file of 30,900 frequency cards (22,300 Government and 8,700 non-Government), and 22,000 station cards. Notification for the list of coast stations was resumed for the first time since the war. Notification of Government ships, and stations in the aeronautical and special services has not yet been resumed.

CHAPTER III. RADIO BROADCAST SERVICES

1. GENERAL

BROADCAST REGULATION

One of the major activities of the Commission is the general regulation of radio broadcasting—now visual as well as aural. This regulation is largely technical in nature. It involves determining the frequencies to be allocated to different broadcast services; establishing engineering standards and other rules governing transmission; authorizing individual stations to operate on specific frequencies with prescribed power; and exercising licensing functions in passing on applications for construction permits, renewals and modification of licenses, and applications for transfer and assignment of licenses. Broadcast matters are a major consideration in international conferences and agreements; also in litigation and administration.

TYPES OF BROADCAST STATIONS

As of June 30, 1949, there were more than 4,000 broadcast authorizations in 10 categories. The 3 principal commercial broadcast services are the older standard or AM (amplitude modulation); FM (frequency modulation), a comparatively new type of high-fidelity and static-free broadcasting; and TV (television), which is also known as video. In addition, there are facsimile, international, and noncommercial educational broadcast services; remote pick-up and studio links; and experimental and developmental broadcast stations.

GROWTH OF BROADCASTING

Broadcast authorizations saw a net gain of 118 for the year. Standard (AM) authorizations increased by 145, to a total of 2,179. The only broadcast service to show a decrease was FM, whose 865 authorizations were 155 less than at the close of fiscal 1948. Eight new TV broadcast stations were authorized before the "freeze." Experimental TV authorizations, not affected, increased from 124 to 205. Noncommercial educational authorizations rose to 58, or 12 more than last year. International broadcast stations remained at the same figure, 37.

Outstanding AM, FM, and TV authorizations, collectively, totaled 3,161, which was two less than the aggregate for the previous year. The number of licensed stations rose to 2,353, which was one-fourth more than there were in 1948 and more than double the number in 1946. The growth of AM, FM, and TV broadcast services in the past seven fiscal years is shown in the following table:

Fiscal year	AM		FM		TV		Total	
	Authorizations	Licenses	Authorizations	Licenses	Authorizations	Licenses	Authorizations	Licenses
1943	912	911	48	37	6	6	966	954
1944	924	912	52	45	9	6	985	963
1945	955	931	53	46	25	6	1,033	983
1946	1,215	961	456	48	30	6	1,701	1,015
1947	1,795	1,298	918	48	66	6	2,779	1,352
1948	2,034	1,693	1,020	142	109	7	3,163	1,842
1949	2,179	1,963	865	377	117	13	3,161	2,353

BROADCAST APPLICATIONS

Section 308 (a) of the Communications Act provides that "the Commission may grant licenses, renewals of licenses, and modifications of licenses only upon written application therefor received by it." Consequently, a large portion of its broadcast work involves the processing of applications by existing and prospective broadcasters. A brief description of the chief types of applications follows:

Construction permit.—A person seeking a new station (be it AM, FM, or TV) must first file an application for a "construction permit," If, as frequently happens, the grant is made subject to certain engineering or other conditions, he must next file an application for "modification of construction permit" to meet these conditions. If this application is approved, he may then proceed to construct the station. A permittee normally has 8 months in which to complete construction. After operating tests, he applies for the actual "license."

Change in facility.—If a permittee desires to change locality, increase power, shift to another frequency, etc., he applies for "modifi-

cation" of his construction permit. A licensee wishing to change facilities may sometimes file for a modification of license but more often he has to ask for a new construction permit.

Renewal.—Under the Communications Act, broadcast licenses may not be granted for a longer period than three years. At present, both AM and FM licenses are issued for the maximum statutory period, whereas TV stations (because of their relative newness) are licensed for one year. Section 307 (d) of the act requires the Commission, in considering renewal applications, to be "governed by the same considerations and practice which affect the granting of the original applications."

Transfer of control.—Another common type of broadcast application is for "assignment" of construction permit or license, or "transfer of control." This arises from section 310 (b) of the act which prohibits such shifts without prior consent of the Commission. In June 1949 the Commission adopted a convenient short form for certain transfer and assignment applications that are pro forma in nature.

All applications are processed through the Bureaus of the Secretary, Engineering, Accounting, and Law. The last three named bureaus, after detailed study of qualifications of the parties and other pertinent problems, make their respective recommendations to the Commission. The system of processing is such that applications are considered by different categories in the order in which filed.

The Bureau of the Secretary receives all applications initially, examines them for completeness, returns them to the applicants if incomplete, records their filing, distributes them for study by the other bureaus, handles the administrative matters incident to conducting hearings, issues official authorizations, and maintains the official files.

The Bureau of Engineering makes a technical study of the quality of signal to be expected and the effect the proposed station or change in an existing station would have on existing stations and on applications on file.

The Bureau of Accounting studies the financial ability of the applicant to take over, construct, change or continue operating a station in the public interest.

The Bureau of Law considers the applicable provisions of the act and the Commission's rules and regulations with respect to applications, advises whether the application may be granted without hearing, and, where hearings are recommended, prepares the issues, recommends disposition of pleadings, and participates in the hearing to insure production of evidence on the matters which the Commission must decide.

A total of 6,268 broadcast applications of all kinds were received during the year, which was a decrease of 1,442 from fiscal 1948. The

year closed with 2,156 applications pending as compared with 2,555 at the start of the year. Pending applications for new stations numbered 932 on June 30, 1949, as against 1,170 the year previous. Applications for assignments and transfers of licenses and permits rose to 503, or 78 more than in fiscal 1948.

More than 40 percent of all broadcast applications involved AM. FM applications amounted to 1,996 and TV applications to 444. The year closed with 382 pending applications for new AM stations as compared with 338 for TV and 65 for FM.

A breakdown of broadcast applications will be found at the conclusion of this chapter.

PROCEDURAL CHANGES

During the year the Commission on various occasions, through formal proceedings and otherwise, made changes in its organization, streamlined its procedures, reduced the information required by it to act upon applications, and dispensed with or modified certain forms. It delegated functions to its staff to accelerate the work and revised its rules and engineering standards accordingly.

BROADCAST HEARINGS

Broadcast cases still constitute the major portion of the Commission's hearing workload, with AM accounting for more than half of the hearing docket. The following docket statistics for the year include all types of broadcast cases:

	Pending July 1, 1948	Designated for hearing	Disposed of without hearing	Disposed of following hearing	Pending June 30, 1949
AM	473	278	233	149	369
FM	53	18	25	12	34
TV	188	34	29	2	191
Other	4	4	3	0	5
Total	718	334	290	163	599

BROADCAST PROGRAMS

Under the provisions of the Communications Act it is the responsibility of each broadcast station licensee to arrange his program structure so that his operations will be in the public interest. Pursuant to duties imposed by the act, the Commission periodically reviews the over-all performance of stations, usually when they apply for renewal of licenses, to determine whether they have lived up to their obligations, and the promises they made in applying for facilities.

This statutory duty does not, however, vest in the Commission any authority to direct a station to put a particular program on or off the air. Section 326 of the act expressly prohibits the Commission from

censoring programs. Moreover, section 3 (h) of the act provides that a broadcaster as such is not a common carrier; consequently broadcast stations are not required to sell or to give time to all who seek to go on the air.

EDITORIALIZING BY BROADCAST LICENSEES

The Commission has consistently held that broadcast station licensees should strive for fairness in airing controversial public issues. On June 2, 1949, the Commission issued its final report in the matter of editorializing by broadcast licensees (Docket 8516) which was the subject of extensive public hearings in March and April of 1948. Its conclusions are here summarized:

To recapitulate, the Commission believes that under the American system of broadcasting the individual licensees of radio stations have the responsibility for determining the specific program material to be broadcast over their stations. This choice, however, must be exercised in a manner consistent with the basic policy of the Congress that radio be maintained as a medium of free speech for the general public as a whole rather than as an outlet for the purely personal or private interests of the licensee. This requires that licensees devote a reasonable percentage of their broadcasting time to the discussion of public issues of interest in the community served by their stations and that such programs be designed so that the public has a reasonable opportunity to hear different opposing positions on the public issues of interest and importance in the community. The particular format best suited for the presentation of such programs in a manner consistent with the public interest must be determined by the licensee in the light of the facts of each individual situation. Such presentation may include the identified expression of the licensee's personal viewpoint as part of the more general presentation of views or comments on the various issues, but the opportunity of licensees to present such views as they may have on matters of controversy may not be utilized to achieve a partisan or one-sided presentation of issues. Licensee editorialization is but one aspect of freedom of expression by means of radio. Only insofar as it is exercised in conformity with the paramount right of the public to hear a reasonably balanced presentation of all responsible viewpoints on particular issues can such editorialization be considered to be consistent with the licensee's duty to operate in the public interest. For the licensee is a trustee impressed with the duty of preserving for the public generally radio as a medium of free expression and fair presentation.

PROGRAMS INVOLVING LOTTERIES OR GIFT ENTERPRISES

Effective September 1, 1948, section 316 of the Communications Act, prohibiting the broadcast of any advertisement of, or information concerning, any lottery, gift enterprise or similar scheme, was recodified without substantial change, as part of a general recodification of the criminal law as section 1304 of the Criminal Code (18 U. S. C. sec. 1.304) and section 316 of the Communications Act was repealed. Previously, on August 8, 1948, the Commission had issued a notice of proposed rule making (Docket 9113), looking toward the adoption of

new rules applicable to AM, FM, and TV broadcasting, spelling out the elements of programs which would, on the basis of the Commission's understanding of the existing law applicable, involve violation of the Congressional prohibition against lotteries, gift enterprises, and similar schemes. On August 27, 1948, the Commission issued a supplemental notice of proposed rule making, calling attention to the recodification of the prohibition on the broadcast of such information, and reiterating its intention of promulgating rules for informing licensees and other interested persons of the Commission's interpretation of the law in this matter, which would be followed in the exercise of the Commission's licensing functions. Oral argument was held the following October and decision was pending at the close of the year.

OBSCENITY ON THE AIR

A provision formerly in the Communications Act as section 326 was recodified in the United States Criminal Code as section 1464, effective September 1, 1948. It states: "Whoever utters any obscene, indecent, or profane language by means of radio communication shall be fined not more than $10,000 or imprisoned not more than 2 years, or both." This prohibition is reflected in the Commission's rules applicable to broadcasting and other forms of radio communication, also operator performance.

AVCO RULE REPEALED

On February 21, 1949, the Commission (in Docket 9061) proposed repeal of the so-called "AVCO" procedure, adopted in 1945, which required advertising for competitive bids in connection with the sale of broadcast stations. At the same time, the Commission proposed extensive changes in its handling of broadcast applications which, among other things, would have required applicants for new AM, FM, and TV stations, or changes in existing stations, as well as applicants for renewals, to publicly advertise such intent. On June 9, 1949, the Commission abolished the AVCO rule, effective as of that date. Oral argument on the other proposals, heard June 27, however, resulted in this proceeding being vacated as of July 15, 1949.

SPOT ADVERTISING

Tie-in agreements between broadcast networds and their affiliates for the sale of national spot advertising and other commercial time were the subject of a hearing before the Commission during the past winter, pursuant to order of July 21, 1948 (Docket 9080). Decision on whether such arrangements violate the chain broadcasting regulations or are otherwise contrary to the public interest was pending at the close of the fiscal year.

MAIN STUDIOS

Under the Commission's present rules and regulations, it is possible for a broadcast station to originate most of its local programs from a place other than the city in which its main studio is located. Accordingly, the Commission on February 24, 1948 (in Docket 8747), proposed to recognize AM and FM stations as being located in the city and State where the "main studio" is shown on the license, and to require a majority of a station's nonnetwork programs to originate locally. Hearing was held in October 1948, and decision was pending.

RADIO TIME RESERVATION IN STATION SALES

Special rules relating to contracts which seek to reserve radio time upon the sale of an AM, FM, or TV station were announced by the Commission on January 7, 1949. They are the result of proposals made February 6, 1948, in Docket 8774.

MULTIPLE OWNERSHIP

The Commission, on August 19, 1948, proposed changes in the multiple ownership rules affecting commercial broadcast stations which would limit ownership, operation, or control by the same interests to not more than seven AM stations in the country as a whole, and overlapping interests or connections to not more than 14 AM, 12 FM, and 10 TV stations (Docket 8967). Oral argument was held in January 1949 and decision was pending.

The proposals would augment existing rules which preclude the same interest or group from operating more than one station in either category in the same service area, or more than six FM stations or five TV stations throughout the country.

NETWORKS

Stations owned by or affiliated with networks are subject to the chain broadcasting regulations promulgated by the Commission in 1940 and now contained in part 3 of its rules.

At the close of the year, there were 4 major networks—American Broadcasting Co., Columbia Broadcasting System, Mutual Broadcasting System, and National Broadcasting Co.—more than a score of regional webs, also various FM and TV affiliations. A breakdown of the 1,152 stations linked with the 4 national networks follows:

Network	Network owned stations	Affiliated stations
ABC	4	272
CBS	6	178
MBS	[1] 0	520
NBC	6	166
Total	16	1,136

[1] Although MBS does not itself operate any broadcast station, its stock is held by seven corporations which are station licensees.

RECEIVING SETS

The total number of radio receiving sets was estimated to be approaching 79 million. Ninety-five percent of the families in this country (about 40 million) are said to possess one or more receivers.

Production of home receivers declined 27 percent between 1947 and 1948 and was expected to show a further drop in 1949 of 40 percent. This drop has been mainly confined to the AM only sets. Both TV and FM set production gained in 1948 as these services expanded. During 1949, production of TV sets was further stepped up while the output of FM receivers (including AM–FM) decreased. During the first half of 1949, home receiver production was reported at 3,244,024 sets. Of this total, 913,071, or 28.1 percent, were TV sets, and 424,381, or 13.1 percent, were FM. Production of AM only receivers accounted for 58.8 percent of the total; as contrasted with 90.8 percent in 1947. Many of the new TV sets, however, contain FM or AM bands, or both.

The Commission does not license receiving sets or regulate their production.

2. STANDARD (AM) BROADCAST SERVICE

The number of standard (AM) broadcast stations holding authorizations from the Commission increased to 2,179 by the end of the fiscal year as compared with 2,034 at the close of the fiscal year 1948.

Fewer applications for new AM authorizations were filed in fiscal 1949 than in fiscal 1948 and at the close of 1949 there were 382 such applications pending as compared with 575 at the end of the previous year. The decrease in the number of AM applications filed during fiscal 1949 and the number of authorizations granted is due in large part to a crowded spectrum and, in a lesser degree, to economic readjustment in the broadcasting field. Nevertheless, the number of stations holding AM broadcast authorizations continued to be the largest of any category of the broadcast services.

The Commission is continuing its policy of handling AM applications in two processing lines, the first dealing with those which involve relatively simple technical problems, such as requests for local (class IV) stations, or for daytime facilities, and the second dealing with those involving complex engineering problems, such as requests for unlimited time facilities on clear or regional channels, most of which involve directional antennas. The Commission has a smaller staff than was previously available to work on these cases. However, the Commission is undertaking to provide field offices with facilities and needed information so that they may aid in the processing of such cases and thus reduce the time within which final disposition may be had.

On April 13, 1949, the Commission (in Docket 9287) proposed to refrain from authorizing further share-time or specified hours AM stations, but on June 24 vacated this proceeding. As of January 1, 1949, there were 35 and 16 stations respectively in these categories. The proposal did not involve regular daytime operation stations, which now exceed 500.

As a convenience to AM stations which initiate live programs for foreign broadcast or make transcriptions for such purpose, the Commission on May 19, 1949 (Docket 9320) proposed to eliminate formal applications in this connection. The proceeding was pending.

In view of the receipt of the first applications for regular broadcast facilities in the station-less Virgin Islands, the Commission on June 22, 1949, vacated its proposal of March 23, 1949 (Docket 9261) to relax certain requirements in order to bring broadcasting to those islands.

CLEAR CHANNELS

The Commission had under renewed consideration the testimony and exhibits presented at the clear channel hearing (Docket 6741) which was held throughout 1946 and 1947, since the Committee on Interstate and Foreign Commerce of the United States Senate withdrew its request that the Commission withhold its decision while the committee had under consideration the Johnson bill (S. 2231) providing for limitation of power for 50 kilowatt and duplicate operation on clear channels. Subsequent to the adjournment of the clear channel hearing on October 31, 1947, the matter was consolidated with Docket 8333 which deals with the related problem of daytime skywave transmission.

The clear channel hearing involves issues of importance both to the American listening public and to the broadcasters. The controversy resolves itself into whether it would be better to share existing nighttime facilities on clear channels with applicants throughout the United States proposing to serve areas where little or no satisfactory service presently exists, or to allow only the present licensees on each clear channel to have super power in order to better their coverage. The solution of the problem depends upon which plan would tend toward betterment of service or duplication of service, particularly as it concerns rural listeners. Also presented are questions such as the economic and competitive effects upon other broadcasters if a few should be allowed super power, and whether this would be conducive to the proper distribution of broadcasting service and the larger and more effective use of radio as contemplated by the Communications Act.

The allocation and use throughout North American countries of these channels (traditionally enjoying more power than others al-

lotted for regional or local use) will be among the chief subjects for deliberation by the forthcoming North American Regional Broadcasting Agreement Conference. The Commission has, accordingly, sought to coordinate its efforts in these matters. Further reference to clear channels appears in the Commission's 1948 Annual Report.

540 KILOCYCLES

Under the terms of the Fourth Inter-American Radio Agreement, which was negotiated in the latter part of the fiscal year, the addition of 540 kilocycles to the AM broadcast band cannot be made effective until after the reallocation of stations on frequencies immediately below the present band. For that reason the Commission is not yet in a position to promulgate rules for the assignment of any particular class of stations to this frequency. There appears to be no question that 540 kilocycles is to be used for broadcasting as soon as the rearrangement of the services on the adjacent bands can be effected. This matter will be given consideration by the forthcoming Third North American Regional Broadcasting Conference.

The Department of State's protest of the Mexican operation on this channel, as reported in the 1948 Annual Report, was not resolved during the year.

NORTH AMERICAN REGIONAL BROADCASTING AGREEMENTS

The Commission's services in the international field as concern broadcasting are related chiefly to its activities in connection with the North American Regional Broadcasting Conferences and the work of their committees. The first of these conferences formulated an agreement (NARBA) for the purpose of establishing principles and regulations governing the allocation and use of broadcast channels throughout the various North American signatory countries. This agreement expired in March 1946 but was extended in that year to March 28, 1949, with certain modifications.

The second conference (1946) also established a Technical Engineering Committee (NARBEC) which had for its chief purpose the determining of facts and making of recommendations to enable the signatory governments to comply with the technical provisions of the NARBA and to aid in the establishment of better broadcast reception throughout the countries involved. This committee, whose activities are continuous, has so far resolved at least three international disputes which involved station operations and has handled surveys and projects which have provided data useful in connection with settlement of interference questions between the countries concerned.

Signatories to the conference have, with the exception of Cuba, agreed to extend the present agreement until a new agreement could be formulated and made effective. For this purpose, the third

NARBA conference is scheduled to be held in Montreal, starting September 13, 1949.

Preparatory to this conference the Commission, in collaboration with the Department of State, organized a Government-Industry NARBA Preparatory Committee for the purpose of considering United States proposals for the new agreement. The work of the committee has included studies of standards, broadcasting coverage, improvement of broadcast reception on a region-wide basis, as well as legal and administrative problems. The representation and activity of industry on the committee were extensive. Particularly noteworthy were the tests of highly directional antennas and the comparison of their theoretical with actual effects. Such tests involved operation of some 30 stations after midnight in conjunction with that of about 15 field intensity recording installations scattered throughout the United States. Other committees engaged in various other projects, including the determination of coverage of existing broadcast stations of Canada, Cuba, Mexico, and the United States.

The proposals for the new conference were submitted at the close of the year when they were given distribution to all NARBA signatories. The preparatory committee will continue its efforts and will advise the United States delegation to the 1949 session.

3. FREQUENCY MODULATION (FM) BROADCAST SERVICE

FM SERVICE NOW AVAILABLE OVER LARGE AREA

During the year the number of FM stations on the air increased by 150, bringing the total on June 30, 1949, to 737, of which 377 held licenses. FM service is now available over almost all of the Eastern half of the United States, over most of the West Coast area, and in a number of cities and adjacent rural areas in the West. It has been estimated that more than 100 million people live within range of one or more FM stations. While the construction planned by many FM broadcast stations was completed during the year, many of them decided not to install high powered equipment because of economic problems; in addition many found that the coverage provided by their lower powered installations exceeded expectations and was adequate for their areas.

FEW NEW FM APPLICATIONS

Although FM service was expanded by previously authorized stations commencing operation and by existing stations improving their facilities, the rate of filing of new FM applications fell off sharply during the year. Many FM modification applications were received, but only 43 applications for new FM stations were filed during the twelve-month period.

Also, the total number of FM stations authorized decreased from 1,020 to 865. This reduction was largely due to economic problems and uncertainties; the relatively small number of FM receivers owned by the public and the resulting limited audience to attract substantial broadcast advertising revenue; competition from standard AM broadcast and TV stations (as well as other FM stations); and high costs of station construction. In a number of instances permittees were dilatory in constructing their authorized stations and forfeited their FM permits for failing to comply with the Commission's requirement that they either complete construction or commence operation with interim equipment. Some FM permittees withdrew from the field because of their active desire to engage in television broadcasting. Although most FM stations are at present operating at a deficit, only a few stations ceased operation during the year. Approximately 80 percent of FM stations are operated in conjunction with standard broadcast stations and operating expenses are thus minimized.

FM RECEIVERS

At the end of the fiscal year, approximately 3,500,000 FM receivers were in use. Although recent FM receiver production was less than expected, the appearance of AM-FM receivers in practically all price ranges indicates that the FM audience will grow in the future. Placed on the market during the past year were several makes of small inexpensive receivers providing FM reception only. Further, a large percentage of television receivers now being offered for sale are combination television-FM sets. Since the FM and television services operate in the same general frequency range, it is thus possible to provide FM broadcast reception in television receivers at very little increase in cost.

SERVICES PROVIDED BY FM STATIONS

Under the Commission's rules, FM stations operated in conjunction with AM stations may employ duplicate or separate programming of the two stations or a combination of the two. In most cases fully duplicated programming is chosen. Accordingly, established standard broadcast programs are available over the superior FM system, as well as the programs broadcast only by FM stations.

Due to the noise-free characteristics of FM reception, many FM stations rebroadcast the programs of others and thereby form regional networks without the use of wire facilities. Also, a number of AM stations pick up programs from FM stations for rebroadcasting. In one instance, an FM station serves many AM stations within a radius of approximately 150 miles.

4. TELEVISION (TV) BROADCAST SERVICE

INCREASE IN TV APPLICATIONS AND SERVICE

With the greater availability of television receivers, transmitting equipment, and the increased public interest and acceptance, there was a steady increase in the number of applications for new television broadcast stations. However, the number of authorizations granted was temporarily curtailed due to the adoption of the current so-called "freeze" policy, explained hereafter.

At the end of the year 13 television stations were licensed, 104 construction permits were outstanding, and 338 applications were pending. In addition to those licensed, 58 stations were operating on a commercial basis under special temporary authorizations.

Thanks to relay facilities, television is no longer limited by the horizon. Despite only 12 channels (between 54 and 216 megacycles) being available throughout the Nation for commercial TV use, the year's close saw 71 stations bringing television broadcast service to 42 cities and metropolitan districts, as compared with 17 cities served by 30 stations the previous year. The demand for new stations remained greater than the available facilities so that 237 of the pending applications were in comparative hearing at the end of the year.

Television receiver production continued to mount with a trend toward reduced prices. It was estimated that approximately 1,750,000 receivers were in the hands of the public in the broadcasting areas. The 10-inch-tube model continued to be the most popular. The 16-inch-tube direct view receiver made its debut.

EXPERIMENTAL TV SERVICE

At the end of the fiscal year there yere 175 experimental television stations licensed and 30 outstanding construction permits. Included in these figures were 136 relay stations operating in the microwave region and used primarily as television pick-up, television studio-to-transmitter link, and interim television intercity relay stations. Rules were in preparation to cover these television auxiliary services on a regular basis.

Television research and experimentation continued with special interest displayed in the 475–890 megacycle band which is allocated to experimental television. About 30 authorizations were outstanding in this band. Emphasis was placed on studies of propagation, developments in circuits and tubes for use in the UHF (ultra high frequency), color transmission, phonevision, stratovision, comparisons with transmission conditions in the present VHF (very high frequency) or low-band television channels, and television relaying.

Several applicants proposed to use simple pulse-type transmitters for the sole purpose of exploring the coverage possibilities of UHF television signals in a particular area or city.

OTHER TELEVISION DEVELOPMENTS

The principal development in the expansion of TV network facilities was the linking of the eastern and midwestern coaxial cable systems, bringing 14 metropolitan areas into the coaxial cable and microwave relay chain. Additional cities on the main routes and on proposed branches of these routes were added to the system, so that simultaneous networking of programs could make possible the viewing of a program by about one-third of the population of the country. (See also coaxial cable and microwave relay in the chapter on common carriers.)

The constant improvement in camera techniques, kinescope recordings, studio lighting and pick-up facilities resulted in improved picture quality. Some novel telecasting included television transmissions from a plane in motion and the splitting of the screen image into two parts with two people at different locations being televised simultaneously. Two motion-picture companies continued their experiments in the microwave relaying of events of interest to theater audiences.

TV CHANNEL ALLOCATIONS

Since part 3 of the Commission's rules presently provides only 140 metropolitan districts with television broadcast channel allocations, it was necessary to propose changes in the allocation plan to provide service to the smaller cities throughout the country and to as much of the rural areas as possible. A hearing for this purpose was held commencing June 29, 1948. More than 80 appearances were filed and over 130 exhibits were introduced into the record. The Commission proposed an allocation table that was an expansion of the existing one and included cities with a population as low as 5,000 wherever geographically possible. Although most of the witnesses requested additional allocations for various cities, a few introduced evidence with respect to tropospheric interference and contended that the proposed allocation plan would result in intolerable interference between stations. At about that time, the Commission had completed a study based on measurements made over a period of a number of years which also pointed to the need for greater station separation than had been provided for in the proposed plan.

On September 13 and 14, 1948, a joint Commission-Industry Conference was held to discuss procedural problems in the light of the

latest engineering information which had been introduced in the previous hearing. The result of this conference was reflected in the so-called "freeze" order of September 30, 1948, which called a halt in the processing of applications for new television stations pending the adoption of new rules and standards based on the latest available engineering information with respect to coverage and interference. During the week of November 30, 1948, an engineering conference was held to discuss the technical reports concerning propagation characteristics in the VHF band which had been made available to the public, and to gather any further information from the expert witnesses present in order to provide for the best possible television service to the country. The final act of the conference was to appoint an Ad Hoc Committee composed of members of the Bureau of Standards, consulting engineering firms, and the Commission's Engineering Bureau to make a study of propagation problems left unsolved at the engineering conference and to submit a report thereon. The Ad Hoc report was signed by all its members (with reservations on the part of several, which did not affect its conclusions), and was presented to the Commission on May 27, 1949. (For detailed information as to the contents of this report see the section dealing with Technical Information.)

In a public notice dated May 26, 1949, the Commission presented to the industry and the public a status report on the "freeze" and a working schedule for lifting the "freeze" and adopting new rules and standards for the television broadcast service.

ULTRA HIGH FREQUENCY TV

The Commission several times in the past indicated that the 12 "low band" television channels did not constitute a sufficient allocation of spectrum space to provide for a nation-wide competitive system of TV broadcasting. In allocating the 475–890 megacycle band to experimental television, the Commission further pointed out that any future expansion would have to take place in that portion of the radio frequency spectrum. The great demand for television assignments, coupled with the fact that the evidence on hand pointed to the need for greater spacing between stations, thus resulting in fewer possible assignments, further emphasized the need for more space for this service.

On September 20, 1948, a hearing was begun to determine the utility of the band 475–890 megacycles for television broadcasting. The purpose of this hearing was to obtain information on the state of development of transmitting and receiving equipment capable of operating in this band in color as well as monochrome; to obtain information on

any proposals for the utilization of the band and standards to be proposed; to receive any additional information as to the propagational characteristics of the band; and to obtain information concerning interference to television stations on channels 2 through 13.

Most of the witnesses urged that additional channels be allocated for monochrome television using the same standards as are presently used. Several witnesses recommended that a portion of the UHF band be reserved for experimental work in color, high definition black and white, and "stratovision." Subsequent to the adjournment of the hearing, a consulting engineering firm filed a petition to provide for a type of telecasting in the UHF band, called "polycasting," which envisions the use of a large number of low-powered stations to cover a given area.

5. NONCOMMERCIAL EDUCATIONAL BROADCAST SERVICE

Stations in this service are used principally by universities and school systems for transmitting educational and entertainment programs to schools and to the public. Their operation is entirely on a noncommercial basis. Since the 20 channels allocated for this service are contained within the regular FM band (88 to 108 megacycles), regular FM receivers can be used by the schools. FM receivers used by the public, of course, also can pick up the school programs.

Interest in the Noncommercial Educational Broadcast Service has been increasing gradually, and 58 stations were authorized at the end of the fiscal year as compared with 46 in 1948.

