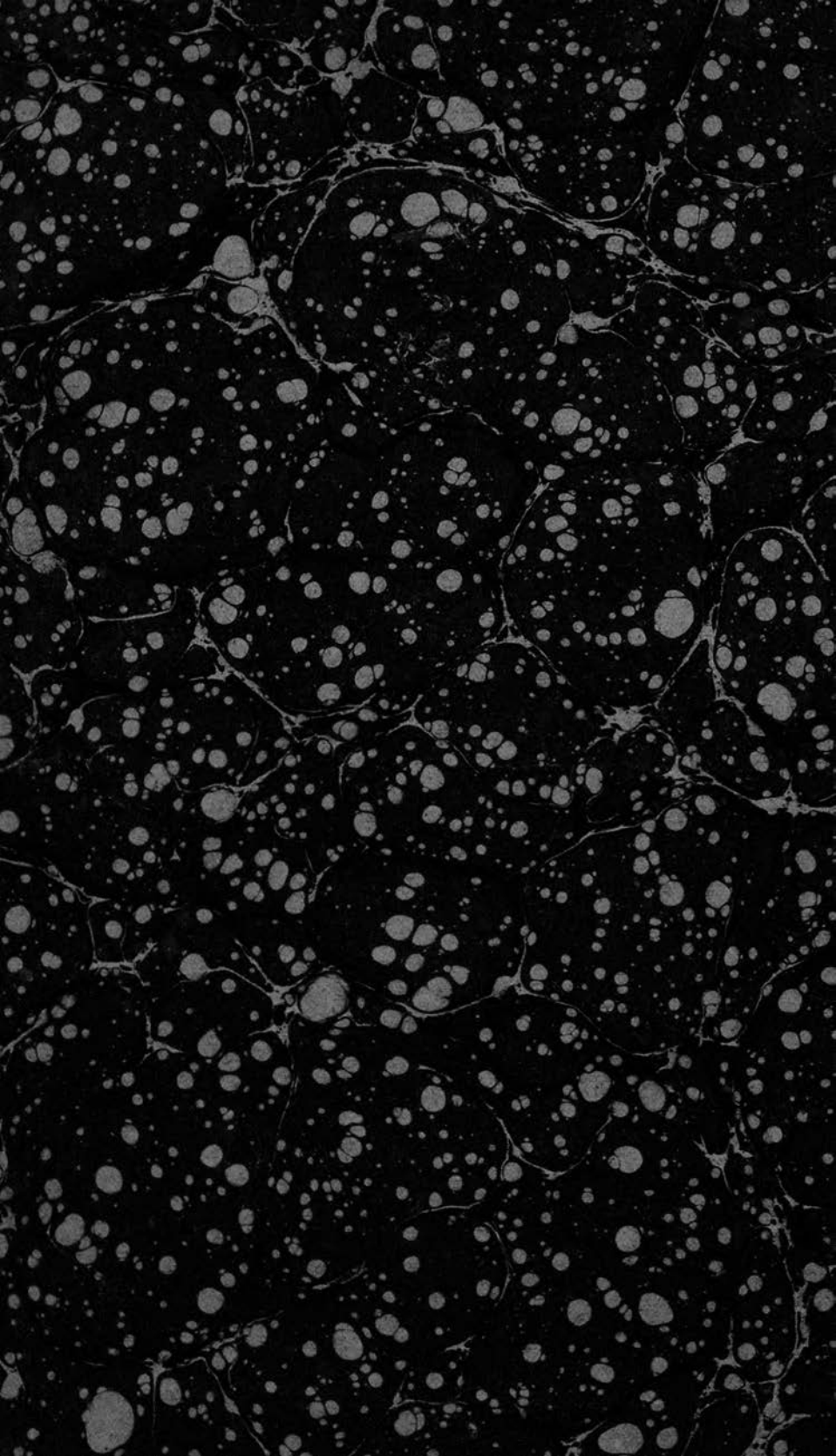


SPECIAL
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ANNUAL REPORT
OF THE
SECRETARY OF COMMERCE
1918

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ANNUAL REPORT
OF THE
SECRETARY OF COMMERCE.

DEPARTMENT OF COMMERCE,
OFFICE OF THE SECRETARY,
Washington, October 30, 1918.

To the PRESIDENT:

I have the honor to submit herewith my sixth annual report, covering the operations and condition of the Department during the fiscal year which ended June 30, 1918. It traces in a general way its operations to October 1, 1918.

Travel Allowance to Department Employees.

The unjust practice continues requiring some of our employees on small salaries who travel on Government business to pay, in large part, their own expenses. I renew my request that the law be changed to permit paying the necessary expenses of employees when required to travel on Government work.

Representatives to Meetings and Conventions.

When representatives from the Coast and Geodetic Survey, the Bureau of Fisheries, the Bureau of the Census, and other services are called upon to address conventions and meetings on the work conducted by them, they can not go unless they pay their own expenses or the expenses are paid by the organization they address. By special provision of law the Bureau of Standards may and does send representatives to meetings and conventions at public expense. This privilege should be extended to all other bureaus of the Department.

The American-Canadian Fisheries Conference.

The American-Canadian Fisheries Conference was appointed by the Governments of the United States and the Dominion of Canada for the purpose of considering and adjusting the differences between the two countries on the subject of fisheries. The con-

ference held its first session in Washington on January 16, 1918, and later conducted hearings in Boston; Gloucester; St. John, New Brunswick; Seattle, Wash.; Prince Rupert, British Columbia; Ketchikan, Alaska; Vancouver, British Columbia; New Westminster, British Columbia; and Ottawa, Canada. The final meeting of the conference was held at the Hotel Champlain, New York, on September 6. A report was then signed and transmitted to the Secretary of State of the United States and to the Governor in Council of the Dominion of Canada. The report is unanimous, and it is hoped will lead to a satisfactory and permanent solution of the problems considered.

Vessels of the Department's Marine Services.

The first-class seagoing lighthouse tender *Cedar* was placed in commission in Alaska in August, 1917, and has rendered satisfactory service.

Three of the older vessels of the Bureau of Fisheries, the *Grampus*, *Curlew*, and *Blue Wing*, having outlived their usefulness, have been condemned and sold.

The small Fisheries steamer *Halcyon*, which was taken over by the Navy on May 14, 1917, made the fine record of 98.20 per cent on patrol service during the past severe winter, only two ships out of over a hundred making a higher record.

The Department had the following vessels in its marine service on October 1, 1918:

Service.	In operation.	Not in operation.	Being built.	Loaned to Navy Department.	Total.
Coast and Geodetic Survey.....	3	1	0	5	9
Bureau of Navigation.....	2	0	0	1	3
Bureau of Lighthouses:					
Tenders.....	3	0	0	47	50
Light vessels.....	63	0	2	3	68
Bureau of Fisheries.....	6	0	0	4	10
Total.....	77	1	2	60	140

This is exclusive of 4 vessels loaned to the Coast and Geodetic Survey by the Philippine Government and of 54 motor boats of all sizes operated by the Bureau of Fisheries.

On February 4, 1918, Cross Rip Light Vessel No. 6, Mass., was dragged from her station by ice and was lost with all the crew of six. On August 6, 1918, Diamond Shoal Light Vessel No. 71,

N. C., was sunk at her station by an enemy submarine. The crew were all saved.

No Trials Under Indictments Resulting from "Eastland" Disaster.

Last year I called attention to the fact that the courts had not acted under existing indictments in the matter of the licensed officers who were in charge of the steamer *Eastland* when she sank. No action has yet been taken. The attention of the proper authorities has been called to the delay of over three years.

A Permanent Home for the Department of Commerce.

This matter has been referred to repeatedly in my annual reports and the reports of the Public Buildings Commission, authorized to ascertain what public buildings are needed to provide permanent quarters for all Government activities in the District of Columbia.

The buildings occupied by the Department of Commerce and covered by the following statement are:

1. Commerce Building, Nineteenth Street and Pennsylvania Avenue NW.
2. Bureau of Fisheries Building, Sixth and B Streets SW.
3. Coast and Geodetic Survey Building, New Jersey Avenue near B Street SE., directly opposite the House of Representatives Office Building.

The buildings of the Bureau of Standards, located on Pierce Mill Road, near Connecticut Avenue, are excluded.

As the new Commerce Building contemplated by existing law (36 Stat., 698) should include the Coast and Geodetic Survey (releasing the property occupied by that service for other uses), and also the offices (not the laboratories) of the Bureau of Fisheries, it is treated first.

Five of the eight services of the Department and the divisions of the Secretary's Office are in the Commerce Building. With the normal growth of these services, which are the Bureaus of the Census, Foreign and Domestic Commerce, Navigation, Lighthouses, and the Steamboat-Inspection Service, the building will be too small before a new one can be constructed. It is now crowded.

The annual rent is \$65,500, which, though one of the lowest rentals per square foot in the District, represents, capitalized at 3 per cent, a valuation of \$2,183,333. It is a satisfactory structure.

My preference would be that the Department of Commerce should be housed in a building of commercial character.

Land for a new building was acquired for the then Department of Commerce and Labor under the act of May 30, 1908 (35 Stat., 545), and, by the act of June 25, 1910 (36 Stat., 698), the Secretary of the Treasury was directed to prepare designs and estimates for a fireproof building. On March 3, 1913, the plans for the proposed building for the Department of Commerce and Labor were approved by my predecessor. Since then three bureaus of the former Department have been transferred to the Department of Labor. One has gone to the Federal Trade Commission. Two of the present bureaus were omitted from the plans. The building, redesigned, should be made to accommodate the office, the lithographing establishment and its accessories, the drawing room and the instrument shop of the Coast and Geodetic Survey, and the administrative offices of the Bureau of Fisheries. If this were done, the property on Capitol Hill adjoining the Public Health Service, opposite the House Office Building and close to the Capitol itself, could be used for other purposes.

The lease of the present Commerce Building expired on August 31, 1918, and was renewed for 10 months, with privilege of renewal for a further period of 1 year.

The public interests, as they relate to this Department, will be advanced by redesigning the proposed Commerce Building as above suggested and by its construction at as early a date as possible.

Until such time as a permanent home is provided for the Department, authority is needed for the rental of an additional building containing approximately 10,000 square feet of office space. This is required by the increase of work. This additional space is particularly needed now to relieve congestion in the Bureau of Foreign and Domestic Commerce.

Coast and Geodetic Survey.

The buildings occupied by the Coast and Geodetic Survey are kept in a sanitary condition by persistent effort, but money is daily wasted in their occupancy. The buildings are five and six stories high, respectively, with 16 different levels in one and 11 different levels in the other. Anything more ill-suited for their use can hardly be imagined. On pages 218-220 of my report for 1917 I gave in detail the needs of an office building for the Coast and Geodetic Survey. These needs have been for a time relieved

in part by the allotment of a fund from your appropriation for national security and defense for constructing a plain, two-story, fireproof building to house and enlarge the instrument shop, the drawing room, and the carpenter shop, all of which are actively engaged in war work. This building is now under construction. It will include a fireproof vault for the original records of the service.

Bureau of Fisheries.

The structure occupied by the Bureau of Fisheries is unsuited to the growing work of the service and is a fire menace. By great care and by expenditure which is in no small part waste, the building is kept in fair condition. As an efficient working tool, however, it is hopeless. On July 2, 1918, you allotted \$125,000 from the fund for the national security and defense for a laboratory for the Bureau of Fisheries. This laboratory, which is to be located in Washington, will be equipped for experimentation in methods of preparing and preserving fish foods and other fishery products. The specifications for the building are prepared; it will be erected at the earliest possible date.

Laboratory-Aquarium.

I again call attention to the need of a laboratory-aquarium for the Bureau of Fisheries. (See pp. 12-14 of the Annual Report for 1917.) The mere mention of an aquarium may call up a picture of a popular resort with a certain incidental educational value. This would be an error. The proposed laboratory-aquarium would, first of all, be a laboratory in which the development of the food supply of the country would have the chief consideration. It would be in substance what an experiment station is to the Department of Agriculture, and would perform a similar function as regards food for the country.

Bureau of Standards.

Owing to the rapid expansion of the Bureau's work in metals upon our entrance in the war and the critical importance of metallurgy in its many military applications, an allotment was made by you on August 30, 1917, from the fund for national security and defense of \$250,000 for the erection of a laboratory for standardization of metals, appliances, and instruments for

military purposes. This building is in use. It provides suitable housing for other lines of military standardization.

The radio laboratory, for which a special appropriation of \$90,000 was provided by Congress, is completed and occupied by the Bureau and the representatives of the War and Navy Departments. It gives increased facilities for radio work, although, owing to the rapid expansion of this work since the war began, the building is not now large enough. It may be necessary to continue some radio work in another building.

The erection of an airplane-engine research laboratory for the Bureau of Standards will be commenced in the near future. The importance of the airplane program and the fact that the Bureau has long been continuously studying the underlying scientific principles involved in aircraft design and improvement for both Army and Navy made it necessary to provide suitably equipped housing for researches on airplane motors. This building will house four dynamometers, the refrigeration plant, two altitude laboratories, and the necessary equipment for running altitude tests of airplane engines. In this laboratory studies of airplane engines may be made under conditions which simulate high altitudes as to air pressure, air movement, and temperature, for altitudes near the surface and up to as high as 40,000 feet. These researches are enabling the Bureau to furnish the aviation services of both Army and Navy with new and reliable data for improving the efficiency of operation and control of airplane engines.

Special attention is invited to the recommendation respecting guaranteed standards in industry on page 85 of this report.

Bureau of the Census.

With each recurring census period and for about three years' time in each period the force of the Census Bureau is raised to about seven times its regular size. It is, of course, impossible to quarter any of this increase in the present Commerce Building. Were the new Commerce Building to be begun in the immediate future, a portion of it might be utilized to house some of this great additional force. Failing this, some of the special buildings occupied for war purposes may be used, provided they are not then required for war work and are in sufficiently good condition. The census period commences July 1, 1919; the buildings would have to be ready for use by or about that time. Failing one or another of these expedients, if the war should continue it may be

difficult to provide in Washington at any reasonable cost the necessary quarters for the census force.

At this time a measure (H. R. 11984) is pending providing for the Fourteenth Decennial Census—that of 1920. In preparing this measure a careful study was made of previous census legislation and experience. The pending bill is an advance over previous practice in every respect. It is essential that the measure be enacted by the present Congress, for the census period begins with July 1, 1919, and if authority of law is not provided prior to that time for taking the census of 1920, there will be added expense in doing the work, and the work itself will be delayed and its quality will be endangered.

An Archives Building.

The public buildings act of March 4, 1913, authorized the preparation of a design for an archives building, and the Secretary of the Treasury was authorized to select a site. The Public Buildings Commission has recommended squares 294 and 295 for such purposes.

In the recapitulation of space for the executive departments and independent establishments, 85,000 cubic feet are shown as needed by the Department of Commerce. It would not be sufficient, however, to have the Department's records given mere storage space. They are in constant use back to the beginnings of the Government, and the building should be so designed as to have them readily accessible. A small working force of librarians would be necessary.

Urgent Needs of the Department.

Among the urgent needs of the Department are:

1. Enlargement of the funds and the organization of the Bureau of Foreign and Domestic Commerce to make same adequate at home and abroad for the vital work that will be forced upon it at the war's close. This provision should immediately be made. More commercial attachés are needed abroad, and proper provision should be made for their clerks.

2. Two seagoing vessels and wire-drag launches for the Coast and Geodetic Survey and officers and crews for them.

3. Larger clerical force in the field service of the Steamboat-Inspection Service and in the office of the Coast and Geodetic

Survey, together with more draftsmen and computers at more adequate salaries in the latter service.

4. Provision, as above indicated, for the census of 1920 and arrangements for housing the increased force necessary at that time.

5. A building at the Bureau of Standards for a suitable power plant. The original installation has long since proved too small, and steps should be taken at once to provide a suitable and efficient heating and lighting plant.

6. A laboratory-aquarium for the Bureau of Fisheries.

7. A Government-owned commerce building to house all services except the Bureau of Standards and the laboratory-aquarium of the Bureau of Fisheries.

8. An assistant to the Secretary of Commerce to aid in the greatly increased volume of work.

Appropriations and Expenditures.

The itemized statement of the disbursements from the contingent fund of the Department of Commerce and the appropriation for "General expenses, Bureau of Standards," for the fiscal year ended June 30, 1918, required to be submitted to Congress by section 193 of the Revised Statutes of the United States; the itemized statement of expenditures under all appropriations for propagation of food fishes during the fiscal year ended June 30, 1918, required by the act of Congress approved March 3, 1887 (24 Stat., 523); and a statement showing travel on official business by officers and employees (other than special agents, inspectors, and employees who, in the discharge of their regular duties, are required to travel constantly) from Washington to points outside of the District of Columbia during the fiscal year ended June 30, 1918, as required by the act of Congress approved May 22, 1908 (35 Stat., 244), will be transmitted to Congress in the usual form.

The table following shows the total amounts of all appropriations for the various bureaus and services of the Department of Commerce for the fiscal year ended June 30, 1918.

Bureau.	Legislative act.	Sundry civil act.	Deficiency act.	Special act.	National security and defense.	Total.
Office of the Secretary.....	\$306,600.00		\$6,900.00		\$6,000,000.00	\$6,313,500.00
Bureau of Lighthouses.....	64,030.00	\$6,553,950.00	346,952.56			6,964,932.56
Bureau of the Census.....	1,383,460.00					1,383,460.00
Bureau of Foreign and Domestic Commerce.....	479,120.00		9,000.00		25,550.00	513,670.00
Bureau of Navigation.....	227,980.00			\$1,369.21		229,349.21
Bureau of Standards.....	759,900.00	65,000.00	492,087.38		1,395,000.00	2,711,987.38
Steamboat-Inspection Service.....	662,340.00		5,925.00			668,265.00
Bureau of Fisheries.....		1,190,560.00	123,000.00		75,000.00	1,388,560.00
Coast and Geodetic Survey.....		1,379,970.00	35,790.00		105,000.00	1,520,760.00
Total.....	3,883,430.00	9,189,480.00	1,019,654.94	1,369.21	7,600,550.00	21,694,484.15
Increase of compensation.....	449,871.15					449,871.15
Allotment for printing and binding.....		400,000.00				400,000.00
Grand total.....	4,333,301.15	9,589,480.00	1,019,654.94	1,369.21	7,600,550.00	22,544,355.30

The disbursements by the authorized disbursing officers of the Department of Commerce during the fiscal year ended June 30, 1918, arranged according to items of appropriation, are as follows:

By Disbursing Clerk, Department of Commerce.

OFFICE OF THE SECRETARY.

Salaries, Office of the Secretary of Commerce, 1917.....	\$7,248.77
Salaries, Office of the Secretary of Commerce, 1918.....	168,304.08
Contingent expenses, Department of Commerce, 1916.....	1,059.46
Contingent expenses, Department of Commerce, 1917.....	19,776.36
Contingent expenses, Department of Commerce, 1918.....	92,714.99
Rent, Department of Commerce, 1917.....	5,958.34
Rent, Department of Commerce, 1918.....	60,541.66
Total.....	355,603.66

BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

Salaries, Bureau of Foreign and Domestic Commerce, 1917.....	5,185.65
Salaries, Bureau of Foreign and Domestic Commerce, 1918.....	136,532.64
Promoting Commerce, Department of Commerce, 1917.....	8,435.16
Promoting Commerce, Department of Commerce, 1918.....	53,680.17
Promoting Commerce, South and Central America, 1917.....	4,399.61
Promoting Commerce, South and Central America, 1918.....	29,431.62
Commercial attachés, Department of Commerce, 1917.....	2,051.64
Commercial attachés, Department of Commerce, 1918.....	4,437.25
National security and defense, Department of Commerce, export control.....	33,429.76
National security and defense, Department of Commerce, inland waterways.....	518.14
National security and defense, Department of Commerce, import and export statistics.....	8,550.28
Total.....	285,651.92

BUREAU OF STANDARDS.

Salaries, Bureau of Standards, 1917.....	\$12,424.10
Salaries, Bureau of Standards, 1918.....	304,454.55
Equipment, Bureau of Standards, 1916.....	474.09
Equipment, Bureau of Standards, 1917.....	14,163.48
Equipment, Bureau of Standards, 1918.....	47,108.08
General expenses, Bureau of Standards, 1916.....	24.33
General expenses, Bureau of Standards, 1917.....	8,247.31
General expenses, Bureau of Standards, 1918.....	25,318.08
Testing structural materials, Bureau of Standards, 1917.....	8,522.92
Testing structural materials, Bureau of Standards, 1918.....	132,133.12
Improvement and care of grounds, Bureau of Standards, 1917.....	2,645.68
Improvement and care of grounds, Bureau of Standards, 1918.....	4,752.00
Investigation of fire-resisting properties, Bureau of Standards, 1916....	15.38
Investigation of fire-resisting properties, Bureau of Standards, 1917...	6,555.63
Investigation of fire-resisting properties, Bureau of Standards, 1918...	22,349.34
Testing machines, Bureau of Standards, 1916.....	2,264.50
Testing machines, Bureau of Standards, 1917.....	4,441.97
Testing machines, Bureau of Standards, 1918.....	22,735.46
Testing railroad scales, etc., Bureau of Standards, 1916.....	6.46
Testing railroad scales, etc., Bureau of Standards, 1917.....	4,140.24
Testing railroad scales, etc., Bureau of Standards, 1918.....	28,631.97
Investigation of public-utility standards, Bureau of Standards, 1917..	1,960.06
Investigation of public-utility standards, Bureau of Standards, 1918..	45,935.49
High-potential investigations, Bureau of Standards, 1916.....	150.00
High-potential investigations, Bureau of Standards, 1917.....	1,052.82
High-potential investigations, Bureau of Standards, 1918.....	11,189.45
Investigation of railway materials, Bureau of Standards, 1917.....	2,071.79
Investigation of railway materials, Bureau of Standards, 1918.....	11,514.28
Refrigeration constants, Bureau of Standards, 1917.....	547.56
Testing miscellaneous materials, Bureau of Standards, 1917.....	2,477.90
Testing miscellaneous materials, Bureau of Standards, 1918.....	19,169.62
Radio research, Bureau of Standards, 1916.....	1.00
Radio research, Bureau of Standards, 1917.....	2,072.29
Radio research, Bureau of Standards, 1918.....	8,495.41
Equipping Chemical Laboratory building, Bureau of Standards, 1916-1917.....	19,519.52
Equipping Chemical Laboratory building, Bureau of Standards, 1917-1918.....	24,581.77
Investigation of clay products, Bureau of Standards, 1917.....	761.26
Investigation of clay products, Bureau of Standards, 1918.....	10,877.26
Determining physical constants, Bureau of Standards, 1917.....	1,394.95
Determining physical constants, Bureau of Standards, 1918.....	4,760.32
Color standardization, Bureau of Standards, 1917.....	2,245.15
Color standardization, Bureau of Standards, 1918.....	8,358.54
Radio Laboratory, Bureau of Standards.....	56,761.52
Chemical Laboratory, Bureau of Standards.....	2,553.80
Laboratory, Bureau of Standards.....	598.45
Workshop and storehouse, Bureau of Standards.....	17.00
Standardizing mechanical appliances, Bureau of Standards, 1917.....	6,716.05
Standardizing mechanical appliances, Bureau of Standards, 1918.....	9,553.99
Investigation of optical glass, 1918.....	8,993.62
Gauge standardization, Bureau of Standards, 1917-18.....	141,989.44

Military research, Bureau of Standards, 1917-18.....	\$361,754.21
Military research, Bureau of Standards, 1918-19.....	49,971.18
Investigation of mine scales and cars, Bureau of Standards, 1918-19..	439.67
National security and defense, Bureau of Standards, production of optical glass.....	74,443.08
National security and defense, Bureau of Standards, new building...	232,552.39
National security and defense, Bureau of Standards, metallurgical work.....	40,579.65
National security and defense, Bureau of Standards, production of fabrics.....	326.75
National security and defense, Bureau of Standards, industrial laboratory.....	257,310.93
National security and defense, Bureau of Standards, Roberts by-product coke oven.....	1,929.15
National security and defense, Bureau of Standards, thermite investigation.....	7.00
Total.....	<u>2,077,043.01</u>

STEAMBOAT-INSPECTION SERVICE.

Salaries, Office of Supervising Inspector General, Steamboat-Inspection Service, 1917.....	685.03
Salaries, Office of Supervising Inspector General, Steamboat-Inspection Service, 1918.....	17,349.70
Salaries, Steamboat-Inspection Service, 1917.....	33,586.59
Salaries, Steamboat-Inspection Service, 1918.....	381,089.05
Clerk hire, Steamboat-Inspection Service, 1917.....	7,165.67
Clerk hire, Steamboat-Inspection Service, 1918.....	81,675.27
Contingent expenses, Steamboat-Inspection Service, 1916.....	81.23
Contingent expenses, Steamboat-Inspection Service, 1917.....	19,389.16
Contingent expenses, Steamboat-Inspection Service, 1918.....	78,537.49
Steamboat-Inspection Service, Tampa, Fla., 1918.....	3,942.69
Total.....	<u>623,501.88</u>

BUREAU OF NAVIGATION.

Salaries, Bureau of Navigation, 1917.....	1,485.30
Salaries, Bureau of Navigation, 1918.....	35,662.22
Clerk hire, shipping service, 1917.....	3,246.54
Clerk hire, shipping service, 1918.....	40,385.01
Salaries, shipping service, 1917.....	2,369.77
Salaries, shipping service, 1918.....	25,438.07
Contingent expenses, shipping service, 1917.....	856.44
Contingent expenses, shipping service, 1918.....	5,544.34
Preventing overcrowding of passenger vessels, 1917.....	2,037.31
Preventing overcrowding of passenger vessels, 1918.....	15,244.21
Enforcement of navigation laws, 1917.....	895.63
Enforcement of navigation laws, 1918.....	36,737.24
Enforcement of wireless-communication laws, 1916.....	1,258.50
Enforcement of wireless-communication laws, 1917.....	4,556.98
Enforcement of wireless-communication laws, 1918.....	34,612.32

Admeasurement of vessels, 1917.....	\$237. 31
Admeasurement of vessels, 1918.....	2, 091. 21
Total.....	212, 658. 40

BUREAU OF FISHERIES.