Nearly all of the new activity in this service centers around the low power (10 watt), low cost equipment permitted under rules adopted by the Commission in September 1948. With such equipment, easily installed and operated, schools may begin broadcasting for as little as $2,000 if studio facilities are available. (If studio equipment is required, the minimum cost is usually increased by another $1,000 or more.) Such inexpensive equipment fits into many school budgets, permitting FM broadcasting to begin with service to a small area, generally about 2 to 5 miles in radius. Higher powered equipment may be added when desired. Many inquiries concerning 10-watt stations and requests for application forms were received during the year, and it appears that a considerable number of such stations will be established during the next year.

A considerable number of educational institutions are also licensed in the standard (AM) broadcast service, and some of the latter operate on a nonprofit basis.

6. FACSIMILE BROADCAST SERVICE

Following years of development and experimentation, which indicated that broadcast facsimile equipment was adequately developed, the Commission adopted rules providing for commercial facsimile broadcasting by FM stations, effective July 15, 1948. A few FM stations carried on a regular facsimile service during the year, and in some instances FM stations operated facsimile on a temporary basis for experimental and exhibition purposes. Upon the further development and distribution of inexpensive facsimile recorders, it is expected that facsimile broadcasting will become a more important broadcast service.

Facsimile transmission of printed matter and pictures, for reception by recorders attached to FM receivers, may be accomplished on either a simplex or a multiplex basis. When using simplex facsimile the regular aural FM program is not transmitted, but with multiplex operation both are transmitted simultaneously. It is, of course, preferable that multiplex operation be employed so that there will be no interruption of the aural programs. While multiplex operation has not been entirely satisfactory in the past, recent developments indicate that it may readily be done without perceptible interference between the sound and facsimile. With a relatively small additional investment for facsimile equipment, FM broadcasters may thus provide simultaneous aural and facsimile programming on the same channel without perceptible adverse effect upon either program service.

7. INTERNATIONAL BROADCAST SERVICE

Though licensed by the Commission, international broadcast stations operating in this country function under the auspices of the Department of State. Their number—37—remained unchanged during the year.

8. REMOTE PICK-UP BROADCAST SERVICE

Remote pick-up broadcast stations, employing portable or mobile transmitters of low power, are used for providing temporary circuits to the main studios of broadcast stations from program origination points where regular wire circuits are not feasible. Such transmitters are used at sports events, parades, and for other special broadcasts. These transmitters are also utilized for emergency communications during the disruption of normal circuits by floods or storms. A rule adopted during the year permits broadcasters in Alaska, Hawaii, and Puerto Rico to use remote pick-up broadcast transmitters for any auxiliary purpose except for transmissions intended for direct reception by the general public.

Frequency reassignments were established during the year for this service in the ranges of 26, 153, 166, 170, and 450 megacycles, and proposed rules were issued for specific groupings and licensing of these frequencies. In view of this rule making procedure, construction permits were not issued for remote pick-up broadcast stations during the year except for frequencies in the 2-megacycle range. As a result, the number of stations licensed did not change appreciably. However, hundreds of temporary authorizations were granted to permit equipment to be used for the new frequencies until construction permits and licenses may be issued.

9. ST (STUDIO-TRANSMITTER) BROADCAST SERVICE

FM broadcast stations are often located on mountain tops or at other remote locations where wire circuits may not be available or satisfactory for program transmission from the studio to the transmitter. Studio-transmitter broadcast stations provide a high quality connecting link between the studio and transmitter, and the band of 940 to 952 megacycles is allocated for this purpose. The number of stations authorized during the year increased from 9 to 28, and the equipment now available appears to be very satisfactory. In one case a distance of 89 miles is spanned by one ST transmitter, using only a few watts of power and directional antenna.

10. DEVELOPMENTAL BROADCAST SERVICE

To aid manufacturers or broadcasters who require radio transmission for the testing of transmitters and antennas and for radio propagation studies, the developmental broadcast stations are authorized. The number of these stations decreased by one during the year, giving a total of 14. Projects carried on during the year by developmental broadcast stations included the testing of high power FM transmitters, the testing of FM antennas employing circular polarization, and the development of remote pick-up transmitters operating in the 450-megacycle range.

11. STATISTICS

TOTAL BROADCAST AUTHORIZATIONS

Despite a decrease of FM authorizations, the total number of outstanding broadcast grants passed the 4,000 mark during the year. A tabulation of stations licensed or holding construction permits in the various classes of broadcast services at the close of the past two fiscal years is shown below:

Class of broadcast station	1948	1949	Increase
Standard (AM)	2,034	2,179	145
Frequency modulation (FM)	1,020	865	(−155)
Television (TV)	109	117	8
Television (experimental)	124	205	81
Noncommercial educational	46	58	12
International	37	37	0
Facsimile	2	2	0
Remote pick-up	571	580	9
Studio transmitter (ST)	9	28	19
Developmental	15	14	(−1)
Total	3,967	4,085	118

BROADCAST AUTHORIZATIONS BY STATES AND CITIES

A tabulation of AM, FM, and TV broadcast authorizations as of June 30, 1949, showed that Texas had more such grants collectively than any other State. However, California was a close second, followed by Pennsylvania, New York, and North Carolina in that order. Other States having more than a hundred broadcast authorizations were Ohio, Illinois, Florida, and Georgia.

Texas also led in the number of authorized AM stations, followed in turn by California and Pennsylvania. The most FM authorizations were in Pennsylvania, New York, California, Ohio, and Illinois in the order mentioned. New York, Ohio, and California, respectively, topped the TV list.

All States had AM stations, but five States (Arizona, Montana, New Mexico, Vermont and Wyoming) had no FM authorizations, and 14 States were without TV grants. Puerto Rico's total authorizations were more than any of 15 States. The Virgin Islands was the only possession yet without a broadcast facility.

More than 1,300 cities and towns had broadcast authorizations of one type or another. Chicago led in total authorized stations. New York was a close second, followed by Los Angeles, Philadelphia, New Orleans, Washington, and San Francisco. Both the AM and FM lists were headed by Chicago and New York, in that order, but Los Angeles led all other cities in the number of TV authorizations.

A break-down of AM, FM, and TV authorizations by States and chief cities follows:

BROADCAST AUTHORIZATIONS BY STATES

	AM	FM [1]	TV [2]	Total
Alabama	62	18	2	82
Arizona	24	0	2	26
Arkansas	32	8	0	40
California	147	62	11	220
Colorado	34	3	0	37
Connecticut	26	13	1	40
Delaware	6	5	1	12
District of Columbia	7	9	4	20
Florida	72	24	5	101
Georgia	71	27	3	101
Idaho	21	5	0	26
Illinois	71	50	6	127
Indiana	44	29	3	76
Iowa	47	22	2	71
Kansas	38	8	0	46
Kentucky	43	13	2	58
Louisiana	39	18	3	60
Maine	16	3	0	19
Maryland	24	17	3	44
Massachusetts	46	30	3	79
Michigan	61	28	6	95
Minnesota	44	11	3	58
Mississippi	40	6	0	46
Missouri	45	21	2	68
Montana	26	0	0	26
Nebraska	21	4	2	27
Nevada	9	2	0	11
New Hampshire	11	6	0	17
New Jersey	19	17	1	37
New Mexico	23	0	1	24
New York	93	64	14	171
North Carolina	90	40	2	132
North Dakota	14	1	0	15
Ohio	63	53	12	128
Oklahoma	43	14	2	59
Pennsylvania	108	71	7	186
Rhode Island	11	7	1	19
South Carolina	43	14	0	57
South Dakota	14	1	0	15
Tennessee	56	18	2	76
Texas	178	39	6	223
Utah	19	3	2	24
Vermont	8	0	0	8
Virginia	53	24	2	79
Washington	46	7	1	54
West Virginia	34	20	1	55
Wisconsin	51	22	1	74
Wyoming	12	0	0	12
Alaska	8	0	0	8
Hawaii	9	0	0	9
Puerto Rico	26	1	0	27
Virgin Islands	0	0	0	0
Total	2,187	868	120	3,175

[1] Does not include 58 authorized noncommercial educational broadcast stations.
[2] Includes 2 experimental authorizations operating on commercial basis (Los Angeles and Salt Lake City).

BROADCAST AUTHORIZATIONS BY CITIES

	AM	FM	TV	Total
Chicago	16	14	4	34
New York	14	12	6	32
Los Angeles	12	10	7	29
Philadelphia	10	10	3	23
New Orleans	11	7	3	21
Washington	7	9	4	20
San Francisco	8	8	3	19
Minneapolis-St. Paul	11	3	3	17
Pittsburgh	7	9	1	17
Portland (Oreg.)	10	6	1	17
San Antonio	9	6	2	17
Baltimore	7	6	3	16
Boston	7	6	3	16
Cleveland	6	6	3	15
Seattle	9	5	1	15
Detroit	5	6	3	14
Miami	6	7	1	14
Houston	8	4	1	13
St. Louis	7	5	1	13
Buffalo	6	5	1	12
Cincinnati	5	4	3	12
Columbus (Ohio)	4	5	3	12
Dallas	5	5	2	12
Jacksonville	6	3	3	12
Louisville	7	3	2	12
Oklahoma City	7	4	1	12
Providence	6	5	1	12
Richmond	6	5	1	12
Denver	8	3	0	11
Milwaukee	7	3	1	11
San Diego	7	3	1	11
Syracuse	5	4	2	11
Rochester	6	3	1	10
Kansas City (Mo.)	4	4	1	9
Salt Lake City	5	2	2	9
Charleston (S. C.)	5	3	0	8
Fort Worth	6	1	1	8
Tulsa	5	2	1	8
Albany	5	2	0	7
Toledo	3	3	1	7
Spokane	6	0	0	6

BROADCAST APPLICATIONS

AM BROADCAST APPLICATIONS

	Pending July 1, 1948	Received	Disposed	Pending June 30, 1949
New stations	575	193	386	382
Change in facilities	306	240	253	293
Renewals	197	619	615	201
License	194	481	583	92
Transfers	82	331	310	103
Miscellaneous	205	964	1,054	115
Total	1,559	2,828	3,201	1,186

FM BROADCAST APPLICATIONS

New stations	188	43	166	65
Change in facilities	5	104	59	50
Renewals	17	106	102	21
License	81	275	267	89
Transfers	27	54	66	15
Miscellaneous	151	1,414	1,539	26
Total	469	1,996	2,199	266

TV BROADCAST APPLICATIONS

New stations	294	88	44	338
Change in facilities	19	61	66	14
Renewals	0	7	5	2
License	1	14	6	9
Transfers	0	22	12	10
Miscellaneous	10	252	249	13
Total	324	444	382	386

ALL OTHER BROADCAST APPLICATIONS [1]

New stations	113	252	218	147
Change in facilities	12	45	44	13
Renewals	42	306	267	81
License	25	182	174	33
Transfers	2	96	58	40
Miscellaneous	9	119	124	4
Total	203	1,000	885	318

TOTAL BROADCAST APPLICATIONS

New stations	1,170	576	814	932
Change in facilities	342	450	422	370
Renewals	256	1,038	989	305
License	301	952	1,030	223
Transfers	111	503	446	168
Miscellaneous	375	2,749	2,966	158
Total	2,555	6,268	6,667	2,156

[1] Includes noncommercial educational, facsimile, international, relay and studio link, experimental and developmental.

BROADCAST DELETIONS

Actual deletions of broadcast authorizations rose to 274 during the year, with those in FM accounting for more than 200. There follows a list of deletions by months:

Deletions	AM	FM	TV	Monthly total
1949:				
June	5	20	3	28
May	7	17	0	24
April	10	38	1	49
March	5	31	1	37
February	3	10	1	14
January	1	17	1	19
1948:				
December	6	19	0	25
November	7	16	0	23
October	1	14	0	15
September	3	9	0	12
August	3	9	0	12
July	4	12	0	16
Total	55	212	7	274

ASSIGNMENTS AND TRANSFERS

	Pending July 1 1948	Received	Disposed	*Pending* June 30,1949
AM	82	331	310	103
FM	27	54	66	15
TV	0	22	12	10
Other	2	96	58	40
Total	111	503	446	168

STANDARD BROADCAST FINANCIAL DATA

The following table shows comparative calendar year 1947–48 financial data for the standard (AM) broadcast industry as a whole:

AM networks and stations	1947 7 networks 1,464 stations	1948 7 networks 1,824 stations	Percent increase or (decrease)
Investment in tangible broadcast property:			
Cost to respondent	$150,373,623	$201,408,564	33.94
Depreciation to date under present owner	57,065,893	66,745,050	16.96
Depreciated cost	93,307,730	134,663,514	44.32
Revenues from sale of network time	134,726,631	141,052,353	4.70
Revenues from sale of nonnetwork time	239,360,055	275,667,926	15.17
Commission paid representatives, etc	47,969,521	50,292,281	4.84
Revenues from sale of talent, etc	37,597,222	40,567,416	7.90
Total broadcast revenues	363,714,387	406,995,414	11.90
Total broadcast expenses	291,918,447	342,903,730	17.47
Broadcast income (before Federal income taxes)	71,795,940	64,091,684	(10.73)

The following table compares the 1947–48 broadcast revenues, expenses and income of the four Nation-wide networks and their key stations:

4 Nation-wide (AM) networks and their key stations	1947	1948	Percent increase or (decrease)
Number of key stations	11	11	
Total broadcast revenues	$91, 232, 718	$95, 788, 942	4. 99
Total broadcast expenses	$75, 091, 412	$80, 508, 811	7. 21
Broadcast income (before Federal income taxes)	$16, 141, 306	$15. 280. 131	(5. 34)

The distribution of the 1948 broadcast revenues and broadcast income (before Federal income taxes) as between networks and stations is shown in the following tables:

Distribution of total (AM) broadcast revenues, 1948

	Amount	Percent of total	Amount	Percent
Networks, including 27 owned and operated stations			$109, 031, 802	26. 8
Networks and their 11 key stations	$97, 290, 571	23. 9		
16 other networks owned and operated stations	11, 741, 231	2. 9		
1,797 other stations			297, 963, 612	73. 2
1,080 stations serving as network outlets	228, 938, 322	56. 2		
717 stations not serving as network outlets	69, 025, 290	17. 0		
Total broadcast revenues			406, 995, 414	100. 0

Distribution of (AM) broadcast income (before Federal income taxes)

	Amount	Percent of total	Amount	Percent
Networks, including 27 owned and operated stations			$18, 085, 191	28. 2
Networks and their 11 key stations	$15, 283, 970	23. 8		
16 other network-owned and operated stations	2, 801, 221	4. 4		
1,797 other stations			46, 006, 493	71. 8
1,080 stations serving as network outlets	43, 347, 338	67. 6		
717 stations not serving as network outlets	2, 659, 155	4. 2		
Total broadcast income (before Federal income taxes)			64, 091, 684	100. 0

Because of the substantial number of new stations in their early and less profitable months of operation included in 1948, trends in the data given above may not correspond to trends in the experience of "old" stations. For this reason, comparative data for the 2 years are presented below for identical stations, i. e., for stations which were in operation in both years and which did not change their status during the period with respect to class, time, and whether or not affiliated with a network. The data are shown in terms of averages per station of broadcast revenues, expenses and income for each class of station, excluding the Nation-wide networks and their 11 key stations.

AM broadcast stations (excluding 11 key stations of Nationwide networks)	1947	1948	Percent increase or (decrease)
Averages per station:			
Clear channel 50-kw. unlimited:			
Number of stations, 41.			
Total broadcast revenues	$1,187,743	$1,238,993	4.31
Total broadcast expenses	857,682	897,736	4.67
Broadcast income	330,061	341,257	3.39
Clear channel 50-kw. part time:			
Number of stations, 4.			
Total broadcast revenues	871,581	900,983	3.37
Total broadcast expenses	660,742	729,705	10.44
Broadcast income	210,839	171,278	(18.76)
Clear channel 5–25 kw. unlimited:			
Number of stations, 29.[1]			
Total broadcast revenues	420,895	437,741	4.00
Total broadcast expenses	346,285	357,596	3.27
Broadcast income	74,610	80,145	7.42
Regional unlimited:			
Number of stations, 342.			
Total broadcast revenues	301,129	310,777	3.20
Total broadcast expenses	228,111	245,786	7.75
Broadcast income	73,018	64,991	(10.99)
Regional part-time:			
Number of stations, 185.			
Total broadcast revenues	86,486	110,321	27.56
Total broadcast expenses	81,779	103,576	26.65
Broadcast income	4,707	6,745	43.30
Local unlimited:			
Number of stations, 641.			
Total broadcast revenues	92,521	100,660	8.80
Total broadcast expenses	77,803	88,135	13.28
Broadcast income	14,718	12,525	(14.90)
Local part time:			
Number of stations, 66.			
Total broadcast revenues	49,930	72,739	45.68
Total broadcast expenses	46,526	68,275	46.75
Broadcast income	3,404	4,464	31.14
All stations:			
Number of stations, 1,313.			
Total broadcast revenues	191,863	205,111	6.90
Total broadcast expenses	150,971	166,646	10.38
Broadcast income	40,892	38,465	(5.94)

[1] Includes 1 part-time station.

NOTE.—All broadcast income before Federal income taxes.

FREQUENCY MODULATION BROADCAST FINANCIAL DATA

Of the 700 commercial FM stations on the air as of December 31, 1948, 593 (or 85 percent) were authorized to licensees of standard broadcast (AM) stations and 107 (or 15 percent) to persons having no AM broadcast interests.

Financial reports filed by FM licensees for the calendar year 1948 indicated that in the majority of cases where FM stations were authorized to AM licensees, the two stations were "jointly operated," i. e., programs broadcast over the AM stations were duplicated simultaneously by the FM station at no additional cost to the advertiser.

Thus, of the 593 AM licensees operating FM stations, only 77 reported separate revenues from their FM operation during 1948. A summary of the financial information reported for these 77 stations is as follows:

	Aggregate	Average per station
Total broadcast revenues	$621,469	$8,070
Total broadcast expenses	2,153,659	27,970
Total broadcast loss	1,532,190	19,900

Of these 77 FM stations, 54 had been in operation for the full year of 1948. Total revenues of the full-year group averaged $9,300 per station and average expenses about $33,600. Thus, the average loss for stations operating the full 12 months was slightly over $24,000. Of the 77 stations, 4 reported an income from FM operation during 1948.

Estimated FM station expense data were submitted by 65 of the 516 FM licensees who apparently engaged in a joint AM-FM operation during 1948. These reports indicated that FM station costs in an AM-FM joint operation averaged about $15,000 during 1948.

The following table summarizes the 1948 financial information reported for 89 of the 107 FM stations operated by persons having no AM broadcast interest:

	Aggregate	Average per station
Total broadcast revenues	$1,126,208	$12,650
Total broadcast expenses	4,182,558	46,990
Total broadcast loss	3,056,350	34,340

Of these 89 FM stations, 52 had been in operation for the full year of 1948. Total revenues of the full-year group averaged $19,000, expenses $53,300 with an average loss of $34,300. All but 3 of the 89 reporting stations showed a loss from operations during 1948.

TELEVISION BROADCAST FINANCIAL DATA

During the calendar year 1948, the 4 television networks and 50 stations (total on the air during the year) reported aggregate revenues of 8.7 million dollars, aggregate expenses of 23.6 million dollars and losses of almost 15 million dollars. All TV networks and stations reported a loss from operations during the year.

Of the 8.7 million dollars TV industry revenues, approximately 2.5 million dollars were derived from network programs with the remaining 6.2 million dollars sold directly by stations.

The distribution of total revenues, expenses and losses as between TV networks and stations was as follows:

	Revenues	Expenses	Loss
	Millions	*Millions*	*Millions*
4 networks (including 10 owned and operated stations)	$4.8	$11.2	$6.4
40 other stations	3.9	12.4	8.6
Industry total	8.7	23.6	14.9

Exactly half of the TV stations operated 6 months or less with only 17 in operation during the entire year. Average monthly station revenues ranged from $20,000 in the case of the "full year" stations to $5,000 for stations in operation only 2 months or less.

With respect to operating costs of TV stations, the following data are based on 14 of the 17 stations in operation during the whole of 1948:

Aggregate annual operating costs of 14 stations	$7,532,000
Average per *station*	538,000
Average per month per station	45,000
Highest annual operating expense	814,000
Lowest annual operating expense	[1] 59,000

[1] The wide range in annual operating costs reported during 1948 is accounted for, in large measure, by differences in the number of hours of station operation per week.

In several of the large cities, TV station revenues during 1948 constituted a relatively high proportion of the total revenues reported by *all stations* (*both* aural and visual) in those cities. In Philadelphia, TV revenues reported by three stations were almost 10 percent of the combined revenues of all broadcasting stations in that city. In New York and Washington, the proportion going to TV was approximately 8 percent, while in Baltimore and Milwaukee TV accounted for approximately 7 percent of the total revenues of all stations.

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CHAPTER IV. SAFETY AND SPECIAL RADIO SERVICES

1. GENERAL

The Safety and Special Services comprise all of those varied and extensive radio activities administered by the Commission with the exception of the broadcast and common carrier services.

Until recently, the technical limitations on the use of the radio spectrum made it necessary to confine the special employment of radio to purposes directly concerned with the safety of life and property. As a result of developments during the war years, the Commission found it possible to embark upon a more liberal policy regarding the general public use of radio. It encouraged experimentation on the part of all those interested in order that the most informed judgment possible might be exercised with respect to the fullest use that could be made of upper portions of the radio spectrum that new techniques had opened.

At the close of fiscal 1948, it was felt that the experimental program had progressed sufficiently to enable the Commission to determine which services might best serve the public interest if established on a regular basis. Accordingly, comprehensive rule-making proceedings were instituted involving a complete revision of frequency allocations and rules for the domestic use of two-way radio communication by all types of land vehicles. Because of the widespread interest, extensive oral argument was heard during October 1948.

As the result of the comments filed and the arguments presented, the Commission, on April 27, 1949, issued a report and order which, among other things, established two new groups of services—Land

Transportation, and Industrial—and revised the Public Safety Radio Services. These rules represented the culmination of several years of study and coordination by various State and local government instrumentalities, industry, and the Commission.

The new commercial services, together with those relating primarily to the public safety which had been in existence for a number of years, may, for convenience, be considered as falling into three general categories as follows:

1. *Services devoted to safety.*—Aeronautical; Marine; Public Safety (Police, Fire, Forestry-Conservation, Highway Maintenance, and Special Emergency).
2. *Services devoted to commerce, industry, and science.*—Land Transportation (Railroad, Taxicab, Automobile Emergency, Intercity Bus, Highway Truck, and Urban Transit); Industrial (Power, Petroleum, Forest Products, Relay Press, Motion Picture, Low Power Industrial, Special Industrial); Industrial, Scientific, and Medical (special radiating equipment, such as industrial heating and diathermy); Experimental (developing new radio equipment and techniques); and Low Power Radio Devices.
3. *Services covering operation of radio transmitters by individuals.*—Commercial Radio Operators, Amateurs, and Citizens. (For the purpose of this report, these services are grouped and discussed in a separate chapter.)

The number of stations is one index of the regulatory workload in connection with the Safety and Special Services. The nonbroadcast services (exclusive of commercial and amateur operators) had less than 10,000 authorized stations in 1940, did not reach 13,000 at the outbreak of the war, but increased to nearly 22,000 in 1946, to over 36,000 in 1947, exceeded 47,000 in 1948, and numbered more than 61,000 stations, exclusive of associated mobile units, in 1949.

2. AERONAUTICAL RADIO SERVICES

The Aeronautical Radio Services, one of the most vital groups in the safety category, is of the utmost importance to aircraft operation and the safety of life and property in the air. This group includes not only communications equipment for private and carrier aircraft but also various navigational aids, both on the ground and in the air, essential to provide an adequate system of air navigation.

The rapid rate of expansion of the Aeronautical Radio Services which has been experienced since the war continued during 1949. Comparison statistics show an increase from 20,858 authorized aircraft and ground stations at the close of fiscal year 1948 to 27,227 aircraft

and ground stations at the close of fiscal 1949. Applications received for 1949 totaled 17,824.

AVIATION ORGANIZATIONS AND CONFERENCES

In order to maintain these services at the very high level of efficiency and reliability necessary for safety purposes and to encourage further development, the Commission has had to increase its participation in the various interagency coordinating and policy groups both on a domestic and international scale. The most important of these are the International Administrative Aeronautical Radio Conference, the Air Coordinating Committee, The Radio Technical Commission for Aeronautics, and the International Civil Aviation Organization.

The International Administrative Aeronautical Radio Conference convened in Geneva in May 1948 to deal with frequency assignments in the bands allocated exclusively for aeronautical use. This conference established technical standards for the assignment of frequencies and drew up a plan for their allotment for the aeronautical mobile off-route services. A plan for the route services could not be completed because of lack of information, and a recess was called to enable administrations to coordinate their requirements. During this recess the nations of the Western Hemisphere met in Washington in conjunction with the Fourth Inter-American Radio Conference, and an allotment plan was established which will be used at the second session of the International Administrative Aeronautical Radio Conference convening in Geneva in July 1949. Upon conclusion of this conference, the recommendations and plan adopted will be used as a basis not only for the international allocation of frequencies but also in the high frequency for the continental United States.

A major and continuing function of the Commission is participation in the work of the Air Coordinating Committee. The ACC recommends proposed United States policy on aviation to the President, and acts as a vehicle for coordinating aviation matters between the various departments of the government and industry. The Commission is active in the ACC through its membership on the Technical Division and the following subcommittees of that division: Aeronautical Communications and Electronic Aids; Airspace—Rules of the Air and Air Traffic Control; Search and Rescue; Dimensional Standardization; and Airmen Qualifications.

In addition, the Commission is represented on the Air Traffic Control and Navigation Panel which was established by the Air Coordinating Committee for the guidance and implementation of the National All-weather Air Navigation and Traffic Control Program. The activity of this panel has been appreciable during the past year and is expected to increase during the next year.

The Radio Technical Commission for Aeronautics is a cooperative association of the United States Government-industry aeronautical telecommunication agencies. It conducts studies of aeronautical telecommunications problems and related matters for the purpose of providing guidance to and coordinating the efforts of the organizations concerned. One of the major and continuing activities of the Commission involves participation in the executive committee and special technical committees of the RTCA. During the past year, the RTCA has studied and recommended on such problems as:

Test standards and procedures for VHF radio equipment.

Standardization of distance measuring equipment testing procedures.

Implementation of air traffic control transponder—private line visual communication equipment.

Implementation of VHF emergency and airway station communication frequencies.

The International Civil Aviation Organization is an advisory group established to develop the principles and techniques of international air navigation and to foster the planning and development of international civil aviation throughout the world. During 1949 the Commission assisted in the preparation of the United States position and furnished advisers to three Regional Air Navigation meetings and one divisional meeting of ICAO. These meetings were: North Atlantic Regional Air Navigation Meeting, Paris; North Pacific Regional Air Navigation Meeting, Seattle; African-Indian Ocean Regional Air Navigation Meeting, London; and Communications Division Meeting, Montreal.

In addition, the Commission helped prepare the United States position for the Ocean Stations Vessel Conference in London, April-May 1948, and the MET-Telecommunications Meeting held in London, April-May 1949, through its activities on the Technical Division of the Air Coordinating Committee and its subcommittees.

During the past year it became increasingly evident that the development of unified regulations and specifications covering the erection and marking of radio towers, which are potential hazards to aircraft in flight, were required. This matter received extensive consideration during 1949 and, at the present time, a proposal is being discussed with radio interests in order to arrive at a basis for the promulgation of rules setting forth criteria for determining obstructions to air navigation caused by radio towers. Since both aviation and radio interests are users of airspace and, since the locations of airports are normally ideal locations for the erection of antenna towers, the interests are conflicting to a certain degree. For this reason, it has been and will continue to be necessary to effect thorough coordi-

nation in order that the standards established are equitable to both interests.

AIRCRAFT RADIO STATIONS

The largest increase in the Aeronautical Radio Services was that of private aircraft. There were 23,723 licensed aircraft stations at the end of 1949 compared with 17,736 in 1948 and, of the former, 21,517 were private planes. This large increase was due to several factors.

More and more aircraft owners are becoming familiar with the advantages of very high frequency communication, thus making the use of radio more popular. A very high frequency plan for "air carrier en route" communications in the United States was formulated by the Commission during 1949 and, although full effect of this plan is not expected until 1950, the implementation accomplished during 1949 is reflected in the growth of aircraft stations.

There has been a sizable increase in the number of aircraft using specialized air-borne radio equipment such as radio altimeters, air-borne radar, and other traffic control and navigational equipment. Until recently, this equipment was used primarily by transport aircraft; however, private aircraft production has shifted to larger type planes, some of which are used for executive purposes and are capable of carrying equipment comparable to the regular air lines.

The aforementioned factors, together with the fact that many major airdromes now require aircraft to be radio-equipped before they can use their facilities, and the fact that a large number of aircraft manufacturers offer two-way radio as standard equipment on their aircraft have resulted in a 33 percent increase in the number of aircraft stations during 1949.

AERONAUTICAL LAND AND AERONAUTICAL FIXED RADIO STATIONS

The Aeronautical Land and Aeronautical Fixed Services are other continuously expanding aids to aviation. These stations provide radio communication service necessary for the safe, expeditious, and economical operation of aircraft. At the close of fiscal 1949, the Commission had licensed 1,485 such stations in the United States and Alaska. The expansion is due in large measure to the implementation of the VHF plan previously mentioned. VHF aeronautical stations are being located within approximately 200 miles of each other along established air routes to provide effective communication. This plan provides for future expansion and will accommodate additional VHF aeronautical stations as required by the growth of the industry.

The growing importance of Alaska and the reconversion from military to civilian status of the airways has necessitated major changes in aeronautical communication. An Alaskan communications plan

is being formulated, and will require considerable coordination between Government agencies and industry because of the diversified nature of Alaskan operations before it can be finally implemented.

CIVIL AIR PATROL STATIONS

The Civil Air Patrol is a civilian auxiliary of the United States Air Force but its radio stations are licensed by the Commission. The number of ground stations in this service has increased from approximately 1,000 in 1948 to 1,608 in 1949. This count does not accurately reflect the actual number of CAP stations, since one licensed base station may have as many as 100 mobile units associated with it. To expedite the handling of applications for radio facilities to be used in this service, it has been necessary to promulgate and add appropriate rules to part 9 of the Commission's Rules and Regulations Governing Aeronautical Services.

AIRDROME CONTROL STATIONS

The number of airdrome control stations licensed at the end of the fiscal year showed a decrease of six stations as compared with 1948. This is due mainly to the fact that the Civil Aeronautics Administration has taken over the operation of certain airdrome control stations throughout the country rather than to any cessation of operation.

AERONAUTICAL MOBILE UTILITY STATIONS

This service was first implemented in 1947 and is used aboard crash, maintenance, and emergency vehicles at airdromes for communication with the control tower, ground vehicles and aircraft on the ground. It has increased from 109 stations in 1948 to 162 stations in 1949.

AERONAUTICAL NAVIGATION RADIO STATIONS

This service, for the most part, is operated by the Civil Aeronautics Administration; however, the number of stations licensed by the Commission has increased from 66 in 1948 to 88 in 1949. This increase is caused primarily by the inauguration of new routes in areas where the CAA is not prepared to render the desired service.

FLYING SCHOOL RADIO STATIONS

Flying school stations on the ground and aboard aircraft are used for communication pertaining to instructions to students or pilots while actually operating aircraft. There were 19 flying school stations licensed at the close of fiscal 1949, whereas 23 stations were licensed at the close of 1948.

FLIGHT TEST RADIO STATIONS

A flight test radio station is a radio station, ground or aircraft, used for the transmission of communications in connection with the test of

aircraft and major components of aircraft. There were 89 flight test stations licensed at the close of fiscal 1949 in comparison with 104 flight test stations the year previous.

AERONAUTICAL PUBLIC SERVICE RADIO STATIONS

The public service type of station has been provided so that individuals aboard aircraft in flight can communicate with land radio facilities connected with land-line telephone and telegraph systems. There were 606 public service aircraft at the close of fiscal 1949, or 94 more than the year before. Although an exclusively aviation public air-ground telephone communication system has not yet been provided, this service has continued to increase. Coastal telegraph and coastal telephone stations are providing this communication service at the present time.

3. MARINE RADIO SERVICES

GENERAL

The use of radio on ships is the oldest of the safety radio services and the one with which the public is perhaps the most familiar because of the publicity attending its use under distress conditions. The Marine Radio Services include the radio equipment of ships for commercial as well as for safety communication and for aids to navigation, the shore stations of all types, and the necessary means to connect them with general public service land line systems. Communication may be between ships, between ships and aircraft, or between ships and shore. Since many ships normally engage in international voyages, they must be able to communicate with the ships and shore stations of other maritime nations.

Broadly speaking, maritime radio uses may be divided into those which are compelled by law for safety purposes, and those which are voluntary on the part of ship owners and combine safety with other purposes such as navigation and commerce. The Commission is required by the Communications Act to license all radio stations (other than United States Government stations) on board ships of United States registry whether voluntary or compulsory, and of whatever kind (radiotelephone, radiotelegraph, radar, etc). At the same time, the Commission is responsible for the administration, including many phases of enforcement, of the purely compulsory safety provisions of the law in this field.

Important from the compulsory safety standpoint, in addition to the Communications Act, are the Ship Act of 1910 and the International Safety of Life at Sea Convention (London, 1929 and 1948). The Ship Act applies only to the Great Lakes; the other two are applicable to the oceans. The 1948 Safety Convention, which will supersede the 1929 Convention, establishes numerous important ad-

vances in safety at sea through compulsory radio. During 1949, steps were taken by the Commission looking toward negotiations with Canada to improve the safety situation on the Great Lakes.

Apart from its aforementioned responsibilities, the Commission is obliged by the Communications Act to foster new uses of radio in the public interest. In this connection, the past year witnessed some significant developments. Important from the marine standpoint was the establishment, on an experimental basis, of certain radar stations located at fixed positions on or near the shore intended to aid the safe and expeditious movement of ships in adjacent waters. Another important activity was laboratory and field investigation on the part of the Commission, together with considerable national and international consultative work, looking to the development of a suitable radiotelephone automatic alarm signal and receiving device for calling and distress purposes on the new international radiotelephone frequency 2182 kilocycles.

The Commission continued to cultivate and maintain liaison with the domestic government and nongovernment shipping interests. In this connection, it is active in the Radio Technical Commission for Marine Services which is striving to bring government and industry closer together to the mutual benefit of all concerned.

A further discussion of various phases of marine radio activity is set forth below.

ADMINISTRATION OF SHIP SAFETY PROVISIONS

As of June 30, 1949, the Commission's records disclosed that 1,863 ships of United States registry were compulsory equipped with radiotelegraphic installations under title III, part II, of the Communications Act. These ships, when navigated in the open sea, must carry qualified radiotelegraph operators and maintain radio watches for safety purposes.

In administering these provisions, the Commission finds it necessary from time to time to impose fines and forfeitures and to apply other corrective measures of a less stringent nature. Because of a small decrease in the total number of compulsory equipped ships and partly because of the existence of a maritime strike in this country from August to November 1948, the number of violations involving this class of vessel declined slightly during the year. However, the number of reported violations involving foreign vessels subject to compulsory United States radio requirements showed an increase over 1948.

VOLUNTARILY EQUIPPED SHIP STATIONS

An aggregate of 18,140 ship stations are licensed by the Commission to use radio for communication. Of these, 15,647 use radiotelephone

and 630 employ radiotelegraph, all "voluntarily" established. Violation cases concerning voluntarily equipped ships showed a marked increase during the year. Further, the continuing increase in the number of radiotelephone equipped ships has aggravated the already serious congestion in the medium frequency band in which practically all of these stations now operate. Hence, the Commission has had to devote more effort to the regulation and control of such frequencies in order to secure their effective and beneficial use by all concerned.

SHIP RADIO EXEMPTIONS

The Communications Act and the 1929 Safety Convention authorized the Commission to grant exemptions from the compulsory radiotelegraph requirements of the act and the treaty respectively when the vessels concerned are navigated under certain limiting circumstances.

Acting under this authority, the Commission continued to grant blanket exemptions, on an annual basis, for passenger vessels of 15 gross tons or under when navigated not more than 20 nautical miles from the nearest land or more than 200 nautical miles between two consecutive ports, and to passenger vessels of less than 100 gross tons when navigated within certain prescribed areas which are not considered hazardous. It was felt that it would be unreasonable, because of the size of these vessels, to require the radio installation and operators prescribed by law. Individual applications for exemptions received during the year numbered 56.

INTERNATIONAL COORDINATION

The administration of the maritime services cannot be carried forward without international coordination inasmuch as ships travel to almost all parts of the world and there must be universality of communication.

Many of the provisions contained in the regulations resulting from the International Administrative Radio Conference of Atlantic City, 1947, came into force for this country on January 1, 1949, and brought several changes in the Commission's rules governing ship service. In order to accomplish these changes, as well as others necessitated by the wartime lag, over-all revision was undertaken during the year. A redraft was completed and conferences thereon were held with industry representatives. It is anticipated that the proposed rules will be finalized during the coming year.

The 1948 Safety Conference reviewed the 1929 Safety Convention and adopted improvements in the application of radio for the safety of life and property at sea. The United States Senate ratified the 1948 Convention and, assuming its future proclamation by the President and ratification by the prescribed minimum number of countries, it will come into force on January 1, 1951.

The Commission participated in the preparatory work for the sixth meeting of the International Radio Consultative Committee (CCIR) to be held in Prague, Czechoslovakia, in 1951. This Committee is associated with the International Telecommunications Union. Its function is the study of technical radio problems and the submission of recommendations to the 76 members of the Union. The latter then translate such recommendations into proposals for possible adoption by the next International Administrative Radio Conference.

The Commission was represented in the United States delegation to the European Maritime Regional Radio Conference at Copenhagen in the summer of 1948. This Conference, held simultaneously with the European Broadcast Conference, reached tentative agreements for the protection of the frequency band used fundamentally for distress and safety by the maritime mobile radiotelegraph service against encroachment by European broadcast stations operating in portions of the same band. As a result, several continental European broadcast stations were removed from this band.

The 1947 Atlantic City Conference extended the lower limit of the standard broadcast band from 545 to 535 kilocycles, realizing, however, that this might create a source of interference to the operation of certain types of ship-borne auto alarms designed to intercept distress signals on frequencies between 487.5 and 512.5 kilocycles. Numerous tests were conducted during the year to determine the extent to which existing types of auto alarms might be interfered with by emissions from broadcast stations using the new 540 kilocycle frequency.

Of particular advantage to maritime radio was the recognition by the Fourth Inter-American and Region 2 Radio Conferences of a detailed safety radio system for the maritime telephone service based upon the new calling and distress frequency 2182 kilocycles, as well as standardized frequencies for operational communications and public correspondence. Important regulations for relatively short-distance maritime telegraphy also were established. These matters required coordination with contiguous countries, and will require further coordination with countries throughout the Western Hemisphere.

A Commission marine radio engineer was assigned to the United States delegation attending the Region 1 and 3 Radio Conferences at Geneva at the close of the year. These sessions are similar in purpose to the Region 2 Conference, except that they pertain to other regions of the world. Another marine radio engineer rendered technical assistance to the United States delegation to the Provisional Frequency Board in session at Geneva for the purpose of preparing the new International Frequency List pursuant to provisions of the Atlantic City Radio Conference.

Informal conferences were held with Canadian and United States interests concerning a proposed treaty encompassing compulsory safety radio requirements of a regional character for ships plying the Great Lakes. Vessels navigating these waters are excluded from the Convention for Safety of Life at Sea and from title III, part II, of the Communications Act. It is expected that these negotiations will be completed shortly.

The 1948 Safety Conference adopted, for the first time in the history of radio, provisions which will permit the use of radiotelephone equipment and operators as an alternative to compulsory radiotelegraph and operator requirements on previously exempt class of cargo vessels of between 500 and 1,600 gross tons engaged on international voyages. These provisions, however, may be waived for individual ships under certain conditions. It is estimated that not more than 200 United States ships would come under this requirement when the new Safety Convention comes into force January 1, 1951. Radiotelephone equipment on those ships must be capable of operation on the radiotelephone distress frequency 2182 kilocycles adopted at the Atlantic City Conference, 1947, and further included in the Regulations of the Inter-American Radio Agreement of Washington, 1949.

During the year, informal negotiations were undertaken with interested European maritime nations looking toward an advance partial implementation of the Radiotelegraph High Frequency Maritime Mobile Plan included in that portion of the Atlantic City Radio Regulations which is to become effective some time after 1949.

Another matter discussed informally with Europe maritime nations and with Canada concerned the necessary coordinated organization of the maritime mobile telephone service in the very high frequency 152–162 megacycle band. Because the United States had previously adopted a channel separation in this band of 60 kilocycles and the United Kingdom had adopted 100 kilocycles for this purpose, only one maritime mobile service frequency in this band was internationally agreed upon at Atlantic City—namely 156.80 megacycles, for calling, safety, intership, and harbor-control purposes. Through these informal discussions, a workable compromise was achieved, and frequency assignment plans for radiotelephone service in this band are being prepared for implementation in the United States, Canada, and Great Britain. The Commission, through readjustments of its VHF frequency allocation plan, adopted 100 kilocycle channel separation in this maritime band in the interest of international standardization.

RADIO TECHNICAL COMMISSION FOR MARINE SERVICES

The Commission does not have the staff nor facilities sufficient to develop adequately new equipment or conduct extensive technical in-

vestigations as are required from time to time for effective regulation of the maritime service. Consequently, much of the necessary information must be obtained from the researches and developments of other government agencies, private industry, and joint industry-government committees such as the Radio Technical Commission for Marine Services (RTCM), on which the Commission is represented.

SAFETY ON THE GREAT LAKES

During the year, the Commission, in coordination with the Interdepartment Radio Advisory Committee and the Radio Administration of Canada, allocated a new intership medium working frequency (2003 kilocycles) exclusively for use by ships on the Great Lakes. This frequency, available for safety and ship operational radiotelephone communication effective August 1, 1949, replaces the present intership medium frequency (2738 kilocycles) on the lakes, which is widely used for this same purpose in other regions. The serious interference condition heretofore existing on 2738 kilocycles in the Great Lakes area will thereby be alleviated.

COMMERCIAL COAST STATIONS

During World War II, United States military stations made use of the coast telegraph high frequencies normally assigned to commercial stations by the Commission. These frequencies are gradually being released and returned to coast stations previously using them, so that in numerous instances during the past year coast stations regained assignment of their prewar frequencies or substitutions therefor. There were no changes in the number of public coast harbor (telephone) stations although a large number of applications were filed. In most cases the applications were not finally acted upon by the Commission because of the lack of frequencies available for additional assignments, and in four cases the applications were designated for public hearing. These hearings, in all probability, will not occur until extensive study concerning a revision of frequency allocation for all radio services within the band 2000–4000 kilocycles has been made relative to the Inter-American Radio Agreement of Washington, 1949.

A new public coast telegraph station was authorized at Jacksonville, Florida, where none previously existed, in order better to serve ships using that port.

The total number of public coast harbor (telephone) stations in the United States, exclusive of Alaska, is 52. There are five coast telephone stations in the United States employing high frequencies for long-distance public service with ocean-going vessels. In addition,

three mobile press stations are licensed for ship-shore telegraph press traffic exclusively, and 80 Class 2 experimental stations are engaged in the development of marine radio services.

In Alaska, where both radiotelegraphy and radiotelephony are widely used to exchange safety, weather and commercial messages, the number of licensed stations on land (excluding stations in the aeronautical services) increased to a total of 480 for point-to-point communication and 302 for communication with ships in Alaskan waters. As an established regulatory policy, these stations normally are licensed for general public correspondence entirely within the territory; in addition, they operate in conjunction with the network of United States Government point-to-point stations under jurisdiction of the Army Signal Corps. As an aftermath of World War II, the activity of the military stations as related to commercial stations has given rise to certain problems of a regulatory and policy nature which are being studied jointly by the Commission and the Army.

RADAR AIDS TO NAVIGATION

The first shore-based nonmilitary harbor radar authorization in the United States was granted on an experimental basis to the City of Long Beach, California, on March 16, 1949. It emphasized a notable growth in radar as an aid to the movement of ships. Similar authorizations were subsequently granted to the cities of San Francisco, Calif., and Baltimore, Md. The value of shore based radar in association with very high frequency radiotelephone communication as an aid in the movement of ships in periods of reduced visibility will be tested by these trial operations. As a result of coordination with the United States Coast Guard, a limitation has been imposed that information furnished through the operation of these radar stations will not be used to aid the movement of any ship unless the station licensee first obtains from the Commandant of the Coast Guard a permit such as required by law for a so-called private aid to navigation.

A number of experimental radar authorizations (for radionavigation land stations) has been granted to the petroleum industry engaged in off-shore oil-drilling activities in the Gulf of Mexico. These grants were for the very limited purpose of aiding in the movement of ships utilized by the licensee in his particular operations.

Aside from the radionavigation land stations, there were 863 United States merchant ships equipped with radar for regular use in navigation, and additional installations are being made continually.

A few experimental authorizations have been granted to cover shore-based radar training stations for the training of merchant marine deck officers in shipboard radar operation.

EQUIPMENT APPROVAL

Three new types of radiotelegraph transmitters for use aboard ships compulsorily equipped for safety purposes were given type approval after commercial laboratory tests witnessed by Commission engineers. Two types of ship radiotelegraph receivers were approved with respect to the Commission's rules imposing limitation on the radiation of energy from shipboard receiving equipment. A number of commercial type radar sets have also been type approved for licensing in the ship service.

INTERFERENCE PROBLEMS

Numerous reports of interference involving the maritime service were received during the year. Some of this interference was caused by emissions on frequencies which were multiples of the assigned frequencies. In such case the interference is usually readily eliminated by suppression circuits. In other instances, when interference results from stations in the same area using adjacent frequencies, the interference is not so easily eliminated. Instances of the latter kind have been numerous in Alaska where ships, coast, and point-to-point telephone stations have repeatedly been reported by the Civil Aeronautics Administration stations to have caused interference to reception from aircraft. While one case of interference was so severe that the use of a commercial point-to-point frequency in one locality was discontinued, the Commission is studying the general problem with the object of possibly eliminating the interference without serious curtailment in the use of frequencies already licensed.

4. PUBLIC SAFETY RADIO SERVICES

After extensive rule-making proceedings, the Commission, on April 27, 1949 approved a major revision of Part 10, Rules Governing Emergency Radio Services, to become effective July 1, 1949. As virtually all communications authorized in the Emergency Radio Services relate either directly or indirectly to public safety and general welfare, and licenses are normally limited to instrumentalities of government (i. e., State, county, and municipal governments), this part has been renamed "Rules Governing Public Safety Radio Services," and includes the Police, Fire, Forestry-Conservation, Highway Maintenance, and Special Emergency services.

The revised rules embody the Commission's experience, from both an administrative as well as a technical standpoint, obtained since 1938 when part 10 was originally promulgated. Information regarding the administrative procedures incidental to submission of applications, technical standards for the transmitting equipment, operator regulations, and rules for the particular services, are now grouped in part 10.

Increased frequency allocations have been approved for the different services which will allow more flexibility and a broader scope of service for existing operations. The Highway Maintenance Service has been established on a regular basis. The revised frequency allocations were adopted after extensive rule-making procedures, and, while some changes in the previous public safety allocations were required, particularly with respect to the police and forestry services, the over-all allocation for these services as now set forth in part 10 appears to meet existing needs more fully than previous allocations.

The trend in equipment development has been in the direction of apparatus capable of satisfactory performance while at the same time conserving frequency space. In this connection, several manufacturers striving to meet the channel width requirements established by the Commission have produced equipment which can be reliably operated on adjacent frequency assignments. This achievement is considered a major advancement in the communications field since all previous equipments have required at least alternate assignment separation. Development of microwave equipment for use in control and repeater links, which are an integral part of many radio systems, has been very slow and is still not readily available for application in these services. Control and repeater operation is being continued temporarily on the lower land mobile frequencies, pending availability of higher frequency equipment.

POLICE RADIO SERVICE

The Police Radio Service is available to non-Federal governmental organizations with police responsibilities. The licensees in this service, through the judicious use of the various classes of stations provided for in the rules and through use of the increased number of frequencies made available, may obtain service between headquarters base stations and mobile stations, and between mobile stations, including walkie-talkie operation between officers in the field where necessary, as well as intercity communication by either voice or telegraph emission.

Police radio stations have been established in every State in the country. Nearly every county and most cities with populations above 5,000 persons now have some degree of police radio service. More than 4,500 authorizations covering approximately 50,000 radio transmitters were outstanding on June 30, 1949.

In addition to established voice and telegraph radio communications in the police service, some licensees are developing other radio and electronic techniques to assist in performing efficient police work. Examples of such development are the radio speed meter, which from a fixed point can measure the speed of passing automobiles, and spe-

cialized television for transmitting police line-ups from headquarters to all precincts.

FIRE RADIO SERVICE

In view of the increased frequency allocation to this service and the needs of smaller communities, the eligibility requirements for the Fire Radio Service has been extended from cities having a minimum population of 250,000 to include not only all of the various governmental subdivisions, such as cities, counties, States, territories, and possessions, but also persons and organizations charged with specific fire-protection activities. The latter category now includes volunteer fire departments.

While the smaller communities may continue to serve both the police and fire mobile stations from the police base station, it is expected that many of the present licensees will provide separate systems for each service, particularly in the larger communities where each service is relatively busy. Judging from the widespread interest shown by volunteer fire departments throughout the country, a very sharp rise in the number of stations may be expected. A total of 124 licenses was outstanding at the year end.

The scope of communication provided under the revised rules for the fire service now permits a fire headquarters base station on a secondary basis to transmit to radio receivers at fixed locations. This, for example, would permit the operator to place a call on the air advising volunteer firemen in their homes or places of business of the location of a fire, thereby precluding the necessity for such personnel to assemble at headquarters. This operation is, of course, in addition to the normal communication with mobile units and secondarily between base stations.

FORESTRY-CONSERVATION RADIO SERVICE

In order to permit a closer coordination between related state agencies, the previously established forestry operation was combined with conservation activities and established as the Forestry-Conservation Radio Service in the new rules. Stations in this service are authorized to transmit communications directly relating to public safety and the protection of life and property including those essential to the prevention, detection, and suppression of forest fires and official forestry-conservation activities. Eligibility for this service is restricted to States, territories, possessions and other governmental subdivisions, including counties, cities, towns, and similar governmental entities, and persons or organizations charged with specific forestry-conservation activities.

A total of 565 licenses was outstanding on June 30, 1949, including over 7,000 authorized radio transmitters. Some increase in the num-

ber of stations in this service may be expected as the conservation activities in many states begin to more fully utilize radio communication in their operations.

HIGHWAY MAINTENANCE RADIO SERVICE

The Highway Maintenance Radio Service is a new service authorized on a regular basis as of July 1, 1949. Eligibility for this service has been restricted to states, territories, possessions, and other governmental subdivisions. Stations in this service are authorized to transmit messages directly relating to public safety and the protection of life or property, also communications essential to official activities directly relating to the maintenance, supervision, and operation of public highways. This service, like other public safety services, provides for communication primarily between base stations and mobile stations, and between mobile stations, and secondarily between base stations.

The use of radio communication in highway maintenance was observed for some time by the Commission through the medium of reports on experimental radio operation prior to the establishment of the service on a regular basis. At the time of its regular establishment, there was a total of 165 stations operating experimentally. It is expected that this service will have a rather rapid growth in view of its regular frequency allocation and the material contribution radio makes toward the public safety and convenience in the highway maintenance field.

SPECIAL EMERGENCY RADIO SERVICE

Communications in the Special Emergency Radio Service are restricted to matters directly relating to public safety and the protection of life and property. The eligibility requirements have been expanded in the revised rules to include physicians normally practicing in remote areas where other communication facilities are not available, ambulance services, beach patrols responsible for life-saving activities, school bus operators having regular routes into rural areas where other communication facilities are not available. These are in addition to the previously recognized eligible groups, namely, persons having establishments in remote locations where other communication facilities are not available, organizations established for relief purposes in emergencies and which have a disaster plan, and communication common carriers when using such facilities for bridging breaks in lines.

A total of 87 licenses was outstanding. New groups, now eligible under the revised rules, will undoubtedly seek licenses in large numbers.

DEVELOPMENTAL RADIO OPERATION

Rules governing developmental or experimental projects expected to be used exclusively in the Public Safety Radio Services were incorporated in the revised part 10, effective July 1, 1949. This addition was considered essential for better administrative control and evaluation of certain experimental phases of the activities related to the established services.

5. LAND TRANSPORTATION RADIO SERVICES

RULE CHANGES

The adoption of part 16 of the Commission's Rules, on April 29, 1949, consummated the efforts of the Commission to consolidate radio services which are closely connected with the transportation industry. Part 16—Rules Governing Land Transportation Radio Services—embraces regulations for the following individual radio services: Railroad Radio Service, Taxicab Radio Service, Automobile Emergency Radio Service, Intercity Bus Radio Service, Highway Truck Radio Service, and Urban Transit Radio Service.

These rules were drafted after considerable study had been made of the docket and the comments at the oral argument held in this connection. They reflect to a large extent the experience gained in the general mobile experimental program which has been in progress since the end of the war. The rules are designed primarily for permitting the maximum utilization of frequencies allocated to the various services with a minimum of interference. They cover not only the technical specifications for the equipment to be used but also provide for the taking of necessary steps by licensees to determine that the equipment is in proper operating condition. Application procedures looking toward expeditious processing are also provided in the rules.

One of the features of the new rules is a provision whereby a person who is licensed in any one of the Land Transportation Radio Services can render dispatching service on a cost-sharing nonprofit basis to any other person engaged in the same type of transportation activity. This will permit separate companies to make use of common facilities, thereby reducing original investment and operating cost. Provision is also made for experimental use of newly developed equipment pursuant to the terms of a "development" license.

RAILROAD RADIO SERVICE

In view of the overwhelming demand made upon the Commission for frequencies in the 152–162 megacycle band, it has been necessary to review the frequency allocations to all services for the purpose of revaluating their individual requirements. Inasmuch as information

then available indicated that 30 usable frequencies would be required to provide satisfactory radio communication systems for the railroads in Chicago, which was the most congested area, the original frequency allocation, made in May 1945, allocated 60 frequencies to the Railroad Radio Service.

Due to the technical limitations of equipment, assignments could be made only on the alternate channels. Therefore, it was necessary to allocate a total of 60 channels in order to provide 30 usable channels. As the railroads, until recently, have had difficulty in obtaining radio equipment suitable to their needs, and as they experienced difficulty in integrating radio communication with their already existing communication systems, the Railroad Radio Service did not expand as rapidly as some of the other radio services.

In reviewing the situation it was found that the railroads were using only 13 channels in Chicago and, by making use of new improved radio equipment which is now available, the required 30 channels in that area could be obtained with less than the 60 frequencies originally allocated. Consequently, following the allocation made in the proposed rules for the Railroad Radio Service, released June 11, 1948, the final rules allocated 41 frequencies to the railroads in the Chicago area. Thirty-nine of these 41 frequencies are allocated to the Railroad Radio Service for use outside of the Chicago area but may also be used by stations in the Public Safety Radio Service in areas where there will be no interference to the Railroad Radio Service. Although this action results in a reduction of 19 and 21 channels respectively, it is believed that a satisfactory radio communication system can be evolved and the safety aspects of the service will not be impaired.

TAXICAB RADIO SERVICE

The Taxicab Radio Service has at the present time approximately 3,000 separate radio communication systems involving about 46,000 mobile units. Although seriously hampered by the lack of frequencies, this service has grown at a phenomenal rate.

During the 4 years it has been authorized, licenses were issued on an experimental basis and only two frequencies in the 152–162 megacycle band were available for assignment. However, in accordance with the final rules which became effective July 1, 1949, a total of eight frequencies in this band are now available. In addition, ten frequencies in the 450–460 megacycle band have been allocated to this service for developmental operation looking toward the eventual establishment of this service on higher frequencies.

It is felt that as soon as these additional frequencies can be put into use, interference caused by simultaneous operation of several systems on the same frequency in the same area will be reduced and a general

improvement will continue to grow at a rapid rate for the next several years.

AUTOMOBILE EMERGENCY RADIO SERVICE

The Automobile Emergency Radio Service has been included as a part of the Land Transportation Radio Services because of the very close relationship with other transportation activities. This service is available to persons or organizations rendering emergency automobile road service to the general public and is intended to be used for dispatching service cars and trucks. Prior to July 1, 1949 authorizations were issued only on an experimental basis. However, now that the service is on a regular basis, and due to the apparent widespread need for this type of communication, it is expected that there will be a substantial expansion.

INTERCITY BUS RADIO SERVICE

Prior to the adoption of the new part 16, eight frequencies were made available on an experimental basis for the use of intercity buses. After an examination of the record and of the experience gathered in the experimental operation, the service was established on a regular basis July 1, 1949 and 16 frequencies were allocated for its use.

As the name implies, this service is intended for operators of intercity buses. Its primary purpose is to furnish communication between the buses en route and the terminal, thus improving the efficiency of motorbus operation. In addition, the use of radio provides for immediate communications in emergency situations requiring medical and other assistance. It also permits prompt reporting of weather and local road conditions for safety purposes.

HIGHWAY TRUCK RADIO SERVICE

The Highway Truck Radio Service has been established for the purpose of making radio communication systems available to those persons engaged in trucking operations on an intercity basis or in rural areas where normal wireline facilities are not generally available. Although the proposed rules restricted this service to common carrier operators traveling on an intercity basis only, the Commission, after examination of the record and of the needs of the trucking industry, revised the rules so as to include distributors who operate outside of metropolitan areas on a route basis.

This service was licensed previously on an experimental basis only and it is believed that many persons eligible for the service have delayed making application for facilities because of the financial risk involved. However, increased interest is expected now that a regular service has been established.

URBAN TRANSIT RADIO SERVICE

The Urban Transit Radio Service is intended to be used for improving the efficiency of street railway systems and city bus lines. This service was formerly the Transit Utility Radio Service but the name has been changed in order to more clearly define its scope. The primary purpose is to furnish communication between supervisors' cars and repair trucks during periods of emergency occasioned by power failures, collisions, or break-down of equipment.

6. INDUSTRIAL RADIO SERVICES

During the period covered by this report, extensive rule-making proceedings were concluded to cover the Industrial Radio Services. These rules became effective July 1, 1949. They consolidated a number of services previously administered by the Commission under different sets of rules and, in addition, make radio facilities available on a regular basis to a number of industries previously unrecognized or operating only to a limited extent under temporary experimental authorizations. Among the services superseded in their entirety to make way for the more all-inclusive new ones were the Geophysical, Special Press, Intermittent, and Utility Radio Services, all of which were described in chapter IV of last year's annual report.

Seven new services—Power, Petroleum, Forest Products, Motion Picture, Relay Press, Low-Power Industrial, and Special Industrial—make up the new industrial group. In these services, radio is authorized in connection with all matters pertaining to safety of personnel and property, and for operational purposes essential to the conduct of the licensee's business.