Salaries, Bureau of Fisheries, 1917.....	26, 820. 84
Salaries, Bureau of Fisheries, 1918.....	361, 831. 71
Miscellaneous expenses, Bureau of Fisheries, 1916.....	257. 74
Miscellaneous expenses, Bureau of Fisheries, 1917.....	53, 268. 24
Miscellaneous expenses, Bureau of Fisheries, 1918.....	413, 239. 12
Protecting seal and salmon fisheries of Alaska, 1916.....	214. 67
Protecting seal and salmon fisheries of Alaska, 1917.....	2, 132. 38
Protecting seal and salmon fisheries of Alaska, 1918.....	101, 297. 04
Marine biological station, Florida.....	20, 116. 75
Payment to Great Britain and Japan under Article XI of Fur-Seals Convention of 1911.....	20, 000. 00
Motor launches, Alaska fisheries service, 1917.....	499. 84
Developing aquatic sources of leather, 1917-18.....	1, 382. 82
Repairs to steamer <i>Fish Hawk</i>	21. 10
Investigating damages to fisheries.....	8, 219. 44
Buildings and improvements, fur-seal islands, Alaska.....	14, 906. 31
Launch for fish hatcheries, Mississippi River Valley.....	3, 355. 00
Fish hatcheries:	
Bozeman, Mont.....	2. 86
Cape Vincent, N. Y.....	35. 65
Clackamas, Oreg.....	613. 75
Cold Spring, Ga.....	52. 70
Edenton, N. C.....	7. 50
Puget Sound, Wash.....	6, 847. 33
Rhode Island.....	4, 000. 00
South Carolina.....	2, 451. 75
Utah.....	12, 824. 32
Wyoming.....	5, 265. 99
Vessels, fish hatchery, Boothbay Harbor, Me., 1915-16.....	4, 421. 70
National security and defense, food-fish supply.....	6, 970. 52
National security and defense, rescuing food fish.....	5, 280. 42
National security and defense, seal-oil plant.....	4, 357. 50
Total.....	1, 080, 694. 99

BUREAU OF THE CENSUS.

Salaries, Bureau of the Census, 1917.....	27, 243. 47
Salaries, Bureau of the Census, 1918.....	625, 516. 95
Collecting statistics, Bureau of the Census, 1917.....	34, 704. 81
Collecting statistics, Bureau of the Census, 1918.....	402, 561. 75
Tabulating machines, Bureau of the Census, 1917.....	5, 280. 04
Tabulating machines, Bureau of the Census, 1918.....	31, 913. 83
Total.....	1, 127, 220. 85

BUREAU OF LIGHTHOUSES.

Salaries, Bureau of Lighthouses, 1917.....	\$2,632. 15
Salaries, Bureau of Lighthouses, 1918.....	57,052. 80
Salaries, Lighthouse Service, 1917.....	281. 25
Salaries, Lighthouse Service, 1918.....	4,543. 75
Salaries, lighthouse vessels, 1917.....	77. 50
Salaries, lighthouse vessels, 1918.....	75. 00
General expenses, Lighthouse Service, 1916.....	161. 24
General expenses, Lighthouse Service, 1917.....	33,940. 14
General expenses, Lighthouse Service, 1918.....	88,469. 74
Aids to navigation:	

Alaska.....	100. 94
Ashtabula Harbor, Ohio.....	10. 50
Conneaut Harbor, Ohio.....	3. 25
East River, N. Y.....	1. 00
Hudson River, N. Y.....	1. 39
Fighting Island Channel, Detroit River, Mich.....	. 30
Lorain Harbor, Ohio.....	5. 85
Pearl Harbor, Hawaii.....	. 25
Puget Sound, Wash.....	7. 60
St. Johns River, Fla.....	184. 43
Toledo Harbor, Ohio.....	3. 50
Cape Cod Canal Lights, Mass.....	3. 35
Cape St. Elias Light Station, Alaska.....	419. 99
Navassa Island Light Station, West Indies.....	48,393. 95
Tender for first lighthouse district.....	2,905. 94
Tender for third lighthouse district.....	72. 37
Tender for engineer, sixth lighthouse district.....	4. 86
Lighthouse tender for general service.....	57,743. 80
Light vessels for general service.....	4,794. 29
Light vessels for general lake service.....	80. 57
Chicago Harbor Light Station, Ill.....	6. 04
Galveston Jetty Light Station, Tex.....	73. 48
Kellett Bluff Light Station, Wash.....	13. 20
Sand Hills Light Station, Mich.....	30. 60
South West Pass Light Vessel, Mississippi River, La.....	7. 91
Repairing and rebuilding aids to navigation, Gulf of Mexico.....	59. 97

Total.....	302,162. 90
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MISCELLANEOUS.

Increase of compensation.....	140,792. 42
Grand total.....	6,205,330. 03

By disbursing officers of the Lighthouse Service.

Salaries, Lighthouse Service, 1917.....	\$3,911. 33
Salaries, Lighthouse Service, 1918.....	357,722. 18
Salaries, lighthouse vessels, 1917.....	43,584. 08
Salaries, lighthouse vessels, 1918.....	1,224,475. 98
Salaries, keepers of lighthouses, 1917.....	28,674. 78
Salaries, keepers of lighthouses, 1918.....	908,810. 09
General expenses, Lighthouse Service, 1916.....	54,994. 42

General expenses, Lighthouse Service, 1917.....	\$409, 079. 13
General expenses, Lighthouse Service, 1918.....	2, 323, 470. 64
Increase of compensation, Department of Commerce, 1918.....	217, 657. 72
Aids to navigation:	
Alaska.....	14, 584. 36
Ashland, Wis.....	56. 20
Ashtabula Harbor, Ohio.....	1, 070. 88
Atchafalaya Entrance Channel, La.....	5, 757. 92
Conneaut Harbor, Ohio.....	23, 950. 70
Coquille River, Oreg.....	63. 66
Delaware River, Pa. and Del.....	32, 824. 93
East River, N. Y.....	1, 325. 00
Fairport Harbor, Ohio.....	400. 00
Fighting Island, Detroit River, Mich.....	7, 437. 44
Florida Reefs, Fla.....	2, 300. 56
Hudson River, N. Y.....	1, 789. 65
Huron Harbor, Ohio.....	11. 84
Indian Harbor, Ill.....	28. 00
Keweenaw Waterway, Mich.....	14, 676. 32
Lorain Harbor, Ohio.....	891. 78
Manistique, Mich.....	22. 08
Pearl Harbor, Hawaii.....	4, 169. 62
Puget Sound, Wash.....	3, 029. 91
St. Johns River, Fla.....	10, 048. 39
Toledo Harbor, Ohio.....	13, 085. 31
Washington and Oregon.....	131. 25
Cape Cod Canal Lights, Mass.....	2, 176. 58
Detroit River Lights, Mich.....	5, 691. 82
Superior Pierhead Range Lights, Wis.....	1, 187. 22
Aransas Pass Light Station, Tex.....	5. 75
Cape St. Elias Light Station, Alaska.....	730. 78
Chicago Harbor Light Station, Ill.....	55, 037. 14
Galveston Jetty Light Station, Tex.....	51. 95
Kellett Bluff Light Station, Wash.....	1, 824. 00
Manitowoc Breakwater Light Station, Wis.....	964. 23
Navassa Island Light Station, West Indies.....	3, 464. 69
Sand Hills Light Station, Mich.....	23, 233. 07
Thimble Shoal Light Station, Va.....	3, 867. 64
White Shoal Light Station, Mich.....	780. 00
Woods Hole Light Station, Mass.....	14, 576. 82
Tender for first lighthouse district.....	1, 161. 40
Tender for engineer, sixth lighthouse district.....	2, 181. 67
Lighthouse tender for general service.....	1, 903. 40
Light vessels for general service.....	2, 175. 55
South West Pass Light Vessel, Mississippi River, La.....	75. 60
Staten Island lighthouse depot, N. Y.:	
Office.....	10. 04
Wharves.....	12. 54
Repairing and rebuilding aids to navigation, Gulf of Mexico.....	107, 653. 54
Repairing and rebuilding aids to navigation, Atlantic coast.....	15, 822. 05
Oil houses for light stations.....	12. 55
Lighting Norfolk Harbor, Va.....	1, 874. 08
Total.....	5, 956, 510. 26

By special disbursing agent, Coast and Geodetic Survey.

Salaries, Coast and Geodetic Survey, 1917.....	\$12,729.06
Salaries, Coast and Geodetic Survey, 1918.....	337,224.39
Party expenses, Coast and Geodetic Survey, 1916.....	7.71
Party expenses, Coast and Geodetic Survey, 1917.....	79,650.25
Party expenses, Coast and Geodetic Survey, 1918.....	322,083.69
Repairs of vessels, Coast and Geodetic Survey, 1917.....	5,164.80
Repairs of vessels, Coast and Geodetic Survey, 1918.....	19,217.17
General expenses, Coast and Geodetic Survey, 1916.....	.35
General expenses, Coast and Geodetic Survey, 1917.....	4,596.37
General expenses, Coast and Geodetic Survey, 1918.....	64,515.12
Pay, etc., of officers and men, vessels, Coast and Geodetic Survey, 1917.....	53,602.09
Pay, etc., of officers and men, vessels, Coast and Geodetic Survey, 1918.....	162,078.24
Charts, Coast and Geodetic Survey, 1917-18.....	32,854.34
Outfitting Coast Survey steamer <i>Surveyor</i> , 1917.....	4,838.35
Two new vessels, Coast and Geodetic Survey.....	87,388.55
Increase of compensation, Department of Commerce, 1918.....	27,312.20
National security and defense, Department of Commerce, Coast and Geodetic Survey, new building.....	80.12
Additional employees, Coast and Geodetic Survey, 1918.....	3,762.72
Total.....	1,217,105.52

By special disbursing agents, Bureau of Fisheries.

Protecting seal and salmon fisheries of Alaska, 1918.....	\$1,998.05
Miscellaneous expenses, Bureau of Fisheries, 1918.....	15,717.73
Salaries, Bureau of Fisheries, 1918.....	1,198.31
Pay, officers and crews of vessels, Alaska fisheries service, 1918.....	21,587.59
Increase of compensation, Department of Commerce, 1918.....	1,401.87
Total.....	41,903.55

By the commercial agents investigating trade conditions abroad, Department of Commerce, acting as special disbursing agents.

Promoting commerce, Department of Commerce, 1917.....	\$6.35
Promoting commerce, Department of Commerce, 1918.....	59,420.13
Promoting commerce, South and Central America, 1917.....	650.00
Promoting commerce, South and Central America, 1918.....	54,624.05
Commercial attachés, Department of Commerce, 1917.....	3.56
Commercial attachés, Department of Commerce, 1918.....	86,153.88
National security and defense, export control, 1918.....	104.25
National security and defense, import and export statistics, 1918.....	1,463.47
Increase of compensation, Department of Commerce, 1918.....	921.54
Total.....	203,347.23

Warrants drawn on the Treasurer of the United States to satisfy accounts settled by the Auditor for the State and other departments, during the fiscal year ended June 30, 1918, classified according to items of appropriation:

Office of the Secretary:

Contingent expenses, Department of Commerce, 1916.....	\$62.84
Contingent expenses, Department of Commerce, 1917.....	469.20
Contingent expenses, Department of Commerce, 1918.....	43.80
Total.....	<u>575.84</u>

Bureau of Foreign and Domestic Commerce:

Promoting commerce, Department of Commerce, 1916.....	8.26
Promoting commerce, Department of Commerce, 1917.....	486.68
Promoting commerce, Department of Commerce, 1918.....	647.70
Promoting commerce, South and Central America, 1917.....	228.45
Promoting commerce, South and Central America, 1918.....	97.92
Commercial attachés, 1916.....	56.37
Commercial attachés, 1917.....	13.39
Commercial attachés, 1918.....	41.81
Total.....	<u>1,580.58</u>

Bureau of Standards:

General expenses, Bureau of Standards, 1917.....	331.70
General expenses, Bureau of Standards, 1918.....	8.40
Equipment, Bureau of Standards, 1917.....	115.80
Improvement and care of grounds, 1918.....	11.11
Testing structural materials, 1917.....	387.28
Testing structural materials, 1918.....	288.53
Testing machines, 1917.....	17.44
Testing machines, 1918.....	19.44
Investigation of fire-resisting properties, 1917.....	10.84
Investigation of fire-resisting properties, 1918.....	16.29
Investigation of public-utility standards, 1918.....	5.00
Investigation of railway materials, 1917.....	63.85
Determining physical constants, 1917.....	41.67
Investigation of optical glass, 1918.....	8.75
Gauge standardization, 1917-18.....	46.03
Military research, 1917-18.....	529.06
Military research, 1918-19.....	38.85
National security and defense, production of optical glass.....	96.78
National security and defense, industrial laboratory.....	49.83
Certified claims—	
General expenses, Bureau of Standards, 1915.....	107.38
Testing railroad scales, 1914.....	25.00
Testing railroad scales, 1915.....	100.08
Testing structural materials, 1915.....	15.82
Investigation of railway materials, 1915.....	2.00
Investigation of public-utility standards, 1915.....	227.00
Equipment, Bureau of Standards, 1915.....	55.67
Total.....	<u>2,619.60</u>

Bureau of Navigation:

Contingent expenses, Shipping Service, 1917.....	4.15
Refunding penalties or charges erroneously exacted.....	1,401.79
Enforcement navigation laws, 1917.....	11.01
Enforcement wireless-communication laws, 1916.....	60.00

Bureau of Navigation—Continued.

Enforcement wireless-communication laws, 1917.....	\$9. 41
Enforcement wireless-communication laws, 1918.....	6. 58
Preventing overcrowding passenger vessels, 1917.....	2. 00
Total.....	<u>1, 494. 94</u>

Steamboat-Inspection Service:

Contingent expenses, Steamboat-Inspection Service, 1916.....	7. 41
Contingent expenses, Steamboat-Inspection Service, 1917.....	194. 36
Contingent expenses, Steamboat-Inspection Service, 1918.....	148. 91
Steamboat-Inspection Service, Tampa, Fla.	1. 17
Certified Claims—Contingent expenses, Steamboat-Inspection Service, 1915.....	. 83
Total.....	<u>352. 68</u>

Bureau of Fisheries:

Miscellaneous expenses, Bureau of Fisheries, 1916.....	2. 54
Miscellaneous expenses, Bureau of Fisheries, 1917.....	13, 356. 20
Miscellaneous expenses, Bureau of Fisheries, 1918.....	18, 016. 49
Protecting seal and salmon fisheries of Alaska, 1917.....	1, 824. 47
Protecting seal and salmon fisheries of Alaska, 1918.....	631. 34
Marine Biological Station, Fla.	2. 52
Steamer <i>Albatross</i> , repairs, 1917.....	9, 996. 75
Investigating damages to fisheries.....	83. 67
Repairs to steamer <i>Fish Hawk</i> , 1918.....	414. 90
Certified claims—	
Miscellaneous expenses, Bureau of Fisheries, 1914.....	8. 01
Miscellaneous expenses, Bureau of Fisheries, 1915.....	2. 26
Protecting seal and salmon fisheries of Alaska, 1915.....	2. 33
Total.....	<u>44, 341. 48</u>

Bureau of the Census:

Collecting statistics, Bureau of the Census, 1917.....	6. 49
Collecting statistics, Bureau of the Census, 1918.....	4, 354. 55
Tabulating machines, Bureau of the Census, 1917.....	2. 75
Relief of Alice V. Houghton.....	900. 00
Certified claims—Collecting statistics, Bureau of the Census, 1915.....	16. 35
Total.....	<u>5, 280. 14</u>

Coast and Geodetic Survey:

Party expenses, Coast and Geodetic Survey, 1916.....	37. 28
Party expenses, Coast and Geodetic Survey, 1917.....	14, 029. 58
Party expenses, Coast and Geodetic Survey, 1918.....	7, 966. 64
Repairs of vessels, Coast and Geodetic Survey, 1917.....	6, 625. 66
Repairs of vessels, Coast and Geodetic Survey, 1918.....	832. 57
General expenses, Coast and Geodetic Survey, 1917.....	63. 70
General expenses, Coast and Geodetic Survey, 1918.....	155. 00
Two new vessels, Coast and Geodetic Survey.....	14, 799. 36
Outfitting Coast Survey steamer <i>Surveyor</i> , 1917.....	1, 044. 53
Total.....	<u>45, 554. 32</u>

Bureau of Lighthouses:

Salaries, keepers of lighthouses, 1918.....	\$62. 00
Cape St. Elias Light Station, Alaska.....	1. 52
Light station, Sand Hills, Mich.....	417. 32
Light station, Navassa Island, West Indies.....	198. 06
Light vessel, South West Pass, Mississippi River, La.....	446. 10
Lights—	
Cape Cod Channel, Mass.....	4. 10
Detroit River, Mich.....	134. 17
Superior Pierhead Range, Wis.....	6. 60
Tender, engineer, sixth lighthouse district.....	149. 86
Lighthouse tender, general service.....	354. 90
Aids to navigation—	
Alaska.....	2, 563. 06
Delaware River, Pa. and Del.....	337. 59
Keweenaw Waterway, Mich.....	993. 37
Puget Sound, Wash.....	473. 28
St. Johns River, Fla.....	1, 352. 01
Fighting Island Channel, Detroit River, Mich.....	322. 21
Pearl Harbor, Hawaii.....	118. 91
Washington and Oregon.....	60. 86
General expenses, Lighthouse Service, 1916.....	4, 747. 39
General expenses, Lighthouse Service, 1917.....	31, 284. 86
General expenses, Lighthouse Service, 1918.....	45, 105. 66
Salaries, lighthouse vessels, 1916.....	2. 33
Salaries, lighthouse vessels, 1917.....	1, 000. 66
Salaries, lighthouse vessels, 1918.....	4, 490. 83
Salaries, Lighthouse Service, 1917.....	24. 34
Light vessels for general service.....	9. 44
Claims for damages by collision with lighthouse vessels.....	598. 58
Repairing and rebuilding aids to navigation, Gulf of Mexico.....	1, 521. 45
Repairing and rebuilding aids to navigation, Atlantic coast.....	5, 972. 84
Radio installations on lighthouse tenders.....	23. 12
Certified claims—	
General expenses, Lighthouse Service, 1912.....	166. 66
General expenses, Lighthouse Service, 1913.....	18. 59
General expenses, Lighthouse Service, 1914.....	22. 36
General expenses, Lighthouse Service, 1915.....	156. 23
General expenses, Lighthouse Service, 1916.....	1. 20
Salaries, lighthouse vessels, 1912.....	19. 50
Expenses of buoyage, 1910.....	4, 616. 53
Expenses of light vessels, 1910.....	21, 749. 53
Total.....	129, 438. 83
Grand total.....	231, 238. 41

The following statement shows the expenditures during the fiscal year ended June 30, 1918, on account of all appropriations under the control of the Department, giving the total amounts disbursed by the various disbursing officers of the Department, and miscellaneous receipts for the same period:

EXPENDITURES.

By the Disbursing Clerk, Department of Commerce, on account of salaries and expenses of the Office of the Secretary of Commerce, the Bureau of Foreign and Domestic Commerce, Navigation, Standards, Fisheries, Census, and Lighthouses, the Office of the Supervising Inspector General, Steamboat-Inspection Service, salaries and expenses of the Steamboat-Inspection Service at large, and public works of the Lighthouse and Fisheries Services (shown in detail in the first of the foregoing tables of disbursements).....	\$6, 205, 330. 03
By authorized disbursing agents of the Lighthouse Service.....	5, 956, 510. 26
By special disbursing agent, Coast and Geodetic Survey, on account of salaries and expenses of the Coast and Geodetic Survey.....	1, 217, 105. 52
By special disbursing agents, Bureau of Fisheries.....	41, 903. 55
By the commercial agents of the Department investigating trade conditions abroad as special disbursing agents.....	203, 347. 23
By warrants drawn on the Treasurer of the United States to satisfy accounts settled by the Auditor for the State and other Departments.....	231, 238. 41
Printing and binding.....	394, 952. 24
Total.....	<u>14, 250, 387. 24</u>

MISCELLANEOUS RECEIPTS.

Coast and Geodetic Survey: Sale of charts, publications, old property, etc.....	20, 088. 18
Bureau of Census: Sale of publications, etc.....	310. 00
Bureau of Fisheries:	
Sale of 3,264 sealskins.....	69, 946. 48
Sale of fox and other skins.....	34, 356. 88
Sale of old property, etc.....	11, 136. 18
Bureau of Navigation:	
Tonnage tax.....	1, 171, 418. 36
Navigation fees.....	146, 508. 02
Navigation fines.....	31, 837. 68
From deceased passengers.....	260. 00
Annual yacht tax.....	1, 468. 60
Bureau of Standards: Sale of Government property, etc.....	2, 682. 84
Steamboat-Inspection Service: Sale of Government property, etc.....	13. 00
Bureau of Lighthouses: Sale of Government property, rentals, etc.....	22, 719. 32
Office of the Secretary: Sale of Government property, etc.....	384. 09
Total.....	<u>1, 513, 129. 63</u>

The following unexpended balances of appropriations were turned into the surplus fund June 30, 1918, in accordance with the act of June 20, 1874 (18 Stat., 110-111):

Office of the Secretary:	
Salaries, Office of the Secretary of Commerce, 1916.....	\$1, 709. 09
Rent, Department of Commerce, 1916.....	. 02
Contingent expenses, Department of Commerce, 1915.....	5. 00
Contingent expenses, Department of Commerce, 1916.....	48. 18
Bureau of the Census:	
Salaries, Bureau of the Census, 1916.....	10, 234. 65
Collecting statistics, Bureau of the Census, 1915-16.....	112. 21

Bureau of the Census—Continued.

Collecting statistics, Bureau of the Census, 1916.....	\$351. 57
Tabulating machines, Bureau of the Census, 1916.....	420. 02

Bureau of Foreign and Domestic Commerce:

Salaries, Bureau of Foreign and Domestic Commerce, 1916.....	571. 99
Commercial attachés, Department of Commerce, 1915.....	38. 89
Commercial attachés, Department of Commerce, 1916.....	691. 56
Promoting Commerce, Department of Commerce, 1916.....	33. 66
Promoting Commerce, South and Central America, 1915.....	39. 52
Promoting Commerce, South and Central America, 1916.....	2, 584. 37
Investigating cost of production, Department of Commerce, 1916..	249. 66

Steamboat-Inspection Service:

Salaries, Office of Supervising Inspector General, Steamboat- Inspection Service, 1916.....	124. 99
Salaries, Steamboat-Inspection Service, 1916.....	3, 431. 58
Clerk hire, steamboat-Inspection Service, 1916.....	12. 92
Contingent expenses, Steamboat-Inspection Service, 1916.....	76. 22

Bureau of Navigation:

Salaries, Bureau of Navigation, 1916.....	115. 58
Salaries, Shipping Service, 1916.....	560. 17
Clerk hire, Shipping Service, 1916.....	527. 38
Contingent expenses, Shipping Service, 1916.....	137. 52
Admeasurement of vessels, 1916.....	19. 46
Preventing overcrowding of passenger vessels, 1916.....	23. 85
Enforcement of navigation laws, 1916.....	137. 00
Enforcement of wireless-communication laws, 1916.....	322. 96

Bureau of Standards:

Salaries, Bureau of Standards, 1916.....	15, 700. 16
Equipment, Bureau of Standards, 1916.....	1, 833. 35
General expenses, Bureau of Standards, 1916.....	319. 66
Improvement and care of grounds, Bureau of Standards, 1916....	98. 89
Current meter testing tanks, 1916.....	1. 66
Heating system, north laboratory, 1916.....	479. 46
Investigation of fire-resisting properties, 1916.....	119. 88
High-potential investigation, 1916.....	50. 08
Investigation of public-utility standards, 1916.....	243. 71
Investigation of railway materials, Bureau of Standards, 1916....	572. 85
Radio research, 1916.....	167. 25
Refrigeration constants, 1916.....	76. 77
Testing machines, 1916.....	100. 93
Testing miscellaneous materials, 1916.....	. 04
Testing railroad scales, etc., 1916.....	12, 264. 76
Testing structural materials, 1916.....	517. 07

Coast and Geodetic Survey:

Salaries, Coast and Geodetic Survey, 1916.....	2, 236. 82
Party expenses, Coast and Geodetic Survey, 1915-16.....	685. 82
Party expenses, Coast and Geodetic Survey, 1916.....	2, 385. 66
General expenses, Coast and Geodetic Survey, 1916.....	220. 35
Pay, etc., of officers and men, vessels, Coast and Geodetic Survey, 1916.....	10, 001. 46
Repairs of vessels, Coast and Geodetic Survey, 1916.....	361. 14
Repairs to Coast Survey steamer <i>Explorer</i> , 1916.....	1, 664. 80

Bureau of Lighthouses:

Salaries, Bureau of Lighthouses, 1916.....	\$589. 85
General expenses, Lighthouse Service, 1914.....	300. 00
General expenses, Lighthouse Service, 1916.....	6, 768. 92
Salaries, keepers of lighthouses, 1916.....	17, 917. 97
Salaries, lighthouse vessels, 1916.....	29, 060. 51
Salaries, Lighthouse Service, 1916.....	3, 394. 96
Aids to navigation, Manistique, Mich.....	. 22

Bureau of Fisheries:

Salaries, Bureau of Fisheries, 1916.....	9, 985. 53
Miscellaneous expenses, Bureau of Fisheries, 1915-16.....	598. 99
Miscellaneous expenses, Bureau of Fisheries, 1916.....	2, 123. 63
Pay, officers and crew of vessel, Alaska fisheries service, 1916....	365. 68
Protecting seal and salmon fisheries of Alaska, 1916.....	109. 87
Launch for fish hatcheries, Mississippi River Valley.....	4, 609. 57
Vessels, fish hatchery, Boothbay Harbor, Me., 1915-16.....	247. 49
Cold-storage plant, fur-seal islands, Alaska, 1915-16.....	253. 73

Total.....	149, 009. 51
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Estimates for the Fiscal Year Ending June 30, 1920.