The plan for administration of the industrial group is similar to that adopted for a number of other business and government groups using radio. Separate industries are recognized individually by name for purposes of frequency allocation and determination of eligibility, but are required to follow licensing and operating procedures common to the entire group, and to use transmitting equipment which conforms to common technical standards of performance. In this way the Commission's administrative burden is reduced to a minimum while at the same time a mechanism is established for recognizing specialized spectrum requirements of industrial groups.

One of the problems encountered by the Commission, when dealing directly with thousands of businesses both large and small, is the education of industry as to the types of communications systems which are practical within the limits of the frequencies available. To assist in achieving this educational goal, and to aid it in discharging regulatory obligations, the Commission has encouraged the organization of regional industry advisory committees of engineer employees in the

principal industries using radio, for the purpose of coordinating the industry needs at the local level with respect to the selection of satisfactory frequencies from among those available.

A brief outline of the seven industrial radio services is given in the following paragraphs:

POWER RADIO SERVICE

This service concerns radio use by those public utilities which supply electricity, gas, water, and steam to the public. These facilities were formerly provided to a lesser extent in the superseded Utility Radio Service and before that, although on a very restricted basis, under the Special Emergency classification of the Public Safety rules.

The most important use of radio by these utilities is generally conceded to be in connection with restoration of service after interruption due to fire, storm, flood, or other cause, although the principal volume of messages concerns routine day-to-day maintenance activities which are not necessarily of an emergency nature.

It is anticipated that the approximate doubling of the number of frequencies available for public utilities eligible for the Power Radio Service will provide sufficient spectrum space to permit installation in most parts of the country of two-way radio equipment on every utilities service truck in operation. These frequencies appear to be adequate to allow coverage of approximately 90 percent of the land area of the country where electric power, gas, or water supply is available, although the degree of interference between stations may be considerable in some instances.

In connection with development of the microwave part of the radio spectrum, a number of utilities are being encouraged to experiment with different types of multi-channel radio links between control centers and generating plants. When sufficiently reliable equipment is developed, these circuits will be used for automatic supervisory control and telemetering functions. Such functions are now accomplished by wire circuits which are subject to failure.

There are 4,000 electric utilities, 1,200 gas utilities and 13,000 water utilities, or a total of 18,200 companies eligible to operate their own mobile radiocommunication systems in the Power Radio Service. Members of the industry estimate, however, that not more than 5,000 of these companies will in fact install their own systems in the near future. It is estimated that the number of utility licensees and transmitters will more than double within the next three years, and that the greatest density of transmitters, with attendant interference problems, will be found in the Northeastern States, particularly in New England.

PETROLEUM RADIO SERVICE

This service is available to all members of the petroleum and natural gas industries, except persons engaged in retail distribution activities who are provided for to a limited extent under other rules. The service is used by persons employing geophysical methods in their search for subsurface structures favorable to accumulation of gas and oil; persons engaged in drilling for, producing, collecting, or refining oil and gas; and persons engaged in transporting these materials and their byproducts by means of pipe lines from the sources of supply to the points of distribution.

Petroleum is usually sought and found in areas remote from existing communication facilities and where the construction of telephone or telegraph lines would be impractical. It is necessary that continuous communications be maintained between the well site, field headquarters, and mobile units. Because of the extremely hazardous and expensive type of operation, adequate radio communication facilities are essential to the successful completion of wells and to limit inherent risks. In addition to the mentioned normal radiotelephone requirements, the use of radio telemetering and supervisory control circuits is being developed experimentally. Many producing areas are accessible with difficulty under normal conditions and inaccessible during periods of adverse weather. These locations require constant supervision of production facilities by the remote control of valves and the telemetering of pressures and fluid levels which is often possible only through the medium of radio.

Use of radio by the industry, particularly in the production and pipe line phases, has been increasing at a very rapid rate during the past year. It is estimated that less than 20 percent of the ultimate number of transmitters has been placed in service, and that the number in service will more than double during the next 2 years.

A particularly acute communications problem now exists in connection with expanding off-shore exploration and production operations in the Gulf of Mexico where the use of radio frequencies with long range propagation characteristics is required. The shortage of suitable frequencies is such that no complete solution has as yet been achieved. The problem has been partially solved by establishment of the Petroleum Radio Service, but further steps now being considered are necessary before communication ceases to be a major problem in speedy and efficient development of our off-shore oil reserves on the Continental Shelf.

One of the greatest uses for radio communication in the industry lies in the operation of oil, gas, and refined products pipe lines, which have become an important link in our Nation's transportation system.

Movement of petroleum and petroleum products, including natural gas, through a pipe line is controlled by dispatchers using methods similar to those used in train dispatching. In addition to radio communication with roving pipe line repair crews and patroling aircraft, a new method of pipe line operation designed around microwave radio technique is being developed experimentally. Microwaves are expected to provide voice communication from one end of the pipe line to the other (in some cases more than 1,000 miles) and would include intermediate relays, teleprinters, facsimile, supervisory controls, and the usual multiplicity of circuits necessary for present day operations. Properly designed directional antennas will minimize the possibility of interference between pipe lines and to other services. It is not expected that adoption of microwave technique will be rapid in this field, because the capital investment will be heavy and equipment is in some cases still under development, but pilot installations now under construction may produce sufficient operating data to invite expansion. In the majority of cases the microwave facilities would not replace existing equivalent wireline facilities but would provide circuits where none or inadequate ones existed before.

FOREST PRODUCTS RADIO SERVICE

The Forest Products Radio Service is designed to place in the hands of privately owned timber and logging companies radio communication facilities similar to those already in use by Federal and State governments for purposes of fire detection, prevention, and suppression. Coincidentally, to serve a communications need that has become increasingly important since the lumber industry started mechanizing itself more than a decade ago, these same facilities may be used in the interest of safer, more efficient, and more economical logging operations.

The logging industry is believed to have the highest accident rate of any major industry in the United States, due primarily to the character of its operations. Radiocommunication, by speeding assistance and evacuation when needed, could aid in reducing this accident rate. Radio is used in connection with actual logging operations, and for protection of privately operated forests and tree farms.

The Forest Products Service is one of the services established by the Commission as of July 1, 1949. It is too early to predict the number of companies which will eventually take advantage of the facilities made available, although it is anticipated that all major timber operators in the country will be using mobile radio communications facilities to some extent within the next few years. There is less certainty that a large number of the small operators will be able to justify the cost of extensive radio installations, however desirable such installa-

tions might be from the conservation and accident prevention viewpoints.

RELAY PRESS RADIO SERVICE

There has been available to the newspapers and press associations of the country for many years the privilege of licensing portable radio equipment for relaying news stories from the scene of a news event to a reporter stationed at the nearest telephone. However, this type of operation has never proved to be very practical, apparently for the reason that the special radio equipment was quite expensive and seldom available when needed.

For the past 2 years there has been available to these news-gathering agencies, on a temporary experimental basis, the opportunity of installing a central station transmitter at the newspaper office and mobile radio telephone equipment in the automobiles of reporters and photographers employed by the licensee. The vehicles are then dispatched to the scene of news events when required. One of the advantages of this system is that reporters or photographers can be sent on a routine assignment with the knowledge that they can be contacted at any time by radio and directed to the scene of a more important matter without delay.

The results of experimental operations were recognized as conclusive of the need for this type of radiotelephone facility and the Relay Press Radio Service became a regular service on July 1, 1949. It is expected that those newspapers operating experimentally will convert to regular operation and that a large number of newspapers will establish their own private radiotelephone systems in the interest of a more rapidly and fully informed American public and, at the same time, more economical operation.

MOTION PICTURE RADIO SERVICE

The Motion Picture Radio Service is available only to persons engaged in filming motion pictures for public showing. In the main, radio is used by motion picture companies only when on location. It is used to tie parties out on location to the nearest reliable wire communications facility for purposes of safety and of quick supply, also during the filming of a picture to coordinate action taking place on out-door sets. Since it is estimated that motion picture companies spend as much as $2,000 to $3,000 per hour while on location, exclusive of talent fees, it is apparent that the low-power equipment customarily used for coodination purposes serves a very useful function in smoothing action, frequently to the point where retakes are unnecessary. Owing to the limited number of motion pictures produced at any one time, the number of transmitters in service is compara-

tively small and is not expected to increase materially. To improve flexibility of use, the number of frequencies available to the Motion Picture Radio Service has been increased, but the use of such frequencies is on a shared basis with other industries.

LOW-POWER INDUSTRIAL RADIO SERVICE

This service is available to all the industrial and commercial concerns. It provides for operation of any desired number of units which are restricted to very low power in order to reduce the interference range and thereby allow large numbers to operate on few frequencies.

Although this service did not become available to business until July 1, 1949, it bears promise of being one of the fastest growing in terms of use. It is expected that many thousands of low-power hand-carried or pack-carried transmitter-receiver units will be placed in service during the next two or three years. They are expected to be particularly useful in coordinating all kinds of survey and construction operations. A number of radio manufacturers have recently placed appropriate equipment in quantity production.

Although similar equipment may be licensed in other services as part of a more extensive mobile radiocommunications system, there are tens of thousands of businesses throughout the country which are eligible to hold their own licenses in this service. The distance which can be covered with the equipment varies from something less than three blocks to several miles, depending upon the positions of the two parties with respect to surrounding terrain and other factors.

SPECIAL INDUSTRIAL RADIO SERVICE

This is one of the newly organized services, and is designed to provide frequencies for a number of miscellaneous industrial activities which are not specifically provided for elsewhere in the Commission's rules. The service is available to firms engaged in production, fabrication, construction, or manufacturing, provided the radio is used only within the confines of the plant area, or in connection with construction work of a public character, or in a remote and sparsely settled region. A modest number of frequencies have been made available pending further development of the service by its users.

The establishment of the Special Industrial Service has been attended by many problems, some of which are still unresolved. One of the general problems is how far the Commission should go, in view of the limited spectrum space, toward allowing all enterprises, whatever their character, to license their own private two-way mobile radio systems. Since common carrier radio service is available in most metropolitan areas on a subscription basis, it is felt that such service may provide a partial solution to unsatisfied private communi-

cation system demand. For this reason, the majority of retailing, servicing, and distributing organizations have been declared ineligible to license their own conventional mobile communications systems. The Commission will be faced with many border-line cases which may require some modification of the present rules.

7. INDUSTRIAL, SCIENTIFIC, AND MEDICAL SERVICE

One of the most serious limiting factors in the use of radio transmitting and receiving equipment is the prevalence of electrical interference tending to prevent the satisfactory reception of transmitted signals. This interference may be in the form of atmospheric background noise, or it may appear as a result of spurious and harmonic emissions from various types of electrical and radio frequency operated equipment. Among the latter, the Commission has long recognized that certain radiating machines and apparatus not designed for communication purposes constitute the prime offenders, and often result in the serious disruption of authorized radio signals. On occasion this equipment has prevented the reception of intelligence vital to the safety of life and the safeguarding of property.

In order to minimize the actual or potential interference from special kinds of radiating equipment, the Commission adopted, effective June 30, 1947, part 18 of its rules relating to the Industrial, Scientific, and Medical Service. They are designed to govern the operation of medical diathermy, industrial heating, and miscellaneous apparatus.

Medical diathermy equipment includes any apparatus (other than low power intermittent surgical diathermy equipment) which generates radio frequency energy for therapeutic purposes. Industrial heating equipment refers to radio frequency apparatus used for heating operations in a manufacturing or production process. Miscellaneous equipment covers apparatus, other than diathermy or industrial heating equipment, in which the action of the energy emitted is directly upon the workload and does not involve the use of associated radio receiving equipment.

Part 18 also defines the extent to which harmonic and spurious radiations must be suppressed and stipulates specific frequency bands in which such equipment may operate. Subsequent to the adoption of this part, five additional frequency bands above 40 megacycles have been made available for this purpose but have not as yet been included in part 18.

Proceeding under these rules, the Commission has dealt with interference problems first on a request-for-cooperation basis, and later, in those cases where cooperation was not satisfactorily accomplished, by the use of enforcement provisions available to the Commission. In the administration of part 18, the Commission has been guided by a

desire to provide interference-free communications, and, on the other hand, to permit necessary use of medical diathermy, industrial heating, and miscellaneous equipment. In connection with older types of equipment, it has disseminated advice and suggestions regarding the possibility of modifying and shielding such equipment so that compliance might be secured. In the main, the Commission's efforts have been well received, and most cases arising in this connection have been settled to the satisfaction of all parties concerned.

With the spreading use of television over the past year, and the increased congestion in the spectrum, it is anticipated that a correspondingly greater number of these cases will be encountered. As of this time, an apparently satisfactory procedure has been set up regarding the processing of complaints of interference to radio and television reception; however, the future may present difficult situations capable of resolution only by the use of stronger measures available under the act.

In addition to its regulatory duties, the Commission has held conferences with representatives of industries engaged in the manufacture, sale or distribution of equipment regulated by part 18. On the whole, these conferences have resulted in a better understanding of the problems facing the Commission with regard to interference, and have engendered an increased desire on the part of manufacturers to produce equipment less likely to create the spurious and harmonic emissions. Pursuant to those sections of the rules providing that equipment manufactured by industry may be tested and "type approved" by the Commission's laboratory, approval certificates have been issued covering 44 machines and equipment found to be in compliance with the technical standards.

No amendments or changes of significance in part 18 have been proposed or adopted during the year. However, through rule-making procedure, the Commission has issued orders successively postponing the effective date of rules concerning radio-frequency operated welding equipment until January 30, 1950. An industry-wide group, with the cooperation of the Commission, has striven to eliminate interference resulting from the operation of such welders, and vacuum-type oscillator equipment has been developed to comply with the applicable rules. Two of these vacuum-type machines have been type approved under regulations governing miscellaneous equipment.

8. EXPERIMENTAL RADIO SERVICES

The Communications Act requires the Commission to "study new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest." Pursuant to this provision, rules governing the

Experimental Radio Services have been adopted, and licensing procedures established.

Designed to foster all types of experimentation in and relating to the radio art, part 5 of the rules became effective October 1, 1939, and has been modified from time to time as the exigencies of the experimental service have required. At the present time, class 1, class 2, and class 3 experimental radio stations provide the means for futhering any program of radio experimentation now licensed by the Commission. Of these categories, class 1 stations are for the use of persons or organizations desiring to pursue fundamental scientific research in the radio art; class 2 stations are directed toward the development of a new radio service or the expansion of an established service; class 3 stations may be authorized for the use of a citizen interested in conducting an experimental program on his own behalf for a limited time.

In addition to the above broad categories, two new subclasses of experimental stations have been established by part 2 of the rules. These classes covering the testing of equipment manufactured for export to a foreign country or for use by the United States Government. The former is classified as an "export," and the latter as a "contract" type of experimental station. Details covering these two types of stations are expected to be incorporated in part 5.

Most class 1 experimental stations are presently operated by equipment manufacturers and research and developmental organizations. Their experimentations involve not only the development of new uses of electronics but also the improvement of existing equipment. Considerable research was done during the past year on the development of equipment to operate on closer channel spacing to permit more efficient use of the radio spectrum. Other activities include improvement of equipment to diminish spurious and harmonic emissions, thereby reducing interference among the various radiocommunication systems; development of accurate radiolocation systems, for use in locating oil deposits; projects involving microwaves to further point-to-point communications, and aids to navigation involving radar and racon beacons. Another project involved the use of radio reflections in connection with meteor observations to determine their orbit of travel when penetrating the earth's atmosphere.

The Commission keeps abreast of the result of such authorized experimentation by means of conferences with licensees and through the examination of progress reports which they are required to submit.

Numerous requests are being received from various institutions and manufacturers for permission to train operators and technicians in the operation and maintenance of radar equipment. Normally the Commission does not license radio stations for training purposes only be-

cause, in most instances, adequate training can be given with dummy apparatus without the radiation of radio-frequency energy. However, adequate radar instructions cannot usually be obtained by such means and, accordingly, the Commission has authorized many schools, colleges, and manufacturers to use radar for training purposes.

In the past, specific frequencies above 25 megacycles were available for assignment to class 1 stations. As of February 1, 1949, these frequencies were no longer specifically allocated for class 1 experimental stations. In lieu thereof, part 2 of the rules provides for the use of frequencies in various bands throughout the spectrum, subject to the condition that interference is not caused to the service or stations to which these frequencies are regularly assigned. Under this new plan the Commission may not be able to assign specific frequencies to experimental stations for general use throughout the United States as has been the practice in the past, but may limit the use of a given frequency to a designated geographical area. Specific frequencies below 25 megacycles allocated for class 1 stations and listed in part 5 of the rules are not affected by this change.

Numerous class 1 authorizations have been issued to manufacturers and sales engineers for field intensity or coverage surveys in areas where radio communications are proposed. Results of such surveys provide valuable information for choosing the proper operating frequencies, power, emission, and antenna location for best performance.

Applications for class 2 experimental stations usually involve proposals for the establishment of new services which are not provided for in the regular service or are directed toward the development of some phase of an established service. The number of class 2 licensees has diminished in view of the new services which have been established on a regular basis. These include part of the Land Transportation and the Industrial services.

Because of the limited type of experimentation permitted by class 3 stations, the Commission receives few requests for such operations. Most types of experimentation permitted under the class 3 experimental rules may also be conducted under a class 1 authorization or under the Commission's rules governing the Amateur Radio Service.

Steps and studies looking toward a needed revision of part 5 have been initiated in the last year. It is expected that the additional necessary rule-making procedure will be completed in the coming year.

9. LOW-POWER RADIO DEVICES

Recognizing the necessity for establishing a minimum field strength figure, below which it would not require the use of radio frequency emissions to be licensed, the Commission in 1938 undertook studies resulting in the subsequent adoption of the so-called low-power rules,

presently sections 15.1 to 15.4 of the regulations. These rules provide that radio transmitters and other radiating devices, operating with a power below the standard set by these low-power rules, need not be licensed by the Commission.

Pursuant to the provisions of these sections, considerable use has been made of the spectrum, and particularly that portion now occupied by the AM broadcast band, by low-power transmitting apparatus ostensibly designed to fall within the minimum field strength standards set out in part 15. Illustrative of these uses are college campus low-powered broadcast stations, employing "carrier current" or space radiation techniques for the propagation of programs essentially broadcast in nature, industrial signalling and communication devices using carrier current techniques and employed for electrical power switching, warning, or voice transmissions; also, space radiating devices such as radio-operated baby minders, garage door openers, model aeroplane control devices, etc.

The simplicity of operating radio transmitting devices without a license or code test from the Commission has proved of interest to many persons. As a result, the Commission has received considerable correspondence regarding low-power equipment purportedly operating under part 15. In large measure, however, equipment intended to operate under these rules has proved incapable of compliance with the maximum field strength permitted. College broadcasting, in particular, has grown to such proportions that a careful examination of the problems created by such operation is required.

Accordingly, a notice of proposed rule making has been published, and comments invited regarding suggested amendments to part 15. While the Commission is cooperating with industry and users in an effort to secure all available information and data regarding the various types of low-power equipments and systems presently in operation, it is apparent that before a solution to the ramified low-power problem can be found, further intensive study by all interested groups will be required.

10. STATISTICS

AUTHORIZATIONS

Authorizations in the safety and special radio services (exclusive of amateurs, citizens and special aircraft operator authorizations, which are treated in a separate chapter) exceeded 61,000 at the close of the year. This is an increase of nearly 14,000 since the previous report. Figures for different classes of these nonbroadcast services are shown in the following table:

Class of station	1948	1949	Increase
Aeronautical:			
Aircraft	17,736	23,723	5,987
Ground	3,122	3,504	382
Total	20,858	27,227	6,369
Marine:			
Ship	13,720	18,140	4,420
Coastal and Marine Relay	148	136	(−12)
Alaskan Coastal	277	302	25
Alaskan Fixed Public	412	480	68
Other	467	[1] 946	479
Total	15,024	20,004	4,980
Public safety:			
Police	4,137	4,759	622
Fire	85	124	39
Forestry	461	565	104
Highway maintenance	126	165	39
Special emergency	94	87	(−7)
Total	4,903	5,700	797
Industrial:			
Power	1,656	2,712	1,056
Petroleum	412	802	390
Forest products	32	144	112
Other	755	[2] 608	(−147)
Total	2,855	4,266	1,411
Land transportation:			
Railroad	204	334	130
Transit utility	77	80	3
Buses, trucks, auto emergency	24	[3] 30	4
Taxicabs	2,817	3,144	327
Total	3,122	3,588	466
Experimental:			
Experimental	527	455	(−72)
Miscellaneous	77	46	(−31)
Total	604	501	(−103)
Grand total	47,366	61,286	13,920

[1] Includes 863 ship radar.
[2] Includes 571 special industrial, 19 relay press, 15 motion picture, and 3 low-power industrial.
[3] Includes 20 buses, 8 trucks, and 2 auto emergency.

The foregoing statistics do not include associated mobile units. Mobile transmitters for the calendar year 1948 exceeded 200,000 in the following categories:

Aeronautical	24,695	Railroad	1,850
Marine	17,414	Transit utility	1,047
Police	43,314	Industrial	27,774
Fire	2,524	Experimental	74,649
Forestry	7,128		
Highway maintenance	381	Total	201,212
Special emergency	436		

Class 2 experimental stations include taxicabs, buses, and trucks which, on January 1, 1949, numbered more than 72,000:

Taxicabs	46,085	Trucks and buses	668
Limited common carrier	8,441	Industrial	68
Miscellaneous common carrier	1,370	Other	929
Common carrier highway	5,480		
Common carrier urban	9,442	Total	72,483

APPLICATIONS

More than 52,000 applications were received during the year in the safety and special services previously mentioned. This was within 5,000 of the previous year's figure. Including applications pending at the close of fiscal 1948, the number disposed of in 1949 exceeded 53,000 as compared with about 35,500 disposed of in 1948. A comparison of such applications for the past 2 years follows:

Class of station	1948	1949	Increase or decrease
Aeronautical:			
Aircraft	19,021	13,524	(−5,497)
Ground	3,303	4,300	997
Total	22,324	17,824	(−4,500)
Marine:			
Ship	14,183	15,249	1,066
Coastal and marine relay	154	297	143
Alaskan coastal	492	487	(−5)
Alaskan fixed public	684	599	(−85)
Other	812	[1] 1,111	299
Total	16,325	17,743	1,418
Public Safety:			
Police	5,911	4,609	(−1,302)
Fire	182	254	72
Forestry	727	611	(−116)
Highway maintenance	147	243	96
Special emergency	58	110	52
Total	7,025	5,827	(−1,198)
Industrial:			
Power	2,389	3,167	778
Petroleum	394	1,166	772
Forest products	88	269	181
Other	1,463	[2] 1,249	(−214)
Total	4,334	5,851	1,517
Land Transportation:			
Railroad	296	401	105
Transit utility	173	60	(−113)
Buses, trucks, auto emergency	57	209	152
Taxicab	5,425	3,667	(−1,758)
Total	5,951	4,337	(−1,614)
Experimental:			
Experimental	947	849	(−98)
Miscellaneous	279	105	(−174)
Total	1,226	954	(−272)
Grand total	57,185	52,536	(−4,649)

[1] Includes 966 ship radar.
[2] Includes 40 relay press, 30 motion picture, 50 low-power industrial, and 1,129 special industrial.

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CHAPTER V. COMMON CARRIERS

1. COMMON CARRIER REGULATION

The Commission regulates interstate and foreign communication by telephone and telegraph, whether by wire or radio. Communication which is purely intrastate in character is not, in general, subject to Commission jurisdiction.

Provisions of the Communications Act affecting common carriers reflect congressional policy that the public interest in adequate public communications services and reasonable rates is to be protected and promoted by Federal regulation.

Among the regulatory provisions of the act is the requirement that every subject common carrier furnish service at reasonable charges upon reasonable request. No carrier may construct or acquire interstate facilities, or curtail or discontinue service, without Commission approval. All charges, practices, classifications, and regulations in connection with interstate and foreign communication service must be just and reasonable and nondiscriminatory. To implement this requirement, the common carriers concerned file tariff schedules with the Commission, and those schedules are subject to review and regulation by the Commission.

The Commission regulates rates for interstate telephone and telegraph services, as well as rates for service between the United States and foreign points. At the same time, it reviews the adequacy and quality of these services.

To aid its regulation of rates and services, the Commission is empowered to prescribe the forms of records and accounts kept by the carriers. Under this authority, it has established uniform systems of accounts for them to follow. Commission regulation in this respect includes the establishment and maintenance of original cost accounting, continuing property records, pension cost records, and depreciation records.

The Commission regulates the interlocking of officers and directors of common carriers, it being unlawful for any person to hold office in more than one carrier unless specifically authorized by the Commission. The latter also passes upon applications of domestic telephone and telegraph carriers for authority to merge or consolidate.

The Commission licenses the operation of common carrier radio stations under provisions of the act which require the licensing of all radio transmitters.

The Commission receives all applications to land or operate submarine cables connecting the United States with other countries, and advises the President with respect to the granting of such licenses, after receiving the approval of the Secretary of State.

2. TELEPHONE (WIRE AND RADIO)

GENERAL

The telephone industry continued the unprecedented expansion it has experienced the past several years. The addition of facilities at an average rate of more than 3 million dollars a day mentioned in last year's report continued at about the same rate in 1949. Despite this growth, the Bell system alone, which has about 82 percent of the total telephones in service, had unfilled orders for slightly over 1 million telephones on June 30, 1949, compared with unfilled orders for the entire industry of 1½ million telephones a year earlier. Over 39 million telephones were in service in this country, representing an increase of about 3 million in the past year. The plant investment of the Bell system as of June 1949 amounted to over 9 billion dollars while that of the telephone industry as a whole was estimated to be around 10 billion dollars.

The volume of telephone business kept pace with the growth of facilities and ran about 10 percent ahead of last year. The Bell system handled about 40½ billion exchange conversations and nearly 2 billion toll conversations during the year. The volume of calls reached a new high of 177 million a day.

Similar expansion continued in related telephone services. Revenues for teletypewriter exchange service and private line service of the Bell system, the principal activities other than message telephone service, likewise ran more than 10 percent ahead of last year and at the rate of roughly 80 million dollars annually. Television program transmission service, which was established on a commercial basis effective May 1, 1948, produced revenues at a rate approaching 2½ million dollars a year and present indications are that the full demand for facilities to carry television programs will not be met for several years.

Construction of wire facilities.—The telephone industry requested Commission authority to construct $38,638,919 in interstate wire and cable facilities. A number of the construction projects authorized in fiscal years 1947 and 1948 were still under construction during 1949. In addition to the wire construction, the Bell system has been authorized to provide a large number of intercity communication channels by microwave radio relay construction. There were 24 applications carried over from the preceding year and 318 applications received during the year requesting authority to construct, acquire, extend and lease wire facilities. The Commission approved 333 of these, including 313 for construction, and permitted withdrawal of three. The American Telephone & Telegraph Co. and certain associated companies filed a blanket application covering most of the Long Lines Department's construction to be undertaken during the calendar year 1949, which amounted to $10,730,000. The following table sets forth the amount of wire and cable construction authorized by the Commission during the past 6 years:

Fiscal year	Projects	Cost	Sheath miles of cable	Tube miles of coaxial units	Conductor miles of open wire
1944	121	$9, 582, 239	574. 8	0	7, 968
1945	210	70, 091, 140	2, 378. 3	7, 902	2, 963
1946	239	78, 896, 450	3, 193. 8	16, 580	12, 261
1947	289	126, 325, 771	5, 587. 7	23, 490	15, 976
1948	348	127, 162, 499	2, 637. 5	46, 080	16, 373
1949	313	38, 638, 919	1, 370. 5	1, 323	7, 278

About 1,800,000 toll message circuit miles were added during the 1949 fiscal year to the Bell system facilities, an increase of 10.8 percent over circuit mileage in service at the beginning of the year. As during recent years, about 90 percent of the channels added were provided by carrier systems. The Bell system requested authority to use only about 15,000 channel miles of emergency Type EB carrier systems as compared to 155,000 requested during fiscal 1948.

Planned wire projects.—The American Telephone & Telegraph Co.'s program, which called for a total of 12,000 miles of coaxial cables to be constructed by 1950, has been modified due to the planned installation of microwave radio relay systems between various cities. The Bell system applied for only 331 miles of coaxial cable to be constructed during the past fiscal year at an estimated cost of $9,643,000. Thus, the Commission has authorized a total of 8,028 miles of coaxial cables. Coaxial facilities, as well as microwave relay systems, are designed to transmit television programs and other communication services.

Television program networks.—The Bell system was granted authority to construct five additional television circuits on its coaxial cables, one channel between New York and Washington, two channels between New York and Philadelphia, and two channels between Philadelphia and Chicago. The A. T. & T. received authority to construct four additional coaxial cable television circuits—three channels between New York and Albany, and one channel between St. Louis and Memphis. Additional television terminals will be installed: four transmitting and two receiving at New York, one transmitting and two receiving at Philadelphia, one receiving at Baltimore, one transmitting and one receiving at Washington, two receiving each at Lancaster, Pittsburgh, Cleveland, and Toledo; three receiving and two transmitting at Dayton, two receiving at Erie, two transmitting and three receiving at Albany, and two receiving at Memphis.

On January 11, 1949, the New York–Boston–Washington–Richmond coaxial television network was interconnected with the midwestern network comprising Buffalo, Cleveland, Toledo, Detroit, Milwaukee, Chicago, and St. Louis.

Microwave relay systems.—Toward the end of the fiscal year, the A. T. & T. applied for six new microwave intercity relay systems to be constructed between Albany and Syracuse, Los Angeles and San Francisco, Richmond and Norfolk, Madison and Milwaukee, Pittsburgh and Chicago, and Chicago and Des Moines. The latter two systems are westward links in the microwave chain originating in New York City which is planned eventually to reach the west coast. These microwave systems will carry television programs besides providing communications channels for other telephone services. The A. T. & T.'s New York to Boston microwave system was in regular service throughout the year carrying television programs and, when necessary to accommodate traffic volume, was used also for long distance telephone service.

Speed of service.—The average time required to complete a toll board call on the Bell system was 1.7 minutes during June 1949 as compared with 2.1 minutes in June 1948. This improvement results from the increase in number of toll channels, toll board facilities, more efficient personnel and toll line dialing by the operators. The Bell system objective was an average speed of service of 2 minutes, but with toll line dialing it is expected that the average speed will be reduced to about 1 minute.

Telephone service.—The telephone companies have continued the rapid conversion from manual to dial operations of their exchanges throughout the country. In addition, a toll dialing network has been established centering on the toll crossbar offices in New York, Chicago and Cleveland. It includes many places not previously arranged for

toll dialing and also ties together the small, isolated dialing networks already operating in several states. Toll operators in this network now can dial numbers in nearly 500 communities faster and more accurately than before, and without the assistance of operators in the distant city or at intermediate offices. Also, an increasing number of cities now have equipment by which the customer can dial calls to nearby cities, in the same manner as he dials local calls.

Cable landing licenses.—The Commission received one request and had two requests on hand for a Presidential license for cable landing operations. Authority to construct a second submarine cable containing 30 pairs of conductors at Point Roberts, Wash., was signed by the President on November 22, 1948 upon recommendation of the Commission. Requests for authority to construct a telephone line across the Rio Grande River near Presidio, Tex., and to land and operate two additional submarine cables at Key West, Fla., were pending at the end of the fiscal year.

Discontinuance, reduction or impairment of service.—The Commission received 16 applications for authority to discontinue telephone service and had 4 such applications on hand at the beginning of the year, making a total of 20. It granted 17 applications and 2 others were withdrawn. Fourteen of these applications were filed by the Western Union Telegraph Co. to discontinue telephone service to cities connected to its long distance telephone facilities, one of which was withdrawn. There were few subscribers, if any, to Western Union's telephone service in each city involved in the authorized discontinuance, and in each case the telephone companies were providing adequate service. Five applications were filed by telephone companies to discontinue exchange or toll service in cases where another carrier planned to provide the same service. One of these applications was withdrawn.

A joint application was filed by Western Union, to discontinue its public message toll, private line, and program telephone service; by the American Telephone & Telegraph Co. and certain Bell system companies, for authority to acquire the telephone business and certain telephone property of Western Union located in 30 States; and by the Pacific Telephone & Telegraph Co. and the Bell Telephone Co. of Nevada, for authority to discontinue all message telegraph service rendered by them in California, Oregon, Washington, Idaho, and Nevada. Hearing upon this joint application was scheduled for October 4, 1949.

By a public notice dated June 1, 1949, the Commission invited interested persons to submit comments and proposals by July 18, 1949 on the matter of whether the Commission should promulgate rules governing the protection of employees who are adversely affected by discontinuances, reductions, or impairment of telephone or telegraph

service which are authorized under section 214 of the Communications Act.

Rural telephone service.—More than 330,000 Bell telephones were installed in rural areas during fiscal 1949. The total number of rural telephones connected to the Bell system as of June 30, 1949 was approximately 2,400,000, excluding rural telephones taken over into the base rate areas.

New developments include the "transitor," which replaces the vacuum tube in a number of cases. It is so simple, so tiny and so economical in using electrical energy that it is being tested for many uses in the telephone industry. The "Alpeth" cable, which employs a thin layer of aluminum covered with a layer of polyethylene plastic, is replacing the lead covered type of cable. Western Electric will soon start producing a new handset telephone having improved hearing and speaking qualities, an easier to read dial, and a bell that the customer can adjust for volume. The Type N1 carrier system for cable, developed by the Bell Telephone laboratories, is being tested in general service. This carrier system will play an important part in economically providing facilities in a range of distances as low as 15 or 20 miles, which is not now practical with types of cable carrier systems in use. The N1 system will provide 12 telephone channels and will operate on a four-wire basis over two pairs in a single cable. It is expected to be generally available by 1951. A new electron tube has been developed which will improve the microwave radio relay system and will increase the carrying capacity for speech and television channels. Synthetic quartz crystals are being used in place of the natural quartz, which have been limited, thus increasing the number of carrier systems available for communication service.

Foreign attachment cases.—A complaint of *Hush-A-Phone Corp. et al.* v. *American Telephone & Telegraph Co. et al.* (Docket 9189) attacks as unlawful the so-called foreign attachment provisions in the defendants' tariffs insofar as such tariffs are construed by the telephone companies to prohibit the subscriber's use of Hush-A-Phone devices in interstate and foreign telephone service. Hearing on the complaint was scheduled for August 23, 1949.

Complaint of *Walter S. Berkman et al.* v. *American Telephone & Telegraph Co. et al.* (Docket 9100) requested the Commission to require the defendant telephone companies to furnish a call waiting indicator device which would provide a visual or other signal when a subscriber's telephone is in use to indicate that another call was coming in on the line at the same time. The complainants' request for a hearing was denied, and the complaint dismissed March 23, 1949. A petition for rehearing and reconsideration was pending at the close of the fiscal year.

Mobile radiotelephone service.—Common carrier mobile radiotelephone service, whereby communication service for hire is provided primarily between fixed points and mobile units on land, continued its tremendous expansion as an experimental service. Service furnished by the telephone companies, between mobile telephones and the regular land-line telephone systems, was added in 39 cities, making a total of 146 cities so served. Likewise, the competitive mobile radiotelephone service furnished by nontelephone company carriers, which affords a telephone service between mobile units and radio terminals but does not connect with the land-line telephone systems, was being furnished in 64 cities and applications have been approved to provide such service in 58 additional cities.

In some major cities the demands for this service continued to exceed the capacities of the available facilities and the carriers reported large backlogs of unfilled orders for mobile telephone service. Moreover, in areas such as New York and Los Angeles, where several miscellaneous or nontelephone company carriers are providing a general mobile radiotelephone service on the same pair of frequencies, the problem of frequency interference developed into acute proportions. However, the Commission is endeavoring to effect a solution to these problems, as described elsewhere in this report.

The most significant development in the general mobile radio service during the year was the adoption by the Commission of its report and order in Dockets 8658 et al., dated April 27, 1949, establishing, effective July 1, 1949, rules for the Domestic Public Land Mobile Services. The new rules establish the common carrier general mobile radio service on a regular basis. Their promulgation represented the culmination of an extended rule-making process which included extensive oral argument October 6 to 15, 1948. The Commission received over 200 written comments on the rule-proposals, some 135 persons presented oral argument, and the transcript of the proceeding aggregated 1,913 pages.

It is expected that the new rules will have the effect of stabilizing operations and encouraging long-range planning. They recognize two general categories of licensees: (1) the conventional telephone company, and (2) the miscellaneous, or nontelephone company carriers. The new table of frequency allocations provides these common carrier services with 24 frequencies in the 30–44 megacycle range and 20 in the 152–162 megacycle range.

The Commission also approved a rule which provides that new subscribers to public mobile radiotelephone services shall be furnished service in accordance with designated categories of priority. This is intended to achieve a result whereby essential users will be able to ob-

tain service in preference to nonessential users, thus assuring that this valuable radio facility will be used in the public interest.

With a view to the possibility of making further provision for the expansion of this service, the Commission will consider, in the proceedings having to do with the establishment of UHF television (Dockets 8976 et al.), the question as to whether an allocation of 30 megacycles of frequency space can and should be made between 470 and 500 megacycles in order to provide for the development of a wide-band multichannel system of operation. Such a development, if achieved, might be capable of providing an adequate general mobile radio service for the foreseeable future.

Provision has been made for the operation of the "telecar" service, as developed experimentally in Baltimore by Western Union. Four frequencies in the 35–44 megacycle band are allocated for this service, which involves the pickup and delivery of telegraph messages through the use of cars equipped with facsimile equipment, by means of which the messages are transmitted to and received from the central office.

Ship and aircraft service.—A new coastal harbor radiotelephone station was established at Jacksonville, Fla., on January 17, 1949, by Southern Bell Telephone and Telegraph Company, in order to give more adequate service to vessels in the coastal area between Charleston, S. C., and Miami, Fla. Charges for message toll telephone service between land points and vessels or aircraft via the new station are the same as via other coastal harbor stations of the Bell system.

The number of aircraft affording public radiotelephone and telegraph service to passengers aboard such craft through coastal stations continued to increase.

Short distance radiotelephone service.—The use of very high frequency radio for telephone service, particularly in inaccessible areas where wire line costs would be prohibitive, continued to attract the interest of rural telephone users. The operations are presently conducted experimentally, but rules to place this service on a regular basis were in preparation.

Coastal and Alaskan service.—Coastal harbor, coastal telephone, and Alaskan radio communications, though largely authorized on a common carrier basis, are discussed in "Safety and Special Services" because of their close relationship to radio aids to the safety of life and property.

INTERNATIONAL TELEPHONE SERVICE

Message toll telephone service.—Message toll telephone service was reestablished with 4 countries where it had been suspended during the war and made available with 3 other countries for the first time. At the close of the fiscal year radiotelephone message toll service was in effect with 81 foreign countries outside North America. Of this

number 53 had direct circuits. Negotiations were continuing toward reestablishment of service with points formerly served, as well as with new points. The rates for service established during the year are in conformity with the rate pattern outlined in the Commission's Twelfth Annual Report. The volume of message traffic with overseas points amounted to about 580,000 calls in 1948, a slight increase over the previous year. Private line service is available to 7 foreign countries. Overseas program transmission service is furnished by the Bell companies to 56 foreign countries.

RATES AND TARIFFS

Rate schedules.—At the close of the year 183 telephone carriers had tariffs and concurrences on file with the Commission. During the year they filed a total of 19,204 tariff publications establishing or changing rates, regulations, practices, and classifications of service, including concurrences. The number of carriers subject to the Commission's tariff regulations fluctuates, principally as a result of smaller carriers changing their operating arrangements by either adding or selling interstate facilities. Each tariff publication is processed by the staff to determine whether its provisions comply with the Communications Act and with the rules established by the Commission.

Special permissions.—Twenty-seven applications for special permission to make changes in the tariffs, or to file new tariffs to become effective on less than statutory notice, or involving waiver of certain rule requirements, were received during the year. Of these, 26 were granted and 1 was retired to the files without action at the applicant's request.

Unlawful use of telephone facilities.—The Commission received requests from certain State regulatory authorities to investigate the extent to which interstate and foreign communication facilities are being used for purposes that are in violation of State laws, with a view to prohibiting such use insofar as interstate and foreign communications are concerned. The Commission has not deemed an investigation necessary in view of the fact that tariff regulations of Western Union already on file with the Commission and applicable to leased wire services appear to provide an effective means whereby State law enforcement authorities can bring about discontinuance of telegraph service to persons using such services for illegal purposes. Although the Bell system companies had not filed specific tariff regulations on the subject, it was understood that, as a matter of policy, the companies had instructed their personnel not to furnish interstate and foreign communication service to persons using the same for unlawful purposes. By letter dated January 6, 1949, the Commission requested the Bell companies to file appropriate tariff regulations

with the Commission which would reflect the policies and practices of these companies concerning this matter insofar as interstate and foreign communication service is involved.

Such provisions were filed by most of the companies to become effective during the latter part of the fiscal year. In general, the tariffs provide that telephone service will be furnished subject to the condition that it will not be used for an unlawful purpose and, further, will not be furnished if any law enforcement agency acting within its jurisdiction advises the company that such service is being or will be used in violation of law. These provisions are similar to those incorporated in the telegraph company tariffs.

Channels for TV program transmission.—The Fourteenth Annual Report of the Commission referred to the events leading up to the investigation and hearing, instituted by the Commission on April 28, 1948 (Docket 8963) into the rates, regulations, practices, and services of A. T. & T. and Western Union in connection with the furnishing of intercity channels and facilities for the transmission of network television programs. One of the principal issues involved is the reasonableness of the restrictions adopted by the A. T. & T. regarding interconnection of its facilities with those of others. Hearings on this issue were held in the spring, fall, and winter of 1948, and decision was pending, with hearings on the remaining issues to be held, in the future.

Studies of Long Lines Department operations.—The Commission instituted a series of studies directed toward the development of a comprehensive report on the results of operations of the Long Lines Department of the American Telephone & Telegraph Co. These studies will cover all phases of the company's operations, including analyses of its plant investment, revenue and expense accounts, and will provide the Commission with a more adequate basis for determination of matters involving the earnings or revenue requirements of Long Lines.

Separation of property, revenues and expenses.—In cooperation with State regulatory commissions, the Commission continued its studies of the procedures used by the Bell system companies to separate telephone plant investment, expenses and revenues among exchange, intrastate toll, and interstate toll telephone services for rate-making purposes. (See Fourteenth Annual Report.) Methods and procedures for telephone separations have been the subject of formal proceedings before the Commission (Docket 6328), but decision will be withheld until additional experience has been gained in the use of these separation procedures. During the past year, studies of the division of revenues and application of the separation procedures have been made on a general basis for the industry, and specific de-

tailed studies of certain companies are in progress. In connection with the study of operating results of the Long Lines Department of A. T. & T., special attention is being given to the effects of the separation procedures upon the level of Long Lines earnings. The importance of this matter and the amount of work involved in these studies may be gauged by the fact that the entire industry investment of an estimated 10 billion dollars is subject to these apportionments, of which over 1.7 billion dollars is apportioned to interstate service, and approximately 600 million dollars annual revenues are derived from interstate services.

Western Electric costs and prices review.—It was noted in the Commission's Fourteenth Annual Report that the Western Electric Co., Inc., which serves as the manufacturing and supply department of the Bell system, furnishes nearly all of the telephone equipment, materials, and supplies to the Bell operating companies, and that the level of prices charged by Western Electric has a considerable impact on Bell telephone exchange, intrastate, and interstate toll rates. This impact has been intensified by the volume of Western Electric sales to Bell companies running at about a billion dollars a year since 1946, resulting from the very heavy construction program undertaken during the postwar years. A cooperative committee consisting of staff members of this Commission and State commissions, appointed January 1948, continued its studies of the operations of Western Electric. Particular attention is being given by the Commission to Western Electric's sales of equipment and services to the Long Lines Department of A. T. & T. as part of the aforementioned study of Long Lines operating results. It is significant that since the initiation of these studies, Western effected a net reduction in its prices amounting to about 77 million dollars and reduced on an annual basis its pension expenses by approximately 3 million dollars.

State telephone rate cases.—A large number of requests were received from State regulatory commissions as well as some municipalities for assistance in connection with intrastate telephone rate cases. Assistance was rendered, to the extent possible, and consistent with available staff personnel and budget, on problems of common concern to this Commission and state jurisdictions. In general, this assistance consisted of furnishing information with respect to such matters as depreciation rates and charges, pension accrual rates and costs, procedures concerning the separation of telephone plant, revenues and expenses between exchange, State, and intrastate services and license service fees paid by Bell companies to the parent company. In several cases, comprehensive studies were conducted in cooperation with state commissions and testimony presented by Commission staff mem-

bers concerning depreciation rates, pension costs, and license service fees.

Depreciation.—Depreciation expense is second only to salaries and wages in operating costs of telephone companies. Depreciation charges for 53 large domestic telephone carriers reporting to the Commission amounted to $307,755,000 for the 12 months ending April 30, 1949, an increase of $46,470,000 or 18 percent over charges for the previous 12-month period.

While the major part of this increase is directly attributable to the vast expansion in telephone plant at current high-cost levels, some contribution also results from the upward trend in annual depreciation rates for certain classes of telephone plant. This is due largely to the fact that, in efforts to reduce the backlog of unfilled orders for telephone service, the industry in many instances expanded existing facilities of old types pending the availability of modern and more adequate equipment. This is particularly true where manual switchboard installations are expanded pending conversion to dial operation. In fact, in many instances the depreciation rate proposed for manual central office equipment is found to be entirely responsible for the over-all increase in depreciation charges. Accordingly, arrangements have been made whereby telephone companies will file with the Commission annual data designed to facilitate effective regulation of depreciation rates for manual installations during the period of conversion to dial. Data so filed will be studied in the light of the companies' plant replacement and construction programs.

Investigation of depreciation rates and practices and studies concerning the reasonableness of proposed changes in rates were continued. Some of these investigations involved field studies at the locations of the companies' properties. Based on studies completed, the Commission, pursuant to the provisions of section 220 (b) of the Communications Act, prescribed depreciation rates for the Michigan Bell Telephone Co. and for each of the operating areas (nine States) served by the Southern Bell Telephone & Telegraph Co. The prescribed rates produced total depreciation charges about 10 percent below the charges resulting from the rates previously in use or proposed by the telephone companies. Looking toward fixing depreciation rates for other Bell companies, studies with respect to several companies are in progress. In general, these studies are conducted in cooperation with State regulatory commissions.

Allocation of depreciation reserves of multistate company.—From time to time State public utility regulatory and tax authorities request Commission assistance in connection with determining the depreciation reserves applicable to individual States in the case of multi-State telephone companies. At the request of the Southeastern

Association of Railroad and Utilities Commissioners, representing the States served by Southern Bell Telephone & Telegraph Co., joint studies undertaken in 1948 and nearing completion at the end of fiscal 1949, will provide data on the service life expectancies and salvage recoveries for the various classes of plant which are necessary for allocating the company's depreciation reserve to the various States on an equitable basis. It is planned that a report setting forth details of the study and results of the allocation will be prepared during fiscal 1950.

Toll rate study.—Widening disparities between the rates for interstate toll message service and the rates for comparable intrastate service have resulted from postwar increases in intrastate toll rates. The Commission and cooperating State commissions have undertaken a comprehensive study of the telephone toll rate structure. The study is designed to develop complete data on all technical and economic phases of both intrastate and interstate toll services.

OTHER REGULATORY MATTERS

Uniform systems of accounts.—The Commission's uniform systems of accounts for telephone companies (part 31 for class A and class B telephone companies and part 33 for class C telephone companies, of the rules and regulations) were revised and reissued during the year. The revised issues included all separately adopted amendments since the last previous issues—August 1, 1946, and January 1, 1939, respectively—with appendices which set forth the several accounting interpretations adopted by the Commission. Studies are being continued on matters directly related to the uniform systems of accounts, including determinations of noncompliance by carriers, coordination of the regulations with requirements of the industry and other regulatory authorities, preparation of necessary changes in the regulations and interpretations of the regulations.

Financing and refinancing.—Issuance of new securities by telephone companies continued in substantial volume, although somewhat less than the previous year and a definite downward trend was noted during the first five months of the current calendar year. In addition to collaborating with the Securities and Exchange Commission by examining prospectuses filed with that Commission in the light of accounting and financial data on file with this Commission, other related matters of accounting were the subject of further study after the securities were authorized for issuance.

Pensions and relief.—Because of increases in the number of employees, raises in wages, and liberalization of benefits, the relief and pension costs of telephone carriers continued upward, reaching approximately 130 million dollars during the calendar year 1948 for the

Bell system alone, not including social security taxes amounting approximately to an additional 25 million dollars. Problems of pension accounting, therefore, continue to be of great significance, particularly in regard to the reasonableness of costs, the methods of determining the costs, and the accounting for these costs. During the past fiscal year an extensive analysis of the Bell system's actuarial methods was completed and studies were made with respect to the pension accrual rates and resulting charges to operating expenses of both Bell and independent companies. In these studies attention was also directed to the extent to which current payments into pension funds relate to past service of employees. Many inquiries relative to these pension problems were received from State commissions and labor groups.

Preservation of records.—A proposed complete revision of the Commission's rules for the preservation of records by telephone carriers, required in the exercise of regulatory functions, embracing modernized techniques such as microfilming, indexing for ready reference, and prescribing periods of retention based upon studies of the usage of records, is being developed. It has occasioned studies of appropriate descriptions and periods of retention of more than 600 individual items. Advice was sought and received from the Bureau of the Budget, the National Archives, the Bureau of Standards, manufacturers of microfilm and equipment, and the State commissions, as well as the several Federal regulatory agencies having similar problems.

New types of plant and services.—The development of new types of plant and services such as microwave radio relay systems, telephone recording devices, mobile radiotelephone services, and others heretofore mentioned, require studies to determine the adequacy of the records and accounts maintained by the carriers with respect to such plant and services. During the year the Bell system instituted procedures and opened subaccounts to provide the information, with respect to such activities, required for the Commission's regulatory functions.

Restatement of plant accounts on basis of original cost.—The Bell system companies have substantially completed, and the Commission has analyzed and approved with certain qualifications, restatements of Bell plant accounts on the basis of original cost with respect to those acquisitions of plant made since 1913 where the consideration was more than $25,000. During fiscal 1949 a comprehensive analysis was made of reductions in the net book cost through charges to income or surplus, by telephone companies, including independents. The aggregate of these charges since the effective date of the present systems of accounts approximates 43 million dollars. This figure includes certain amounts, not previously mentioned in prior reports, which came to light as a result of the recent analysis. There are pending

several cases where adjustments have not been made because past accounting is in controversy. Current acquisitions continued to be dealt with in accordance with the provisions of the uniform system of accounts.

Continuing property records.—Cooperative activity with State regulatory authorities and representatives of the telephone industry continued, with the objective of providing regulations that facilitate the refinement and clarification of continuing property record procedures and to enable the achievement of uniformity throughout the industry in the form and usage of basic record data underlying the continuing property records. Field studies by the Bell companies of a proposed new method for determining average unit costs for retirement purposes were discontinued after somewhat less than 2 years' duration when results revealed that little significant economy or material improvement in accuracy over methods previously used would be gained. The committee of State and Federal representatives that had been formed to evaluate, in cooperation with industry representatives, the field studies referred to, continued to function by considering proposals to revise the Commission's rules relating to this matter. A detailed study of the continuing property records of one large telephone company was completed during the year and general studies of continuing property records of other companies were carried forward. Efforts were continued to obtain full compliance of independent telephone companies with the continuing property record regulations.

3. TELEGRAPH (WIRE, CABLE, AND RADIO)

DOMESTIC SERVICE AND FACILITIES

Western Union modernization program.—Substantial progress was made during the year by the Western Union Telegraph Co. in its 72 million dollar mechanization program. The principal essential of the plan is the substitution of about 140 manual relay locations with 15 high-speed reperforator-switching relay centers. Seven of these were completed and apply the principle of selective through-switching techniques for automatically and rapidly advancing telegrams from the originating office to a distant city without intermediate attention by personnel. The number of reperforator-switching centers in operation was 14. Upon the completion of changes in traffic patterns involved in this highly integrated system, it is expected that the speed and quality of telegraph service will improve.

Western Union is continuing the development of the facsimile process for terminal handlings of telegrams. One type of instrument is the "Desk-Fax", which is placed on the customer's desk for the transmission of messages in picture form between the customer and the company's office. Nearly 2,000 of these were being installed in 8

cities. Another type called "Telefax", designed primarily for hotels, office buildings, and apartment houses, was in experimental service at two Washington hotels.

Construction of wire facilities.—The year brought 52 requests covering wire telegraph construction and extensions. Four such applications were carried over from the preceding year, making a total to be accounted for of 56. Fifty-four applications were granted. They covered the construction of 41,926 telegraph channel miles at a cost of $372,600 and the lease of 2,988,550 telegraph channel miles at an annual rental of $2,966,505, and terminal equipment costing $11,446,240.

Speed of service.—The origin to destination speed of service (the interval from the time a message is filed to the time it is delivered, or first attempt) during the year averaged 41 minutes where delivery was effected by telephone, 39 minutes in the case of delivery by customer teleprinter tieline, and 47 minutes for delivery by messenger. The time required to relay messages through the 25 largest Western Union offices ranged from 14.1 to 9.9 minutes—the average being 11½ minutes, or 1 minute slower than in the preceding 12-month period.

Microwave relay systems.—Western Union continued its experimental use of the microwave radio triangle connecting New York, Washington, and Pittsburgh. All three legs of the triangle were in limited telegraph service carrying traffic formerly routed over wire-line facilities. The microwave circuits continue to prove satisfactory from a technical standpoint and appear to offer advantages from the operating, maintenance, and economic standpoints, particularly on circuits carrying heavy traffic volumes.

During the year Western Union established a microwave circuit for transmitting television programs between New York and Philadelphia. The circuit was not used commercially because interconnection with telephone company facilities at New York and Philadelphia was not permitted by the Bell system, and it was, therefore, impossible for Western Union to supply network service to TV broadcasters. The interconnection problem is involved in the proceedings in Docket 8963 which is discussed in connection with Domestic Telephone Service—Rates and Tariffs.

Discontinuance or reduction of telegraph service.—During the year, 942 applications for reduction in business hours, or closure of public telegraph offices, were filed. In addition, 227 applications were pending at the beginning of the year. Most of these requests were made by Western Union. The Commission acted favorably on 928 requests and denied 3. Twenty-four were withdrawn and 214 were pending at the year's close. In most cases where hours were reduced or offices closed, alternate service was made available.

In connection with applications filed by common carriers for authority under section 214 of the Communications Act to discontinue,

reduce, or impair telephone or telegraph service, the Commission is considering whether it should adopt rules and regulations relating to the protection of employees who may be adversely affected by curtailment of service. (See Domestic Telephone Service—Discontinuance, etc., of Service.)

The Pacific Telephone & Telegraph Co. and Bell Telephone Co. of Nevada requested authority to discontinue all message telegraph service rendered by them in the States of California, Oregon, Washington, Idaho, and Nevada. This application is joined with an application of Western Union to discontinue its telephone service, and an application of certain Bell system companies to acquire Western Union's telephone business and certain telephone property. (See Domestic Telephone Service—Discontinuance, etc., of Service.)

On May 16, 1949, the Commission terminated the proceeding in Docket 7982, in which an investigation was conducted in the early part of 1947 of the over-all plans, policies, and standards of Western Union with respect to the discontinuance, reduction, or impairment of telegraph service. The purpose of the proceeding was accomplished in enabling the Commission to obtain certain information material to the performance of its duties under section 214 of the Communications Act with respect to service curtailment applications filed by Western Union.

The Commission, on April 20, 1949, adopted a proposed report in Docket 8088 proposing to grant Western Union's application to close a branch office in Dallas, Tex.

Following informal proceedings, referred to in the Fourteenth Annual Report, to determine the maximum size of Western Union's company-operated telegraph offices which, under normal circumstances, might be considered for conversion to teleprinter agency offices operated by persons engaged in nontelegraphic business, the Commission approved the standard that conversion to agencies of offices whose daily average traffic volume exceeds 46 messages is considered justified only by evidence of exceptional circumstances, but that this does not mean the Commission will necessarily authorize any proposed conversion to agency operation where traffic volume is less than the suggested traffic maximum. The applicant will be expected to make a satisfactory showing in each instance that, under the proposed agency operation, adequate telegraph service will be available to the particular community.

INTERNATIONAL TELEGRAPH SERVICE

Circuits.—Direct radiotelegraph communication was established between the United States and four countries—Saudi Arabia, Pakistan, Union of South Africa, and Formosa. Circuits via the Tangier, North Africa, relay stations of RCA Communications, Inc., and

Mackay Radio & Telegraph Co., Inc., were established to Pakistan and Saudi Arabia by those companies respectively, as well as to six other countries previously served by direct operations only.

Due to the current unsettled conditions in China, communication with Nanking, the former Nationalist capital, was discontinued by United States carriers. However, communication with Shanghai continued. To insure continuation of service to those areas of China remaining under Nationalist control, United States radiotelegraph carriers were authorized to communicate with Canton, Chungking, and Taipeh, Formosa. Direct circuits to Brazzaville, French Equatorial Africa, and to Tananarive, Madagascar, were closed at the request of the French Administration of Posts, Telephones, and Telegraphs, which indicated a desire to return to the prewar practice of handling all communications to its outlying territories and possessions through Paris.

A total of 69 foreign countries and United States territorial possessions are now served by radiotelegraph circuits from the United States and most other points in the world are served through connections with the facilities of foreign carriers. Program material originating with the United Nations and the Department of State is being transmitted by United Sates radiotelegraph carriers to approximately 30 countries throughout the world.

Frequencies.—All but three of the frequencies relinquished by licensees in the fixed public service for use by the military during the war have now been returned to that service and, in addition, many new frequency assignments were made during the year. New frequency assignments are being registered with the Berne Bureau. The present crowded condition of the radio frequency spectrum makes it necessary for the majority of new assignments to be on a shared basis. Effective May 1, 1949, call letters assigned to all frequencies below 30 megacycles in the fixed public services were changed to conform with the call letter assignment plan agreed to at the 1947 International Telecommunications Conference.

Interference.—Fifty-eight cases of interference involving licensees in the fixed public services were handled during the year. Causes of interference included spurious emissions, long distance transmission of frequencies in the VHF range (30 to 300 megacycles), and cases involving sharing of frequencies in the HF range (3 to 30 megacycles). Interference complaints were expeditiously handled and relieved as soon as possible.

Equipment.—Modernization and expansion of the transmitting plants of major carriers continued with the addition of a total of 20 new transmitters and the deletion of 11 transmitters in the radiotelegraph services. In the new transmitters, emphasis is placed on im-

proved frequency stability, capability of operation on higher frequencies, and ease of change from one frequency to another.