The estimates for the fiscal year 1920, aggregating \$39,727,740, exceed the estimates for the fiscal year 1919, amounting to \$18,156,065, by \$21,571,675 and exceed the appropriations for 1919, amounting to \$15,227,779.56, by the sum of \$24,499,960.44.

The principal increases are shown in the estimates for the Bureau of the Census, which under the law must take up the preparation for and the taking of the Fourteenth Decennial Census, the work in connection with which will extend over a period of three years, beginning with July 1, 1919, and ending on June 30, 1922.

It is impossible to apportion with any degree of accuracy the cost of the work among the three fiscal years which will constitute the census period. The records of the Thirteenth Census provide no reliable basis on which to make such an apportionment. That census was taken as of April 15, 1910, and at the close of the first fiscal year not all the enumerators had been paid. It is proposed to take the Fourteenth Census as of January 1, 1920, and at the close of the fiscal year all the enumerators will have been paid and the work of compilation will be approximately three and a half months further advanced than was the corresponding work of the Thirteenth Census on June 30, 1910. Obviously, however, the greatest part of the total expense of the census—perhaps as much as \$15,000,000—will fall within the first fiscal year, for during that year the great bulk of the payments for field work will have been made.

For the Lighthouse Service the increase approximates \$4,000,000, the principal items for which have been authorized by the Congress.

For the Bureau of Foreign and Domestic Commerce an increase of \$698,380 is estimated for the extension of the postwar trade.

For the Steamboat-Inspection Service the increase is \$342,230 and is to provide for additional inspectors, clerks, and contingent expenses necessary to carry on the work of the Bureau incident to the shipping program of the Government.

For the Bureau of Standards the increase is \$263,100, due to largely increased activities of the Bureau, and especially in connection with the war work of the Government.

For the Coast and Geodetic Survey the increase is \$654,885.44, principally for new vessels required for that service.

The table following gives the details of all items of estimates for the fiscal year 1920 as compared with items of appropriations for the fiscal year 1919:

COMPARISON BETWEEN THE ITEMS OF ESTIMATES FOR THE DEPARTMENT OF COMMERCE SUBMITTED FOR THE FISCAL YEAR 1920 AND APPROPRIATIONS FOR THE FISCAL YEAR 1919.

	Estimates, 1920.	Appropriations, 1919.	Increase.	Decrease.
OFFICE OF THE SECRETARY.				
Salaries.....	\$206,900.00	\$189,040.00	\$17,860.00	
Contingent expenses.....	60,000.00	70,000.00		\$10,000.00
Rent.....	79,000.00	66,500.00	12,500.00	
Rent of storage space.....	2,000.00	2,000.00		
Total.....	347,900.00	327,540.00	30,360.00	10,000.00
Net increase.....			20,360.00	
LIGHTHOUSE SERVICE.				
Salaries, Bureau of Lighthouses.....	65,430.00	65,430.00		
General expenses.....	4,000,000.00	3,500,000.00	500,000.00	
Salaries of keepers.....	1,321,600.00	940,000.00	381,600.00	
Salaries, light vessels.....	1,880,000.00	1,265,000.00	615,000.00	
Salaries, Lighthouse Service.....	433,000.00	380,000.00	53,000.00	
Retired pay, Lighthouse Service.....	50,000.00		50,000.00	
Public works:				
Tenders and light vessels.....	760,000.00		760,000.00	
Hawaiian Islands, lighthouse depot.....	120,000.00		120,000.00	
Light-keepers' dwellings.....	75,000.00		75,000.00	
Fifth lighthouse district, depot Portsmouth, Va.....	275,000.00		275,000.00	
St. Marys River, Mich., aids to navigation.....	80,000.00		80,000.00	
Staten Island, depot machine shop.....	45,000.00		45,000.00	
Virgin Islands, aids to navigation.....	50,000.00		50,000.00	
Staten Island, wharves.....	65,000.00		65,000.00	
Potomac River, aids to navigation.....	95,000.00		95,000.00	
Eighth lighthouse district, depot, New Orleans.....	88,500.00		88,500.00	

COMPARISON BETWEEN THE ITEMS OF ESTIMATES FOR THE DEPARTMENT OF COMMERCE SUBMITTED FOR THE FISCAL YEAR 1920 AND APPROPRIATIONS FOR THE FISCAL YEAR 1919—Continued.

	Estimates, 1920.	Appropriations, 1919.	Increase.	Decrease.
LIGHTHOUSE SERVICE—continued.				
Public works—Continued.				
Third lighthouse district, riprap protections.....	\$284,000.00		\$284,000.00	
Charleston, S. C., depot.....	115,000.00		115,000.00	
Seventh lighthouse district, site, etc., depot.....	200,000.00		200,000.00	
Alaska, aids to navigation.....	75,000.00		75,000.00	
Ludington, Mich., aids to navigation.....	50,000.00		50,000.00	
Tampa Bay, Fla., aids to navigation.....	17,500.00		17,500.00	
Delaware Bay Entrance, aids to navigation.....	148,500.00		148,500.00	
Goose Island Flats, fog signal.....	140,000.00		140,000.00	
California and Nevada, aids to navigation.....	37,775.00		37,775.00	
Goat Island, Cal., dwellings.....	16,500.00		16,500.00	
Guantanamo Bay, aids to navigation.....		\$14,000.00		\$14,000.00
Second lighthouse district, Boston depot.....		85,000.00		85,000.00
Detroit, depot.....		53,000.00		53,000.00
Sand Island Light Station.....		37,000.00		37,000.00
Spectacle Reef Light Station.....		28,000.00		28,000.00
Ambrose Channel, N. Y., buoys.....		26,000.00		26,000.00
Fifth lighthouse district, gas buoys.....		65,000.00		65,000.00
Sixteenth lighthouse district, depot.....		90,000.00		90,000.00
National security and defense (depot, third lighthouse district).....		175,000.00		175,000.00
National security and defense (aids to navigation, Caribbean Sea).....		100,000.00		100,000.00
Total.....	10,487,805.00	6,823,430.00	4,337,375.00	673,000.00
Net increase.....			3,664,375.00	
BUREAU OF THE CENSUS.				
For salaries and necessary expenses of every kind and character in connection with taking and publishing the Fourteenth Census, and covering three years, July 1, 1919, to June 30, 1922.....				
Salaries.....	30,500,000.00		30,500,000.00	
Collecting statistics.....		739,240.00		739,240.00
Tabulating machines.....		490,000.00		490,000.00
Punching machines.....		60,000.00		60,000.00
National security and defense special statistics ^a		60,000.00		60,000.00
Total.....	30,500,000.00	1,544,240.00	30,500,000.00	1,544,240.00
Net increase.....			18,975,760.00	
BUREAU OF FOREIGN AND DOMESTIC COMMERCE.				
Salaries.....	314,500.00	154,120.00	160,380.00	
Promoting commerce.....	435,000.00	125,000.00	310,000.00	
Promoting commerce, South and Central America.....	125,000.00	100,000.00	25,000.00	
Promoting commerce, Far East.....	137,000.00	50,000.00	87,000.00	
Commercial attachés.....	272,000.00	125,000.00	147,000.00	
Developing trade by motion pictures.....	69,000.00		69,000.00	
National security and defense, foreign-trade statistics.....		100,000.00		100,000.00
Total.....	1,352,500.00	654,120.00	798,380.00	100,000.00
Net increase.....			698,380.00	

^a Part for Bureau of Foreign and Domestic Commerce.

COMPARISON BETWEEN THE ITEMS OF ESTIMATES FOR THE DEPARTMENT OF COMMERCE SUBMITTED FOR THE FISCAL YEAR 1920 AND APPROPRIATIONS FOR THE FISCAL YEAR 1919—Continued.

	Estimates, 1920.	Appropriations, 1919.	Increase.	Decrease.
STEAMBOAT-INSPECTION SERVICE.				
Salaries, Office of Supervising Inspector General.....	\$23,940.00	\$19,440.00	\$4,500.00	
Salaries, Steamboat-Inspection Service.....	729,150.00	463,300.00	265,850.00	
Clerk hire.....	127,000.00	100,000.00	27,000.00	
Contingent expenses.....	175,000.00	130,000.00	45,000.00	
Total.....	1,055,090.00	712,740.00	342,350.00	
BUREAU OF NAVIGATION.				
Salaries, Bureau of Navigation.....	39,730.00	38,130.00	1,600.00	
Salaries, Shipping Service.....	30,100.00	30,100.00		
Clerk hire, Shipping Service.....	51,300.00	47,700.00	3,600.00	
Contingent expenses.....	8,365.00	8,365.00		
Admeasurement of vessels.....	3,500.00	3,500.00		
Instruments for counting.....	250.00	250.00		
Enforcement of navigation laws.....	26,000.00	26,000.00		
Overcrowding of vessels.....	18,000.00	18,000.00		
Enforcement wireless laws.....	45,000.00	45,000.00		
National security and defense (new vessel).....		40,000.00		\$40,000.00
Total.....	222,245.00	257,045.00	5,200.00	40,000.00
Net decrease.....				34,800.00
BUREAU OF STANDARDS.				
Salaries.....	533,760.00	432,360.00	101,400.00	
Equipment.....	100,000.00	75,000.00	25,000.00	
Repairs, etc.....	10,000.00	6,000.00	4,000.00	
General expenses.....	60,000.00	50,000.00	10,000.00	
Grounds.....	10,000.00	7,500.00	2,500.00	
High potential.....	25,000.00	15,000.00	10,000.00	
Structural materials.....	175,000.00	125,000.00	50,000.00	
Testing machines.....	35,000.00	30,000.00	5,000.00	
Fire-resisting properties.....	60,000.00	25,000.00	35,000.00	
Public utilities.....	200,000.00	50,000.00	150,000.00	
Railway materials.....	20,000.00	15,000.00	5,000.00	
Miscellaneous materials.....	35,000.00	30,000.00	5,000.00	
Radio communication.....	40,000.00	20,000.00	20,000.00	
Color standardization.....	15,000.00	10,000.00	5,000.00	
Clay products.....	30,000.00	20,000.00	10,000.00	
Physical constants.....	15,000.00	5,000.00	10,000.00	
Mechanical appliances.....	25,000.00	10,000.00	15,000.00	
Investigation optical glass.....	25,000.00	20,000.00	5,000.00	
Standard materials.....	10,000.00	4,000.00	6,000.00	
Paper, leather, rubber, etc.....	25,000.00	10,000.00	15,000.00	
Sugar technology.....	30,000.00	20,000.00	10,000.00	
Gauge standardization.....	150,000.00	150,000.00		
Storage batteries.....		20,000.00		20,000.00
Mine scales, etc.....	55,000.00		55,000.00	
Electrodeposition metals.....	10,000.00		10,000.00	
Metallurgical research.....	50,000.00		50,000.00	
Chemical reagents.....	15,000.00		15,000.00	
Illumination investigation.....	10,000.00		10,000.00	
Radioactivity.....	10,000.00		10,000.00	

COMPARISON BETWEEN THE ITEMS OF ESTIMATES FOR THE DEPARTMENT OF COMMERCE SUBMITTED FOR THE FISCAL YEAR 1920 AND APPROPRIATIONS FOR THE FISCAL YEAR 1919—Continued.

	Estimates, 1920.	Appropriations, 1919.	Increase.	Decrease.
BUREAU OF STANDARDS—continued.				
Magnetic analysis.....	\$10,000.00		\$10,000.00	
Insulating materials.....	10,000.00		10,000.00	
Sea-water concrete.....	15,000.00		15,000.00	
Industrial pyrometry.....	15,000.00		15,000.00	
Industrial safety standards.....	25,000.00		25,000.00	
Alloy steels investigation.....	25,000.00		25,000.00	
Equipping laboratory.....	100,000.00		100,000.00	
Sound investigation.....	15,000.00		15,000.00	
Testing large scales.....	40,000.00	\$40,000.00		
Test-car depot.....	40,000.00		40,000.00	
Power-plant building.....	25,000.00		25,000.00	
Military research ^a		250,000.00		\$250,000.00
Investigating mine scales and cars ^a		15,000.00		15,000.00
Investigating public-utility companies ^a		50,000.00		50,000.00
National security and defense, thermite investigation.....		4,300.00		4,300.00
National security and defense, aircraft production.....		60,000.00		60,000.00
National security and defense, industrial laboratory.....		31,500.00		31,500.00
National security and defense, industrial laboratory.....		235,000.00		235,000.00
Total.....	2,098,760.00	1,835,660.00	928,900.00	665,800.00
Net increase.....			263,100.00	
BUREAU OF FISHERIES.				
Salaries, Bureau of Fisheries.....	133,440.00	109,120.00	24,320.00	
Salaries, field service.....	336,080.00	328,340.00	7,740.00	
Cabin boy, Fish Hawk.....		480.00		480.00
Miscellaneous expenses.....	710,500.00	665,500.00	45,000.00	
Fish hatcheries:				
Cape Vincent, N. Y.....	10,000.00		10,000.00	
Duluth, Minn.....	4,500.00		4,500.00	
Wytheville, Va.....	10,000.00		10,000.00	
Yes Bay, Alaska.....	25,000.00		25,000.00	
Lobster rearing plant.....	10,000.00		10,000.00	
Pur-seal islands, Alaska.....	15,000.00		15,000.00	
Hatchery, Berkshire, Mass.....		2,500.00		2,500.00
St. Johnsbury (Vt.) Station.....		5,000.00		5,000.00
Pur-seal islands power lighter.....		20,000.00		20,000.00
National security and defense, fishery foods, etc.....		150,000.00		150,000.00
Total.....	1,254,520.00	1,280,940.00	151,560.00	177,980.00
Net decrease.....				26,420.00
COAST AND GEODETIC SURVEY.				
Party expenses.....	382,600.00	382,600.00		
Repairs of vessels.....	31,000.00	36,000.00		5,000.00
Pay, etc., officers and men.....	185,000.00	225,000.00		40,000.00
Salaries.....	607,820.00	477,360.00	130,460.00	
General expenses.....	90,000.00	80,000.00	10,000.00	
New vessels.....	770,500.00	50,000.00	720,500.00	

^a Deficiency act approved Mar. 28, 1918.

COMPARISON BETWEEN THE ITEMS OF ESTIMATES FOR THE DEPARTMENT OF COMMERCE SUBMITTED FOR THE FISCAL YEAR 1920 AND APPROPRIATIONS FOR THE FISCAL YEAR 1919—Continued.

	Estimates, 1920.	Appropriations, 1919.	Increase.	Decrease.
COAST AND GEODETIC SURVEY—continued.				
Two motor-driven lathes.....		\$1,500.00		\$1,500.00
Taku, vessel to replace.....		50,000.00		50,000.00
Four or more motor launches.....		62,500.00		62,500.00
National security and defense, map-work building.....		3,854.56		3,854.56
National security and defense, printing charts.....		14,000.00		14,000.00
National security and defense, new building.....		29,250.00		29,250.00
Total.....	\$2,066,920.00	1,412,064.56	\$860,960.00	206,104.56
Net increase.....			654,855.44	
Printing and binding.....	342,000.00	400,000.00		58,000.00
Grand total.....	39,727,740.00	15,227,779.56	27,955,085.00	3,455,124.56
Net increase.....			24,499,960.44	

Personnel.

The accompanying table shows, by bureaus, the number of permanent positions in the Department on July 1, 1918, and the increase or decrease as compared with July 1, 1917. The figures do not include temporary appointments, nor the following appointments or employments not made by the head of the Department: Persons engaged in rodding, chaining, recording, heliotroping, etc., in field operations of the Bureau of Fisheries; mechanics, skilled tradesmen, and laborers in the Lighthouse Service employed under authority of Schedule A, Subdivision I, section 12, of the civil-service rules. Enlisted men on vessels of the Coast and Geodetic Survey in the Philippine Islands and officers and men of the Navy Department employed on vessels of the Bureau of Fisheries are also excluded. The total of these excluded miscellaneous employments and enlistments is approximately 4,444 as compared with 4,524 for the fiscal year 1917. At the close of the fiscal year 1918 there were 832 employees in the service of the Department serving under temporary appointment or employment.

The total number of permanent positions referred to in the accompanying table, together with the employments and enlistments just mentioned, on July 1, 1918, was approximately 11,051 as compared with 10,079 on July 1, 1917. This includes 1,372 positions the incumbents of which have been temporarily transferred to the War or Navy Departments. The total number of employees of all kinds actually in the service of this Department on July 1, 1918, was approximately 9,679.

Bureau.	Statutory.	Nonstatutory.	Total.	In District of Columbia.	Outside District of Columbia.	Increase (+) or decrease (-).
Office of the Secretary.....	178		178	178		+ 6
Bureau of the Census.....	609	788	1,397	^a 713	684	+150
Bureau of Foreign and Domestic Commerce.....	113	107	220	^a 171	49	- 13
Bureau of Standards.....	342	719	1,061	914	147	+543
Bureau of Fisheries.....	405	15	420	82	338	- 32
Bureau of Lighthouses.....	56	5,767	5,823	43	5,780	+110
Coast and Geodetic Survey.....	313	227	540	^a 341	199	-250
Bureau of Navigation.....	^c 44	189	233	35	198	+ 66
Steamboat-Inspection Service.....	264	83	347	13	334	+ 26
Total (permanent).....	2,324	7,895	10,219	2,490	7,729	+666
Temporary appointments and employments.....		832	832		832	
Grand total (including temporary employments and enlistments).....		8,727	11,051		8,561	

^a Employees engaged in work in the field for a part of each year, with headquarters in Washington, are treated as within the District of Columbia.

^b Includes the following positions, appointment to which is not made by the head of the Department: 409 (259 classified competitive and 150 classified excepted) mechanics, skilled tradesmen, and laborers employed in field construction work in the Lighthouse Service and work of a similar character at the general lighthouse depot at Tompkinsville, N. Y., 1,523 laborers in charge of post lights, and 1,376 members of crews of vessels.

^c Includes 2 stenographers and typewriters authorized by law, and not to be employed exceeding months.

The following tables give a summary of changes in the personnel of the Department for the fiscal year ended June 30, 1918:

APPOINTMENTS, PROMOTIONS, AND REDUCTIONS.

Bureau.	Appointments. ^a						Promo- tions.	Reduc- tion
	Permanent.				Tempo- rary.	Grand total.		
	Com- peti- tive.	Ex- cepted.	Un- classi- fied.	Total.				
Office of the Secretary.....	59	.....	8	67	77	144	45	1
Foreign and Domestic Commerce.....	158	76	.....	234	60	294	153	8
Census.....	88	.....	233	321	212	533	130	1
Standards.....	433	10	70	513	1,070	1,583	586	8
Fisheries.....	37	3	8	48	103	151	43	.....
Lighthouses.....	384	70	.....	454	385	839	887	b 122
Coast and Geodetic Survey.....	47	.....	6	53	175	228	212	4
Navigation.....	46	25	5	76	77	153	84	.....
Steamboat-Inspection Service.....	57	1	.....	58	47	105	49	.....
Total.....	1,309	185	330	1,824	2,106	3,930	c 2,187	144

^a Includes appointments of the following character: Presidential, by selection from civil-service certificates under Executive order, to excepted positions, by reinstatement, and by reason of transfer within the Department or from other departments or independent establishments.

^b Mainly voluntary reductions accepted by employees to secure more desirable conditions of living.

^c Includes 466 temporary increases in the personnel of the Lighthouse Service.

SEPARATIONS AND MISCELLANEOUS CHANGES.

Bureau.	Separations. ^a					Grand total.	Miscellaneous changes. ^b
	From permanent positions.				From temporary positions.		
	Competitive.	Excepted.	Un-classified.	Total.			
Office of the Secretary.....	63	2	10	75	38	113	10
Foreign and Domestic Commerce.....	91	18	.....	109	17	126	34
Census.....	95	.....	148	243	212	455	26
Standards.....	241	17	30	288	469	757	21
Fisheries.....	102	2	14	118	44	162	17
Lighthouses.....	448	48	.....	496	190	686	75
Coast and Geodetic Survey.....	59	.....	2	61	69	130	21
Navigation.....	34	5	1	40	37	77	8
Steamboat-Inspection Service.....	62	.....	.....	62	17	79	6
Total.....	1,195	92	205	1,492	1,093	2,585	218

^a Includes separations by reason of resignations, discontinuances, removals, deaths, transfers within the Department, and transfers from the Department to other departments or independent establishments.

^b Includes reappointments by reason of change of station, name, designation, or appropriation, extensions of temporary appointments, changes from temporary to permanent status, etc.

It is the aim of the Department to encourage its employees to acquire in pursuance of their duties as thorough a knowledge of the operations of the various services as possible in order that whenever vacancies occur in higher grade positions they may be filled by promotion. This policy leads to efficiency. By having competent employees ready to assume the duties of higher positions under present extraordinary conditions the Department has been able to prevent a serious demoralization of the work owing to the unusually heavy drain on its trained force by separations. This serious drain is shown by the fact that 1,615 out of a total force of 6,398 regularly appointed employees, over 25 per cent, left the service during the year. There were only seven transfers from other departments or independent offices at a compensation greater than the usual entrance salary, and in each case it was specifically shown that the vacancies could not be adequately filled by promotion or transfer within the Department.

Before the war we could secure clerks at the low entrance salary of \$900; we can not do so now. These positions are needed for our work and to have them vacant means that the work is done at the expense of clerks in the higher grades whose duties have been increased because of the war.

The remedy for this situation is a higher entrance salary, but we can not provide this without congressional authority. The Government work must go on, but if it is to be done well it will be necessary to make the entrance salary \$1,200 per annum, eliminating the \$900 and \$1,000 salaries for first-class clerks. A certain number of minor clerical positions, carrying a \$1,000 salary, should continue and can be filled by persons whose services can be utilized for work of a minor character.

The cost of living bears cruelly now upon those who fill the lower salaried positions. It is hardly too much to say that a clerk paid \$1,800 has had his salary cut in half within the last two years by the advance in prices, and for all practical purposes of living he stands where he would have stood two years ago had he then received \$900 per annum. The facts are too well known to require argument. A spirit of humanity alone should lead to a radical readjustment of the entrance salaries.

The following table shows that the average amount of both annual and sick leave used by employees for the fiscal year 1918 was a reduction over that of the previous year:

TOTAL AND AVERAGE AMOUNT OF ANNUAL AND SICK LEAVE, BY BUREAUS, STATED SEPARATELY AND TOGETHER, TAKEN BY THE EMPLOYEES OF THE DEPARTMENT IN THE DISTRICT OF COLUMBIA, ARRANGED ACCORDING TO SEX, DURING THE CALENDAR YEAR 1917, AND THE AVERAGE LEAVE FOR 1916.

MALE.

Bureau.	Num-ber. ^a	Annual leave. ^b		Sick leave.		Total.		Aver- age, 1916.
		Days.	Aver- age.	Days.	Aver- age.	Days.	Aver- age.	
Office of the Secretary.....	77	1,864	24.21	334½	4.34	2,198½	28.55	33.59
Bureau of the Census.....	279	7,954	28.51	1,763	6.32	9,717	34.83	36.76
Bureau of Foreign and Domes- tic Commerce.....	74	2,067	27.93	336	7.24	2,603	35.17	35.69
Bureau of Standards.....	268	5,636	21.03	954½	3.56	6,590½	24.59	31.33
Bureau of Fisheries.....	51	1,280	25.09	287½	5.63	1,567½	30.72	28.92
Bureau of Lighthouses.....	24	694	28.91	117	4.87	811	33.78	35.80
Coast and Geodetic Survey....	146	3,916	26.82	792	5.42	4,708	32.24	33.83
Bureau of Navigation.....	20	547	27.35	96½	4.82	643½	32.17	31.58
Steamboat-Inspection Service.	8	226	28.25	6	.75	232	29.00	29.44
Total and average.....	947	24,184	25.54	4,887	5.16	29,071	30.70	33.88

^a Only those employees are included who were considered as being entitled to the full yearly allowance of both annual and sick leave.

^b In the count of the annual leave, all periods of one-half day and over were counted as a full day; periods of less than one-half day were omitted.

TOTAL AND AVERAGE AMOUNT OF ANNUAL AND SICK LEAVE, BY BUREAUS, STATED SEPARATELY AND TOGETHER, TAKEN BY THE EMPLOYEES OF THE DEPARTMENT IN THE DISTRICT OF COLUMBIA, ARRANGED ACCORDING TO SEX, DURING THE CALENDAR YEAR 1917, AND THE AVERAGE LEAVE FOR 1916—Continued.

FEMALE.

Bureau.	Number.	Annual leave.		Sick leave.		Total.		Average. 1916.
		Days.	Average.	Days.	Average.	Days.	Average.	
Office of the Secretary.....	39	1,134	29.08	242½	6.21	1,376½	35.29	37.22
Bureau of the Census.....	226	6,773	29.97	2,685½	11.88	9,458½	41.85	40.59
Bureau of Foreign and Domestic Commerce.....	12	357	29.75	94½	7.87	451½	37.62	37.46
Bureau of Standards.....	2	60	30.00	58	29.00	118	59.00	39.00
Bureau of Fisheries.....	19	559	29.42	231	12.15	790	41.57	35.65
Bureau of Lighthouses.....	2	60	30.00	47	23.50	107	53.50	50.00
Coast and Geodetic Survey....	15	443	29.53	191½	12.76	634½	42.29	40.15
Bureau of Navigation.....	3	87	29.00	41½	13.83	128½	42.83	43.80
Steamboat-Inspection Service.....								
Total and average.....	318	9,473	29.79	3,591½	11.29	13,064½	41.08	39.85

TOTAL.

Office of the Secretary.....	116	2,998	25.84	577	4.97	3,575	30.81	34.78
Bureau of the Census.....	505	14,727	29.16	4,448½	8.81	19,175½	37.97	38.55
Bureau of Foreign and Domestic Commerce.....	86	2,424	28.17	630½	7.33	3,054½	35.50	35.95
Bureau of Standards.....	270	5,696	21.10	1,012½	3.75	6,708½	24.85	31.38
Bureau of Fisheries.....	70	1,839	26.27	518½	7.40	2,357½	33.67	30.81
Bureau of Lighthouses.....	26	754	29.00	164	6.30	918	35.30	37.06
Coast and Geodetic Survey....	161	4,359	27.07	983½	6.10	5,342½	33.17	34.30
Bureau of Navigation.....	23	634	27.56	138	6.00	772	33.56	34.13
Steamboat-Inspection Service.....	8	226	28.25	6	.75	232	29.00	29.44
Total and average.....	1,265	33,657	26.60	8,478½	6.70	42,135½	33.30	35.42

By act of Congress approved June 20, 1918, authority has been given for the retirement on pension of superannuated employees of the Lighthouse Service. Retirement is voluntary after 65 years of age with 30 years of service; compulsory after 70 years of age. The payment authorized is one-fortieth of the average annual salary during the last five years of service for each year of total service rendered, not exceeding a maximum of three-fourths of such average annual salary. This is a recognition, late but welcome, of long and efficient service.

The 5 and 10 per cent increase for the fiscal year 1918 has been replaced by a straight \$120 per annum increase (with certain ex-

ceptions) for all those filling what may be considered permanent positions. While this is more equitable to those receiving small salaries, it is only a slight and temporary palliative of the hardship resulting from the constantly increasing cost of living. The average salary of the Government employee is estimated to be less than \$1,200 per annum, and with the \$120 per annum increase his earnings are augmented approximately 10 per cent over a standard which has remained practically unchanged for decades. In the last 10 years the cost of living has increased almost two-fold, for, considering the standard of prices in 1907 as 100 per cent, the same on June 30, 1917, would be represented by 197 per cent.

It is estimated that over 10 per cent of the Department's total force of approximately 10,000 were of draft age. The Service Flag flying from the Commerce Building bears the number 1,824, indicating the Department's contribution of personnel to the military forces of the Nation up to October 1, 1918. The flag also carries three gold stars in memory of those who have rendered the supreme sacrifice. No exemption from the draft has been claimed for any employee. Deferred classification has been claimed and granted, to date, in about 400 cases, these consisting almost entirely of scientists or specialized workers whose duties pertain to war work or preparations. The record of the Department in this respect was published in the Congressional Record of July 9, 1918. There has been a large increase in the number of female employees in conformity with my instructions that during the war and until further notice women should be employed wherever possible. During the past fiscal year 226, or about 15 per cent, of the probational appointments were issued to women, in each instance upon the same conditions as men were appointed. The probabilities are that this percentage will be much increased during the present fiscal year.

I renew my approval, mentioned in previous reports, of continuing the Saturday half holiday throughout the year.

Printing and Binding.

The sundry civil appropriation act of June 12, 1917, allotted to the Department \$400,000 for printing and binding during the fiscal year 1918. Of this, \$394,952.24 was expended, leaving an unused balance of \$5,047.76. The increase in expenditures in 1918 over 1917 was \$12,349.48 (or 3.23 per cent); the allotment in 1917 was \$400,000; the expenditures \$382,602.76.

The estimated cost of unbilled and uncompleted work of the Department at the Government Printing Office on July 1, 1918, was \$64,864.57, while the actual cost of such work at the Government Printing Office on July 1, 1917, was \$69,104.73.

During the fiscal year the Department issued on the Public Printer 2,871 requisitions for printing and binding, an increase of 149 compared with 1917. There were at the close of business June 30, 1917, 501 requisitions which were incomplete, compared with 416 on the same date in 1917.

The following table shows the cost of printing and binding for each of the bureaus, offices, and services of the Department during the fiscal years 1917 and 1918, with the increase or decrease in 1918 for each and the estimated cost of the work on hand but not completed June 30, 1918:

Bureau, office, or service.	Cost of work delivered.		Increase (+) or decrease (-).		Estimated cost of work not completed, June 30, 1918.
	1917	1918	Cost.	Per cent.	
Office of the Secretary (Secretary, Assistant Secretary, Solicitor, Chief Clerk, and Division of Publications).....	\$15,432.08	\$18,388.96	+\$2,956.88	+19.16	\$1,314.45
Appointment Division.....	373.00	651.23	+ 278.23	+74.59	60.64
Disbursing Office.....	696.21	564.78	- 131.43	-18.88	28.97
Division of Supplies.....	184.85	202.55	+ 17.70	+ 9.58	20.33
Bureau of the Census.....	115,971.35	96,487.31	-19,484.04	-16.80	27,656.48
Coast and Geodetic Survey.....	28,685.67	45,610.93	+16,925.26	+59.00	9,624.28
Bureau of Fisheries.....	16,432.46	15,364.28	- 1,068.18	- 6.50	968.24
Bureau of Foreign and Domestic Commerce.....	121,529.73	118,617.02	- 2,912.71	- 2.40	10,756.21
Bureau of Lighthouses.....	18,569.17	18,586.42	+ 17.25	+ .09	886.53
Lighthouse Service.....	4,771.61	6,443.32	+ 1,671.71	+35.03	1,615.30
Bureau of Navigation.....	14,740.06	12,902.86	- 1,837.20	-12.46	19.71
Shipping Service.....	2,491.36	3,440.45	+ 949.09	+38.10	1,119.73
Radio Service.....	589.98	447.29	- 142.69	-24.19	.....
Bureau of Standards.....	23,649.34	35,638.74	+11,989.40	+50.70	6,839.58
Office of the Supervising Inspector General,					
Steamboat-Inspection Service.....	1,009.08	1,760.34	+ 751.26	+74.45	13.46
Steamboat-Inspection Service.....	10,701.05	9,795.13	- 905.92	- 8.47	1,230.17
Customs Service.....	6,775.76	10,050.63	+ 3,274.87	+48.33	2,710.49
Total.....	382,602.76	394,952.24	+12,349.48	+ 3.23	64,864.57

The amount and cost of each class of work called for by requisitions on the Public Printer during the fiscal years 1917 and 1918 are shown in the following statement:

Class.	1917	1918	Increase (+) or decrease (-).	
	Number.	Number.	Number.	Per cent.
Blank forms.....	17,298,211	25,605,702	+8,307,491	+48.03
Reports, pamphlets, etc.....	4,016,515	4,560,340	+543,825	+13.54
Letterheads.....	3,562,000	3,360,000	-202,000	-5.67
Envelopes.....	50,000	58,000	+8,000	+16.00
Circulars, summaries, and notices.....	384,475	1,562,625	+1,178,150	+306.43
Index cards.....	1,837,400	1,318,500	-518,900	-28.24
Guide cards and folders.....	88,500	431,817	+343,317	+387.93
Memorandum sheets.....	1,586,000	2,240,000	+654,000	+41.24
Blank books.....	27,191	24,578	-2,613	-9.61
Miscellaneous books (binding).....	2,866	2,819	-47	-1.64
	Cost.	Cost.	Cost.	Per cent.
Blank forms.....	\$33,246.00	\$52,441.17	+\$19,195.17	+57.74
Reports, pamphlets, etc.....	320,981.44	305,761.33	-15,220.11	-4.74
Letterheads.....	4,971.42	5,380.60	+409.18	+8.23
Envelopes.....	210.71	146.97	-63.74	-30.25
Circulars, summaries, and notices.....	2,118.95	4,083.13	+1,964.18	+92.70
Index cards.....	1,268.75	1,153.60	-115.15	-9.08
Guide cards and folders.....	857.81	2,779.80	+1,921.99	+224.06
Memorandum sheets.....	407.24	2,122.46	+1,715.22	+421.18
Blank books.....	8,190.64	14,348.41	+6,157.77	+75.18
Miscellaneous books (binding).....	9,513.53	6,055.63	-3,457.90	-36.35
Miscellaneous.....	836.27	679.14	-157.13	-18.79
Total.....	382,602.76	394,952.24	+12,349.48	+3.23

During the fiscal year 1918 the Department issued 1,141 publications (1,192 during the fiscal year 1917). Those issued in 1918 contained 42,644 printed pages (54,407 in 1917). There were printed for the Department a grand total of 4,804,180 copies (4,444,200 in the preceding year).

The following table summarizes the publication work of each bureau of the Department for the fiscal years 1916, 1917, and 1918. The year 1916 was an abnormal one in both the number of publications issued and copies printed due to the printing and distribution during that year by the Bureau of the Census of 789 advance press summaries of the results of the census of manufactures in 1914, of which 1,200,000 copies were printed, and the printing and distribution by the Bureau of Foreign and Domestic Commerce of 1,500,000 circulars used in the campaign for saving waste paper.

Bureau or office.	Publications.			Pages.		
	1916	1917	1918	1916	1917	1918
Office of the Secretary.....	77	78	70	2,428	3,006	2,860
Bureau of the Census.....	836	135	83	14,163	13,161	4,548
Coast and Geodetic Survey.....	56	62	55	3,960	3,097	5,378
Bureau of Fisheries.....	81	81	91	2,620	2,440	2,852
Bureau of Foreign and Domestic Commerce.....	575	553	544	21,645	17,803	16,372
Bureau of Lighthouses.....	129	111	100	4,361	3,087	3,517
Bureau of Navigation.....	23	22	16	3,207	3,102	1,576
Bureau of Standards.....	150	122	158	8,328	6,623	4,591
Steamboat-Inspection Service.....	18	28	24	988	2,088	970
Total.....	1,945	1,192	1,141	61,702	54,407	42,644

Bureau or office.	Copies printed for De- partment.			Cost. ^a		
	1916	1917	1918	1916	1917	1918
Office of the Secretary.....	261,850	183,550	231,050	\$6,331.07	\$7,157.60	\$6,909.31
Bureau of the Census.....	1,432,910	645,150	427,875	54,283.37	92,562.23	73,150.95
Coast and Geodetic Survey.....	79,750	109,300	93,600	22,218.71	25,577.94	37,775.82
Bureau of Fisheries.....	171,350	339,700	981,840	10,339.36	11,681.49	13,833.18
Bureau of Foreign and Domestic Commerce.....	4,359,200	2,411,450	2,235,850	120,459.01	114,937.10	107,359.38
Bureau of Lighthouses.....	351,175	270,800	309,050	21,646.99	18,720.83	19,129.80
Bureau of Navigation.....	59,950	52,750	22,065	17,483.47	14,303.72	12,435.29
Bureau of Standards.....	203,050	138,300	238,950	28,209.20	21,202.22	23,154.69
Steamboat-Inspection Service.....	204,800	293,200	263,900	8,062.35	9,870.44	6,634.33
Total.....	7,124,035	4,444,200	4,804,180	289,033.53	316,013.57	300,382.75

^a Figures relate to publications actually delivered to the Department during the year; consequently they do not agree with similar figures in a preceding table giving the cost of work done by the Government Printing Office during the fiscal year. Frequently the cost of a publication is charged against allotments for two or more fiscal years.

The Department's policy of limiting free distribution of its publications resulted in sales by the Superintendent of Documents during the year of 89,808 copies of reports and pamphlets of the Department through miscellaneous sales and 2,884,213 copies by annual subscriptions, a total of 2,974,021 copies. In 1917, 122,896 copies were sold through miscellaneous sales and 3,402,430 copies by annual subscriptions, a total of 3,525,326. Receipts from both sales and subscriptions were \$32,993.59 in 1918 and \$42,461.46 in 1917. The decreases in 1918 are due largely to war conditions, the receipts from sales of publications of the Bureau of Foreign and Domestic Commerce alone falling off \$7,289.52. Coast Pilots, Inside Route Pilots, Tide Tables, and Charts are sold by the Coast and Geodetic Survey, and the receipts from these sales during the year were \$20,194.19. Thus, the total receipts from sales of

the publications of the Department during the past year were \$53,187.78.

During the last fiscal year 3,863,594 publications and printed circulars of the Department were distributed to the public through the Division of Publications, compared with 3,593,563 during the fiscal year 1917, an increase of 270,031.

There were received and acted on during the year 61,538 requests for 568,703 copies of publications, compared with 106,301 requests for 891,971 copies in 1917.

The Department maintains in its Division of Publications a number of mailing lists for use in sending typewritten or multi-graphed information, as well as publications. On July 1, 1918, there were 350 lists, containing 285,877 names.

During the year the Department expended \$2,190.55 for advertising for proposals for furnishing supplies of various kinds, for construction work, and for the purchase of condemned property.

Motor Vehicles.

The present motor-vehicle equipment quartered in the Commerce Building consists of two trucks and two motor cycles, a recent increase of one motor cycle. The 1,500 and 2,000 pound trucks and the older motor cycle were operated during the last fiscal year at a cost per mile of \$0.0944, \$0.0674, and \$0.05028, respectively, as against \$0.055, \$0.057, and \$0.014 per mile during the preceding fiscal year.

The following statement shows the operation and maintenance cost of this equipment:

	1,500- pound truck.	2,000- pound truck.	Motor cycle.
Mileage.....	9,477	10,334	3,481
Operating days.....	281	301	194
Average miles per diem.....	33.73	34.33	17.94
Gasoline consumption (gallons).....	979	1,001	161
Miles per gallon of gasoline.....	9.63	10.32	21.62
Operating expenses;			
Tires and tubes.....	\$323.29	\$345.40	\$9.31
Repairs to tires and tubes.....	14.75	11.63	5.46
Equipment.....	25.42	23.02	28.95
Miscellaneous supplies.....	15.80	15.80	.....
Gasoline.....	219.58	224.52	36.11
Cylinder oil.....	20.68	21.12	3.71
Repairs to machines.....	137.89	24.44	84.09
Replacements.....	137.30	30.10	7.40
Total operating expenses.....	\$94.71	\$66.03	175.93

Stock and Shipping Section.

The stock and shipping section received and filled during the year 7,179 requisitions for supplies of all kinds, of which 2,971 were for the offices and bureaus of the Department located in Washington and 4,208 for the outside services. Of the requisitions received 2,703 were for blank forms, 623 for printed stationery, and 3,853 for stationery supplies.

The following table shows the number of books and blanks sent to each of the outside services during the year:

Service.	Blank books.	Blank forms.
Customs Service (Bureaus of Navigation and Foreign and Domestic Commerce) .	9,271	1,005,877
Fisheries Service.....	248	485,617
Lighthouse Service.....	12,951	898,630
Bureau of Navigation:		
Shipping Service.....	7,876	199,169
Radio Service.....	286	76,020
Steamboat-Inspection Service.....	185,180	724,992
Miscellaneous.....	25	160,293
Total.....	215,837	3,550,598

The following statement gives the quantity of each class of printed stationery supplied during the year, both in Washington, D. C., and in the field:

Blank books.....	4,411	Guide cards.....	111,337
Blank forms.....	290,274	Index cards.....	1,015,250
Continuation sheets.....	552,500	Letterheads.....	522,500
Embossed envelopes.....	3,000	Memorandum sheets.....	2,150,184
Embossed letterheads.....	16,000	Stenographers' notebooks.....	2,721
Envelopes.....	6,833,875	Vertical folders.....	552,500

Four hundred and sixty-two orders were placed with the contractors for 7,043,200 envelopes, costing \$8,658.94, of which 5,622,375 were used in Washington and 1,420,825 by services in the field.

Department Library.

During the year 3,396 volumes and 926 pamphlets were added to the library. Two thousand and ninety-six trade and technical periodicals were received, and brought to the attention of officials interested in their contents. There were 3,600 volumes discarded to make room for new material.

Figures do not indicate the amount of work performed in the library during the past year; it has been unprecedented.

In addition to furnishing material to the bureaus of the Department, the library has been opened to all the war boards and commissions, which use it freely. A great deal of time has also been given these services in research work in connection with various investigations, without any increase in the force. The library has proven a valuable and useful instrument in the war work of the Government.

Books to the number of 1,169, donated by clerks for our soldiers and sailors, were transmitted through the library to the Library of Congress.

The Division of Supplies.

At the beginning of the year the Division was much handicapped by losses in its trained personnel, caused by the draft and transfers to war bureaus, but a number of the positions were filled by the appointment of women. By a readjustment in salaries, made possible by separations from the service of higher salaried clerks in other divisions of the Secretary's Office, it has been practicable to better assign the several duties of the Division to clerks who are paid salaries more nearly commensurate to their tasks.

A total of 3,132 requisitions were handled, involving the writing of 4,140 orders and 6,974 invoices. This also necessitated the issuance of 4,027 sets of proposals. The sum of \$204,587.56 was expended for supplies ordered through the Division during the fiscal year, and 4,369 vouchers were audited for payment. In addition to this a representative of the Division inspected 479 tons of coal for the Department.

The sum of \$1,067.08 was received from the sale of old and condemned furniture, office equipment, four horses, three carriages, stable equipment, and miscellaneous other property of no further use to the Department.

Two hundred and seventy-three typewriters were purchased at a total cost of \$18,980.15. As the allowances on old machines amounted to \$2,248.50, the total net cost of these 273 machines was \$16,731.65, or an average price of \$61.288 each.

Liberty Loans and War Savings Stamps.

The subscriptions to the several loans and War Savings Stamps were as follows:

	Subscribers.	Subscription.
Liberty Loan (first).....	2,516	\$500,850.00
Second Liberty Loan.....	3,377	604,700.00
Third Liberty Loan.....	4,793	607,550.00
Total in bonds.....	10,686	1,713,100.00
War Savings Stamps (6 months).....		78,197.71
Grand total.....		1,791,297.71

At this writing subscriptions to the Fourth Liberty Loan are reported as follows: Subscribers, 5,772; subscription, \$841,600. Some of the more distant parts of the field services have not yet reported.

Purchase of Dutch Harbor, Alaska.

I renew the recommendation made in my reports for 1915, 1916, and on page 50 of my report for 1917, that the Government should purchase Dutch Harbor, the abandoned village of the North American Commercial Co. in Alaska.

Foundation for the Promotion of Industrial Peace.

Pursuant to the joint resolution of Congress approved July 12, 1918, the trustees of the Foundation for the Promotion of Industrial Peace at a meeting on July 18, 1918, authorized the American Security & Trust Co., treasurer of the foundation, to return the fund now in its custody to Hon. Theodore Roosevelt. This has been done.

Abolition of the Official Register.

The abolition of the Official Register, for which House bill 2354 provides, would save a waste of paper and labor on a publication which no longer serves the purpose for which it was intended. The card system for which the measure provides would be much less expensive and far more efficient.

Status of Proposed Legislation Affecting the Department.

The following items of pending legislation are deemed of special importance by the Department:

House bill 10236. To prohibit the importation, bringing into, or landing in the United States, and so forth, of lobsters taken in waters outside the territorial waters of Canada and opposite thereto during closed seasons in such waters.

House bill 11984. To provide for the Fourteenth and subsequent decennial censuses. (Passed the House of Representatives July 2, 1918. Now pending in the Senate.)

House bill 10366 (S. 4458). To authorize the adoption, registration, and protection, of a national trade-mark to distinguish merchandise manufactured or produced in the United States of America and used in commerce with foreign nations, or among the several States, or with Indian tribes, and to authorize the Secretary of Commerce to license the use of same, and for other purposes.

House bill 1753. For the protection, regulation, and conservation of the fisheries of Alaska, and for other purposes.

House bill 5338. Extending the benefits of care and treatment by the Public Health Service to seamen on vessels used in the service of the United States.

House bill 2346. To amend section 13 of an act entitled "An act to promote the welfare of American seamen in the merchant marine of the United States, to abolish arrest and imprisonment as a penalty for desertion, and to secure the abrogation of treaty provisions in relation thereto; and to promote safety at sea," approved March 4, 1915.

House bill 2354. To provide for the registry of officers, clerks, and employees in the Federal service, and for other purposes.

House bill 2878. To regulate and control the manufacture, etc., and use of weights and measures, and of weighing and measuring devices.

House bill 10475. For the establishment of a uniform system of weights and measures in the United States.

House bill 6186. To fix and establish a legal or standard crate and a legal or standard basket for tomatoes.

House bill 12392. To authorize the formation and organization of corporations for the transaction and conduct of commerce with foreign nations.

Development of Waterways.

An important step forward, which will be of great advantage to our commerce, was taken when the Director General of Railroads assumed, on behalf of the Government for the period of the war, the operation of the Cape Cod and the Delaware and Raritan Canals, the latter being operated in connection with the New York State Barge Canals. Every economic, military, and naval argument points to the importance of the earliest possible development of a Government-owned waterway corresponding with what is commonly known as the Atlantic intracoastal waterway, connecting all the great cities of our Atlantic seaboard with one another, with the New York State waterways, reaching to the Great Lakes and Lake Champlain, and with all the railroad terminals along our eastern coast. Such a waterway, safe alike from the effects of storms and from the acts of enemies, would be a great asset to the Nation if it were available to-day. The development of the use of our internal waterways having been taken over by the Railroad Administration, this Department retains an interest in them only because of their effect in promoting our commerce.

Work of the Solicitor's Office.

During the fiscal year ended June 30, 1918, 118 contracts, totaling \$1,130,529, together with 25 contracts of indeterminate

amounts; 43 leases amounting to \$115,752; 20 revocable licenses, amounting to \$12,240; 4 deeds in the sum of \$6,350; 101 contract bonds amounting to \$289,503; and 50 official bonds amounting to \$285,000, were examined, approved, disapproved, drafted, redrafted, or modified.

The number of legal opinions rendered, formal and informal (memorandum), totaled 398. Legislative matters handled which concern the Department of Commerce (drafting and redrafting of bills, reports relative thereto, etc.) numbered 418. In addition, 1,999 miscellaneous matters embracing everything submitted for the advice or suggestion of the Solicitor, or for the formulation of Department action, not included in the foregoing items, were handled by the Office of the Solicitor.

In connection with the Solicitor's Office, I point out the small salaries (\$1,400 to \$1,800) paid the attorneys in this office. These attorneys (though classified as clerks) are graduates of law schools and members of the bar. Their duties are those of attorneys and law clerks and require training and legal ability. They are paid much less than those doing similar work in other departments. In fact, these professional employees receive no greater salaries than are paid departmental clerks without professional training. The salaries of these attorneys should range from \$1,800 to at least \$2,500 per annum, to correspond to salaries received by attorneys and law clerks in other departments.

Because of the low salaries paid, the Solicitor's Office has, during the year, lost two of its most competent law clerks. As the employees of this office are under the jurisdiction of the Department of Justice, I have taken up with the Attorney General the matter of making the salaries conform to those paid for similar work in other law offices of the Government. Assurances have been received from the Attorney General that he would be very glad, indeed, to give the matter consideration when the estimates are being prepared for the next fiscal year beginning July 1, 1919. The Solicitor has accordingly submitted estimates providing for the rearrangement of the positions of the attorneys in his office, both in designation and salaries.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

(BURWELL S. CUTLER, *Chief.*)

This Bureau is the national center for economic information and statistics of the resources, transportation, and trade of foreign countries. The past war year brought unprecedented demands for that class of information. At home and abroad the Bureau helped the War and Navy Departments to find new sources of needed materials, in some cases taking part in the actual purchase. Congress, too, and all the war boards sought information about our foreign trade, our raw materials and markets, as well as trade data from foreign countries on their raw materials and indispensable imports. The statistics and facts were available chiefly in the Bureau. Therefore, in addition to the normal function of promoting foreign trade, the Bureau became also a mainstay of economic research for the War Trade Board, War Industries Board, Shipping Board, and other Federal agencies of less intimate contact with trade.

Most of our commercial attachés are representing the War Trade Board or the Shipping Board, some of them having taken part in the economic conferences of the allies on blockade and embargo matters in London and Paris, and all having contributed frequent reports on commercial matters to the above war organizations. Our special traveling agents have collected and turned over volumes of information to the war boards. The Latin American division has time and again supplied specialized information which could have been obtained from no other quarter; indeed, the division has been expanded greatly under the influence of that demand. It is easy to see what great contributions might also have been made by a Russian division and a far eastern division and a western European division had we been fortunate enough to have such facilities at command; much valuable information in respect to those fields exists in the Bureau, but it could not all be organized for use with the means available. The statistical division has been at times absorbed in satisfying the extraordinary and comprehensive demands of the war agencies for minutely classified import and export figures, and this situation has obtained also in a less degree with the research division. It is not too much to say that the Chief and Assistant Chiefs of the

Bureau have labored day and night to meet the war-time demands without allowing the regular functions of the Bureau to lapse.

Balance of Trade in Favor of United States.

The visible balance of trade in favor of the United States on merchandise transactions for the fiscal year ended June 30, 1918, was \$2,982,226,238. The total of our merchandise export trade was \$5,928,285,641 and of our import trade \$2,946,059,403.

Working Policy.

At the beginning of the year the American manufacturer and exporter was still seeking foreign trade where he could find it, and he was encouraged rather than discouraged by the Bureau in his efforts. It was thought proper to supply the needs of the foreign customer so long as there was involved no interference with the war program. Eventually there came a time when the effective prosecution of the war demanded a cutting down of foreign sales to conserve tonnage and materials. Thereupon the Bureau ceased for the time to promote the expansion of present general export business and turned to the problems involved in keeping close touch with the remaining available markets and the close investigation of other markets, so that there would be the fewest possible obstacles in the way of resuming trade when the war ends. Investigations now carried on in foreign fields are aimed not so much at stimulating present business as at supplying our manufacturers and exporters with information that will enable them to meet future competition. This has naturally led the Bureau to consider plans relating to the resumption of trade after the war; the organization is giving attention to the problems of commercial readjustment.