International conferences.—The Commission was represented on the United States Delegation to the International Telegraph Regulations Revision Committee, which met at Geneva in January 1949, to consider what changes would have to be made in the International Telegraph Regulations to make them acceptable to countries, like the United States, which were not signatory to those regulations. The Commission, with Chairman Coy as chairman of the United States delegation, was also represented at the Administrative Telephone and Telegraph Conference which opened at Paris in May 1949. The United States participated actively in the telegraph aspects of the conference to the end that regulations might be developed to which it could become a party. (It also participated in the telephone discussions. However, it had advised the conference at an early stage that the United States did not intend to sign the International Telephone Regulations.) The United States delegation advanced various proposals for amendment of the existing telegraph regulations. These included proposals looking to the unification of rates for ordinary telegrams composed of plain language, cipher language, code language, or any mixture thereof; elimination of the deferred classification of telegrams; admission of secret language into telegrams in the letter classification; elimination of special reduced government rates; various changes in operating procedures and practices; and related matters.

In preparation for the Paris conference, the Commission held lengthy hearings (Docket 9094) to obtain the views of interested persons, including international telegraph carriers, telegraph users, and government agencies, as to the proposals to be submitted. The Commission thereafter issued a proposed report, heard oral argument thereon, and then issued a final report which contained the more important proposals which were submitted by the United States Government to the Paris Conference for Revision of the International Telegraph Regulations. The Commission, in cooperation with the Department of State, also held several informal meetings with representatives of the carriers, users, and other government agencies to study and consider detailed proposals for revision of the International Telegraph Regulations other than those involved in Docket 9094.

Docket cases.—Two proceedings involving possible violations of provisions of the Communications Act were instituted during the year. One of these, Docket 9093, was an investigation to determine whether the common ownership and consolidated operations of cable and radio facilities by the American Cable and Radio Corporation system, including All America Cables and Radio, Inc., The Commercial Cable Co. and Mackay Radio & Telegraph Co., were in violation of sec-

tion 314 of the Communications Act. The other proceeding, Docket 9188, was to determine the facts and circumstances surrounding the installation and operation of two transmitters by Mackay Radio & Telegraph Co. prior to the receipt of authorization therefor from the Commission, and to determine, further, whether such transmitters should be licensed. Hearings in both of these matters were held in the fall of 1948, and at the end of the fiscal year were awaiting decision.

On May 4, 1949, the Commission adopted its final report and order in Docket 7822 in which it denied applications of Press Wireless, Inc., for modification of its licenses to permit the handling of traffic in the Government classification. Press Wireless appealed to the Circuit Court of Appeals for the District of Columbia.

Action on the application of RCA Communications, Inc., for a duplicate circuit with Israel (Docket 8990), was postponed until further order, at the request of the applicant.

RATES AND TARIFFS

Rate schedules.—At the close of the year, 156 domestic and international telegraph carriers had tariffs and concurrences on file with the Commission. During the year they filed 5,931 tariff publications establishing or changing rates, regulations, practices, and classifications of services, including concurrences. Numerous irregularities in the rate schedules were corrected or eliminated through examination procedures.

Special permissions.—Domestic and international telegraph carriers filed 151 applications for special permission to make changes in tariffs or file new tariffs. Of these, 144 were granted, 2 were denied, 2 were retired to the files at the applicant's request, and three were pending at the close of the year.

Western Union domestic rates.—Western Union has conducted studies and tests to determine the changes necessary in its domestic telegraph rate structure to eliminate discriminations, particularly with respect to the relationship between rates and distances. (See Fourteenth Annual Report.) In December 1948 the Commission requested that Western Union file revised tariff schedules designed to eliminate the discriminations in its existing rate structure, the revised schedules to become effective within 90 days after the elimination or substantial reduction of the Federal excise tax on domestic telegrams, or December 31, 1949, whichever date is the earlier. The Commission is working closely with the company in this matter.

Channels for TV program transmission.—The rates and regulations of Western Union covering the transmission of television programs over its New York City-Philadelphia microwave radio relay system, effective May 1, 1948, are, together with rates and regulations of the Bell system for its intercity television program transmission services,

the subject of formal investigation and hearing before the Commission in Docket 8963. (See discussions of Channels for TV Program Transmission, Rates and Tariffs, Telephone.)

Baseball-sports service by message and direct wire.—On March 1, 1949, Western Union filed revised tariff schedules, effective April 18, 1949, providing for new and revised regulations and charges relating to furnishing of news reports of baseball and sports events by message and direct wire to radio broadcasters, newspapers, press associations, and others. Following complaint by a radio broadcaster concerning these revisions, the Commission, on its own motion, entered into an investigation of the matter, including the question of the carrier's possible violation of its tariff regulations in having permitted unrestricted network broadcasting of sports reports, contrary to the previously effective provisions of its tariffs. Hearings were held in the spring of 1949, and the matter was pending decision.

United States-Mexican telegraph rates.—In June 1948, the Government of Mexico announced a program of nationalization of its international communication facilities, and canceled the concessions of the Mexican Telegraph Co., jointly owned by Western Union and All America Cables & Radio, Inc., on 1 year's notice, effective June 16, 1949. Traffic between the United States and Mexico formerly handled over the Mexican Telegraph Co.'s ocean cables between Galveston and Mexico is now handled over wire telegraph land lines crossing the border, in accordance with a new contract between the Mexican Government and Western Union. Among other things, the rate zones in the United States and Mexico have been realigned in relation to distance and zone boundaries and have been conformed to State boundaries. Special rates to and from Mexican points where the Mexican Telegraph Co. had offices have been discontinued and regular zone rates made applicable. All other line charges in both the United States and Mexico have been eliminated, as has the night message classification, already discontinued for intra-United States and United States-Canada traffic. The discount for United States and Mexican Government traffic, previously applicable to Western Union's portion of through tolls, has been abolished.

International rate case.—In September 1948 certain of the international telegraph carriers requested that the Commission reconsider the rates theretofore authorized in the proceeding in Docket 8230 (see Fourteenth Annual Report) stating that, despite rate increases authorized in 1947 and 1948, their revenues still were inadequate, and that certain rate increases in addition to those previously authorized were necessary. The Commission reopened the proceedings and held further hearings in November 1948. On January 26, 1949, it issued an interim report in which it found that, on the basis of the record in the further hearings, only a few of the international telegraph carriers

were operating at a profit, and that most of them ugently required additional revenues. To meet this emergency situation, the Commission, effective February 2, 1949, authorized out-bound increases estimated to produce about $2,542,000 in gross revenues annually. Increases in in-bound rates to the level of the out-bound rates are expected to produce about $565,000 additional gross revenue.

In granting the latest increase, it was found necessary to permit establishment of rates to certain points in the world in excess of the former maxima of 30 cents per full rate word and 6½ cents per ordinary press word. The authorized rates to most parts of Africa, Asia, and Oceania now are 40 cents per full rate word and 8½ cents per ordinary press word, and to South America they are 35 cents and 7½ cents, respectively. The ceiling rates of 30 cents per full rate word and 6½ cents per ordinary press word, established with British Commonwealth points in the Bermuda Telecommunications Agreement of December 4, 1945, still were in effect, but a conference with the other parties to this agreement was to be held in London during August 1949 to discuss, among other things, the removal of those ceiling limitations.

Multiple address press rates.—As stated in the Fourteenth Annual Report, the Commission in June 1948 reopened Docket 8230 for investigation and hearing with respect to charges, regulations, practices, and services of the three international telegraph carriers (Press Wireless, Inc., Mackay Radio & Telegraph Co., and RCA Communications, Inc.) engaged in the rendition of multiple address press service. This investigation is an outgrowth of the general investigation, in the same docket, into international telegraph rates. Hearings were held in November and December 1948 and January 1949. The matter was awaiting decision.

Distribution of international traffic.—In connection with its authorization of the merger of the domestic telegraph carriers in 1943, the Commission approved a "formula" specifying, generally, the manner in which out-bound unrouted international telegraph traffic should be distributed by the merged carrier, Western Union, among the United States international telegraph carriers, including Western Union's cable system. Since that time many new circuits have been opened and carriers have reinstituted service to areas which were formerly enemy occupied. These factors, in addition to the changing characteristics of international telegraph traffic, have given rise to various problems in connection with the aforementioned formula. In addition, certain of the carriers have alleged that interpretations given to various clauses of the formula deprive them of traffic to which they are entitled. Formal complaints were filed by certain of the international telegraph carriers in connection with operation under the formula and the entire matter was under consideration by the Commission.

OTHER REGULATORY MATTERS (DOMESTIC AND INTERNATIONAL)

Depreciation.—In February 1948, pursuant to the provisions of section 220 (b) of the Communications Act, the Commission prescribed depreciation rates applicable to the various classes of Western Union's land lines plant. (See Fourteenth Annual Report.) Depreciation rates for radiotelegraph (ultra-high frequency radio relay) plant, which was under construction at that time, were not included in this action. By the end of 1948 investment in radio relay facilities had reached sufficient proportions so that in April 1949 the Commission fixed depreciation rates for these new types of plant. In connection with the modernization program, Western Union is retiring much of its plant before normal life expectancy and is amortizing these investments not fully provided for by normal depreciation accruals. The Commission is maintaining a continuing review of this program and is receiving semiannual reports from the company.

In connection with Commission proceedings involving rates and charges for telegraph service between the United States and overseas and foreign points (Docket 8230), it was found desirable to determine the reasonableness of annual depreciation rates and charges, as well as the recorded depreciation reserves of the international telegraph carriers. To this end a comprehensive study was undertaken relative to one large carrier and similar studies are contemplated with respect to the other international carriers.

Continuing property records.—The verification of the form and contents of continuing property records and the evaluation of the effectiveness of continuing property records procedures of radiotelegraph, wire-telegraph and ocean-cable carriers continued. During the year a list of retirement units for wire telegraph and ocean cable carriers was prepared for adoption by the Commission and progress was made on a similar list for radiotelegraph carriers. The three carriers that had not completely fulfilled the requirement to establish and maintain continuing property records at the beginning of fiscal 1949 still have not attained this objective because of extenuating circumstances although progress has been made.

Pensions and relief.—The Commission continued its general studies of the carriers' pension arrangements. Several changes in pension plans that were introduced during the year were analyzed in detail, particularly to determine their effect upon operating expenses.

Uniform system of accounts.—Part 35, Uniform System of Accounts for Wire-telegraph and Ocean-cable Carriers, of the Commission's Rules and Regulations, was amended during the year to conform the accounts with simplified reporting requirements concerning maintenance expenses. Conferences were also held with the carriers with a view to modernizing the prescribed accounting for revenues. At the end of the year rule-making procedures were in process which, upon

adoption by the Commission, will provide uniform accounting and reporting treatment of revenues of the wire, cable, and radio carriers.

Preservation of records.—The development of revised rules for the preservation of the carriers' records that are required in the exercise of regulatory functions was in advanced stages at the close of the fiscal year. These rules enumerate over 500 items specific to the telegraph industry and fix the retention periods therefor.

Reclassification of Western Union plant accounts.—The matter of the reclassification of the plant accounts of Western Union was continued into fiscal year 1949, and completed to conform to the currently effective requirements of the uniform system of accounts, except for minor adjustments which may be necessary with respect to certain plants located in foreign countries.

New types of plant and services.—The development of microwave circuits in the domestic telegraph field, and new types of switching equipment, occasioned the need for studies to determine the adequacy of the accounts and records maintained by the carriers with respect to such plant and service, as well as the adequacy of the Commission's effective rules. In the international telegraph field the institution of new services such as the program transmission service also developed the need for studies to determine the adequacy of the present rules of the Commission.

4. STATISTICS

TELEPHONE CARRIERS

Annual reports were filed by 132 common carriers and 27 controlling companies for the calendar year 1948. Of these, 106 were from telephone carriers. Financial and operating data relating to telephone carriers for the calendar year 1948, as compared with 1947, are shown in the following table:

Item	1947	1948	Percent increase
Investment in plant and equipment (as of December 31)	$7,788,162,429	$9,108,408,570	16.95
Depreciation and amortization reserves	$2,513,997,977	$2,665,101,862	6.01
Net investment in plant and equipment	$5,274,164,452	$6,443,306,708	22.17
Local service revenues	$1,354,984,904	$1,598,952,274	18.01
Toll service revenues	$908,363,760	$1,061,661,716	16.88
Total operating revenues [1]	$2,398,317,527	$2,820,088,577	17.59
Operating expenses [1]	$1,935,995,020	$2,235,184,804	15.45
Taxes	$260,829,709	$310,718,568	19.13
Net operating income after all taxes	$201,492,613	$274,186,145	36.08
Net income	$170,271,710	$228,596,769	34.25
Dividends declared	$203,519,238	$218,806,027	7.51
Company telephones:			
Business	10,301,919	11,146,019	8.19
Residential	20,499,920	22,609,910	10.29
Average number of calls originating per month:			
Local [2]	4,390,078,430	4,835,601,447	10.15
Toll [2]	180,202,249	182,460,596	1.25
Number of employees at end of October	556,889	585,702	5.17
Male	183,686	198,841	8.25
Female	373,203	386,861	3.66
Total pay roll for the year	$1,435,902,570	$1,667,054,353	16.10

[1] Intercompany general service and license fees and rents, amounting to approximately $45,000,000 for 1948 and $41,000,000 for 1947, have not been eliminated.
[2] Partly estimated by reporting carriers.

LAND LINE TELEGRAPH

Annual financial and operating reports were received from 26 wire-telegraph, ocean-cable and radiotelegraph carriers for the calendar year 1948. Statistical data compiled from the reports of Western Union for the calendar year 1948, as compared with 1947, are given in the following table. The figures pertain to the land line operations of that carrier; data concerning its cable operations are included in another table relating to ocean-cable carriers:

The Western Union Telegraph Co.[1]

Item	1947	1948	Percent increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$314,275,030	$310,295,071	(1.27)
Depreciation and amortization reserves	$142,664,085	$136,267,016	(4.48)
Net investment in plant and equipment	$171,610,945	$174,028,055	1.41
Transmission revenues	$183,834,397	$165,595,812	(9.92)
Total operating revenues	$199,654,193	$183,429,431	(8.13)
Operating expenses, depreciation, and other operating revenue deductions	$185,313,959	$185,362,154	.03
Net operating revenues	$14,340,234	[2] $1,932,723	(113.48)
Net income	$905,970	$1,264,578	39.58
Dividends declared		$1,228,428	
Revenue messages handled	[3] 220,154,500	[3] 197,915,842	(10.10)
Number of employees at end of October	53,572	48,967	(8.60)
Total pay roll for the year	$138,976,008	$140,900,964	1.39

[1] Represents data for land line operations. Figures covering cable are included in another table.
[2] Deficit.
[3] Includes domestic haul of cable and radio messages (9,851,556 in 1947 and 8,896,985 in 1948).

RADIOTELEGRAPH AND OCEAN-CABLE CARRIERS

Financial and operating data compiled from the annual reports of radiotelegraph and cable carriers engaged in international traffic for the calendar year 1948, as compared with 1947, are set forth in the accompanying two tables:

Radiotelegraph carriers

Item	1947	1948	Percent increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$36,614,331	$37,369,829	2.06
Depreciation and amortization reserves	$17,828,421	$17,472,888	(1.99)
Net investment in plant and equipment	$18,785,910	$19,896,941	5.91
Message and other transmission revenues	$20,582,509	$21,186,729	2.94
Total operating revenues	$21,741,440	$22,423,542	3.14
Operating expenses, depreciation, and other operating revenue deductions	$23,611,828	$23,009,343	(2.55)
Net operating revenues	[1] $1,870,388	[2] $585,801	
Income taxes	$262,494	$624,709	137.99
Net income	[1] $1,573,781	[2] $453,748	
Dividends declared	$5,000	$2,000	(60.00)
Revenue messages handled: [3]			
Domestic-service classification [4]	63,558	59,998	(5.60)
Foreign-service classification [3]	11,204,102	10,148,439	(9.42)
Marine	857,030	905,332	5.64
Number of employees at end of October	5,261	5,782	(7.65)
Total pay roll for the year	$19,368,981	$18,452,422	(4.73)

[1] Deficit.
[2] Excludes domestic haul of foreign, insular, and marine messages to avoid duplications.
[3] International messages (primarily Canadian and Mexican) transmitted in accordance with carriers' rules governing domestic traffic are included under Domestic Service Classification. Insular messages are included under Foreign Service Classification.

Ocean cable carriers

[Including cable operations of The Western Union Telegraph Co.]

Item	1947	1948	Percent increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$96,061,650	$98,256,204	2.28
Depreciation and amortization reserves	$61,522,573	$64,614,333	5.03
Net investment in plant and equipment	$34,539,077	$33,641,871	(2.60)
Transmission revenues:			
Domestic service classification	$812,228	$608,664	(25.06)
Foreign service classification	$20,755,463	$20,896,317	.68
Total operating revenues	$23,772,389	$23,856,903	.36
Operating expenses, depreciation, and other operating revenue deductions	$24,357,552	$23,024,993	(5.47)
Net operating revenues	[1] $585,163	$831,910	
Income taxes	$301,933	$211,219	(30.04)
Net income	[1] $1,141,364	[1] $324,288	
Dividends declared	$1,381,005	$706,936	(48.81)
Revenue messages handled:			
Domestic service classification	663,491	535,089	(19.35)
Foreign service classification	11,511,512	10,468,017	(9.06)
Number of employees at end of October	6,247	5,973	(4.39)
Total pay roll for the year	$14,309,199	$13,265,006	(7.30)

[1] Deficit.

INTERNATIONAL TELEGRAPH TRAFFIC

Reports relating to international traffic filed by cable and radiotelegraph carriers show that an aggregate of 562,118,333 paid words were handled during the calendar year 1948. The out-bound traffic amounted to 282,327,827 words, and in-bound 279,790,506 words. A break-down of the traffic with the principal countries is shown in the following table:

International telegraph (radio and cable) traffic, 1948

Country	Number of words		Country	Number of words	
	Out-bound from the United States	In-bound to the United States		Out-bound from the United States	In-bound to the United States
Europe, Africa, and the Near East:			West Indies, Central, North, and South America:		
Austria	1,506,963	1,831,081	Argentina	10,007,187	9,702,062
Belgium	6,070,402	5,525,101	Brazil	11,629,818	12,782,549
Czechoslovakia	1,367,585	1,651,467	British West Indies	2,889,793	2,650,143
Denmark	1,912,469	1,625,969	Canada	6,842,081	9,388,917
Egypt	2,429,144	2,205,424	Chile	2,280,223	2,555,625
France	18,293,256	14,196,364	Colombia	4,945,793	4,027,336
Germany	5,939,901	8,818,384	Costa Rica	1,068,863	915,776
Greece	2,667,885	2,934,375	Cuba	8,880,916	11,432,527
Iran	1,067,946	1,125,259	Dominican Republic	1,214,655	1,450,223
Israel	1,456,787	2,142,884	Ecuador	1,422,124	887,894
Italy	9,629,766	7,721,344	Guatemala	1,252,668	1,257,933
Morocco	1,108,845	1,061,276	Mexico	2,073,456	2,187,925
Netherlands	7,061,184	6,321,705	Netherlands West Indies	1,025,689	1,228,122
Norway	2,830,737	2,117,846	Panama	2,284,244	1,909,303
Palestine	1,153,340	1,129,225	Peru	1,953,636	1,620,773
Poland	1,033,902	711,686	Puerto Rico	3,255,831	3,010,941
Portugal	2,096,570	1,386,252	Uruguay	1,733,731	1,364,290
Spain	3,434,849	2,462,393	Venezuela	7,054,211	7,993,310
Sweden	4,048,263	3,526,016	All other countries	4,820,521	3,931,573
Switzerland	8,726,640	6,748,815			
Turkey	1,310,610	970,898	Total	76,635,440	80,297,220
Union of South Africa	4,464,087	4,403,191			
U. S. S. R	7,286,653	3,830,006			
United Kingdom and Eire	52,005,747	54,226,734	Asia and Oceania:		
Yugoslavia	1,474,874	1,165,753	Australia	3,405,577	3,278,627
All other countries	9,070,171	9,025,612	China	7,983,950	6,834,423
			Hawaii	5,763,631	5,746,695
Total	159,448,576	148,865,060	India	6,831,567	6,288,505
			Indonesia	734,581	1,000,319

International telegraph (radio and cable) traffic, 1948—Continued

Country	Number of words		Country	Number of words88	
	Out-bound from the United States	In-bound to the United States		*Out-bound* from the United States	*In-bound* to the United States
Asia and Oceania—Con.			Unknown destination or origin	1, 552, 213	2, 640, 480
Japan	3, 928, 640	5, 448, 088			
Korea	477, 289	1, 254, 522	Grand total	282, 327, 827	279, 790, 506
Malay States	1, 603, 965	1, 614, 402			
Philippines	8, 548, 245	10, 502, 453			
All other countries	5, 414, 153	6, 019, 712			
Total	44, 691, 598	47, 987, 746			

COMMON CARRIER RADIO STATIONS

Authorized radio stations in the common carrier services now exceed 1,000, not counting associated mobile units. Figures for base stations for the past two fiscal years follow:

Class of station	1948	1949	Increase
Fixed public telephone	27	26	(−1)
Fixed public telegraph	56	57	1
General mobile (experimental)	785	795	10
Other experimental	128	174	46
Total	996	1, 052	56

COMMON CARRIER APPLICATIONS

The Commission received nearly 3,200 common carrier applications of all types and disposed of nearly 3,300, which included some that were pending at the start of the year. Here is a summary:

Class of station	Pending July 1, 1948	Received 1949	Disposed 1949	Pending June 30, 1949
Fixed public telephone	13	194	150	57
Fixed public telegraph	66	400	407	59
General mobile (experimental)	160	830	944	46
Other experimental	21	298	257	62
Wire service extensions	25	376	389	12
Wire service reductions	238	1, 067	1, 147	158
Total	523	3, 165	3, 294	394

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CHAPTER VI. RADIO OPERATORS

1. GENERAL

This separate chapter is devoted to all those who personally operate radio transmitters—the professionally paid radio operator, the amateur, the civilian flyer who uses radiotelephone in his plane, and the ordinary citizen who finds radio convenient to his every day activities.

The 645,000 operators and private stations authorized in these categories constitute the largest group with which the Commission has to deal. More than 61,000 new authorizations were issued during the year, typifying the growing interest in radio for individual use. The opening of the Citizens Radio Service is expected to add greatly to these figures.

The administrative problems involved in the regulation of radio operators are unique in the number of persons directly affected and the amount of paper work entailed. The latter is not limited to applications received and granted but covers a huge volume of individual correspondence of a type not common to any of the other services.

The law requires the Commission to approve operators of radio transmitting apparatus as well as stations as such. Under the Communications Act, the Commission prescribes the kinds and classes of radio operators and the technical and other qualifications which they must possess as a basis for licensing. Examinations for the various operator licenses are given regularly at the Commission's field offices, and at quarterly and semiannual intervals at nearly 100 examination points conveniently located throughout the country.

2. COMMERCIAL RADIO OPERATORS

The term "commercial radio operator" is used by the Commission to include all persons holding radio operator licenses which authorize

the operation of radio stations as a part of their livelihood or vocation, as compared with the "amateur radio operator" whose interest in radio technique is solely with a personal aim as an avocation and without pecuniary interest. "Commercial Radio Operator", therefore, embraces the thousands of license holders who are employed, either full-time or part time, for the operation of radio transmitters in broadcast stations, in ship and coastal radiotelephone and radiotelegraph stations, in aircraft stations, aeronautical ground stations, in state and municipal police, fire or forestry stations, etc. The nearly 380,000 commercial radio operators thus constitute, numerically, the largest single group of license holders with which the Commission is concerned in administrative and regulatory matters, and possibly the most complex because of the individual problems which they present.

The duties of a commercial radio operator, with respect to any licensed station, include not only the handling of communications, the manipulation of on-off controls, and the keeping of station logs (if required), but also, in a larger sense, the performance of any technical duties which may affect the station's operation in compliance with the terms of its license and with the Commission's rules and regulations. In some classes of stations, the operators on duty and in charge do not need to be qualified or authorized to perform all of those duties, but in other classes of stations a fully qualified operator, authorized to perform all of those duties, is essential. Accordingly, the commercial radio operator licenses issued by the Commission are graded in accordance with the technical or nontechnical level of duties and responsibilities they are expected to perform.

There are two basic classifications of the commercial radio operator licenses—radiotelephone and radiotelegraph—and several grades within each classification, each conferring a different degree of operating authority in accordance with the demonstrated qualifications (and in some cases experience) of the operators. This grading varies from authorizing limited and nontechnical operation of simple "push-button" transmitters to authorizing unlimited operation, including installation, servicing, and maintenance of the most complicated and powerful installations. The matter of licensing, and thus of examining the qualifications of radio operators, expands with each new development in the use or technique of radio, and requires that the commercial radio operator license and examination structure be constantly reviewed and be brought up to date when necessary.

Between 1939 (the date of the last major revision) and 1948, the wartime and postwar demands upon the Commission prevented revising the commercial radio operator rules, licenses, and examinations to keep step with the rapid advances then taking place in electronic methods, uses, and techniques. As a result, it was necessary early in

1948 to concentrate on a complete revision of the existing commercial radio operator examinations. This project was completed during fiscal 1949, and the scope of the examinations for the higher grades of licenses has been broadened so that they now contain, for the first time, such matters as microwave, television and frequency modulation techniques, radar and loran methods, and radio-navigation systems. A continuing schedule has also been set up to review these examinations periodically and to make such additional changes as may be necessitated by radio's future developments.

In keeping with modernizing the commercial radio operator license and examination structure, several related projects were accomplished, others were under consideration, and still others were in preparation or projected at the end of the fiscal year. One such change which has been made effective is a complete revision of the rules defining the scope of operating authority under the various classes of operator licenses to include in that authority, wherever applicable, permission to operate stations when transmitting by frequency-modulated and pulsed techniques. The scope of the operating authority under the various classes of radiotelephone operator licenses was also broadened to permit the holders to operate, under certain conditions, stations transmitting signals technically classified as telegraphy but which do not involve or require a knowledge of the Morse code.

Another change, made near the end of the fiscal year to become effective January 3, 1950, provides for a special examination and a special endorsement to be placed on radiotelegraph first- or second-class licenses to certify to the special qualifications of the holders to operate radiotelegraph stations on board aircraft in accordance with recommended standards of the International Civil Air Organization. A similar proposal, still pending, would provide for a special examination and a special endorsement for first- or second-class radio operator licenses to certify to special qualifications to perform installation, servicing, and maintenance duties in connection with ship radar stations. A 2-day hearing and oral argument intended to inquire into the need and justification for such an endorsement, and a corresponding limitation on all persons not holding licenses bearing the endorsement, begun in January 1949, was due to resume in September 1949. Accordingly, the questions involved in this proposal may not be resolved until late 1949 or early 1950.

When an applicant for a commercial radio operator license successfully completes the required examination, the license which he receives is valid for 5 years, after which he is required to again qualify for that license if he desires its renewal. In lieu of examination, however, he is permitted to demonstrate his continued qualifications by submitting proof of radio operating experience during the term of

the license. At the present time, the relevant rules of the Commission permit the acceptance of 3 years of service as a radio operator, in the aggregate during the license term, in lieu of reexamination in qualifying the holder of a commercial radio operator license for renewal without examination. They also permit the acceptance of 2 years of service if the last year has been continuous and immediately prior to the date of the application. This has resulted in considerable hardship in the cases of certain radio operators who have been unable to meet either of the above requirements because of irregularities of employment. Accordingly, the Commission has proposed that the rules be changed to permit the acceptance of 2 years of service as a radio operator in the aggregate during the license term, in lieu of a reexamination in qualifying for renewal.

Coincident with the above proposal, the Commission also proposed that an applicant for renewal of a commercial radio operator license, who was unable to qualify for a renewal without examination but who had served under that licensee for an aggregate period of 1 year during the last 3 years of the license term, would be required to successfully complete the entire examination as for new license, but would be issued a renewal upon successful completion of a specified abridged renewal examination. This proposal, which contemplated an increase from 3 months to 1 year in the service required to qualify the applicant to take the renewal examination, attempted to equalize the relative value of service under a license as compared with an examination in demonstrating an operator's continued qualification to hold a license.

Both of the above matters, published as proposed rules, were pending at the close of the fiscal year because of continuing discussions of the subject with interested parties.

In accordance with its obligation to determine the qualifications of every radio operator before issuing him a radio operator's license, it has been necessary in the past that all applications submitted by persons having serious physical disabilities be reviewed by the Commission en banc prior to the issuance of such licenses. This has resulted in a delay, in addition to increasing the work load of the Commission. Because of this, the Commission has proposed to simplify the issuance of such licenses by revising its rules, to clearly set forth those classes of physical disabilities (complete deafness or complete muteness) which disqualify an applicant for any commercial radio operator license and to specify that applicants having other physical handicaps may be issued any operator licenses for which they otherwise qualify, subject to certain conditions intended to insure that the public interest will be served. Thus, in those cases where the operator himself, by virtue of the class of license which he holds, might become personally involved in an emergency affecting a station devoted to the

safety of life and property, such as at a compulsorily equipped ship station, the operator license would be endorsed to prohibit the performance of normal operating duties at such stations if his physical handicap clearly prevents his performance of all operating duties under emergency conditions. At the close of the year this project was awaiting final action by the Commission.

The growth in the number of licensed commercial radio operators corresponds closely with the general growth in the number of licensed radio stations. However, under its statutory authority the Commission has waivéd, in some circumstances and under certain conditions, the basic requirement that the operation of every licensed radio station be performed by a licensed radio operator.