The present purpose of the Bureau is to cooperate to the fullest extent with the national war agencies and not to concentrate attention exclusively on immediate trade promotion, since to do so might handicap our military effectiveness. On the other hand, the Bureau would be remiss in its duty if it did not develop an organization and collect information for the vital period to come. This has been done tirelessly and to the limit of means in men and money, as the following pages will show.

German Trade.

The war aroused keen interest in the trade methods that Germany had used to intrench herself in the markets of the world, and because conflicting opinions and rumors were abroad the

Bureau decided to make a thorough inquiry into the matter and put the truth before the business public in the form of printed reports. The first issued was "German Foreign-Trade Organization," which set forth the development of the German export trade, the organization of German commercial education, the promotion of trade by the German settlements in foreign countries, the German banking and shipping facilities, and the trade-promoting agencies and trade associations. The object was not condemnation of all German efforts, but rather an impartial presentation of the good and bad features, so that the American exporter and manufacturer could profit by what was good as well as avoid what was evil. The report was the work of Mr. Chauncey D. Snow, First Assistant Chief of the Bureau, who was engaged in an industrial investigation in Germany when the war broke out. It was followed by a report, entitled "German Trade and the War," concerned with war-time commercial and industrial conditions in Germany and their bearing on the future trade of that country. The first report was devoted largely to the export trade of the enemy, the second to his raw materials and imports. The second report was prepared by Mr. Snow, in collaboration with J. J. Kral, of the research division of the Bureau. These reports have had wide circulation.

Independence of German Chemicals.

Because the census of dyestuff imports taken by the Bureau in an effort to stimulate the development of an American industry proved effective, the work of completing a similar census of all chemical imports has been pushed vigorously during the last year, with the cooperation of the American Chemical Society. For many years the industries of this country have depended upon Germany for dyestuffs and many other lines of the finer chemicals, and the German exporters have taken good care that particulars of the extent and character of this trade were not made known. The dyestuff census brought this information to light so far as that industry was concerned, and American manufacturers were able to proceed with certainty. The possibility of establishing a self-contained chemical industry in this country is no longer open to question. Germany has definitely lost much ground in our market, and the coming report on prewar chemical imports will make possible additional assaults on former German chemical strongholds.

Defeating German Commercial Plots.

German attempts to register American trade-marks in foreign countries, particularly in South America, were reported to the Bureau at intervals during the last year. Our procedure in cases of this kind is the same as in any attempts to appropriate trade-marks belonging to American concerns; that is, the American firms are notified that marks belonging to them have been offered for registration, and they are advised as to what they may do to maintain their rights. Regulations governing the registration of trade-marks vary in different countries. In this country the person who first uses a mark is considered the owner, even if he does not register it promptly. In many South American countries the man who first registers the mark is the owner. It is easy to see how serious it would be to have any considerable number of American marks pass into German hands in these markets. Some marks have been definitely lost, but others have been re-registered upon proof of fraud in the first registration. The Bureau will continue its watchfulness, but increasing vigilance on the part of our manufacturers is necessary.

The traveling agents and commercial attachés of the Bureau have been in an advantageous position to watch the activities of German merchants and commercial agents in countries where they are still at liberty to plan and plot. Information obtained in this way has been important to the various war organizations of our Government and has enabled the Bureau to anticipate German plans for the future.

Commercial Attachés.

Because of war conditions, the work of these officers has been chiefly given to assisting the special war services—the War Trade Board, War Industries Board, Food Administration, and others.

Mr. Pierce C. Williams, commercial attaché at London, has been transferred to Paris.

Mr. Philip B. Kennedy, formerly at Melbourne, has been given the London post.

Mr. Paul L. Edwards, commercial attaché at The Hague, has been several times called to London and Paris on work for the War Trade Board.

Mr. Erwin W. Thompson, commercial attaché at Copenhagen, has spent much time in London on work for the War Trade Board.

Mr. William C. Huntington, commercial attaché at Petrograd, after actively assisting our ambassador through many trying months, has returned to this country.

The post at Buenos Aires has been filled by Mr. Robert S. Barrett, who represents also the War Trade Board, the Shipping Board, and the War Industries Board in Argentina. He has been intrusted by our ambassador with all enemy-trade investigations.

Mr. William F. Montavon, commercial attaché at Lima, has been active in successfully settling differences between American firms and the Peruvian importers. He was, after the close of the fiscal year, transferred to a new post in Spain.

Mr. William C. Downs, commercial attaché at Rio de Janeiro, resigned, and shortly after the close of the fiscal year the post was filled by the appointment of Mr. J. E. Philippi, who has for years been identified with the American export trade in Brazil.

The work of Mr. Philip B. Kennedy, commercial attaché at Melbourne, has been fruitful in bringing about a kindly commercial understanding between the United States and Australia. His place at Melbourne has been filled by Mr. Augustin W. Ferrin.

Mr. Julian Arnold, commercial attaché at Peking, has long acted as chairman of the International Customs Conference in Shanghai, on which body he represents the United States. During his absence on this duty the post at Peking was filled by Mr. Ferrin, now transferred to Melbourne.

Mr. Frank R. Rutter, commercial attaché at Tokyo, has rendered valuable service in connection with necessary commercial readjustments arising from war conditions.

It is a matter of deep regret that the Department has not been furnished funds with which to increase the force of commercial attachés. Each of these officers has dealt with delicate and important matters with success and self-sacrifice. The commercial interests of the country abroad would be in even better condition than they are had the request of this Department for a larger force of attachés been heeded. There is now an urgent, repeated call from Italy for a commercial attaché at Rome. We hope to answer this call affirmatively.

Trade Commissioners (Traveling Commercial Agents).

These are specialists assigned to investigate particular markets or to study basic conditions underlying the foreign trade of certain countries. They have obtained first-hand commercial information of the greatest importance to the War Trade Board, War Industries Board, Council of National Defense, War Department, Navy Department, Department of State, Shipping Board, and the Railroad Administration. This information has covered such

subjects as trading-with-the-enemy violations, enemy propaganda abroad, opportunities for substituting American for German capital in enterprises of neutral countries, comments on current conditions in Germany, Russia, and Finland, data concerning foreign sources of important raw materials, etc. These agents have thus done their war service in the regular course of their missions on trade subjects.

Valuable assistance has been given by the commercial agents in connection with the war work of the Government in such important matters as current economic developments in Germany, the effect of the war and blockade on conditions in Scandinavia, the status of commercial concerns in South America, the source of supply of boots and shoes in South America, assistance in purchasing supplies for our Army in Spain, data on port facilities and freight conditions in South America, on lumber supplies available in Scandinavia, on the commercial and political conditions in Finland, on the crude-rubber resources of the world, on railways in the Far East and in New Zealand, Australia, and Japan, and the lumber trade in Russia and on industries in that country.

The work thus briefly summarized has been utilized by the War Department, the State Department, the Navy Department, the War Trade Board, the conservation division of the War Industries Board, the Council of National Defense, the Bureau of Mines, and the Geological Survey of the Interior Department, the War Minerals Committee of the War Industries Board, the Shipping Board, the Railroad Administration, etc.

The Department regrets that the necessity for making this report as brief as possible prevents its naming here the various traveling representatives who have done so much in the past year under difficult conditions on behalf of their country. One at least of them was thrown into a Russian prison, and others have had to work in distant places under circumstances of stress or danger. Their work has been well done and they are entitled to the thanks of the country, not only for the quality of the services they have rendered, but for the unselfish and patriotic spirit in which they have done their part.

Investigations Completed During the Year.

Some of the most important investigations ever undertaken by the Bureau were completed during 1918 by these traveling agents. Other investigations of no less importance were started

during the year and have yet to be completed. A brief outline of both groups follows:

The study of the markets for agricultural implements in Australia, New Zealand, and the Union of South Africa was completed.

Reports were published on "Markets for Agricultural Implements and Machinery in South Africa," and "Agricultural Implements and Machinery in Australia and New Zealand."

The study of cotton-goods markets in British India and Ceylon was finished early in the fiscal year. Parts IV, V, and VI of "Cotton Goods in British India" were published during the year. They are concerned with the trade of the Bombay Presidency, a summary of the Indian trade, and cotton manufacturing in India, respectively.

An investigation of markets for electrical goods in Australia, New Zealand, China, Chosen, and Japan was completed during the year. Monographs were published on "Electrical Goods in New Zealand" and "Electrical Goods in Australia."

Inquiry into the possibilities of South Africa and Portuguese East Africa as markets for American hardware disclosed an eagerness on the part of importers in those lands to enter into permanent trade relations with this country. The report of the officer who conducted this investigation will be published soon.

A study was made of markets for motor vehicles in Japan, China, and Hawaii. The report covering these countries is completed and will be issued in the near future.

The study of markets for paper, paper products, and paper machinery in South America and Cuba was completed early in 1918. This field was formerly dominated by German products. Reports were published during the year on "Chilean Market for Paper, Paper Products, and Printing Machinery," "Paper Products and Printing Machinery in Argentina, Uruguay, and Paraguay," and "Brazilian Markets for Paper and Paper Products, Including Machinery."

The well-known popularity of American shoes in those foreign countries where they have been well advertised led the Bureau to undertake a study of shoe markets in Latin America, Australasia, and the Far East. The investigation in Australia, the Philippines, China, and Japan was completed during the winter, resulting in reports entitled "Shoe and Leather Trade in New Zealand," "Shoe and Leather Trade in Australia," and "Shoe and Leather Trade in the Philippines." The survey of Latin American shoe markets was completed. "Markets for Boots and Shoes in Peru"

appeared during the year, and monographs covering Chile and the River Plate countries are in press.

The investigation of Latin American markets for textiles proceeded, but was not completed. The following monographs were published during the year: "Textile Markets of Bolivia, Ecuador, and Peru" and "Textile Markets of Chile."

The increasing importance of manufactured rubber in industry and our dependence on foreign sources for this material led the Bureau to arrange for a study of sources of raw rubber, export methods, and other factors affecting the domestic rubber industry. An interesting feature of this work is the review of experiments with guayule cultivation in the desert lands of our Southern States. It seems probable that within a comparatively short time guayule production within our own borders will become profitable. Conditions prevailing in the rubber-producing regions of Brazil, the East Indies, and other parts of the world are covered in a monograph which will soon be published.

A study of investment opportunities in Latin America was finished during the spring. From the standpoint of United States foreign trade and the furtherance of existing good relations with the South American Republics, our investing public should give more attention to South American opportunities after the war.

Investigations in Progress.

The study of Latin American markets for construction materials and machinery has been completed in Cuba, Argentina, and the west-coast countries of South America. During the year one monograph was published, entitled "Market for Construction Materials and Machinery in Colombia."

The investigation of South American markets for American furniture has disclosed a remarkable development of local industries, but it seems likely that upon the restoration of normal conditions American lines will be sold as heretofore on a quality basis. "Colombian Markets for American Furniture" is the title of the only report issued on this subject during the year.

The investigation of Latin American markets for jewelry and silverware was completed in Cuba and the west-coast countries. Much progress has been made by American exporters in this line since the war started. This investigation is of particular significance, because the South American market has been dominated by European jewelry.

Preliminary work in connection with after-war markets for wood and lumber in Great Britain and France has been completed. Effective work was done in convincing officials and importers that American construction woods are stronger in proportion to size than the softer woods of the Baltic countries. The study of after-war lumber markets in the Spanish Peninsula, Italy, and Greece was begun. All these countries are important future markets for American goods.

The study of timber resources and export methods in Finland was completed. This work was carried on in spite of severely adverse conditions.

The preliminary survey of the Swedish lumber industry is finished. That work in Norway will soon begin.

A study of Russian timber resources has progressed in the face of many difficulties. The investigation of the inaccessible forest regions of eastern Siberia was pioneer work. It is believed that no other reliable information is available concerning the timber resources of this important potential source of supply. The Bureau will continue this work in European Russia, if possible.

The investigation of markets for railway equipment in Australia, China, and Japan was completed during the winter and a voluminous report on conditions in Japan, China, and Chosen will shortly be issued. One report was published under the title "Markets for Railway Materials, Equipment, and Supplies in Australia and New Zealand."

The study of financial and economic conditions in China continues.

A survey of the mineral resources of Japan has been completed and a comprehensive report is nearly ready.

An inquiry into the mineral resources of China, that are destined to play so large a part in the development of that country, will soon begin.

A study of ports, harbors, and interior transportation facilities of all kinds in China and other far eastern countries is being continued. The potentialities of China as a market for American products and a field for American enterprise make such an investigation very desirable.

The growing interest in Latin America as a market for the increasing volume of American exports and the lack of information on the part of the American advertising agencies regarding Latin American advertising methods have led to an investigation of advertising conditions in South and Central America. The

study of these conditions in Cuba and the west-coast countries is completed.

The research work on export marketing methods was not finished because the officer assigned to it was called to important war work by the United States Shipping Board. The work will be resumed and completed as soon as opportunity offers.

An agent was sent to Christiania in January to study economic and commercial conditions in the three Scandinavian countries. He has incidentally sent valuable information concerning current tendencies in Germany and in Russia.

At the request of the United States Shipping Board, the Bureau detailed a commercial agent to investigate the production and export of certain tropical products in Central America and Colombia. He is also obtaining for the Bureau information on commercial conditions in the Central American countries.

Statistical Division.

As the compilation center of all American foreign-trade statistics, the statistical division was, during the year, continuously used by the War Trade Board, the Food Administration, the Shipping Board, the Fuel Administration, the War Industries Board, and such bodies as the Textile Alliance and the Tanners' Council. It is no exaggeration to say that every Government office handling war-trade problems called on the division for special statistical service during the year.

The extra demands for a time threatened to interfere with the regular work of preparing statistics for publication. Naturally the condensed published figures did not always meet war-time requirements, and in most cases it was necessary to go back to the detailed monthly records on file. It was soon found impossible for our few statistical clerks to handle all this work. The staff was materially increased, and arrangements were made to furnish desk room and place the records at the disposal of clerks detailed from the various departments and boards. This has worked admirably. The regular staff has devoted much time to assisting the force so detailed.

Early in the year the war boards suggested that the monthly statistics usually available a month to six weeks after the close of the period which they covered were not sufficiently up to date for their purposes. A plan was accordingly perfected for furnishing them each month with three statistical statements of both exports and imports, each brought up to 10 days from date.

This meant a revolution in the methods used at the custom-houses, as well as at the Bureau, but the 10-day reports have been furnished regularly for exports since February and for imports since April. These reports are for the confidential use of the war boards.

To meet the needs of the war boards and of commercial interests for more detailed export statistics for commodities in which the trade has increased since the war, but which have been included in "All other" classes, suggestions were invited from boards of trade, chambers of commerce, and private firms for additional classes. A generous response followed and many suggestions were made. While first consideration is given to the needs of the war boards, the object of making the classification of the greatest permanent value to trade promotion after the war is kept in view. It is now planned to devise an entirely new classification along the lines suggested from the material available in the Bureau and constantly accumulating.

A new schedule governing the classification of imports was issued, effective July 1, 1918. It shows more detail than the former Schedule E, as almost every item mentioned in the tariff is separately classified. This detailed classification was provided for the use of the United States Tariff Commission in its work of collecting information regarding imported commodities as a basis for tariff legislation.

In spite of the press of war work, the division has issued the usual statistical publications without serious delays. Mechanical tabulation will be extended with the beginning of the next fiscal year to all import, warehouse, and noncontiguous-territory reports.

Latin American Division.

The Latin American division has contributed to war work as extensively as any division in the Bureau, except, possibly, the division of statistics; but the fundamental duty of trade promotion has not been neglected. Restrictions upon foreign trade through the curtailment of shipping space and import and export license requirements have retarded our trade with Latin America in many respects, although the trade with the nearer regions of Latin America—notably Central America and northern South America—has been stimulated because of the impossibility of importing certain commodities from the islands of the Far East and from the remoter regions of Latin America. In anticipation of

requests of American importers and exporters for assistance in trade with the Caribbean countries, the division has undertaken detailed investigation of trade problems in these countries. A gratifying response has been observed in the activities of American houses in that field.

Far Eastern Division.

The work of inaugurating a division to handle far eastern commercial matters, similar in scope to the Bureau's Latin American division, was begun during the year. It will centralize matters relating to the countries of the Far East and will have assistants who specialize on each of these countries.

Already the newly formed division has been able to render assistance to the various war boards that are making studies of the shipping and trading situation on the Pacific. In view of the situation in Manchuria and Siberia, it is believed that the division's activities will have a helpful influence in shaping trade policies with respect to that portion of the Far East.

An appropriation of \$50,000 for the development of the division became available July 1, 1918, and it is expected that commercial information concerning the Far East will soon be as well organized as that relating to Latin America.

Division of Foreign Tariffs.

The work of this division has naturally been affected by the war activities of the Bureau as well as of outside organizations, particularly the War Trade Board and the Shipping Board. The division was recognized by the war organizations as a source of information regarding trade restrictions of foreign countries, such as export embargoes and import prohibitions, and requests for such information have formed a conspicuous feature of the division's correspondence during the last year. The growing interest in reconstruction problems has also served to widen the scope of the division's work, so that it covers not only foreign commercial and tariff policies, but also many other phases of foreign business life. Close and helpful relations have been maintained during the year with the Department of State, the Department of Agriculture, and the Tariff Commission.

No other part of the division's work is productive of more good will for the Bureau than that done in connection with trademark priority. Notifications are sent out when evidences of attempts to appropriate American trade-marks are discovered

abroad, particularly in Latin America, and many letters have been received expressing appreciation of this service. Trade-mark attorneys who have visited the division as a result of notices sent to their clients have been surprised at the extent of the trade-mark information available.

District Offices.

For nearly seven months of the fiscal year the various district offices of the Bureau handled the work of the Exports Control Committee, which afterwards became the War Trade Board. During July and August, 1917, more than half of the applications for export licenses made in the United States were presented at our New York office, and more than 15,000 licenses were granted there without the delay necessary had they been sent to Washington for action. On each of several days approximately 2,000 persons applied for export licenses at the New York office.

The branch offices have in other ways assisted in carrying on the war. With the passage of the trading-with-the-enemy act many requests came for advice regarding the interpretation and scope of the measure. Many business houses whose former representatives were placed on the enemy-trade list, particularly in Latin America, appealed to the district offices for assistance in obtaining new connections. In such cases, the district offices often rendered valuable service. They have aided important business houses throughout the country to adjust their operations to the regulations of the various departments of the Government whose decrees tended to check or change the normal flow of commerce.

Many special investigations were made on behalf of various branches of the Government on the abnormal conditions incident to the war. This was true particularly when difficulties arose in connection with foreign shipments, for not only the regulations of this Government but those of foreign Governments changed the natural course of trade. Meanwhile the regular promotive work in many of the offices has increased to a remarkable degree.

The district offices are coming to be looked on as local centers of foreign-trade activity. Foreign visitors frequently make their headquarters at these offices, and visiting consuls, special agents, and commercial attachés always do. The samples gathered in foreign markets by consuls and Bureau representatives are exhibited there to local manufacturers and exporters. The main sample-exhibit room in New York is a revelation of the precise

nature of foreign competition with American goods. The agents in charge of the offices have also taken a prominent part in foreign-trade educational activities, cooperating with the Bureau of Education, the Federal Board for Vocational Education, and local chambers of commerce. This cooperation with local chambers, banks with service departments, etc., tends to give the Bureau a leading part as a national and disinterested party.

Editorial Division.

Commerce Reports depends largely for material on the consular officers, who since the United States entered the war have had their time taken up more and more by activities that have interfered with the normal commercial reports. The editorial division has, therefore, had difficulty in keeping this important foreign-trade paper up to its usual size and standard. By making increased demands upon the time of the traveling agents, commercial attachés, and the Washington staff it has been possible to prevent any falling off in quality. In quantity there was a slight increase during the year, as 4,912 pages were issued as against 4,896 last year. The supplements, which contain the annual reviews of the trade of foreign countries, contained 1,608 pages, a falling off of 127 pages. Five monographs in the Special Consular Series were published as against one in 1917; in the Special Agents Series 26 monographs of 2,609 pages were issued as compared with 27 monographs of 2,344 pages the year before; while in the Miscellaneous Series there was a drop from 24 reports of 2,752 pages in 1917 to 11 reports of 1,112 pages in 1918.

Statistical Preparation for After-War Trade.

The Bureau has undertaken careful statistical studies of the normal world markets for important lines of merchandise, the object being to enable American manufacturers to prepare themselves for trade after the war. The first study published was devoted to the quantities, values, and sources of furniture imported by countries whose transactions exceeded \$500,000 in value. It is issued under the title "Furniture Imports of Foreign Countries." It is planned to issue a series of similar studies of other lines as rapidly as they can be prepared.

New Plan to Stimulate Foreign Trade.

A novel method of Government trade promotion was begun when the Bureau issued the first of a series of Spanish-English pamphlets defining with scientific accuracy accepted American

industrial standards for construction materials. The first pamphlet issued is entitled "Standard Specifications and Tests for Portland Cement" and was prepared by the American Society for Testing Materials, in cooperation with the American Society of Civil Engineers, the Bureau of Standards, the Bureau of Foreign and Domestic Commerce, and the Office of Public Roads. This will be followed by a long series now in press. The standards of the American Society for Testing Materials are already known and used in the Latin American countries, and the decision to publish them in Spanish was reached as a result of numerous requests from these countries for just this sort of information. Care was taken to make the translations idiomatic as well as technically accurate.

Recommendations.

Measured by the economic needs of the country and by the grave responsibility of postwar competition, the Bureau should be expanded substantially in every branch of its service.

New attachés should be assigned to a number of important capitals, especially Athens, Rome, Madrid, Ottawa, Mexico City, and Santiago, Chile. We should also establish at the earliest possible moment resident trade commissioners in Sweden, Norway, Great Britain, France, Greece, Switzerland, Russia, Mexico, Bolivia, Uruguay, Brazil, Colombia, and Venezuela, Dutch East Indies, China, Philippine Islands, British India, Japan, Malay Peninsula, Egypt, South Africa, Australia, and New Zealand. The value of resident representatives is too obvious to require any argument for the extension of this feature of our service.

The field for European investigations by special agents immediately upon the conclusion of the war will be so extensive that the Bureau will require greatly increased funds. Among the more important subjects of these market investigations may be mentioned industrial machinery of various kinds; mill and factory equipment other than machinery; builders' and other hardware; construction materials other than lumber; machine tools; railway equipment and supplies; electrical equipment for industrial plants and small electrical goods; lumber; vehicles, tires, and other accessories; agricultural machinery and implements of all kinds; and kitchen utensils and sanitary supplies and appliances. American concerns have a tremendous field for service to our allies in helping them rebuild and for future business.

Congress does not provide for the service of collecting and publishing statistics of internal commerce. This was discontinued in 1912 for want of an appropriation. There is a constant demand for statistics of commercial movements on rivers, canals, and the Great Lakes, coastwise shipments between Gulf and Atlantic ports, and other phases of domestic trade for which no official statistics are available. The war services have asked information of the kind which we could not supply.

Our shipments to foreign countries by parcel post are rapidly increasing, and the total value of this business probably amounts to several millions annually. The statistical laws make no provision for requiring returns of goods sent by mail, and they are therefore not included in the export statistics. Plans are being considered to remedy this condition.

A weakness of the district-office service is that with rare exceptions there is no second man in the office with qualifications approaching those of the man in charge. This is a serious handicap to the district-office manager and is a particular hardship to the Bureau and to the local commerce when a change takes place in the management of the office. Provision should be made for increasing the force of all the district offices at least 75 per cent and several of them 100 per cent during the coming year, and not less than five additional offices should be established, as there are at present that number of cities in the country in which the business men should be better served by the Bureau. Additional cooperative offices should also be established in the larger cities, which now have vigorous commercial organizations and which feel the demand for the foreign-trade information which the Bureau possesses.

Closely connected with the district-office organization there is a grave need for traveling commercial agents, at least two, who will spend the greater part of their time conferring with business men on the solution of their trade problems at factories and offices where the problems originate. These agents would also tie up all district offices in a unified program of mutual helpfulness and instant response to public demands in ways that can be ascertained only by daily contact with business men.

Too much emphasis can not be placed on the desirability of employing trained economists, statisticians, and experts on banking,

shipping, etc., in excess of the Bureau's present force. These types of economic authority are constantly needed to conduct work equal in importance to that performed by the great Federal commissions in Washington. The Bureau is frequently called upon to undertake tasks outside of its regular routine, such as the dye and chemical census, compilations of foreign embargo laws, surveys of extraordinary economic conditions in Russia, for instance, and other like studies. It is hoped that salaries commensurate with those found necessary by other divisions of the Government for the employment of such experts may be authorized by Congress.

This introduces mention of the Bureau's utter inability to secure employees in competition with other Government commissions and private concerns. In order to meet the increased cost of living, particularly at Washington, and to retain desirable men for whom there is a growing demand in every direction, liberal increases in salaries have come about automatically wherever it was necessary to hold organizations together. The Bureau's disability in this respect has cost it many a valuable employee during the year and has prevented men of the highest qualifications from entering the service. Especially urgent is the need for larger appropriations in the commercial-attaché service to retain the present successful incumbents and to provide for new posts. To the increased living costs abroad, where commodities are becoming scarcer every day, we must add the declining value of the dollar in certain countries, the most notable instance of this being in China, where the rising value of silver exchange has made the dollar worth only about one-half its value of a year ago. The attaché posts are further handicapped by the limit of salaries for clerks to attachés at \$1,500, making it necessary to apply to Congress for post allowances in order to keep these employees merely clothed and fed.

Our country is looking to the Bureau of Foreign and Domestic Commerce to do its share in preparing the country for economic security and prosperity after the war, when the chief industrial and commercial forces in both hemispheres will be ready to launch great organizations on the commercial seas in quest of trade. The instinct of commercial self-preservation demands organized action. This is not the time for short-sighted thrift. Other countries are looking ahead and spending money to organize for their commercial security. A wisely liberal preparation now will

mean millions of income some day to this country, will mean industrial prosperity for our labor, and will mean strength for our economic structure against adverse conditions or sharper competition from any quarter. No country has excelled us in the type of commercial service which we have for six years past rendered to the business community, and this position should be maintained by us regardless of our temporary absorption in military defense.

BUREAU OF STANDARDS.

(Dr. S. W. STRATTON, *Director.*)

The functions of the National Bureau of Standards are the development, construction, custody, and maintenance of reference and working standards and their intercomparison, improvement, and application in science, engineering, industry, and commerce.

When the United States entered the war this service already possessed exceptional facilities, equipment, and personnel for exact scientific research in physics, chemistry, and engineering. This enabled it to take up promptly many important military researches. The Bureau, indeed, cooperated with the Army and Navy, prior to the war, in the development of radio apparatus, in developing automatic devices for recording battleship target practice, the design of optical systems for submarine periscopes and other purposes, the testing of all kinds of supplies, and the furnishing of data in electricity, heat, light, engineering, and chemistry.

The laboratories, so useful during peace, proved of especial importance in war. Instruments, materials, and supplies were on hand which were then almost unobtainable elsewhere. The Bureau promptly extended its service to all lines of scientific work which would assist in the war.

In anticipation of demands the Bureau before the war had begun special researches known to be required. The urgency of many of these problems was not realized even by those in close touch with the situation. The absolute cutting off of the optical-glass supply, the failure of the linen supply, the total lack of ship chronometers, and the necessary uses of light alloys are examples. The rapidity with which the military researches were prosecuted is gratifying, as is the fine spirit of cooperation exhibited. The one thought has been the fullest aid where science could help win the war. The expansion of the Bureau to meet the new demands engaged the most serious attention of the staff, and men and facilities were freely furnished for military work. Practically every section of the Bureau's regular organization has had military problems of the most pressing nature submitted to it, and invaluable service has been rendered.

The recent expansion of the Bureau has been on lines vital to the success of the war. It is interesting to note, however, that many of these lines are of essential value to our industries in peace. The need for the national provision for master-gauge

standardization was only realized by those in close touch with such work. The establishment of a gauge-standardization laboratory has proven an important aid to the mechanical industries. The accurate dimensioning of the functioning parts of mechanisms will permit extending the American system of manufacturing interchangeable parts to its maximum usefulness. The importance of nation-wide standardization has long been known, but the practical working out of such standardization is best met by a national laboratory such as the Bureau of Standards. The same principle holds for all the technologies and special branches of physics. The researches now being conducted for war purposes will prove of inestimable permanent value for the general welfare.

The combination of pure science and technology has proven especially stimulating and effective. The close cooperation of physicists and engineers in practical as well as theoretical work has given an unusual breadth to such researches. In turn, the technologic facilities have proven of great value in the purely scientific work. Many cases might be cited where the elements of a research problem ramify into laboratories of practically every division of the Bureau. The airplane is an example, and a problem apparently as simple as the spark plug has called for experiments in many different sections of the Bureau. The establishment of new industries in America, such as those of optical glass and chemical porcelain, and the scientific remodeling of older industries are fruits of the more intimate cooperation of science and industry which it is the function of the Bureau to perfect.

Aeronautical Research.

During the year scientific problems in nearly all branches of aeronautics have been investigated by the Bureau, comprising material, design, power sources, and technical data. The work is being done in cooperation with the National Advisory Committee for Aeronautics and the military departments of the Government. The primary researches include the development of systems of laboratory tests of all details of airplane design, such as materials, construction, efficiency of form, motor performance, the efficiency of lubrication, carburetion, ignition, choice of fuel, propeller and plane performance, measuring instruments, and the appliances and physical constants required throughout for control. These and other pertinent airplane investigations were taken up in the laboratories of the Bureau under closely simulated service

conditions, embracing such factors as air pressure and air movement, temperature, vibration, humidity, etc.

The engineering testing and investigation covered airplane parts, the use of spruce in airplane construction and mahogany for propellers, the development of instruments for measuring the tension in airplane cables, study of shock-absorbing wheels for airplanes and sea planes, and many others.

A unique feature of the airplane-research program now under way is the development, in connection with the National Advisory Committee for Aeronautics, of a system of free-flight tests made in normal flying as actually practiced by Army aviators. Here the problem is to develop a series of autographic instruments, which during free flight will furnish the primary data for a scientific study of the theory on which airplanes are designed. The six autographic instruments have been designed at the laboratories of the Bureau of Standards, and three have been completed. These will furnish, without any attention from the aviator, a continuous graphic time record during the entire period of flight, showing the engine torque, revolutions per minute, propeller thrust, plane speed, angle of attack, and inclination with horizon.

The epoch-making advance of all phases of aeronautics during the great war has caused experts to realize the strategic importance of perfect control of aircraft with speed and precision. The mastery of the air depends upon such control, which in turn depends upon a whole battery of measuring instruments for indicating position, direction, speed, temperatures, pressures, etc.

The Bureau's aeronautical-instrument laboratory had done fundamental work on the theory of the altimeter and had been testing such instruments for several years before the war began. The staff was promptly increased and now consists of about 35 men. The work of this section is to discover sources of error or improvement in the instruments on which aviators depend for aerial navigation, scouting, fighting, and bombing, and to develop standard testing methods. In one instance, the Bureau's tests caused the rejection of 5,000 altimeters.

The Bureau is now engaged in further researches to promote the operative efficiency of these devices. It has been in close touch with the manufacturing industries in order to make these instruments more reliable and to guard especially against errors due to low temperature, vibration, and centrifugal effects occurring during

the banking of planes. New kinds of dynamometers, for example, have been designed.

Information gained by this section has been given in lectures to aviation officers supplemented by laboratory demonstrations. Many technical conferences with those concerned have been the means of furnishing a great deal of information. Reports have been made covering many aspects of aviation instruments. The Bureau furnished the data upon which the specifications for aviation instruments were drawn for the Signal Corps. The Bureau's experts visit the factories and the factory experts visit the Bureau for cooperation in overcoming errors and improving output. The Bureau staff has not only conducted theoretical and experimental researches in the laboratory under simulated service conditions, but its experts have also studied the instruments in actual flight, including air-speed meters and dynamometers.

The work of aeronautical research required special attention to be given to aerodynamics. A special laboratory for this purpose was built, containing a wind tunnel provided with a wind stream maintained by a 9-foot propeller mounted directly upon the shaft of a 100-horsepower motor. Air speeds of 90 miles were obtained in this tunnel. The purpose of the wind tunnel is to test measuring instruments used on airplanes, to study the design of airplane parts, stabilizing control devices, the efficiency of stream lines, plane sections, etc. For example, the tests included models of airplane and dirigible air-speed indicators, bomb-dropping devices, characteristics of aerial bombs in the wind tunnel, and the like. Incidental uses of the wind tunnel have been made in the study of wind stresses on telephone, telegraph, and electric-power wires coated with ice, and the efficiency of ventilators.

Airplane Power Plants.

At the beginning of the fiscal year, research on airplane-motor problems, such as the radiator and spark-plug design problem, was already under way; this work has greatly expanded and many research problems on aeronautic power plants and accessories have been taken up. An altitude laboratory has been built and put in operation in which aeronautic engines can be tested at the atmospheric pressures and temperatures encountered at high altitudes under service conditions in warfare. One hundred and twenty sets of observations have been made and

results of great importance secured. A dynamometer laboratory has been constructed and equipped with a 400-horsepower dynamometer. This has been of special service in the spark-plug and lubrication investigations.

The effective operation of airplanes at the front depends upon perfecting the essential functioning parts of the engine and also upon the maintenance of the most efficient adjustment of carburetor, lubrication, etc., at all altitudes. The Bureau's work has covered both the design and the working characteristics. A study has been made in particular of spark plugs. Fifty compositions of porcelain were made and studied, and the porcelain which showed the highest performance was selected. In operating the spark plug it became essential to study the various types of magnetos, and favorable results have been obtained. The results of the ignition investigations are being utilized by manufacturers and the various military bureaus.

The Bureau was enabled to locate serious faults with the carbureting systems when operated at high altitudes, and, as a result, a radical improvement may now be expected in this equipment.

More than 100 radiator designs for airplane use were tested out. New features are to be undertaken with a view to the most effective design. Valuable results have been obtained in the investigation of lubricants, and since the lubricating problem is a vital factor in airplanes, these results are important in that field. Tests have been made of various models of the Hispana-Suiza and Liberty motors as to performance, durability, lubrication, etc.

The basic scientific problems are being attacked in these researches which, when correlated with related work in other parts of the Bureau, will mark a distinct advance in airplane construction and operation.

Standardization of Munitions Master Gauges.

A particularly urgent need upon our entrance into the war was for an adequate supply of standardized master gauges for making munitions. Such gauges are a fundamental requisite. The Bureau had already begun such gauge work in its weights and measures laboratories. A matter so vital to the increase in munitions called for by the declaration of war caused the Bureau to anticipate this need, and it actively prepared to take

up the work to meet the demand to come from the military departments and munitions industries. The rapid organization of the technical and mechanical force to handle the great variety of gauges required for producing munitions has been a fine achievement; its success is unqualified. The Bureau's chief expert in charge has entered the military service to cooperate in this work of gauge testing for the arsenals and munitions plants. Before the war only one member of the Bureau staff was engaged in this work; at the close of the fiscal year a staff of 140 was busy in it. A branch gauge laboratory has been established in New York City, and laboratories in Cleveland, Ohio, and Bridgeport, Conn., are to be opened soon.

The testing of master gauges is perhaps the most fundamental and exacting kind of work in connection with war materials. So important are the dimensions of gun parts and shells that accuracy of fire, safety, and durability of guns depend upon the precision of the gauges by which the gun parts and shells are measured. The tests are made promptly and the gauges returned at once with the reports of the tests. In July, 1917, 244 gauges were tested as compared with 5,559 gauges during the month of June, 1918. Within one month 150 master gauges were measured for one type of gun alone. The gauge section has a shop for the construction of special apparatus required for the rapid and accurate testing of complicated gauges. About 50 machines have been manufactured in this shop for measuring screw threads and profile gauges. The staff has been of particular service in the salvage and building of gauges required for exigency needs. This has saved valuable gauges and has avoided the serious delay required to produce new gauges. Of the 27,865 gauges tested during the year, about 60 per cent were for the Army Ordnance Department, 15 per cent for the Motor Transport Division of the United States Army, 10 per cent for the Signal Corps, and the remainder for other branches of the Government and war-essential industries.

Optical Instruments and Light.

The Bureau's optical staff has rendered most important service in connection with the war. This includes the manufacture of optical glass, the design and construction of new optical instruments for military purposes, the testing of such instruments and others purchased for war use, and also highly technical work on radiometry, spectroscopy, and colorimetry.

The technical staff in optics has aided in the design of optical systems for periscopes, airplane cameras, long-distance cameras, gun-sight telescopes, stadimeter telescopes, field glasses, etc. The Bureau has especially cooperated to bring about quantity production of the instruments essential to the Army and Navy. More than 2,000 instruments and parts have been tested. These are mainly American instruments made of American optical glass. The high standard of perfection attained is a gratifying result of the active cooperation between the military departments, the Bureau, and the industries.

Closely related to the above are the applications of optical methods during the year to the measurement of the expansion of such materials as standard steel gauges, fused quartz, and optical glass. The Bureau has perfected instruments and methods for standardizing methods of turbidimetry, a new and important branch of measurement applicable, for example, to smoke, fog, dusty gases, muddy rivers, ocean turbidity, and the special cases of optical glass, crystals, opal and milk glass; in fact, wherever solid suspensions are an important factor. The industrial applications include tanning, dyeing, paper manufacture, a control of city-water filtration, the regulation of the maximum smoke and dust permitted to be discharged into the atmosphere in the cities, and numerous others.

With the advent of the war foreign sources of optical glass were cut off, and, of course, no German glass could be obtained. The French and English needed every pound of their own production and were unable to meet their own requirements. The problem of producing glass of the kinds and qualities required for military purposes was a most serious one. The need for the most perfect obtainable binoculars, camera lenses, optical systems for periscopes, range finders, and optical glass for other purposes could scarcely be overstated, as in a very real sense such optical-glass products are the eyes of the military services.

At the time we entered the war the Bureau had been actively interested for several years in the problem of producing optical glass in the United States. It was believed that this country could be a producer of optical glass, and the Bureau planned to do its part in stimulating such production, both by experiment and research and by the closest possible cooperation with the industries concerned. When we became a belligerent the problem was no longer one of national pride or revenue or independence of

foreign supplies. The production of optical glass in America became an acute, vital, and immediate necessity. The Bureau, therefore, promptly expanded its force and assigned the needed assistance to the existing glass section of the Bureau, with instructions to develop the methods of producing optical glasses of all varieties required, on a commercial scale. The technical literature contained a sufficient variety of acceptable formulas, but little as to technique. Experiments were conducted by the Bureau, and every detail of the manufacture was worked out by study of theory, by actual experiment, and by the study of each factor affecting the optical quality of the glasses produced. The result was gratifying. The Bureau has developed the types of optical glass required for military purposes in the war, and has produced them on a commercial scale. It is now supplying optical glass in quantities made in its own shops to be used for the manufacture of optical instruments. The glass is of excellent quality. The Bureau also made the clay pots in which the glass was melted. Strangely enough, the problem of producing suitable clay pots for the purpose was one of the fundamental problems in quality production—one which had not been solved by private manufacturers. The Bureau determined the clays suitable and the methods of making the glass pots. It actually produced the pots in the quantity required for its own work and furnished the industries with directions for making them.

The Bureau has fully cooperated with all glassmakers in producing a supply adequate for war purposes.

The study of the defects in optical glass will prove useful in all future work on this subject. Methods are now available at the Bureau for studying bubbles, stones, and striæ, and the effects of such defects upon the resulting image. Gratifying success resulted from the effort to produce optical glass whose surface would remain unimpaired. This result was obtained through the control effected by the study of the weathering and other properties of optical glass.

The Bureau has established an efficient optical shop for developing and constructing new optical instruments and devices. The optical glasses manufactured in the Bureau's glass section have been worked up into planes, prisms, mirrors, and lenses, as required. It has produced optical devices of the highest grade of workmanship. The various divisions of the Bureau have thus been enabled to make use of optical systems in entirely novel ap-

plications. It is needless to say that the results will be available for industrial use wherever the principles are applicable.

Tests of the nonshatterability of laminated glass without undue loss of light transparency showed the material to be useful in the development of eyeglasses, goggles, face masks, and wind shields, to prevent the splinters produced in accident from injuring the eye, especially in the case of aviators and certain industrial workers.

Important investigations in radiometry have been made during the year. Standards of radiation in absolute measure were inter-compared. Methods were developed for measurements required in the life tests of incandescent lamps. The effect of radiation on balloon fabrics was studied experimentally. The rising temperature of the fabric when exposed to solar radiation was measured, using the precision thermocouple. A small-size model balloon is now being used for this study. Extensive data have been obtained of the photo-electric sensitivity of molybdenite, in view of possible important applications of these properties. The Bureau's work on glasses for protecting the eyes from injurious radiations has been extended by gathering new data on the transmission of the invisible ultra-violet and infra-red radiations. The Bureau has furnished data on various phases of radiation for military applications.

Mine and Railroad-Track Scales.

The mine-scale work of the Bureau of Standards, for which Congress made special provision for a nation-wide investigation, is of special interest, in view of the need for maximum output of coal at the mines. Disputes over weighings cause strikes, loss of time, and reduced output. The Bureau experts were called upon, and they found the conditions wholly unsatisfactory. In one case a 2-ton scale was 616 pounds in error against the miner. Improper installation, faulty methods of weighing, and errors were corrected and mines greatly improved. Indictments were found and fines imposed on the evidence of Bureau experts. A general awakening and improvement have resulted, and the prevention of strikes and the renewed satisfaction of the miner has gone far to maintain conditions favorable to a maximum output of coal at the mines.

Since 1913 the Bureau has been testing master scales and general track scales throughout the country. The hearty cooperation of State officials, railroad companies, weights and measures inspectors, shippers, and others has insured the success of the

work. The Bureau is called upon to settle disputes, to test the master scales by which the local track scales are adjusted, and to advise as to methods of operating such scales and keeping them in effective condition. This work becomes of special importance in view of the Government control of railroads. The vast freight revenue is based upon the weighings of these scales. The Director General of the Railroads has, therefore, authorized the Bureau to make tests and reports on railroad scales or test cars. During the year new units have been added to the traveling test equipments of the Bureau. Tests of 583 master and track scales were made, of which less than half passed the test. Of the industrial scales 36 per cent and of the railroad scales only 42 per cent were able to meet the requirements. In addition, the Bureau calibrated 31 test cars owned by the railroads. As a primary standard for this entire work a master scale has been ordered and completed. A suitable housing for it is now required with an auxiliary laboratory for calibrating the test-car weights.

Standardization of Timepieces.

The time laboratory of the Bureau maintains a precision standard clock of the Riefler type corrected from the noon signals from the Naval Observatory. The Bureau's clock in a recent 54-day run exhibited remarkable accuracy, maintaining a constant rate within 0.15 of a second and a net change of rate during the 54 days of 0.01 of a second. The standard clock is connected electrically with the laboratories, which require precise time measurements. The Bureau has for several years been equipped to test timepieces in the most rigorous manner for the Government and the public. The complete lack of ship chronometers on the American market at the outbreak of the war made it necessary to secure substitute timepieces. This was done by the Bureau in cooperation with the Emergency Fleet Corporation. More than 5,000 timepieces have been tested within the year, practically all for the United States Shipping Board, the Army, and the Navy.

Sound and Acoustics.

An interesting feature of the Bureau's work has been the development of its laboratory for the study of sound. This has been placed upon a practical basis during the year by the acquisition of much-needed equipment. The applications of acoustics to warfare have been quite important. These include elements in the problems of sound ranging and the detection of submarines,

airplanes, and enemy operations by acoustic methods. Devices have been perfected which analyze sounds into their components. A special study has been made in the sound laboratory of the photographic analysis of sound waves with particular reference to the improvement of airplane-engine mufflers.

Electrical Research and Testing.

The electrical work of the Bureau is of two kinds—first, the establishment and maintenance of fundamental standards for all electrical measurements used in research and engineering (involving researches in the most refined methods of measurements and the most delicate and precise apparatus); and, secondly, engineering applications of electricity, including a limited amount of testing of commercial instruments and products. All this work is important for the business of war, as well as that of peace. Important service was rendered to the military departments in the standardization of electrical equipment for military use, the formulation of proper specifications for the purchase and testing of such equipment, and the development of new and hitherto unavailable equipment for the new exigencies. The Bureau made tests of electrical blasting devices for firing trench mortars and mines, and redesigned these machines with great reduction in their weight and cost and increase in their reliability. Extensive investigations of the electrical ignition systems for airplane and other gasoline engines have been carried out. This, combined with the Bureau's work in ceramics, has resulted in a great improvement in the quality of spark plugs made in this country. An extensive comparison of magneto and battery systems of ignition has also been made with the promise of marked improvement. Specifications have been prepared and revised after experimental laboratory work under controlled temperature conditions. The large number of such batteries used for military purposes and the extreme importance of their unvarying and proper functioning make this problem one of unusual importance and urgency.

In the field of special illuminants the Bureau was able to assist the military departments in developing trench flares, portable acetylene lights, and field searchlights. The Bureau is testing self-luminous paints. Radium has had direct application to military uses as a component of self-luminous materials employed extensively on the dials of aeronautic and other instruments used at night. In the important field of X-rays, special attention has been given to the development of protective materials

to safeguard the users of X-ray equipment, and gratifying results have been obtained in the improvement of this class of material. The novel methods of magnetic analysis developed at the Bureau for testing steel rails and other magnetic materials are now being used in testing steel for rifle barrels with the object of materially speeding up the production of rifles.

While the commercial and engineering work of the Bureau has found direct military application, its highly specialized staff and equipment, however, ordinarily engaged in refined research in more or less abstract scientific questions has been turned directly upon the development of scientific instruments for use in the war and the solution of other war problems, some of which have long puzzled the naval and military authorities. Much of this work is of a confidential nature.

Special equipment has been designed for the measurement of the velocity of projectiles, and the Bureau has contributed in no small part to the methods now in regular use for this purpose. Another important field in which successful work has been done is the development of equipment for locating hostile batteries on land and for detecting subterranean sounds. In the field of radio communication, the Bureau has contributed the designs of various instruments, has made extensive tests of materials for use in such apparatus, and has contributed large numbers of completed instruments. It has served also as a source of supply for highly trained men for the military radio service and has prepared circulars which are serving as the most up-to-date textbooks in the service radio schools.

Public Utilities.

As a result of the research and testing done by the electrical division, important work has developed on public-utility services, such as electric light and power, gas, street railway, telephone, and heating service. The Bureau had already contributed materially to the establishment of public-utility standards for several of these services. It has also promoted with marked success the practice of settling disputes on the basis of sound engineering and of cooperation between interests rather than by litigation, and in so doing has attained an enviable position as an impartial mediator. During the past year the abnormal conditions gave rise to many cases in which readjustment of service standards or of rates has been called for and the public-utility staff of the

Bureau has been called upon for an extraordinary amount of work. Congress in providing a special appropriation made possible important additions to the staff toward the close of the year.

In the field of gas service the Bureau last year carried out extensive tests on the relative usefulness of different qualities of gas. The results obtained this year found wide application where the fuel supply necessitated change of quality. Manufactured gas is a most available source of toluol, a material essential in the manufacture of munitions. The Bureau's experience in connection with gas manufacture enabled it to contribute important data on methods of recovering toluol, to give valuable advice to military authorities in the formulation of contracts for the construction and operation of toluol plants, and finally to assist in a readjustment of gas-service requirements to allow the removal of toluol and benzol from the gas.

In the field of electric service a wider adoption of the National Electrical Safety Code developed by the Bureau has been secured during the year. This code covers most completely the construction, operation, and maintenance of electrical plants and is contributing materially to the adequacy of service and uniformity of requirements throughout the country, as well as the effective safeguarding of life and property. The Bureau has assisted various cities in reducing the damage from stray electric currents, and despite war conditions active work in this line has been carried on during the past year. Particular success was had in reconciling conflicting interests without recourse to the courts. A striking result is that in some communities damage by electrolysis has been practically eliminated by methods which have actually been profitable to the electric railway companies because the saving of power more than offset the expense of the work.

In the field of telephone service the Bureau has for several years been engaged in laying thorough foundations for future work. The development of an acute situation in the telephone-service situation of Washington gave occasion for the service to take up this problem actively. While time did not permit a thorough-going study, we contributed material information highly useful in future consideration of telephone-service requirements.

In all such public-utility work the importance of a central agency to correlate the activities of the numerous State and city authorities can hardly be overemphasized. Even if it were

possible it would be uneconomical for each State commission to maintain an engineering staff capable of solving all the questions which arise.

Heat and Temperature.

The important applications of heat measurements in the industries and the need for standardized equipment for this purpose have made the heat laboratories of the Bureau of special service to industries engaged in the technology of materials and in technologic research generally.

An important investigation of the fire-resisting properties of structural materials has been conducted to furnish architects, construction engineers, builders, State and city building bureaus, insurance interests, and others with basic data for the efficient design of structures with a view to a minimum fire loss. In the study of fire-resistive properties of materials, structural steel columns were specially investigated. Many such columns with and without protective coating were tested in a specially devised furnace. The research showed that unprotected columns which would fail in half an hour, if properly protected by concrete or other material, would remain intact for eight hours. The resistive property of concrete columns was found to depend largely upon the aggregate used. Quartz aggregate proved specially resistive. Seventy-five steel and iron columns were tested during the year, all designed according to standard current practice with a view to excellent workmanship.

In addition to the above, 40 columns of reinforced concrete were submitted to fire test. The columns were subjected to pressure such as is encountered in structures and were mounted within a gas-fired furnace. Valuable results were obtained which will greatly aid in the effective design for similar columns in actual use. The column research is typical of the Bureau's investigation of the fire-resistive properties of materials. It has already yielded valuable information and promises further results of importance to the building industries.

The work of testing temperature-measuring and recording devices continued. The practice of using misleading clinical thermometer certificates has been broken up. Publicity resulted in stopping the use of those certificates to which the Bureau objected. Our experts have visited the factories in which clinical and other thermometers are made with a view to more effective cooperation with this important industry.

The subject of airplane thermometry was investigated; we aided in preparing specifications for several types of thermometers for airplanes.

The Bureau is now conducting check tests of samples of materials to control the quality of deliveries on war contracts.

An example of an important physical constant is the solidifying point of naphthalene which the Treasury Department uses in the collection of duties. The Bureau developed a standard method for determining this point, prepared detailed specifications for the method and the temperature-measuring instruments to be used, and will distribute standard samples of naphthalene for use in other laboratories.

The high-temperature scale is maintained through the melting or freezing point of certain pure metals, such as zinc, aluminum, and copper. Standard samples of these metals were prepared during the previous year, and many of these samples were distributed to the metallurgical industries in standardizing the master instruments for checking the pyrometers used in these industries. The special demand for these samples from the arsenals, navy yards, and war-essential industries has exceeded our capacity to produce them under war conditions. The standard analyzed samples of sugar and naphthalene have enabled users of calorimeters to check the accuracy of their own instruments. This is especially important now that large fuel contracts are based on the heat value of the fuel.

The study of low temperatures down to that of liquid air is provided for by special machinery housed in a building constructed for the purpose. This equipment has been of the utmost service to the various research laboratories of the Bureau as well as to others. The variety of applications of low temperature in various industries is remarkable and is steadily increasing.