It is of interest to note that, although the trend in the total number of licensed radio operators has continued upward since the end of the war, the rate of increase has declined and has now apparently stabilized to a near parallel to the increase in the number of stations at which those operators might be employed. It should also be pointed out that the number of holders of the higher classes of radiotelegraph operator licenses decreased from 22,352 at the end of fiscal 1947 to 19,104 at the end of 1948 and to 14,687 at the end of 1949. On the other hand, holders of the higher classes of radiotelephone operator licenses increased from 46,292 in 1947 and 49,116 in 1948 to 50,996 in 1949. This indicates an expanding need for technically qualified operators for the operations and supervision of radio transmitters in the expanding use of radiotelephone communications in the industrial and commercial fields.

3. SPECIAL AIRCRAFT RADIOTELEPHONE AUTHORIZATIONS

A special form of radio operator's authorization is available to private flyers who desire to use radiotelephone in their planes. It is issued by all Commission field offices and, as a special convenience, at the airfields through approximately 2,400 aircraft pilot examiners of the Civil Aeronautics Administration delegated for this purpose. More than 100,000 special aircraft radiotelephone authorizations were outstanding at the close of fiscal 1949, an increase of nearly 25,000 from the year previous.

4. AMATEUR RADIO SERVICE

The Amateur Radio Service is internationally recognized as a service carried on by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest. Accordingly, this service provides all interested and qualified citizens with a means of obtaining purely voluntary technical training and communications experience in the field of radio. In the United States it is one

of the largest and most active of the radio services authorized by the Commission. Thus, at the close of the fiscal year there were more than 81,600 amateur station licenses and over 80,700 amateur operator licenses outstanding, which reflected a normal addition during the fiscal year of about 6,000 new operator and station licensees.

The Amateur Radio Service has no age limits. It interests the young as well as the old. Though the average age of self-styled "hams" is about 34, teen-agers are numerous. During the year 2 youngsters—one 9 years old and the other aged 11—qualified for licenses.

The amateur field, besides being a boon to the invalid, and even the blind, is an appropriate outlet for radio-conscious youth to pursue an engaging and instructive hobby. The parents of a boy or a girl holding an amateur license have little cause to worry about where these young people are spending their spare time and evenings. They are usually in air communication with other "hams" or helping a neighbor re-rig his set.

Although nominally a personal hobby, the nature of the Amateur Radio Service is such that it has a high degree of public value. Thus, the service maintains a pool of self-trained radio technicians upon which the country can draw in case of need. For example, during the fiscal year the National Military Establishment created an organization known as the Military Amateur Radio System for the purpose of fostering interest in military radio communication. Although operating as a military organization, on military frequencies, using military call signs, this system is staffed principally by personnel holding amateur licenses issued by the Commission.

Another aspect of the public service value of the Amateur Radio Service was illustrated in 1949 when amateurs furnished emergency means of communication during the failure, because of natural disasters, of normal communication facilities in various parts of the United States. Thus, during the winter months of 1948–49 when a large portion of the Far West was snowbound, gaps in communication lines were bridged by amateur radio thereby aiding rescue work. Amateur radio performed a similar important function in connection with the major hurricanes that struck Florida during September and October of 1948. Arrangements were effected during the year for closer coordination between amateur emergency communication activities and the disaster service of the Red Cross.

With a view to further fostering the development of the Amateur Radio Service, the Commission on April 20, 1949, adopted a notice of proposed rule making which attempted, by setting forth an over-all plan, to provide express scope and direction for the immediate and long-range development of this service. To achieve this purpose,

a number of major and minor amendments to the amateur rules were proposed. The Commission invited comments from all interested parties and set July 20, 1949 as the final date for filing. Hundreds of amateurs submitted comments, both pro and con, attesting to the deep interest of the amateur in the service in which he operates.

During the fiscal year the interim authorization for use at amateur stations of narrow band frequency or phase-modulation in the bands 3,850 to 3,900 kilocycles, 14,200 to 14,250 kilocycles, 28.5 to 29.0 megacycles and 51.0 to 52.5 megacycles was extended to July 31, 1949. Other rule amendments clarified the prohibition against "broadcasting" by amateurs; authorized mobile and portable amateur operation in the United States, its territories or possessions on all amateur frequency bands; shifted the 27 megacycle band from 27.160–27.430 to 26.960–27.230 megacycles (to become effective July 1, 1949); and made certain frequencies in the band 1,800 to 2,000 kilocycles (160-meter band) available to amateurs on a geographical basis provided no harmful interference is caused to the loran system of radio navigation.

The growth of television presented a challenge to many amateur licensees to reduce radiation by their transmitters of harmonics and other spurious emissions which result in interference to TV receivers. Some radio amateurs, with facilities to do so, made extensive tests which indicated that reduction of such interference could be satisfactorily accomplished on the part of amateur station licensees within the normal service areas of television stations.

A comparatively new amateur activity, the use of "radio printers," is making rapid strides due to the availability to amateurs of surplus radio-teletype equipment. Two-way "radio printer" contacts between amateur stations in the United States and Japan have been reported.

5. CITIZENS RADIO SERVICE

The Citizens Radio Service was established on a regular basis on June 1, 1949, at which time newly adopted rules governing its operation also became effective.

The Commission allocated the frequency band 460–470 megacycles to the Citizens Radio Service in 1945, and until the effective date of the new rules stations using this frequency band were operated on a temporary basis under experimental class 2 radio station licenses.

It is the purpose of the Citizens Radio Service to provide for private short-distance radio communication, radio signaling, and the control of objects or devices by radio, with a minimum of licensing requirements, and to provide procedure whereby manufacturers of radio equipment to be used or operated in this service may obtain "type approval" of such equipment.

Any citizen of the United States 18 years of age or over is eligible to apply for a citizens station license. Pending further study of the eligibility regulations, applicants such as police, municipalities and other government agencies which might be eligible for license in any other radio service, must make a satisfactory showing of need before they may obtain licenses in the Citizens Radio Service.

The present Citizens Radio Service rules provide, among other things, a simplified licensing procedure for users of equipment approved by the Commission; operation under certain conditions of citizens radio stations without the necessity of securing a radio operator's license; two classes of stations dependent upon the power input and frequency stability; and engineering standards, technical specifications and procedural requirements for obtaining Commission type approval of equipment.

Under the simplified licensing procedure, an applicant for a citizens radio station license intending to use type-approved equipment may submit application on a single card form to the Commission's engineering field office for the area in which the applicant is located, and receive a station license without delay. Proposed users of equipment not type-approved must submit applications, including technical data regarding the equipment, to the Washington office of the Commission, where a determination will be made regarding the technical acceptability of the equipment.

In addition, the new rules outline the types of communication that are permitted, station identification requirements, station locations, etc.

The Commission has endeavored to allow the widest possible latitude of activity in the Citizens Radio Service commensurate with provisions of treaty, law, and regulation. Studies were completed during the year of information and technical data regarding station operation obtained during the experimental period of this service, and many of the findings resulting therefrom are reflected in the new rules.

The public interest in the Citizens Radio Service increased considerably during the past year and, with the service established on a regular basis, greater interest is anticipated. It is expected, too, that an increased number of manufacturers will provide equipment for use in this new service. As of this date, the transmitter of one manufacturer has received approval from the Commission under the Citizens Radio Rules.

6. STATISTICS

AUTHORIZATIONS

Authorized amateur stations and amateur operators, citizens and special aircraft radiotelephone authorizations increased by more than 61,000 during the year, bringing their total figure in excess of 645,000. Below is a comparative table for the past 2 fiscal years:

	1948	1949	Increase
Stations:			
Amateur	78,434	81,675	3,241
Citizens	48	122	74
Total	78,482	81,797	3,315
Operators:			
Amateur	77,923	80,721	2,798
Aircraft	[1] 80,000	104,569	24,569
Commercial	347,803	378,500	30,697
Total	505,726	563,790	58,064
Grand total	584,208	645,587	61,379

[1] Estimated.

APPLICATIONS

During fiscal 1949, applications in these operator groups collectively totaled more than 162,000. By service, these applications were as follows: Amateur, 33,604; citizens, 488; commercial radio operators, 102,606; special aircraft radiotelephone authorizations, 26,136, and about 200 applications to act as issuing agents in the latter connection.

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CHAPTER VII. FIELD ENGINEERING AND MONITORING

1. GENERAL

The Commission's field engineering and monitoring activities tie in with the technical aspects of radio regulation. Their chief function is to maintain watch over the use of the radio spectrum to see that frequency allocations, station assignments and equipment performance specifications are adhered to. In this respect the field force constitutes an ether traffic patrol.

The field work is decentralized into nine regions for the United States and its possessions. Within these regions are 23 district offices, 6 suboffices and 3 ship offices, supplemented by 10 primary monitoring stations and 10 secondary monitoring stations. (See listing in appendix.)

2. FIELD OFFICES

Field engineering offices are located in 33 cities in the United States, Puerto Rico, Alaska, and Hawaii. Their duties include monitoring to see that stations operate on the frequencies assigned to them; inspection of all types of radio stations to insure that equipment is properly installed, particularly on ships and aircraft where safety of life and property is a major consideration; tracing and closing down illegal operation; investigating interference complaints which arise in connection with radio transmission; making engineering surveys and measurements for use of the Commission in allocating frequencies; conducting examinations for radio operators; and, on occasion, furnishing directions to lost airplanes and providing bearings on ships in distress.

Field offices function as "on the spot" representatives of the Commission in supplying information, both general and technical, to persons desiring to apply for construction permits or licenses and, further, to assist them to operate their stations in compliance with Commission rules and regulations. This is particularly true in areas located at considerable distances from Washington. After the applicants have received their permits, field office files and records are established. Then follows inspection, monitoring, investigation and technical survey work which is necessary to regulation.

3. DISASTER EMERGENCY COORDINATION

The nine regional managers maintain contact with organizations concerned with safety of life and property, such as the Coast Guard, Naval Reserve, Army amateur nets, Army engineers, and with municipal and state police organizations normally in control during times of emergency and disaster. Regional managers are also perfecting organizations in their respective regions whereby there will exist throughout the various states reliable amateur contacts who will take charge of and be responsible for dealing with the Commission in requesting a declaration of a state of communications emergency when conditions warrant.

These arrangements involve close collaboration with the American National Red Cross, which has established both fixed and mobile disaster communication facilities in various sections of the country, interconnected by wire and radio circuits. A TWX machine has been installed by the Red Cross in the field net control for direct communication with the Commission's Washington office for emergency purposes.

FCC assistance was given, through regional managers, in 5 communication emergencies during the past fiscal year: The Florida hurricane, September 20 to 22, 1948; Midwest ice storm, January 12, 1949; Midwest blizzard, January 29, 1949; levee break at Port Allen, La., March 24, 1949; and West Virginia flood, June 19, 1949.

4. MONITORING

Radio monitoring is the key to policing radio transmissions. A station slightly off frequency or one overmodulated, as examples, can cause serious disruption to other radio services. Another important monitoring service is the gathering of data for use in frequency allocations, assignments of stations, and in international conferences. This work is supplemented by station inspections by the field offices. The latter correct many discrepancies, such as enforcing proper tower lighting for the protection of air travel, measures for the safety of operating personnel, and compliance with other rules and regulations.

The 1,738 major monitoring cases handled during the year, compared with 1,445 in 1948, illustrate the growing dependence upon the Commission's listening posts for policing the ether and enforcing radio traffic regulations.

Because of its efficient system, the monitoring network performs an incidental service in helping locate lost planes. Systems operated by the military, which were set up for such work in the United States during the war, are no longer in operation, and the Commission's monitoring facilities constitute the only large system now available for performing this service. During the past year 141 requests were received in this connection as compared with 170 in 1948. To some extent, this decrease reflects increased air safety measures. However, requests for such aid will continue. Among instances of monitoring assistance given during 1949 were those resulting in the rescue of a plane forced down in the Caribbean, aid to a famous transoceanic flyer, and getting a planeload of cadets back on the beam.

Representatives at recent international conferences have requested information concerning the Commission's monitoring system. International planning organizations continue to require its assistance in collecting data on occupation and use of frequencies. With such information, the United States representatives are aided materially in their participation in world-wide planning for efficient use of the spectrum.

These and other monitoring services depend upon a highly coordinated interconnecting teletypewriter and radio communication system which handled more than 46,000 messages (over 1,600,000 words) last year.

ENFORCEMENT ARM OF MONITORING

Enforcement work is an integral part of monitoring operations. Enforcement is required by the Communications Act and by international treaties to which the United States is a party. Additionally, the Commission issues regulations based upon its authority under the act and many of these require monitoring for enforcement.

Practical administration must concern itself with the effect of a radio signal and its characteristics. Monitoring stations, by scrutinizing the signals of radio stations, fill this practical need. They employ highly accurate frequency measuring equipment, and perform signal analysis through the use of special analyzing devices developed by the Commission.

During the fiscal year all monitoring stations except one were equipped with a device for converting radio printer signals into actual printed messages, which has enabled the Commission to propose relaxing the requirement that such stations employ old-fashioned and costly hand-sending methods to identify themselves. This is an ex-

ample of the manner in which the Commission cooperates with industry in lessening requirements when radio progress makes it possible to do so. With respect to ships, the situation in regard to maintaining frequency within the allowable tolerances has greatly improved, and it is believed that this improvement resulted largely from monitoring findings.

The world continues to experience unstable conditions and one of the fields of instability is in radio. While many nations are pledged to cooperate in the submission of information concerning their operations and to adhere to established standards of operation, some of these promises are not always met. As a result, there come to notice many unlisted foreign radio operations which not only cause interference but often operate contrary to agreed international procedure. By means of monitoring an elaborate identification file and "knowing how," the Commission has been enabled to identify many of these stations and report their improper performance to the Department of State.

The public was recently acquainted with the effects of "jamming" the broadcasts of the United States intended to reach the nationals of another country. The Commission's monitoring stations played an important part in collecting evidence upon which the United States position was predicated and made public.

As far as our own country is concerned, the policing of hundreds of thousands of radio signals is a huge task. Stations which operate with technical deficiencies such as off-frequency, broadness beyond that necessary, and poor quality of signals, are advised and required to correct the condition. A follow-up is provided so that actual correction results in practically all cases.

As a result of the necessity of employing monitoring personnel in other more pressing work, the number of men who could devote their attention to enforcement has been reduced. This is reflected in a drop in advisory notices sent to offending stations from 15,064 in 1948 to 11,679 in 1949.

5. INSPECTIONS

BROADCAST STATION INSPECTIONS

Commission engineers made 1,966 inspections of broadcasting stations in fiscal 1949, which were 210 less than the previous year. AM stations led with 1,663 inspections, while 267 inspections were made of FM stations and 36 inspections of TV stations. Inspections are made on an irregular basis—once during the station's license period—to assure that the station is rendering a satisfactory broadcast service in compliance with the terms of its authorization. Numerous technical requirements such as tower lighting, safety devices, and

maintenance of directional characteristics are checked during these inspections.

Included in the above figures are initial inspections of new broadcast stations. These were made while the stations were on equipment tests preliminary to commencing regular operation. The break-down of initial inspections was 329 AM, 73 FM, and 8 TV stations. Upon being found satisfactorily constructed and operated, these stations were certified for regular programming.

SHIP STATION INSPECTIONS

Since 1910, when the United States first enacted laws requiring radiotelegraph installations on ships, the inspection and enforcement activities of the Commission and its predecessors have been directed toward achieving the most reliable and efficient operation of such equipment. As a result of regular, thorough inspections and the strict enforcement of essential regulations, the efficiency of radio in safeguarding the lives of the thousands of people who travel by sea, and in preserving millions of dollars in property, has been maintained in a very high degree.

However, the enforcement of safety radio standards on board United States and foreign merchant ships, under the provisions of the Communications Act of 1934, the International Convention for the Safety of Life at Sea and various other international treaties, was relaxed somewhat during the year due to the transfer of field engineers, normally assigned to ship inspectional work, to the solution of problems created by the rapid growth of other radio services. Despite the shortage of adequate personnel, more than 11,000 ship radio station inspections were completed. A comparison of the number of ship station inspections conducted during the past five fiscal years is provided by the following table:

Number of ship inspections

	1945	1946	1947	1948	1949
United States ships	13,843	12,765	11,717	10,117	7,991
Foreign ships	1,888	1,023	2,231	2,364	3,041
Total	15,731	13,788	13,948	12,481	11,032

It will be noted that though the number of foreign ship inspections increased by 29 percent during 1949, the number of United States vessel inspections decreased by 21 percent. This was due in part to the fact that for several months during that year domestic shipping was at a standstill because of seamen's and longshoremen's strikes. This was reflected in the number of discrepancy notices served. Comparable figures for the last 5 years were:

Number of discrepancy notices served

	1945	1946	1947	1948	1949
United States ships	8,677	8,365	8,040	10,519	8,244
Foreign ships	714	404	1,190	1,688	1,752
Total	9,391	8,769	9,230	12,207	9,996

A total of 3,556 violations of safety radio standards were detected and remedied during the inspections of ship stations in 1949. This compares with 4,433 in 1948. Statistics for the last five fiscal years are here shown:

Violations cleared during inspections

	1945	1946	1947	1948	1949
United States ships	7,580	6,830	4,673	3,925	3,000
Foreign ships	229	129	455	508	556
Total	7,809	6,959	5,128	4,433	3,556

INSPECTION OF OTHER RADIO STATIONS

The tasks in which radio may be employed and the benefits to be derived from its many uses continue to increase with each year. New services and new stations call for an increase in the scope and complexity of other than broadcast and ship inspections. In 1948 a total of 14,605 inspections were made of land stations other than broadcast, while in 1949 the figure was 10,534. In 1948 technical deficiencies numbering 4,308 were reported; in 1949 there were 4,212.

6. OPERATOR EXAMINATIONS

Unabated interest in obtaining radio operator authorizations of various kinds was attested by the growing number of applications (see chapter on "Radio Operators").

Operator examinations are largely given in the field. In the commercial radio operator classes, there were 20,874 new applicants for radiotelephone and 2,032 new applicants for radiotelegraph. Of these, 9,746 failed the radiotelephone examination and 816 failed the radiotelegraph code test. However, 4,949 were issued restricted radiotelephone operator permits by virtue of having obtained a passing grade in element I, while 71,986 applicants obtained this permit on declaration of their familiarity with rules and regulations pertaining to small station nonbroadcast and nonamateur operation. Renewal licenses numbering 5,988 were issued. Amateur radio operator applicants totaled 4,829 for class A privileges and 17,229 for class B. Special

aircraft radiotelephone authorizations issued by the field offices amounted to 663.

7. INVESTIGATIONS

The Commission's field engineers were increasingly active in investigating cases of interference between the various radio services, as well as interference caused to broadcasting by various electrical devices. During the year, 7,618 cases required their attention. This was 778 more than in 1948.

Besides the licensed radio stations involved, 155 unlicensed stations were located in 1949 as compared to 153 in 1948. The latter were promptly taken off the air and their operators advised of their liability to prosecution under the Communications Act.

Nine of these cases were referred to the Department of Justice for appropriate action. Three convictions were obtained during the fiscal year and fines of $100, $50, and of 1 year's probation were imposed, respectively. Additionally, 4 defendants scheduled to be tried in October 1949 were at liberty on $1,000 bond each, and 3 defendants involved in another unlicensed operation were under $1,500 bond each pending trial set for August 1949.

The Commission does not, in all cases, seek the conviction of illegal operators. Some offenders have no previous violation record and are admonished about the menace of unauthorized transmission to regular radio services—particularly those used for the protection of life and property—as well as the possible penalties which may incur to themselves. In the case of thoughtless or reckless minors, the latter and his parents are not only reminded of these consequences but are advised about approved ways for youth to take up radio operation as a profession or as a hobby.

The fact that intruders on the ether lanes are speedily detected, and can be run down by fixed and mobile monitoring apparatus, is a deterrent to would-be violators generally. It is usually a person unaware of this who attempts to engage in unauthorized operation.

One unusual case during the year was the tracing and closure of a nonlicensed transmitter, hidden in a store in a West Virginia municipality, which was used by a local faction to broadcast derogatory statements about the city officials. Commission investigators also halted the operations of several "bootleg" stations which charged for time but caused interference to regular broadcast. Each year the Commission apprehends unlicensed individuals who invade the bands assigned to amateurs. One such operation was traced to a crew member of a ship far at sea, and he was made aware of his transgression before the vessel reached port.

As in previous years, action had to be taken against unlicensed radio operation in connection with betting on horse racing. Bookmakers in some States, prevented from receiving results by leased wire, actually set up and attempted to operate long- and short-range transmitters to flash track results to their establishments on the outside. On the other hand, some individuals and groups sought to obtain an advantage over certain bookmakers by radioing indications of the winning horse so that confederates could place almost "sure" bets. An example of the bookmaker's use of clandestine radio is contained in a Commission case pending in the Federal court at Las Vegas, Nev. The other category is reflected in an indictment obtained against 3 individuals who resorted to the same means in an effort to "beat" bookmakers in Seattle, Wash.

8. TECHNICAL OPERATIONS

The number of stations operating in higher frequency ranges has increased the need for precision types of measuring equipment at the field offices and monitoring stations. As a result, a considerable quantity of new apparatus was procured, including frequency measuring and field intensity measuring equipment, which will permit more complete surveillance of the technical operation of stations in all frequency ranges. For example, equipment has been purchased which will permit accurate frequency measurements on all frequencies up to 10,000 megacycles.

The number of requests for engineering measurements from within the Commission and from other Government agencies increased about 10 percent over the previous year. Field offices and stations engaged in 118 engineering projects involving engineering studies, investigations and measurements requiring a total of 8,685 man-days for completion as compared with 6,276 man-days for similar work for the previous year, an increase of 35 percent. Examples were:

The directional patterns of 99 different standard broadcast stations were checked to determine whether the stations were operating their antenna systems according to the specifications set forth in their licenses. In addition, 14 projects involving field intensity measurements were initiated.

The long-range broadcast signal intensity recording programs are being continued at the monitoring stations and at the Baltimore district office. These programs now include field intensity recording on AM, FM and TV broadcast stations and on atmospheric radio noise. Information obtained is used in connection with frequency allocation studies and in determination of range of coverage to be expected.

Measurements and observations were made for the Bureau of Standards to determine whether the new standard frequency station now operated in Hawaii materially improves the standard frequency service rendered by the Bureau. All monitoring stations were engaged in this project.

Measurements were made for the Coast Guard for the determination of the interference capabilities of a new transmitter for use in the loran navigation system.

Plans were completed and equipment installation begun on 10 cars which are to be used to test field intensity measurements, frequency measurements and make other technical determinations. These mobile units will also be employed to make various engineering measurements which cannot be accomplished at the fixed monitoring stations.

Other field activities involved construction of special monitoring and other equipment which cannot be procured in the required form, and modification of commercially available equipment to meet specific applications. Extensive improvements were made to the VHF field intensity recording installations at the nine monitoring stations engaged in this activity.

9. FIELD STATION LOCATION CHANGES

The Cleveland, Ohio, suboffice was closed December 31, 1948, due to lack of funds, and Cleveland was established as a quarterly examination point. Budgetary limitations also closed the Juneau, Alaska, secondary monitoring station, as of June 30, 1949, and the Alaskan area will be served by the remaining Anchorage station, which was moved to a new local site.

The Livermore, Calif., primary monitoring station was moved to a new local site and the work for placing it in operation was proceeding. The Hawaiian primary monitoring station moved to Fort Hase from Punch Bowl when the latter site was taken over by the Army. Encroachment of construction caused the secondary monitoring station at Broken Arrow, Okla., to move to Muskogee, and local relocation of one at Bay St. Louis, Miss. Another moved from Navy property at Richmond, Fla., to Commission property at Fort Lauderdale. Inability to renew a lease caused the Searspoint, Maine, station to shift to another local site.

A list of field offices and monitoring stations appears in the appendix.

10. STATISTICS

The extent of certain engineering field activities is indicated in the following tabulations for the calendar year 1949 which pertain only to work done outside of Washington:

Inspections:	
United States Ships	7,991
Notices served	8,244
Violations cleared during inspection	3,000
Foreign ships	3,041
Notices served	1,752
Violations cleared during inspection	556
Land stations	12,500
Notices served	4,212
Monitoring:	
Cases	28,307
Notices served	11,679
Investigations:	
Licensed stations	4,887
Unlicensed stations	3,368
Examinations:	
Commercial, new	23,722
Commercial, renewals	247
Amateur	17,229
Licenses issued:	
New	90,734
Renewals	6,446

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CHAPTER VIII. TECHNICAL STUDIES

1. GENERAL

The technical research staff of the Commission is a radio regulation what the mechanical and civil engineer is to material construction. Unless the foundation of a structure is sound, the ultimate job—be it building, bridge, or frequency allocation—will collapse. Continuing research is essential to radio's future, and its benefits are shared by the public and industry.

Probably the most difficult task of the Commission is the allocation of spectrum space to specific radio services. A workable and lasting allocation plan requires a detailed knowledge of propagation characteristics and their impact upon service ranges, interference potentialities, channel separations, power limitations, and other interrelated matters. Such scientific knowledge is best obtained through practical field measurements and careful engineering analysis of the resulting data. This scientific approach is laborious and time consuming, but there is no satisfactory substitute.

The same considerations apply to principles of radio engineering and technical operation, such as those embodied in the Commission's Standards of Good Engineering Practice. The technical staff must furnish the best available answers to the complex problems involved before allocation plans and engineering standards can be adopted by the Commission.

2. TECHNICAL INFORMATION DIVISION

The Technical Information Division acts as an operational group and technical consultant to the Commission. For this purpose it organizes projects for the collection of data by the Field Engineering and Monitoring and the Laboratory Divisions and for obtaining data from other organizations. It also participates in the technical studies incident to international conferences and treaties, and represents the

Commission in the coordination of radio research, standardization and instrumentation with government and industrial organizations.

During the thirteenth year of its operation, the Technical Information Division continued work on its long term projects, inaugurated new projects, and tailored its general sphere of activities to the requirements of a rapidly changing and expanding industry. The year was marked by a large number of engineering conferences arising largely from the technical problems invited by the development of new radio services. The TID continued to carry on special studies and to collect and analyze basic data concerning radio wave propagation as well as other communication problems, and to make the resulting scientific information available to the Commission for guidance in the promulgation of new rules and the determination of technical limitations and practical engineering standards.

A factual knowledge of equipment capabilities and limitations and of radio wave propagation characteristics is fundamental to frequency allocations. The whole structure of radio regulation depends on the soundness upon which this framework of frequency allocation is built.

A judicious allocation of radio frequencies to the various radio services presupposes a knowledge of many highly technical and complicated things, including ionosphere and troposphere propagation terrain effects, useful intensities of signal as related to various sources of interference, geographical and frequency separations necessary to alleviate interference in accordance with various requirements, equipment capabilities and limitations, new developments and their possibilities, etc.

The Commission requires a detailed knowledge of the propagation characteristics of radio signals throughout the spectrum in order that the most economic and practical allocation of facilities may be achieved. The propagation characteristics of the band of frequencies allocated to a particular service must be consistent with the operating requirements. The allocation of stations within a service, i. e., the determination of cochannel and adjacent channel distance separations, service ranges and power limitations must be founded on a knowledge of propagation. Such knowledge is best obtained from deductions arrived at through the study and analysis of long-term field intensity measurements involving the use of carefully calibrated recording equipment and requiring the attention of experienced engineers. It is the primary function of the TID to obtain such data and furnish highly reliable solutions to the technical problems involved.

The following problems were among those under study during the past year:

MEDIUM FREQUENCY PROJECTS

Sunspot cycle recordings.—Solar activity has a profound effect upon radio wave propagation. During daytime hours, standard broadcast stations are only heard over relatively short distances. At night, skywave signals may be heard from distant States as well as from Mexico and Canada. The sunspot cycle covers a period of about 11 years. The Commission's sunspot cycle project was inaugurated in 1938 and is still active. Continuous recordings of broadcast signals are being made at Baltimore, Md.; Grand Island, Nebr.; Portland, Oreg.; Powder Springs, Ga.; and from time to time at other points.

These data are needed to supplement that taken in previous years. Additional recording must be done to cover the full cycle. Coordination of this information with similar data recorded in Canada was started during the year and will be continued for some time to come.

Meteorological conditions and their effect upon field intensities.—The study of the relationship between field intensities and weather conditions was continued at a decelerated pace. The signals from WCAU, Philadelphia, were recorded at Baltimore and correlated with simultaneous recorded weather data. Too little information is at hand to make any firm conclusions concerning the physical causes involved. The data, however, serve to illustrate the extent to which groundwave signals, and the radio service dependent thereon, vary in time. The work is being continued.

Atmospheric noise.—Continuous field intensity recordings of atmospheric noise between 200 and 1,600 kilocycles were continued as in previous years. This information is analyzed and correlated with thunder-storm data and the results are used in the preparation of a series of noise maps to show characteristic variations with the time of day and a percentage of time for each frequency band and for various latitudes. These maps are used in estimating the signal level required to provide an acceptable radio service in the presence of atmospheric noise and, hence, the possible service ranges when interference from other stations is absent. Because of the pressure of other duties, analyses and map preparation could not be undertaken during fiscal 1949.

Skywave pulse transmissions.—Radio signals which travel from the transmitter to the receiver by the way of the E or F layers of the ionosphere are characterized by multiple reflections of different relative amplitudes and phases, depending on the distance or range of reception. To determine action and effect, pulses transmitted by certain broadcast stations which have volunteered their assistance are received simultaneously on loran receivers at distances of 500 to 2,000 miles. The pulses appearing on the oscilloscopes of each receiver are

photographed at equal intervals of time. The results are then analyzed to determine the signal intensities exceeded for various percentages of the time for the components arriving by way of one, two, three or more reflections or "hops" from the ionosphere. Due to the pressure of other projects, collecting this field data has been delayed. Additional measurements will be needed before any definite correlations can be determined.