Researches on Metals and Alloys.

Metals are so vital a factor in the war that the division on metallurgy has been able to render important service. During the year a new building was completed for the metallurgical work, which is now installed in its new quarters. This laboratory contains a foundry, heat-treating and mechanical plant, rolling mill, power presses, shearing equipment, drawing bench for drawing metal tubes, and a machine shop, thus enabling the Bureau to prepare and investigate alloys, both ferrous and nonferrous, of all kinds.

The year's work comprised the examination of gun metals, light alloys for aircraft, many alloys for special military uses, and pure metals required for technical purposes. The foundry has made 2,249 separate experimental castings during the year. The recent development of light alloys has opened a new chapter in industrial work. The Bureau researches on alloys were given special impetus by the visit of its chief expert to the battle front in France for the study of gun metals and aircraft alloys under war conditions. Light alloys are essential in aircraft, where both lightness and strength are required. It developed that metallurgists were unacquainted with the physicochemical data concerning aluminum and its remarkable series of special alloys. Circulars were, therefore, prepared for technical metallurgists and users of such alloys, and a consolidated circular on this important subject is in press. Many compositions in this series were cast and rolled for the Bureau and studied in its laboratories.

Substantial progress has been made in the study of fusible metals, the melting points of which control the functioning of such devices as automatic fire sprinklers, safety plugs for steam boilers, and others. The output of fusible tin plugs used as safety devices in steam boilers is controlled as to quality by the Bureau's researches. The work in metallurgy has covered numerous other subjects. Low tin solders, bronze, and bearing metals have been developed to aid the War Industries Board in conserving of tin. The serious erosion of machine-gun barrels was the object of a special technical study.

Experimental work was done to establish standards of uniformity for the copper plugs used in testing powders. Standards of composition and thermal treatment were developed for the special metals used in aeronautic instruments.

In the research foundry, methods were developed with respect to standard Government bronze, and details are soon to be published. Standards are being developed for molding sands which we believe will save 90 per cent of the so-called "burnt" sand. A standard method of determining carbon content of steel, devised during the year, permits complete determination in less than five minutes. A convenient method for determining nitrogen has also been devised, as well as new forms for determining other gases.

The great variety of investigative tests includes many novel ones, such as centrifugal steel casting, a new process for obtaining sound steel of a fine uniform quality; investigative tests of armor

plate; studies of the uniformity of electroplated coatings, and of zinc sherardized coatings, tarnishing, working temperatures of machine-gun barrels, structure of gun forgings, suitability of metal for airplane-motor valves, machine-gun barrels, rifle bullets, and the causes of failure of airplane-engine parts. The above shows the range of the Bureau's work in metals. To this should be added the full cooperation which the metal experts have always accorded the military bureaus on metal problems and in the development of standards of quality of metals for war purposes, notably the excellent series of "International Aircraft Standards," developed in cooperation by the Bureau and the technical representatives of the Allied Powers.

Testing of Instruments and Materials.

Apart from scientific researches and technological studies, the Bureau during the year has conducted thousands of tests, many of an investigative character. Examples, in round numbers, will indicate the magnitude of this work. About 18,000 thermometers were tested, including 13,000 clinical thermometers. About 200 tests of thermocouples and pyrometers for high-temperature measurements were made. The metallurgical division made 1,289 thermal analyses, heat treatment, and other kinds of metal tests, besides more than 2,000 separate castings for experimental purposes. About 2,000 tests on military optical instruments were made in the optical laboratories. The chemical work included 18,000 chemical tests during the year. It is now growing rapidly, and 30,000 tests will probably be made during the coming year. The Bureau certified 3,500,000 barrels of cement for the Government departments and tested more than 5,000 timepieces, nearly 3,000 pieces of volumetric apparatus, and 28,000 precision gauges.

In general the testing work, especially of military supplies and equipment, has increased greatly. In order to keep pace with the increase beyond the capacity of the regular staff, the Bureau secured the cooperation of the War Department through detail of technical experts from the Army to assist the experts of the Bureau.

There is a growing tendency on the part of the military departments to improve standards of quality and performance. Without these, competitive buying may be more harmful than helpful. In this work the Bureau has extended the use of its facilities to the utmost.

Materials.

The measurement and investigation of the properties of materials have in recent industrial practice become a vital necessity. In no other way than by an exact knowledge of these properties can high efficiency be had. The successful war work of the Bureau was possible because it had *already* studied the properties of materials useful from a military point of view—for example, optical glass, light alloys, gun metal, cotton fabricated as substitute for linen in airplanes, low tin solders, and the like.

Our work on structural materials was immediately applicable to the construction of cantonments and other military structures, upon many phases of which the Bureau was consulted and rendered aid. It actively experimented and assisted paper manufacturers in the development of the new cantonment board which is far superior to the older wall boards. The Bureau has investigated such structural materials as steel, cement, brick, limestone, paints, roofing material, including both bitumens and roofing plate. Miscellaneous materials investigated and tested are lubricating oils, rubber, leather, textiles, paper, glass, clays, and clay products ranging from terra-cotta tiling to the highest grades of porcelain. In this connection a striking feature of our work is the close union of the practical manufacture on an experimental scale of the materials studied with advanced theoretical studies of the contributory sciences bearing upon such materials. An example of this is seen in the control of American clays through the application of physical chemistry. The Bureau is enabled by this close relationship to make immediate practical application of the principles of science.

In order that the experts in the various laboratories may have definite and known samples to work with and for the purpose of trying out or developing new methods, small manufacturing units have been installed, including a paper mill, rubber mill, optical-glass works, cement mill, and the textile mills which are about to be installed in the Bureau's new laboratory.

In this connection may be mentioned the important fact that a fine laboratory for industrial research is now under construction and will be ready for use in a few months. This laboratory when completely equipped will be one of the most effective of its kind in the world. In no national institution in the world is the union between pure science and practical technology so intimate as in the work of the Bureau of Standards.

Chemistry.

The chemical work of the Bureau was transferred to the new chemical laboratory early during the year. The staff has expanded from 58 to 146, partly by the detail of chemists from the Army to assist in military testing and research. The work has already outgrown its new quarters, and the laboratory is now housing 25 per cent more work than was planned for it.

The chemical division serves all the scientific and technical divisions of the Bureau, and also renders important service to the industries by the standardization of chemicals and reagents and by devising new methods of analysis and improving existing methods. Practically every military problem involves at some point a chemical question. The entire chemical staff of the Bureau has been placed at the disposition of the military branches for technical consultation, and much service has been rendered informally in this manner, as well as by manuscript reports and printed scientific and technological papers.

In connection with the balloon-gas research the Bureau gave technical advice based on experiments which have effected a large daily saving. The chemists of the Bureau assisted the Food Administration in the conservation of materials, such as ammonia, required by the refrigeration industries. The Bureau has also done work on the standards of quality in chemical reagents, a work of a character as fundamental to chemical science as gauges and measures are to the mechanical industries.

By means of these samples the chemical laboratories in the metal and other industries test the accuracy of the analyses made by their chemists. The samples also permit the testing of the accuracy of new and modified methods of analysis. Incidentally they have proven of value in connection with educational work in chemistry.

The system of standard analyzed samples has had a most gratifying development. This year the Bureau has placed the work on a more independent and business-like basis by a special appropriation for the purpose.

Standardization of Sugar Technology.

Owing to the necessity of increasing to the greatest possible degree the American output of sugar, the entire machinery of the industry is overtaxed and upset. Many new problems demanding solution at the earliest possible date have arisen. Additional facilities and assistance were required to attack them. In order

to begin the work Congress granted an appropriation of \$20,000 to be used for the standardizing of sugar-testing apparatus and the development of technical specifications for the various grades of sugar with particular reference to problems made pressing by war conditions.

The United States has the largest and most diversified sugar industry in the world, including, as it does, the cane and beet industry, a great refining industry, a maple-sugar industry, a large sirup industry, and a very important Government interest due to the collection of a revenue from an import duty. The widespread demand for technical assistance in these matters is shown by the fact that an entire edition of 1,500 copies of the Bureau of Standards' circular on sugar was purchased by the public in less than three weeks.

The Bureau's Work for the Soldier.

The applications of science to military uses are illustrated by several examples of the Bureau's work directly affecting the comfort and efficiency of the soldier. The soldier's shoes are investigated in the laboratory and in the field to determine the most suitable leather. A sole-leather-testing machine is used, and the leather is chemically investigated while controlled service tests are in progress by the soldiers in camp. The serviceability of shoe strings has also been under test. Uniform cloth has been under careful investigation for some time in the textile laboratories of the Bureau. An expert was dispatched from the Bureau to England and France to study the quality and serviceability of Army-uniform material, while in the laboratory the Bureau has been making searching examinations of the various fabrics designed and submitted. It has assisted in developing and selecting from the available materials the present standard uniform button.

The heat conductivity of the soldier's blanket has been studied. Cotton blankets may equal wool blankets in this respect. The Bureau has investigated shelter tents, the soldier's canteen, and other kit equipment, washing and shaving soaps, combs, inks, and other supplies for the soldier's use.

The Bureau also determined by careful tests the most suitable trench oil stove, taking account not only of its heating efficiency, but the danger of observation from the light radiated on the ground. It has standardized the gauges for making the service rifle, has studied the problem of gun erosion, and the failure of gun parts and material in service. All the men in the Navy carry an

identification tag devised by and prepared according to specifications developed by the Bureau of Standards. In short, there is scarcely a phase of the soldier's needs and activities in which the Bureau has not cooperated with the military departments to secure the most effective provision for his comfort, convenience, and fighting power.

The Metric System.

The War Department early in the war decided to adopt the metric system for use in connection with maps and gun-firing data. The Ordnance Department has also adopted standard metric-dimensioned guns, such as the 37-millimeter, 75-millimeter, and 155-millimeter models, and this involves corresponding changes in shell sizes. These uses of the metric system made it desirable that the Bureau of Standards issue for the information of the soldier a small manual. This has been prepared for publication early in the coming fiscal year. Furthermore, there is a demand for metric literature for the various officers' training camps, cantonments, radio schools, aviation schools, and other military organizations. The Bureau has supplied for these purposes the graphic chart of the international metric system, together with a descriptive pamphlet and table of equivalents. The latter has proven of great value in connection with the manufacture of war supplies by various war industries. Publications which have proven of great assistance in developing export trade are in demand for military purposes and will be of increasing value for trade purposes upon the conclusion of peace.

The Importance of Guaranteed Standards in Industry.

The functions of the Bureau of Standards should be so enlarged as to permit the maker of any standard commodity to submit a specimen of his product for examination and to provide that the Bureau, after such an examination, should certify to the facts that a buyer, domestic or foreign, ought to know respecting the nature of the article. The manufacturer should be permitted to attach a copy of the certificate to all of his production of the particular kind and quality so certified. Severe criminal penalties should be provided for willful violation of the manufacturer's agreement to attach the certificate of the Bureau of Standards only to goods coming fully up to the certified sample. It is not intended that certification should be compulsory. The whole matter should be voluntary action on the part of manufacturers.

When, however, a certificate has once been issued, the standard of all goods bearing the certification must be kept up to the standard certified, with heavy penalties for violation. It seems only necessary, in order to bring this about, to have legislative authorization for the Bureau to issue such certificates with a penalty clause dealing with the improper use of them.

Something of this nature has already been done in connection with export trade, and there is a measure of analogy in existing pure-food legislation. The present proposal, however, is not a police measure, but, on the contrary, a facility offered by the Government to those who choose to use it without any compulsion whatever.

It is analogous to the fixing of grain standards by Government authority. The official grading of grain permits a precision in handling grain through all domestic and foreign commercial transactions that is now indispensable. It is no more difficult, to say the least, to provide a standard certificate for manufactured articles than it is for grain.

It will be evident that such a certification would provide authoritative knowledge to all buyers concerning the materials bought. The Government to-day has means, by analysis, of determining accurately the facts respecting the articles it buys, and many large business houses have similar facilities for their own use. The ordinary buyer, however, whether in connection with business or personal purchases, is denied accurate knowledge. No means are readily open to him to determine the quality of the goods he purchases, and the tendency of competition is often toward a reduction of quality as well as price. The fact, of course, is that the individual buyer to-day must purchase on appearances or upon the interested assurances of the seller rather than upon any true knowledge of what it is that he is buying. An enormous saving is possible if by the means suggested we can all of us come to buy on the basis of ascertained and known quality.

The suggestion made is very far-reaching. It contains no element of monopoly. Any manufacturer, large or small, could obtain a like certificate of standard quality if he produced the goods. The public would quickly learn what the certificate meant, and it would lead promptly and directly toward the improvement, as well as the maintenance, of the quality of goods.

The plan would be useful, also, in the extension of our foreign trade. The lack of confidence in goods bought in a distant

country is one of the barriers to free commercial intercourse. By the proposed certificates a foreign buyer would be assured that an order placed in the United States for standard goods would reach him under a certificate from the United States Government as to quality and that the power of our Government would be strongly exerted to prevent and to punish any deviation from standards. The proposed step would, at a single bound, put us in a commanding moral position in our foreign trade.

* The suggestion made is not original with the Department, but was brought before it for consideration by persons experienced in domestic and foreign trade and in large financial operations. I do not hesitate to urge that the course suggested be adopted.

BUREAU OF THE CENSUS.

(SAM. L. ROGERS, *Director.*)

During the fiscal year this Service completed for publication the final reports of the last quinquennial census of manufactures; carried on its decennial canvasses of water transportation and shipbuilding and of religious bodies, its quinquennial canvass of electrical industries, and its special canvass of marriage and divorce; prepared and published the Official Register of the United States; conducted its annual inquiries relating to births, deaths, States, and municipalities; published quarterly statistics of stocks of leaf tobacco; made semimonthly and monthly collections and publications of statistics on cotton, cotton seed, and cottonseed products; completed reports on Negroes, deaf-mutes, and prisoners and juvenile delinquents, and a statistical directory of State institutions for the dependent, defective, and delinquent classes; took a special census of the Virgin Islands; inaugurated the publication of weekly mortality reports for certain large cities; performed much war work for other governmental establishments; carried on preparations for the Fourteenth (1920) Decennial Census; and complied with numerous requests for information.

The work done during the fiscal year and since its close along the above lines is described below.

CURRENT AND COMPLETED WORK ON STATUTORY INQUIRIES.

Census of Manufactures.

The reports of the last quinquennial census of manufactures, taken as of December 31, 1914, were finished early in the fiscal year, except some detail work in verifying proof.

Many of the bulletins which present the final reports of this census of manufactures were sent to the printer earlier than heretofore.

Census of Transportation by Water.

The field work on this decennial inquiry, which was made as of December 31, 1916, began in March, 1917, and was completed

in October of that year. Through cooperation with other services the work went faster than hitherto and cost less. Much of the data was collected by mail, and in some cases by telegraph. About half the owners or operators of craft covered by the census were canvassed in this manner before the field force went out. This census covered also the operations of fishing vessels; the last one did not.

A preliminary report, comprising two tables with descriptive text, was prepared late in January, 1918, and released for the press February 6. The tables and text for the final report are completed and will be sent to the printer soon.

Census of Shipbuilding.

This census was taken in conjunction with the water-transportation inquiry and for the same date (Dec. 31, 1916). A large part of the reports was obtained by mail, thus reducing the cost. Statistics for the shipbuilding industry for the year 1914, secured at the last census of manufactures, are included in the report. For military reasons this report has not yet been published, but the statistics compiled have enabled the Census Bureau to furnish valuable information of a confidential nature to various war boards.

Census of Electrical Industries.

This quinquennial inquiry, covering central electric light and power stations, street and electric railways, telephones and telegraphs, and municipal electric fire-alarm and police-patrol signaling systems, is proceeding as of December 31, 1917. The data have been collected so far as possible through correspondence. The field canvass by employees detailed from the office began April 9, 1918, in Omaha, Nebr., and was substantially completed in October, 1918. Compilation of the reports is under way.

Vital Statistics.

The "death-registration area," comprising those States and cities having adequate death-registration systems, has grown until it now embraces 29 States, the Territory of Hawaii, the District of Columbia, and 34 cities in nonregistration States, and contains approximately 76 per cent of the country's population.

The annual mortality report for the calendar year 1916 was completed and the proof returned to the printer during the fiscal year 1918. In order that the more important mortality statistics

for 1917 may be in the hands of the public at the earliest possible date, a bulletin presenting, with little text discussion, certain basic tables to be later included in the final report will be sent to the printer by the close of 1918.

The "birth-registration area" has grown rapidly during recent years; it now embraces 20 States and the District of Columbia, with a population representing about 53 per cent of the aggregate for the United States.

On October 6, 1917, the Census Service began publishing a "Weekly Health Index," giving mortality reports from about 50 of our largest cities.

Financial Statistics of Cities.

The report presenting financial statistics of cities with over 30,000 inhabitants, for the fiscal year 1917, was completed and sent to printer in January, 1918, within less than seven months from the close of the period covered. The report presents detailed statistics of revenues, expenditures, value of municipal properties, municipal indebtedness, assessments, and taxation; and also gives certain data relating to governmental organizations.

General Statistics of Cities.

For the fiscal year 1917 the Bureau published two reports called "Specified Sources of Municipal Revenue" and "Statistics of Fire Departments." The first presents, for the 219 cities estimated to have more than 30,000 inhabitants, data in regard to certain methods of raising revenues, namely, deriving them from business taxes collected without the issue of licenses, as on gross earnings of insurance companies; from business taxes, other than on the liquor traffic, collected through the issue of licenses; from other license taxes; from special assessments for public improvements, as street paving, sidewalks, and sewer construction; and from assessments for other purposes, as for street cleaning and sprinkling.

This information was opportunely made available when cities were readjusting their revenue systems so as to distribute taxation more equitably in regard to their own needs and the war requirements of the National Government.

The report giving statistics of fire departments of cities estimated to have more than 30,000 inhabitants was sent to the printer in January, 1918.

A report on municipal markets, covering the fiscal year 1918, is now being prepared. This will show the extent of municipal activity in providing market facilities and the use made of these facilities. The field work will be completed in December, 1918, and copy will be sent the printer early in 1919.

Financial Statistics of States.

The report presenting financial statistics for the 48 States of the Union, covering the fiscal year 1917, was completed in April, 1918. This report is similar in scope to the municipal finance reports, the general classifications being the same; but data in regard to functions exercised by State governments not generally exercised by municipal governments are also given.

The report for 1918 will be completed early in 1919.

Cotton and Cotton Seed.

During the fiscal year the Census Service conducted its regular inquiries in regard to cotton and cotton seed. There were issued 10 reports relating to cotton ginned to specified dates during the ginning season; 12, published monthly during the year, relating to cotton consumed, imported, exported, and on hand and to active consuming cotton spindles; 12, published monthly during the year, relating to cotton seed received, crushed, and on hand and cottonseed products manufactured, shipped out, and on hand; an annual bulletin on cotton production and distribution for the season of 1916-17; and an annual pamphlet giving complete statistics of cotton ginned from the crop of 1917. This pamphlet was distributed in time to be of use in making comparisons between the crop of 1918 and earlier ones.

Stocks of Leaf Tobacco.

Four reports on leaf tobacco held by certain classes of manufacturers and dealers were published.

Bulletin 136, entitled "Statistics of Leaf Tobacco," which presents, in comparable form, the data collected at the several tobacco inquiries made since the inauguration of the work in October, 1912, together with certain data compiled by other governmental agencies, was distributed during the fiscal year. This bulletin, the first of its kind, was designed to assemble the statistics for the various phases of the tobacco industry published by several governmental bureaus and to present them in form for ready reference.

Work Pertaining to Special Classes of the Population.

The report on deaf-mutes was completed during the fiscal year, and has been published. This report was submitted in proof to various specialists in the subject and received high commendation from them.

The preparation of the report on Negroes was also completed, and the report published. This report is a compilation in one volume of all the census statistics pertaining to the Negro race which have been collected from 1790 to the present time.

The report on prisoners and juvenile delinquents was also completed and published.

Religious Bodies.

The collection of the data at the last decennial religious-bodies inquiry, which was made as of December 31, 1916, was completed in July, 1918. The work was done almost entirely through correspondence. Tabulation of the data has been in progress for some time. A preliminary announcement was issued on May 2, 1918.

This work has been delayed by the pressure of war work.

Official Register.

The July 1, 1917, edition of the Official Register of the United States, which consists mainly of a directory of Federal employees, showing name, designation, compensation, branch of service in which employed, etc., was prepared during the first half of the fiscal year.

WAR WORK.

Work Done by the Bureau for Other Governmental Establishments.

During the fiscal year the Bureau of the Census performed a large volume of war work for the War Department and other Federal departments and establishments. A few of the more important instances of this cooperation are given below.

Census of materials and commodities for use of war agencies.—In February, 1918, at the suggestion of the Director of the Census, I offered to utilize, in aid of the statistical work of the various war agencies, the services of as many as 100 experienced Census employees for six months. This offer was accepted by a number of the war agencies—the War Trade Board, the War Industries Board, the United States Shipping Board, the United States Food

Administration, the Council of National Defense, and the Commercial Economy Board—and on April 8 the work was given specific authorization and approval by you.

The war agencies wished statistics compiled showing the consumption and stocks on hand of certain raw materials used in war industries; also the production and stocks on hand of certain commodities made therefrom. This information was most urgently needed for iron and steel; wool machinery and woolen manufactures; kapok fiber, jute, and silk; leather stocks; boots, shoes, and manufactured leather goods; antimony; and graphite crucibles. Questionnaires or schedules were prepared and mailed as rapidly as possible; reports—monthly in some cases—on all the materials and commodities named have been prepared and transmitted to the war agencies; and work is in progress on other materials and commodities for which statistics have been requested.

In preparing this inquiry a survey of the existing sources of statistics of supply, production, and consumption of materials and commodities was made to ascertain what data were being collected by other governmental agencies, the purpose being to prevent duplication of statistical work. Some duplication was discovered and eliminated. This survey will continue with a broader scope during the war by the Statistical Clearing House, organized in connection with the War Industries Board.

It is my opinion that the usefulness of the Bureau of the Census would be materially enhanced if the scope of its work were extended by law so as to make the Bureau the clearing house for all the statistical information issued by the executive branch of the Federal Government. This could be done by having the executive departments and independent Government establishments submit reports monthly or quarterly to the Bureau of the Census describing all statistical data compiled or published during such period. This would enable the Bureau to detect any duplication or overlapping existing in the statistical work of the Government and recommend its elimination. It would make Federal statistics more easily available to the public and to persons engaged in research work and would bring about material economy.

Census of commercial greenhouses.—For the use of the priorities division of the War Industries Board the Bureau gathered data pertaining to commercial greenhouses, covering for the year ending June 30, 1918, area; value of products; fuel, fertilizers, insecticides, and fungicides used; and number of males 18 years of age and over continuously employed.

Censuses of nitric acid and of acids and materials used in the manufacture of explosives.—In September, 1917, at the request of the Committee on Chemicals of the Council of National Defense, the Acting Secretary of Commerce authorized the Director of the Census to take a census of the production and capacity of plants engaged in the manufacture of nitric acid; also a census of production and capacity of establishments manufacturing sulphuric acid and materials used in making acids and explosives, and the distribution of these commodities, which include cannon powder, mobile artillery powder, small-arms powder, trinitrotoluol, picric acid, ammonium nitrate, and military guncotton. The necessary blanks, together with the lists of manufacturers to whom they were to be sent, were prepared in collaboration with the Committee on Chemicals. The blanks were mailed and the reports received, checked, and acknowledged by the Bureau of the Census, which then transmitted them to the Committee on Chemicals for tabulation. The portion of the work assigned to the Bureau of the Census was completed in November, 1917.

Production of dental gold.—At the request of the Federal Reserve Board, I directed the Bureau of the Census to make a canvass of the production of dental gold. The statistics derived were submitted to the Federal Reserve Board.

Classification of occupations of registrants for Provost Marshal General's Office, War Department.—This work was undertaken, at the urgent request of the Provost Marshal General, on December 21, 1917, that a detachment of skilled workers from the Bureau of the Census be sent to the War Department to train the clerks of that department to prepare an industrial index of the registrants under the selective-service act. The preparation of this index consisted in the classification, according to occupational skill or experience shown, of cards prepared by the local registration boards from questionnaires filled by registrants. The Census scheme of classification of occupations was used.

Preparatory work began in late December, but it was not until the middle of February that the number of cards received at the War Department became sufficiently large to make it feasible to begin the actual classification. From that time until July 1, 1918, a period of four and one-half months, 30 experienced Census employees were occupied, under the direction of our chief statistician for population, in supervising and guiding the work of about 250 clerks employed by the War Department.

The number of cards received to June 30, 1918, and classified under the direction of the expert Census force was 8,147,034. This work was in some respects complex and could not have been successfully handled by inexperienced employees. The skill and energy displayed by the Census force were greatly appreciated by the Provost Marshal General, who, in a letter dated June 26, 1918, to the Director of the Census, paid a high tribute to the value of the service rendered.

Estimates of registrants for Provost Marshal General.—In May, 1917, immediately following the passage of the selective-service law, the Bureau of the Census published an estimate of the number of men 21 to 30 years of age, both inclusive, in the United States. This estimate showed a total of 10,077,700. The actual number of registrants on June 5, 1917, was 9,691,344, which, plus approximately 400,000, the number of men of those ages who were already in the military and naval services, and therefore not required to register, brought the total very close to the Bureau's estimate.

On June 12, 1918, at the request of the Provost Marshal General, the Bureau estimated a total of 1,011,589 men, for the United States as a whole, who had become 21 years of age during the 12 months ended June 5, 1918. The actual number of registrants on June 5, 1918, plus the number of enlistments of men 21 years of age, amounted to 953,453; but the greater part of the difference of 58,136 between this number and the Census Bureau's estimate is accounted for by a decrease of 45,098 in the number of aliens subject to registration.