Performance of directional antennas.—A government-industry conference was held in preparation for the September NARBA session and several subcommittees were appointed to deal with specific engineering tasks. The division collaborated with one committee in testing the performance of about 29 operating directional antennas. The chief object is to determine whether the restriction of skywave interference provided by directional antennas is properly measured by the minima produced in the groundwave radiation pattern or whether any additional precautions are desirable.

TECHNICAL STUDIES AND STANDARDS

General.—The rapid increase in the number and kinds of new radio services has produced a whole new crop of technical problems. Each new service requires the preparation of specific rules including technical definitions, equipment requirements, and operational limitations. This often requires intensive studies involving formation of committees representing other agencies as well as industry. Whenever technical difficulties are encountered, the various divisions of the Commission turn to the Technical Information Division for assistance. During the past year the number of such requests increased to a point where the limited TID personnel was able to handle only those of the very highest priority.

Low-power rules and restricted radiation devices.—The Commission's low-power rules became the subject of serious consideration, partly because of complaints of interference in the broadcast band from certain low-power systems and devices, and partly from the demand of the industry for a clarification of the present rules. The TID sponsored a committee to study the problem and make recommendations to the Commission. During the year this work was organized as a joint effort in which government agencies and the electronics industry participated. One industry-wide meeting and several subcommittee meetings were held. A multiplicity of problems and policy matters have arisen regarding these matters. The study is in its initial stages.

The TVI (television interference) problem.—Television receivers are unusually susceptible to interference. With their rapid manufacture and sale during the past year, the number of complaints of interference received by the Field Division increased far beyond

anything anticipated. A study was undertaken to determine the technical phases of TVI. This is in conjunction with certain analysis work being performed by the Laboratory Division. The problem is complicated and will require much testing and study before a solution can be reached.

Receiver radiation.—The radiation of radio-frequency energy from receivers, especially TV receivers, has also become a serious matter. The rapid development of this new entertainment service and the constant effort to build cheaper and cheaper receivers has made the problem a difficult one. The TID is represented on the joint RMA-SAE Committee dealing with this problem. The Division has conducted studies and furnished technical advice. To date only slight progress has been made. The work is of a continuing nature.

Coordination of technical rules.—With the large number of new radio services recognized by the Commission, the problem of coordinating the various technical phases of the rules for one service with those of other services has become a necessity. The responsibility for such coordination with a view to uniformity throughout all services has been charged to the TID. This work will be continued and expanded during the year.

Single side band suppressed carrier studies.—With the ever-increasing demand for frequency space, engineers have turned to the single side band suppressed carrier method of operation because it offers a saving in the band-width requirements. Many technical questions have arisen concerning the actual band width needed for various types of modulation, the methods of calculating and specifying power, etc. The study of these problems was started early in the year but, due to the pressure of other work, was left for future attention.

Carrier current radiation measurements.—With the proposal to write rules and prescribe technical limits of operation for carrier current systems, it became necessary to investigate the actual nature of the field radiated from a power line or other conductors along which carrier current communications are being propagated. Almost no practical knowledge regarding this matter was available, even from those large commercial organizations where extensive systems are in operation. It therefore was necessary to make comprehensive plans for widespread carrier current field intensity measurements. They have been advanced to the formative stage and the cooperation of the industry and other governmental agencies has been solicited. This project is expected to receive increased attention during the coming year.

VHF AND UHF PROPAGATION STUDIES

VHF television project.—The rapid growth of radio has stimulated development in and increased the demand for higher and higher

frequencies with the result that the Commission has had to establish services and license stations in many parts of this newly developed region. The lack of knowledge regarding propagation and technical standards has made the Commission's problem a difficult one. The study of television allocations alone has constituted a momentous task. During fiscal 1949, the TID devoted the full time of seven employees for a period of approximately 8 months to the television problem and its allied Ad Hoc Committee work. This joint FCC-Industry committee was appointed during the October 1948 television hearing (Docket 8736 et al.). The chief of the TID served as chairman. The television industry and various government agencies were represented. During the period October 1948 to July 1, 1949, the Ad Hoc Committee held 28 formal meetings. The number of informal conferences and subcommittee meetings was not recorded but ran well into three digit figures and involved a large number of man-hours.

The information from Commission field intensity projects was integrated with that obtained from the published work of other authorities on radio-wave propagation. Additional data were furnished by the various representatives of the industry who served on the Ad Hoc Committee. All of this material was analyzed and studied in order to determine, as nearly as possible, the effects of variations in transmitter and receiver antenna height and directivity upon coverage, the amount of transmitter power required for satisfactory service over any given area, the extent of service degradation caused by tropospheric and ionospheric propagation, the amount of variation in signal strength with different types of terrain, and the relative effects of frequency on the above factors.

Under the general direction of the Ad Hoc Committee, the TID cooperated with the General Radio Propagation Laboratory of the National Bureau of Standards in completing a large volume of complex statistical and analytical work in a minimum amount of time. It was only through the close collaboration maintained with the Central Radio Propagation Laboratory as well as with the industry that this momentous job was finished in the time allotted.

The findings of the Ad Hoc Committee appeared in technical reports released by the TID. The whole series include over 130 pages of highly complicated calculations, derivations and extrapolations with resulting formulae, charts, tables, curves, etc. These reports probably represent the most highly scientific study which the Bureau of Engineering has ever undertaken. They are destined to have a profound and far-reaching effect upon the future development of the television industry.

Projects in the FM band (88 to 108 megacycles).—The VHF field intensity recording projects inaugurated during the previous year

were continued. Recorders were in operation at Millis, Mass.; Laurel, Md.; Powder Springs, Ga.; South Miami, Fla.; Allegan, Mich.; Grand Island, Nebr.; Portland, Oreg.; Livermore, Calif.; Honolulu, Hawaii; and Trinidad, British West Indies.

The WBAM-W2XCT project.—The charts obtained in the WBAM-W2XCT project of the previous year were further analyzed with a view to expanding the general propagation knowledge in the VHF and UHF bands. These charts, recorded over a period of about 12 months at four separate locations on 47.1, 106.5, and 700 megacycles, yielded the best data available for analysis on a statistical basis.

The Trinidad project.—Signals from WWV on 35 megacycles were recorded throughout the year at Trinidad, British West Indies. This project is being conducted on a joint basis with the Bureau of Standards. Equipment and supplies are being furnished by the Commission while plant facilities, electric power and personnel are being supplied by the Bureau of Standards. Due to changing conditions in the F2 layer of the ionosphere at this frequency, usable signals were received during only part of the year. However, this negative information is almost as useful as is positive information. The project is being continued.

Other VHF and UHF projects.—In addition to the projects previously described, the following problems received preliminary study and general plans formulated for the inauguration of separate studies:

1. A study of the effects of variable hydrographic conditions on wave propagation.
2. A study of terrain effects upon wave propagation.
3. A study of surface coverage (trees, shrubs, etc.) and their effect upon propagation.
4. Analytical studies of tropospheric interference.
5. Tropospheric interference studies for the UHF band.
6. Tropospheric interference standards for the VHF fixed and mobile services.
7. A study of "scatter effect" and its probable impact upon VHF and UHF services.
8. The development of automatic devices to scale field charts and analyze the resulting data.

Technical cooperation with Government and industry.—The Commission is represented by its Technical Information Division on a number of important standing committees of government and industry. Among these are executive groups of the Central Radio Propagation Laboratory, the URSI (International Radio Scientific Union) and CCIR (International Radio Consultative Committee), committees of the Institute of Radio Engineers and the Radio Manufacturers Association, and panels of the Committee on Electronics.

The Chief of the TID also served as an alternate to the chairman of the Commission on the President's Scientific Research Board.

In addition to furnishing technical advice to the Commission, the TID is called upon to answer technical questions of other government agencies, industry, and private engineers. During the past year demands of this nature increased far beyond those of any previous period, and backlogs in routine work developed.

3. LABORATORY DIVISION

GENERAL FUNCTIONS

The Laboratory Division operates a laboratory at Laurel, Md., for technical research and investigation to assist the Commission in allocating frequency bands and establishing and revising engineering standards and regulations for new as well as existing radio services.

Examples of the Laboratory Division's activities are (1) investigation of various methods of transmission and reception to determine which method permits the most efficient utilization of the spectrum, (2) tests of types of transmitters to determine whether interfering signals are emitted on other than the frequency actually employed, and (3) tests of receivers to determine how close together the Commission might place stations without the listener receiving several stations at the same time.

Laboratory testing concerns type of equipment rather than individual units. Attempt is made to anticipate interference problems and to have remedial measures taken at the manufacturing end rather than to make individual investigation after interference occurs. If this procedure is not followed while a system is developing a multitude of units may be placed in operation, after which the only remedy may be of a "patchwork" nature.

For example, a manufacturer intending to make many identical units submits to the laboratory a sample of those he intends to produce. At the laboratory this model is subjected to tests to determine if its operation is in keeping with engineering standards and will not cause interference to other services. If the equipment proves to be satisfactory, it is type approved. This assures the manufacturer and the Commission that the public interest will be protected by the use of similar equipment.

Following is a summary of particular laboratory activities engaged in during the year:

TELEVISION

A great amount of effort has been devoted to television studies. These studies have been centered on television interference problems since this is a no-man's land in which far too little effort has been

expended. In television broadcasting interference is one of the major problems.

To illustrate the basic reasons why television is so subject to interference: An ordinary voice broadcast channel is only 10 kilocycles wide. At 1000 kilocycles this channel width is 1 percent of the operating frequency. A television channel is 6 megacycles wide. At 60 megacycles this is one-tenth of the operating frequency. So the probability of interference to the TV channel is 10 times as great. In addition, at the frequencies employed in TV, oscillator radiation is a much more important interference factor.

Both laboratory and field tests were made on unsynchronized operation, synchronized operation and off-set carrier methods of interference reduction. In addition, laboratory tests were conducted with the use of FM video modulation within a 6-megacycle channel. Numerous demonstrations of the various TV methods just outlined were conducted at the laboratory for the Commission and for interested industry representatives.

Studies also were made covering the TV receiver oscillation problem, the problem of interference to standard broadcast stations by TV receiver synchronizing circuits and the performance of TV converters to permit the reception of UHF signals on a VHF receiver.

INDUSTRIAL HEATING, DIATHERMY, AND MISCELLANEOUS EQUIPMENT

Radio-frequency heating for industrial, medical, and other miscellaneous uses has expanded to such an extent that the kilowatts of equipment used by this group exceed the total transmitter kilowatt power required for radio communication. Such equipment employs the same frequencies used by the communications industry and, if not properly designed and operated, will emit severe interfering signals. Some of these units use power far in excess of the 50 kilowatt maximum permitted broadcast stations.

To cope with the interference situations, the Commission adopted part 18 of the Rules and Regulations covering Industrial, Scientific, and Medical Service, effective June 30, 1947. Many devices employing radio-frequency energy and capable of serious interference were not clearly within the industrial heating or diathermy classification, so they are covered by the subsequent Miscellaneous Devices section of part 18. Included in this group are electric signs which employ radio-frequency power for excitation of gases, also radio cookers and welding equipment. The welding equipment industry has been granted several extensions of the effective date of the application of part 18 to permit reduction of the emission of interfering signals to the permitted limits.

The Laboratory Division has maintained contact with the industrial heating industry, having representation on a number of committees of the American Institute of Electrical Engineers and the Institute of Radio Engineers. Standards of measurement techniques and interference reduction procedures are presently under consideration by these committees.

Diathermy apparatus used for medical therapy involves a large number of units of identical type. During the fiscal year manufacturers made 50 submissions of models for laboratory type testing. Approval was recommended for 26 types found to meet the Commission's requirements.

The steps taken to control radio interference from noncommunication users of radio devices are of great importance not only to the rapidly developing television service and other civilian radio communication services but are also a great protection to the frequencies utilized by the armed services. This aspect merits particular consideration in view of the importance of the industrial heating devices to production of military material.

STRATOVISION

The Laboratory Division made observation and measurements of the television transmissions made from aircraft flying at high altitudes in experiments by the Westinghouse Electric Corp., in cooperation with the Glenn L. Martin Co.

SERVICES OTHER THAN BROADCASTING

Studies and observations both in the laboratory and in the field were made on the problem of intermodulation which severely limits the use, in the same geographical area, of a large number of stations employed in the various mobile services on the frequencies near 150 megacycles. A number of types of equipment were tested and the problems pointed out to the equipment manufacturers.

The effect of assignment of 540 kilocycles or other lower extension of the standard broadcast band upon the operation of existing auto-alarm (distress) receivers on shipboard was subject to laboratory investigation in conjunction with certain measurements in the field by the Field Engineering and Monitoring Division. As a result of these studies the limitation upon the use of these additional frequencies was delineated.

A number of proposed units for distress use on radiotelephone equipped ships were tested during the year. Several units for this purpose were designed and constructed by the laboratory and furnished the Marine Radio and Safety Division for field testing.

PROPAGATION

The laboratory operated a 400-megacycle transmitter at Dans Rock, near Frostburg, Md., for several months during the summer and fall of 1948 and May and June 1949. Recordings were made at Laurel, and other measurements at fixed and mobile locations. These findings add greatly to the information so far available regarding the interference conditions at distances of the order of 125 miles on frequencies near the low end of the proposed UHF television band.

In addition, the laboratory made both laboratory and field observations of the 500 megacycle and 850 megacycle transmissions made by RCA in the Washington area.

CALIBRATION OF APPARATUS

The Field Engineering and Monitoring Division uses a large amount of technical equipment. The Laboratory Division must calibrate this apparatus for accuracy. For this purpose the laboratory must maintain its own instruments in a highly accurate state. In addition, some equipment used by others in obtaining data submitted in applications was compared on the accuracy of the measurements. These latter tests covered only items for which the National Bureau of Standards was not prepared to calibrate at the time. During the year 3 field intensity sets and 12 signal generators were calibrated.

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APPENDIX

1. FIELD OFFICES
2. PUBLICATIONS
3. TREATIES AND OTHER INTERNATIONAL AGREEMENTS

1. FIELD OFFICES

The Commission has 70 field offices and associated installations in more than 50 cities throughout the United States, including Alaska, Hawaii, and Puerto Rico. The great majority (64) are engaged in engineering pursuits and consists of 9 regional offices, 23 district offices, 6 suboffices, 3 ship offices, 20 monitoring stations, and 3 common carrier offices. The Bureau of Accounting has 4 field offices and the Bureau of Law, 2. A complete list follows:

BUREAU OF ENGINEERING

FIELD ENGINEERING AND MONITORING DIVISION

Regional offices	*Headquarters*
North Atlantic	506 Federal Bldg., New York 14, N. Y.
South Atlantic	411 Federal Annex, Atlanta 3, Ga.
Gulf States	332 U. S. Appraisers Bldg., Houston 11, Tex.
South Pacific	323 A Customhouse, San Francisco 26, Calif.
North Pacific	801 Federal Office Bldg., Seattle 4, Wash.
Central States	876 U. S. Courthouse Bldg., Chicago 4, Ill.
Great Lakes	1029 New Federal Bldg., Detroit 26, Mich.
Hawaiian	P. O. Box 1142, Lanikai, Oahu, T. H.
Alaskan	52 Post Office and Courthouse, Anchorage, Alaska.

District offices	*Address*
1	1600 Customhouse, Boston 9, Mass.
2	748 Federal Bldg., New York 14, N. Y.
3	1005 U. S. Customhouse, Philadelphia 6, Pa.
4	508 Old Town Bank Bldg., Baltimore 2, Md.
5	402 New Post Office Bldg., Norfolk 10, Va. (ship office) 106 Post Office Bldg., Newport News, Va.
6	411 Federal Annex, Atlanta 3, Ga. (suboffice) 214–218 Post Office Bldg., Savannah, Ga.
7	312 Federal Bldg., Miami 1, Fla. (suboffice) 409–410 Post Office Bldg., Tampa 2, Fla.
8	400 Audubon Bldg., New Orleans 16, La. (suboffice) 324 Courthouse & Customhouse, Mobile 10, Ala.
9	324 U. S. Appraisers Bldg., Houston 11, Tex. (suboffice) 329 Post Office Bldg., Beaumont, Tex. (ship office) 406 Post Office Bldg., Galveston, Tex.
10	500 U. S. Terminal Annex Bldg., Dallas 2, Tex.

11	539 U. S. Post Office & Courthouse Bldg., Los Angeles 12, Calif. (suboffice) 230 U. S. Customhouse and Courthouse, San Diego 1, Calif., (ship office) 326 U. S. Post Office and Courthouse, San Pedro 1, Calif.
12	323-A Customhouse, San Francisco 26, Calif.
13	307 Fitzpatrick Bldg., Portland 5, Oreg.
14	801 Federal Office Bldg., Seattle 4, Wash.
15	521 Customhouse, Denver 2, Colo.
16	208 Uptown Post Office and Federal Courts Bldg., St. Paul 2, Minn.
17	3200 Fidelity Bldg., Kansas City 6E, Mo.
18	246 U. S. Courthouse, Chicago 4, Ill.
19	1029 New Federal Bldg., Detroit 26, Mich.
20	328 Federal Bldg., Buffalo 3, N. Y.
21	609 Stangenwald Bldg., Honolulu 1, T. H.
22	322-323 Federal Bldg., San Juan 13, P. R.
23	7-8 Shattuck Bldg., Juneau, Alaska (suboffice) 53 Post Office and Courthouse, Anchorage, Alaska.

Primary monitoring stations	*Secondard monitoring stations*
Allegan, Mich.	Searsport, Maine
Grand Island, Nebr.	North Scituate, R. I.
Kingsville, Tex.	Spokane, Wash.
Millis, Mass.	Twin Falls, Idaho
Santa Ana, Calif.	Fort Lauderdale, Fla.
Laurel, Md.	Lexington, Ky.
Livermore, Calif.	Muskogee, Okla.
Portland, Oreg.	Bay St. Louis, Miss.
Powder Springs, Ga.	Anchorage, Alaska
Lanikai, Oahu, T. H.	Point Maldonado, P. R.

COMMON CARRIER DIVISION FIELD OFFICES

Atlanta, Ga., 515 First National Bank Bldg.
New York, N. Y., 604 Federal Office Bldg.
San Francisco, Calif., 316 U. S. Customhouse.

BUREAU OF ACCOUNTING FIELD OFFICES

Atlanta, Ga., 733 Hurt Bldg.
New York, N. Y., 624 Federal Office Bldg.
St. Louis, Mo., 334 Old Customhouse.
San Francisco, Calif., 316 U. S. Customhouse.

BUREAU OF LAW FIELD OFFICES

New York, N. Y., 604 Federal Office Bldg.
San Francisco, Calif., 100 McAllister St.

2. PUBLICATIONS

In general, the Federal Communications Commission's printed publications are sold by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Following is a list of Commission publications which are available from the Superintendent of Documents, at the prices noted, unless otherwise indicated:

Title	*Price*
Communications Act of 1934, with amendments and index, revised to September 1, 1948	$0.20
Federal Communications Commission reports (bound volumes of decisions and orders exclusive of annual reports):	
Volume 2, July 1935 to June 1936	2.00
Volume 3, July 1936 to February 1937	2.00
Volume 4, March 1937 to Nov. 15, 1937	1.50
Volume 5, Nov. 16, 1937 to June 30, 1938	1.50
Volume 6, July 1, 1938 to Feb. 28, 1939	1.50
Volume 7, Mar. 1, 1939 to Feb. 29, 1940	1.50
Volume 8, Mar. 1, 1940 to Aug. 1, 1941	1.50
Volume 9, Aug. 1, 1941 to Mar. 31, 1943	1.25
Volume 10, Apr. 1, 1943 to June 30, 1945	2.00
Volume 11, July 1, 1945 to June 30, 1947	3.75
Volume 12, July 1, 1947 to June 30, 1948	(1)
Annual reports of the Commission:	
First Annual Report—Fiscal year 1935	.15
Twelfth Annual Report—Fiscal year 1946	.20
Thirteenth Annual Report—Fiscal year 1947	.25
Fourteenth Annual Report—Fiscal year 1948	.30
Fifteenth Annual Report—Fiscal year 1949	(1)
Statistics of the Communications Industry:	
For the year 1939	.25
For the year 1940	.20
For the year 1942	.35
For the year 1943	.30
For the year 1944	.40
For the year 1945	.50
For the year 1946	.55
For the year 1947 (sections A and B)	.75
Section B (Broadcast only)	.25
Report on Public Service Responsibility of Broadcast Licensees, 1946	.25
An ABC of the FCC, 1949	.05
Radio—a Public Primer	.10
Telephone and Telegraph—a Public Primer, 1949	.10
An Economic Study of Standard Broadcasting, 1947	.40

[1] In the process of printing—available at Government Printing Office at a later date.

Title	Page
Study Guide and Reference Material for Commercial Radio Operator Examinations, revised to July 1, 1948	$0.25
Digest of Radio Regulations and Instructions for Restricted Radiotelephone Operators	.05
Standards of Good Engineering Practice:	
Concerning Standard Broadcast Stations, revised to Oct. 30, 1947	1.00
Section 26, Sunrise and Sunset Table	.10
Concerning FM Broadcast Stations, revised to Jan. 9, 1946	.10
Concerning Television Broadcast Stations, revised to Dec. 19, 1945	.15
Rules and Regulations:	
Part 0, Organization, Delegations of Authority, etc	(1)
Part 1, Practice and Procedure, revised to Jan. 26, 1949	.15
Part 2, Frequency Allocations and Radio Treaty Matters; General Rules and Regulations, revised to Apr. 27, 1949	.15
Part 3, Radio Broadcast Services, revised to Jan. 6, 1949	.20
Part 4, Experimental and Auxiliary Broadcast Services, effective Sept. 10, 1946	(2)
Part 5, Experimental Radio Services, revised to Jan. 16, 1948	.10
Part 6, Public Radiocommunication Services, revised to Apr. 27, 1949	.10
Part 7, Coastal and Marine Relay Services, revised to Sept. 30, 1945	(2)
Part 8, Ship Service, revised to May 31, 1943	.15
Part 9, Aeronautical Services, revised to July 1, 1947	.10
Part 10, Public Safety Radio Services, revised to Apr. 27, 1949	.10
Part 11, Industrial Radio Services, revised to Apr. 27, 1949	.10
Part 12, Amateur Radio Service, revised to Nov. 18, 1948	.15
Part 13, Commercial Radio Operators, revised to Mar. 30, 1949	.05
Part 14, Radio Stations in Alaska (other than amateur and broadcast), revised to Apr. 2, 1942	.05
Part 15, Restricted Radiation Devices, recodified July 21, 1948	(2)
Part 16, Land Transportation Radio Services, revised to Apr. 27, 1949	.10
Part 18, Industrial, Scientific and Medical Service, revised to Apr. 30, 1948	.10
Part 19, Citizens Radio Service, effective June 1, 1949	.05
Part 31, Uniform System of Accounts for Class A and Class B Telephone Companies, revised to May 12, 1948	.35
Part 33, Uniform System of Accounts for Class C Telephone Companies, revised to May 12, 1948	.25
Part 34, Uniform System of Accounts for Radiotelegraph Carriers, effective Jan. 1, 1940	.25
Part 35, Uniform System of Accounts for Wire-telegraph and Ocean-cable Carriers, revised to Aug. 1, 1947	.45
Part 41, Telegraph and Telephone Franks, revised to Dec. 4, 1947	.05
Part 42, Preservation of Records, revised to May 27, 1943	.10
Part 43, Reports of Communication Common Carriers and Their Affiliates, revised to July 21, 1948	.10
Part 51, Classification of Telephone Employees, effective July 25, 1944	.05
Part 52, Classification of Wire-telegraph Employees, effective July 11, 1944	.05

[2] Obtainable temporarily from the Federal Communications Commission, Washington 25, D. C., without charge.

Title	*Page*
Rules and Regulations—Continued	
Part 61, Tariffs, Rules Governing the Construction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communications Service, revised to Aug. 1, 1946	$0.10
Part 62, Applications under Section 212 of the Act to Hold Interlocking Directorates, revised to May 23, 1944	.05
Part 63, Extension of Lines and Discontinuance of Service by Carriers, revised to Dec. 30, 1946	(2)
Part 64, Miscellaneous Rules Relating to Common Carriers, revised to July 16, 1948	.10

Purchasers of the Commission's Rules and Regulations are furnished a form by the Superintendent of Documents which, when filled out and forwarded to the Commission, entitles the purchaser to receive any future amendments to the part or parts purchased, until a complete revision thereof is reprinted. In the event any exception is made in this procedure, rule purchasers will be advised by letter where the amendments may be obtained. All Standards of Good Engineering Practice and most of the rule parts are printed on 8-by-10½-inch pages and punched to fit standard three-ring binders.

The Commission is no longer able to supply lists of radio stations but, on request, will furnish a fact sheet about commercial sources of such lists, also one on commercial radio publications and services.

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[2] Obtainable temporarily from the Federal Communications Commission, Washington 25, D. C., without charge.

3. TREATIES AND OTHER INTERNATIONAL AGREEMENTS

Federal laws, international treaties, arrangements, agreements, etc., which were in force as of January 1, 1949, are listed below for reference. *Unless otherwise indicated, copies of these documents may be* purchased from the Government Printing Office, Washington 25, D. C. (TS relates to Treaty Series, EAS to Executive Agreement Series, and TIAS to Treaties and Other International Act Series.)

Date	Series	Subject
1910		Ship Act of 1910 as amended in 1912. (Radio communication on the Great Lakes.)
1925	TS 724-A	*Arrangement with Great Britain, Canada, and Newfoundland to prevent* broadcast interference by ships.
1928-29	TS 767-A	Arrangement with Canada concerning private experimental communication.
1929	TS 777-A	Arrangement with Canada, Cuba, and Newfoundland relating to high-frequency assignments.
1929	TS 910	Safety of Life at Sea Convention (London).
1930	TS 921	Amendment to Regulation XIX of Annex 1 of Safety of Life at Sea Convention.
1934	EAS 62	Arrangement with Canada concerning amateur and private experimental communication.
1934	EAS 66	Arrangement with Peru concerning amateur communication.
1934	EAS 72	Same, with Chile.
1937	EAS 109	Agreement with Canada concerning issuance of radio licenses.
1937	TS 962	North American Regional Broadcasting Agreement (Havana).
1937	TS 938	Inter-American Radio Communications Convention (First Inter-American Conference, Havana).
1938	EAS 142	Agreement with Canada concerning radiocommunications between Alaska and British Columbia.
1938	TS 949	Regional Radio Convention (Guatemala—in behalf of the Canal Zone).
1938	EAS 136	Arrangement with Canada concerning broadcasting.
1939	EAS 143	Arrangement with Canada concerning civil aeronautical services.
1940	EAS 231	Inter-American Radiocommunications Agreement (Second Inter-American Conference, *Santiago, Chile*).
1940	EAS 196	Agreement with Mexico concerning broadcasting.
1941	EAS 227	Supplementary North American Regional Broadcasting Agreement (Washington).
1944	EAS 400	Wartime agreement with Canada re broadcasting stations in Northwestern Canada.
1945		Inter-American Telecommunications Convention (Third Inter-American Conference, Rio de Janeiro). (Not yet ratified by United States.) (Not available from Government Printing Office.)
1945	TIAS 1518	Telecommunications agreement with certain governments of the British Commonwealth (Bermuda).
1946	TIAS 1553	North American Regional Broadcasting Interim Agreement (Modus Vivendi), Washington.
1946	TIAS 1527	Agreement with U. S. S. R. concerning commercial radio teletype communication channels.
1947	TIAS 1726	*Agreement with* Canada concerning FM broadcasting in 88-108 Mc.
1947	TIAS 1670	Interim arrangement with Canada concerning mobile transmitters.
1947		International Telecommunication and Radio Conferences, Atlantic City. (Copies available through International Telecommunication Union, Geneva, Switzerland, pending printing by the Government Printing Office.)
1947	TIAS 1652	Agreement with Great Britain concerning standardization of distance measuring equipment.
1947	TIAS 1676	*Agreement with the United Nations concerning its headquarters' use of* radio.
1948	TIAS 1802	Arrangement with Canada on engineering standards applicable to allocation of standard broadcast stations.

In addition, the United States is bound by certain treaties wherein some of the contracting countries did not become parties to subsequent agreements, thereby binding the United States to the original document. These include:

Date	Series	Subject
1912	TS 581	International Radiotelegraph Convention (London).
1927	TS 767	International Radiotelegraph Convention and General Regulations (Washington).
1932	TS 867	General Radio Regulations annexed to the International Telecommunications Convention (Madrid).
1937	EAS 200	Inter-American Arrangement concerning Radiocommunications and Annex (Havana).
1938	TS 948	General Radio Regulations (Cairo Revision, 1938); annexed to Telecommunications Convention (Madrid, 1932).

There are also some treaties, agreements, or arrangements primarily concerned with matters other than the use of radio but which affect the work of the Commission insofar as they involve communications. Among the most important of these are the following:

Date	Series	Subject
1944	TIAS 1591	International Civil Aviation Agreement, Chicago.
1946		*ICAO Communication Division, Second Session, Montreal.*[1]
1946		Special Radio Technical Meeting, Montreal.[1]
1946		ICAO Regional Air Navigation Meetings, Communications Committee, Final Reports.[1]
1947		
1948		
1949		
1949		ICAO Communication Division, Third Session, Montreal.[1]

[1] Available from Secretary General of ICAO, Dominion Square Bldg., Montreal, Canada.

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