On July 30, 1918, at the request of the Provost Marshal General, the Bureau estimated a total of 13,194,408 men in the United States on July 1, 1918, of the ages from 18 to 20, inclusive, and from 32 to 45, inclusive. Deducting from this number 400,000 already in service, approximately 12,800,000 were estimated to be subject to registration. The actual registration on September 12 of 12,870,000 again confirmed the accuracy of the Bureau's estimates.

Determination of ages of registrants.—Much work was done during the fiscal year in connection with the furnishing of transcripts of ages of persons who did not register under the selective-service law, but who were believed to be within the specified age limits. These transcripts were supplied to the Department of Justice, to local registration boards, and to the individuals concerned. The Bureau has been advised by county officials that as

soon as it became generally known that they had access to Census information in regard to ages many men voluntarily registered.

The recent extension of the draft ages has caused a great increase in this work.

Allocation of enlistments for the Office of the Provost Marshal General.—The 117,974 men who enlisted in the Regular Army from April 2 to June 30, 1917, inclusive, represented a portion of the credits to be applied to the gross quotas of the States, the counties, and the cities of 30,000 population and over in the apportionment of the first draft. At the request of the Provost Marshal General these enlistments were allocated by the Bureau of the Census. Enlistments in the Navy, the Naval Reserve, the Naval Volunteers, and the Marine Corps from April 2, 1917, to June 30, 1918, which numbered 293,788, were similarly allocated.

In a letter dated August 17, 1918, to the Director of the Census, the Provost Marshal General expressed his keen appreciation of the thorough manner in which the work was done.

Work for the United States Fuel Administration.—For the Fuel Administration the Bureau compiled data showing the kinds and quantities of coal consumed by establishments using 100 tons or more per annum and whether such establishments generated electricity for power.

Work for Railroad Wage Commission.—During the months of February and March, 1918, the Census Bureau prepared a large number of tables for the Railroad Wage Commission for use in the adjustment of the wages of railroad employees by the Federal Railroad Administration.

Miscellaneous war work.—In addition to the above, the Census Bureau has performed war work for the American National Red Cross; the Treasury Department; the Department of Justice; the Council of National Defense; the Housing Committee; the United States Shipping Board; the Emergency Fleet Corporation; the Medical Corps, War Department; the Federal Trade Commission; the Federal Reserve Board; the United States Geological Survey; the Joint Information Board on Minerals and Derivatives; the Tanners' Council; the National Committee on Prisons and Prison Labor (through the Bureau of Foreign and Domestic Commerce); the Bureau of Education; the War Industries Board; the United States Food Administration; the Board of Arbitration, New York Harbor Wage Adjustment; and the Port Facilities Commission.

Members of force enlisted and drafted into military and naval services.—During the fiscal year 47 members of the Census force, including 14 local cotton agents, entered the military and naval services; and from the entrance of the United States into the war until September 15, 1918, 64 members of the force, including 20 cotton agents, entered those services. No request was made to obtain deferred classification because of their Census employment.

SPECIAL AND MISCELLANEOUS LINES OF WORK.

Marriage and Divorce.

Marriage and divorce statistics for the calendar year 1916 have been collected and are being compiled.

The canvass has been conducted almost entirely by correspondence. Complete statistics as to divorce were secured at the State capitals of Nebraska, New Jersey, and Wisconsin; and for the remaining States and the District of Columbia the information was obtained through the offices of the county and court clerks. In the case of the marriage statistics the information for 27 States was obtained from the State capitals or from printed reports; and for the remaining States the data were obtained through the county or court clerks or officials having custody of the marriage records.

The tabulations had been in progress for some time prior to the termination of the canvass and were completed at about the same time.

Census of the Virgin Islands.

At the request of the Secretary of the Navy, the Director of the Census was instructed, on October 1, 1917, to take a census of the Virgin Islands. This census covered population, agriculture, manufactures, fisheries, and wages and hours of labor as of November 1, 1917. The work was done under the supervision of the chief statistician for manufactures, assisted by six employees of the Department, but the actual enumeration was done chiefly by local employees. This work began on December 24, 1917, and was completed on January 12, 1918. The final proof of the report was returned to the Government Printing Office, approved for printing, on July 9, 1918, and printed copies were delivered to the Department August 25.

United States Life Tables.

In June, 1916, the Bureau of the Census compiled and published a series of "life tables" based on the population in 1910 and the mortality in the three years 1909, 1910, and 1911 for certain States and the District of Columbia. The preparation of a similar series of tables exhibiting mortality conditions in 1890 and 1901 and during the decennium 1901 to 1910, inclusive, has been nearly completed, and copy will be sent to the printer before the close of 1918.

This work has been made subsidiary to the regular work of the Bureau, and it has therefore not been possible to complete and publish the results sooner. Their value, however, is permanent and will not be impaired by the delay.

Statistical Directory of State Institutions.

During the fiscal year the Bureau completed the compilation of a statistical directory of State institutions for the dependent, defective, and delinquent classes. The classes of institutions covered include State prisons and penitentiaries and State institutions for the insane, feeble-minded, epileptic, tuberculous, blind, deaf, and dependent.

Searching of Census Records to Determine Ages.

During the fiscal year 5,043 searches were made of Census records to determine ages of pensioners.

Tabulation of Data for Disputed Areas of Europe and Africa.

In the latter part of the fiscal year the Bureau, upon my authorization, began the tabulation of data covering the disputed areas of Europe and Africa; that is, those areas whose final disposition will be determined by the outcome of the war. These data are obtained from foreign census reports, statistical yearbooks, official trade reports, and such other sources as are available.

PREPARATIONS FOR THE FOURTEENTH CENSUS.

Both my annual report for 1917 and that of the Director of the Census set forth the urgent need of making adequate preparations for the Fourteenth Census and outlined briefly the preparatory work which had already been done. A careful and detailed study of the act providing for the Thirteenth and subsequent decennial censuses was made, with a view to determining what amendments or changes were needed to meet the conditions under

which the Fourteenth Census will be taken. After thorough consideration it was decided to recommend to Congress the enactment of an entirely new act, differing from the Thirteenth Census act in many details, but containing no radical changes. Such a bill was drafted and submitted to the House Committee on the Census, which held a series of hearings upon it from February 20 to April 10, 1918. After the Director and other Census officials had been heard, the Secretary of Agriculture, representatives of the Bureau of Mines, the Geological Survey, the Food Administration, and myself were called upon to express our views. On July 2, 1918, the bill passed the House with a few amendments of a minor character and is now pending in the Senate.

I can not too strongly emphasize the importance of promptly enacting this bill into law. If further action upon it is deferred until the next session of Congress, there is a possibility that it may not be passed at all by the present Congress on account of lack of time. If this were the case, the Census Bureau would find itself at the beginning of the Fourteenth Census period (July 1, 1919) without the full and definite knowledge of legal authority and requirements under which to perform the great task of inventorying the population and industries of the United States. In certain vital respects the Bureau can not plan intelligently for the coming census until it knows exactly what these legal requirements are to be.

Such preparations for the coming census as are possible have been continued, and everything that can be done under the present conditions is being done.

MECHANICAL EQUIPMENT.

Work in Mechanical Laboratory.

In addition to the maintenance of tabulating machinery for current use in the Census Bureau and the Bureau of Immigration, the Mechanical Laboratory was engaged in overhauling and constructing machinery for the tabulation of the Fourteenth Census reports. The new automatic tabulating machine, completed toward the close of the fiscal year 1917, was given a practical test in connection with the work of tabulating mortality data and was found to be entirely satisfactory and a marked improvement over the machine used at the Thirteenth Census.

The present plans call for the completion of all parts entering into the construction of the Fourteenth Census tabulating equipment *before* the expiration of the present fiscal year.

Integrating Counter.

In a former report I referred to beginning work on the development of an "integrating counter"—that is, a counter which will record and add numbers, instead of mere units, thus performing automatically the work done by the operator of an adding machine—for use in tabulating certain classes of the census data, such as those pertaining to agriculture and manufactures. This work was begun on July 6, 1917, and has shown satisfactory progress to date. The idea of the first model integrating counter has been developed and all drawings made, the patent situation has been carefully studied, and patterns, castings, and practically all parts are ready for assembling. The most difficult features of the work have been completed, and the preliminary tests show satisfactory results.

OFFICE FORCE.

The appropriation act for the current fiscal year provided for 609 permanent officials and employees of the Census Bureau, representing an increase of 46 over last year. At the same time the numbers of positions in the various salary classes have been readjusted so as to provide a somewhat better average salary scale than heretofore. This readjustment will, it is hoped, diminish the tendency of the census force to seek employment elsewhere, although the salary scale is still unduly low as compared with those existing in other branches of the Government.

The greatest difficulty which the Bureau now experiences is in inducing eligibles on the civil service registers to accept employment at the entrance salary of \$900. During the 14 months' period from July 1, 1917, to August 31, 1918, inclusive, offers of appointment were tendered to 569 eligibles on the registers of the Civil Service Commission. Of these eligibles 299 declined, 79 failed to reply, and 191 accepted appointment.

OFFICE ROOM AND STORAGE SPACE.

The beginning of the Fourteenth Census period (July 1, 1919) is now less than a year distant, and the matter of providing adequate office accommodations during that period, as well as proper storage space for its permanent records, is one of importance and urgency.

During the Thirteenth Census period (1909-1912) the total floor space occupied was approximately 200,000 square feet; with this as a basis, and taking into account the growth and

change in the country's population and industries in 10 years, it is estimated that during the next decennial census period the Bureau will need about 275,000 square feet of space, including storage. Since the total floor space occupied in the Commerce Building on June 30, 1918, amounted to only 78,386 square feet, of which about 8,000 square feet is storage space, and as there is no more available room in the Commerce Building, the necessity of finding other quarters for the greatly increased census force (between six and seven times the Bureau's present force) during the Fourteenth Census period is apparent. If the war shall have ended before it is necessary to expand the Bureau's force for the decennial census, it may be possible to accommodate the extra force in some of the temporary buildings erected for the use of the military departments and for the various special war agencies. In order that preparations may be made for sending out the enormous quantities of schedules and other supplies to the supervisors in charge of the field work a reasonable time in advance of January 1, 1920, the date as of which it is proposed to make the enumeration, it will be necessary for part of the enlarged census force to begin work several months in advance of that time—perhaps in September or October, 1919.

BUREAU OF FISHERIES.

(Dr. HUGH M. SMITH, *Commissioner*.)

This service has continued its efforts to meet the peculiar conditions and obligations imposed by war. Its operations, while thus in a measure restricted, have in other essential respects assumed a scope and importance never before attained.

The steamers *Albatross*, *Fish Hawk*, *Halcyon*, and *Phalarope*, of the Fisheries Service, have been during the war under the direct control of the Navy and in active use. The *Halcyon* was new and the *Fish Hawk* had received extensive repairs, including new engines, when turned over to the Naval Service. The entire plant at the marine biological station at Beaufort, N. C., has been taken over by the Navy Department, and the buildings of the marine hatchery and biological station at Woods Hole, Mass., have been largely and continuously utilized as headquarters of a naval reserve force and by the American Red Cross and the Y. M. C. A.

Propagation of Food Fishes.

No new fish hatcheries were constructed during the fiscal year. The regular hatcheries operated numbered 40, together with 36 auxiliaries and 66 egg-collecting stations. The stations at Havre de Grace, Md., and San Marcos, Tex., remained closed during the year for reasons fully set forth on pages 159-163 of my last annual report. The Texas Legislature, however, at its last session enacted a law that complies with the stipulations imposed by Congress, and we were glad to reopen the San Marcos hatchery on July 1, 1918.

The aggregate output of the fish hatcheries was somewhat in excess of 4,000,000,000, as against a little over 5,150,000,000 in 1917. The decrease, which was largely in pike perch, cod, and pollock, was principally due to unfavorable weather conditions during the egg-collecting seasons. Noteworthy advances were made in the hatching and planting of the Pacific salmons, white-fish, and winter flounder. About 90 per cent of the work of the hatcheries is devoted to the maintenance of species that support commercial fisheries.

An important feature of the fish-cultural operations is the increasingly large percentage of fish reared to fingerling or yearling age before being planted. In the fiscal year 1917 the number of such fish was about 82,115,000, while in 1918 the number rose to 168,965,000, an increase of more than 100 per cent. Especially significant is the outcome of the policy of rearing the Pacific salmons to the fingerling and the yearling stages. The Bureau is striving to plant the entire output of the Pacific salmon hatcheries at such an advanced age that the losses to which the young are liable may be minimized. The hatcheries are being adapted to this end, and the problem of providing sufficient and proper food at minimum cost is gradually being solved for the different communities and species. Genuine progress in this vitally important field and practice of fish culture is being made; and although the superior results are achieved at increased expense, it has not yet been necessary to appeal to Congress for a special appropriation.

In the distribution of the output of the hatcheries, the Bureau's special cars traveled 102,330 miles, of which 10,024 miles were free transportation granted by the railroads. Messengers with detached shipments of fish traveled 468,244 miles, of which 54,578 miles were free. Plantings were made in every State and Territory, and the cars were hauled on 47 railroads and the messenger shipments on 190 railroads. The readjustment of rates charged for the distribution of fish is now under consideration by the United States Railroad Administration, and a material advance in cost may be necessary that this service may be rendered without actual loss to the railroads.

Record Work in Rescuing Stranded Food Fishes.

The systematic work done each season in salvaging food fishes left stranded when the flood waters of the Mississippi River and its tributaries subside has attained during the fiscal year large proportions, completely eclipsing the best former records. Specially equipped seining parties have operated from Minnesota to Mississippi, and a field station established at Cairo, Ill., covers both the Illinois and Kentucky sides of the Ohio River, and has been productive. The number of food fishes rescued from landlocked ponds, sloughs, and pools between July 1 and October 21, 1918, in each of the fields of operation was as follows:

Homer field.....	24,583,945
La Crosse field.....	5,392,840
North McGregor field.....	4,848,575

Bellevue field.....	8, 751, 655
Meredosia field.....	1, 218, 415
Cairo field.....	1, 571, 100
Friar Point field.....	253, 180
Total.....	46, 618, 810

As all of these fish would have perished by the drying or freezing of the temporary waters in which they had been caught, the importance of this rescue work is evident. *The cash value of the fish saved, at the rates charged by commercial hatcheries, exceeds the total appropriation of the Bureau for the fish-cultural service.*

Increasing the Consumption of Fish.

The Bureau has been more active and successful than in any previous year in bringing to the attention of the consuming public the merits and availability of fish as food and in indicating sources of supply for the demand thus created.

The work has assumed different aspects in particular localities, but its general purpose has been to induce the American public to rely on fish as a staple food, to overcome unsound prejudice, and to avoid waste in the utilization of aquatic creatures. Because of the economic situation caused by war, these activities have a more direct appeal than ever before.

Aid in developing markets for wholly or partly neglected aquatic food products has been given in the case of the sea herring of Alaska, gizzard shad, river herrings, menhaden, bowfin, burbot, carp, eulachon, grayfishes, sharks, skates, rays, jewfish, drum, redfish, robalo, rockfishes, sablefish, sea catfishes, sea robins, crevalles, and tarpon; such mammals as whales, porpoises, and dolphins; and such by-products as roe and milt of various fishes. In order to do this, it has been necessary to conduct a systematic advertising and educational campaign in the various communities, employing for this purpose persons experienced in the fish trade and in the preparation of foods for the table. One branch of this campaign has been practical field work in the Middle West having for its object the establishment of a regular market for common fishes from the coast of the Gulf of Mexico, which can be supplied in abundance when the interior markets contain little or no fresh fish at a reasonable price. In cooperation with the Department of Agriculture and the Food Administration, the Bureau has instituted in various cities not heretofore supplied a trade in carload lots of cheap, wholesome fishes taken on the west coast of Florida.

The food value of the menhaden has been brought to public attention. This fish, one of the most abundant on the Atlantic seaboard, is caught chiefly for conversion into oil and fertilizer, although the experiments of the Bureau show that it is a wholesome food in a fresh, salted, smoked, or canned condition. Inasmuch as more than 1,000,000,000 menhaden have been caught by our fishermen in a single year (about 600,000,000 pounds), the possibilities of this fish as food are evident. Larger quantities of menhaden are now being offered for sale in the eastern markets, and there is reason to believe that the consumption will increase to a point that will make the menhaden in reality, what it is in potentiality, one of the most important of American food fishes.

In connection with the "eat more fish" campaign, the Bureau has, by means of demonstrations, exhibits, correspondence, and printed matter, advocated and encouraged the home canning of fish by simple processes within the resources of every housewife and the use of pressure cookers for softening the bones of fishes. Fish bones contain an essential food constituent, lime salts, which can not be so conveniently or economically obtained otherwise. It is therefore important to utilize this and the other valuable salts occurring in fish bones.

Development of Aquatic Sources of Leather.

Throughout the year the Bureau has continued its effective cooperation with tanners, fishermen, and others interested in the development of new sources of leather from the skins of aquatic animals. Among the advances to be noted are the designing of special types of nets adapted for catching sharks; the devising of means for quickly removing skins from sharks and similar fishes with reference to the needs of the tanner; progress in methods suitable for tanning the skins of smaller fishes on a commercial scale; arrangements by tanners to engage in the fish-leather industry and establishment of connections with fishing centers to secure supplies of raw materials; establishment of small plants at various coastal points where sharks will be caught, their hides tanned, their flesh prepared for food, their oil extracted for industrial purposes, and their refuse converted into fertilizer; experiments with leathers made from fishskins to determine their special fitness for shoes and other purposes; and expediting of shipments of raw skins from producers to tanners. Through cooperation with the Bureau of Standards, the services of a

technically trained tanner were secured for experimental work at a large tannery; the expert, however, in a short time entered the military service, and the results secured were due largely to the interest of the tanning company. The largest and most available source of fishskins is the shark family. The experiments showed that shark leathers may be very satisfactorily used for shoes, linings, etc., and as cordovan. The average tensile strength of two skins submitted to the Bureau was 3,905 and 4,742 pounds per square inch.

The outlook for this new branch of industry is promising. Shortage of labor, transportation difficulties, and other drawbacks have retarded progress; but the creation of special fisheries for fish hides and the definite movement of raw materials in noteworthy quantities from fishermen to tanneries at prices mutually satisfactory indicate that the business has become well established.

A Fishery-Products Laboratory.

For years the Bureau has suffered for lack of facilities for practical demonstrations and experimentation in the methods of preparing and preserving fishery products. The fishery industries, particularly those concerned in canning and otherwise preserving food products, labor under the serious drawback of ignorance of the scientific principles underlying their operations. There is also an underconsumption of fish, due in part to the inferior quality of much that is placed on the market and in part to the ignorance of the consumer regarding the dietetic qualities and peculiarities of the several species, with consequent improper preparation for the table. As a result there is an annual loss of hundreds of millions of pounds of valuable fish food. With adequate equipment and personnel provided, the Bureau has held that it could render effective aid in developing methods for overcoming such difficulties, and that important results could be achieved in some fields within a short time.

You have approved and authorized an allotment of \$125,000 from the fund for national security and defense for a laboratory and its equipment for the conduct of work of this character and for a temporary personnel. This is being pushed vigorously, and investigations have begun which will yield important results in making available larger quantities of fish for food and in educating the public to the merits of the various fishery products.

Administration of Alaskan Fisheries.

The fisheries of Alaska have been administered in pursuance of the authority and facilities granted by Congress. The laws and regulations for the protection and conservation of the fisheries have been enforced by a corps of agents and wardens; private salmon hatcheries have been inspected; streams have been opened or improved for the passage of salmon by the removal of obstructions; a census of red salmon entering Wood River, a stream closed to commercial fishing, has been taken as heretofore; following public hearings, orders have been promulgated suspending or restricting fishing in salmon streams where circumstances demanded such action; salmon-cultural operations have been conducted on a large scale; special investigations of salmon and salmon streams have been instituted; the further development of the fishing industry has been aided by demonstrations and experiments looking to the fuller utilization of the water resources of the Territory, particularly those that have been partly or wholly neglected; and detailed statistics of the industry have been collected and compiled.

The fisheries of Alaska in 1917 attained a higher development and yielded larger returns than in any previous year. The number of persons engaged in all branches of the industry was 29,491, an increase of 5,497 over 1916; the capital invested was \$54,937,549, an increase of \$15,367,937; and the value of the products as placed on the market was \$51,466,980, an increase of \$25,310,421. The greatly augmented value of the fisheries was due partly to an increased output and partly to a marked advance in the price of canned salmon, ranging from 56 per cent for red salmon to 94 per cent for king salmon.

The salmon industry surpassed all previous records in both size and value of the pack. The canned output reached the astonishing total of 5,947,286 cases of 48 one-pound cans, and had a market value of \$46,304,000, about two-fifths the quantity and one-half the value representing red salmon.

In view of obsolete and inadequate features of the present fishery laws, it is earnestly hoped that the comprehensive bill favorably reported by the House Committee on the Merchant Marine and Fisheries may soon be enacted into law.

Alaska Fur-Seal Industry.

Under the provisions of the act of Congress approved August 24, 1912, giving effect to the North Pacific Sealing Convention of

July 7, 1911, the five-year close time on land killing expired on August 24, 1917; and the taking of fur seals for commercial purposes, as distinguished from the inconsiderable requirements of the natives of the Pribilof Islands, then became lawful. Inasmuch as the regular sealing season properly closes about August 10, owing to the supervention of the so-called "stagy" condition of the fur, only a small number of skins was taken in the calendar year 1917. For 1918 the number of seals that might be secured was tentatively fixed at 25,000, which limit was increased to 35,000, after the season had begun, on the recommendation of the responsible representatives of the Department on the islands. Up to August 10 the number of skins taken was 33,881, of which 26,881 were from St. Paul Island and 7,000 from St. George Island. The skins were mostly from seals 3, 4, and 5 years of age. The requirement of law that in 1918 there should be set aside for breeding purposes 5,000 male seals 3 years of age was met by reserving more than 9,000 seals of that age.

On account of greatly increased sealing operations in 1918, it was considered necessary to provide additional assistance for taking, handling, and curing the skins. Eleven natives were hired for the purpose at Unalaska and five experienced men were sent from Funsten Bros. & Co., of St. Louis, the contractors for dressing the skins. The handling of the augmented business incident to the taking and preparing of the island products has been much facilitated by the introduction (in the spring of 1918) of three motor trucks, used in road building, in making the remoter hauling grounds more accessible, in hauling wood and supplies, and in other ways for the benefit of the natives and the expedition of Government business.

Still further assistance to the proper administration of the Pribilof Islands affairs was afforded by Congress in appropriating \$20,000 for a wooden power lighter for use in handling products of and supplies for the islands and in making trips between the islands and to Unalaska.

Census of Alaska Seal Herd.

The 1917 census of seals at the Pribilof Islands gave, as the total strength of the herd on August 10, 1917, 468,692 animals of all ages. The census of 1918, taken under the same auspices and in the same manner, showed an approximate number of 496,611 seals of all ages on August 10, 1918, in addition to the 33,881 taken for commercial purposes during the year. The different elements of

the herd in 1918, as enumerated and computed by G. Dallas Hanna, the agent of the Department who has supervised the census for a number of years, were as follows: Breeding cows, 143,005; new-born pups, 143,005; yearlings, 83,203; 2-year-olds, 60,564; 3-year-old males, 9,117; harem bulls, 5,344; males 4, 5, and 6 years old, 32,810; idle and surplus bulls, 19,553; average harem, 26.76.

Revenue from Pribilof Islands Products.

During the fiscal year 1918 there were two sales of sealskins, one of fox skins, and two sales of seal bones from the Pribilof Islands.

The sealskins numbered 9,339 and were dyed, dressed, and machined before being sold at public auction in St. Louis. The gross proceeds were \$379,392; the expenses, including cost of preparation of skins, discount for cash, agents' commission, transportation, etc., aggregated \$115,357.29; net proceeds, \$264,034.71.

The fox skins sold at public auction in St. Louis numbered 567 blue and 39 white pelts. The gross receipts were \$35,680.50, the expenses \$4,909.20, the net proceeds \$30,771.30.

Old seal bones, aggregating about 200,000 pounds, collected by the natives during the year, ground, bagged, and delivered at Seattle, were there sold for \$2,742.70, from which sum there was deducted \$1,319.86, payments made to the natives and a few minor expenses, making the net proceeds \$1,422.84. Further lots of bones were collected but not sold during the year.

All of the above products were transported on the steamer *Roosevelt*. The net proceeds, amounting to \$296,228.85, were covered into the United States Treasury.

The arrangements made with Messrs. Funsten Bros. & Co., of St. Louis, for the handling of seal and fox skins have continued to be advantageous to the Government and to the American fur trade. Special importance is attached to the dressing and dyeing of fur sealskins before they are sold, as they thus become immediately available to a much larger number of furriers.

With the publication of Messrs. Funsten Bros. & Co.'s catalogue announcing the sale of Government sealskins on April 22, 1918, there was formally adopted a new classification of such skins. The terms theretofore employed in the trade represented the fortuitous outgrowth of about a hundred years, and were misleading. The new terms avoid the faults of the old usage and have been adopted in conformity with the general practice of the fur trade;

they are applied arbitrarily with reference to certain specified size limits of skins.

A By-Products Plant for Pribilof Islands.

Since the beginning of the sealing industry on the Pribilof Islands, most of the carcasses have been wasted—thrown away. Small quantities of meat and fat have been consumed by the natives, but no use was made of the great bulk of the material, which, with the resumption of commercial killing, has value not to be neglected. The natives will continue to use small quantities of seal meat, and the fox herds will consume a certain amount, but there will remain a large quantity of material that should be converted into fertilizer and oil, for which there is an active demand.

On my recommendation, you made, on April 9, 1918, an allotment of \$25,000 from the fund for the national security and defense to enable the Bureau of Fisheries to erect on the Pribilof Islands a plant for utilizing the waste products of the sealing industry. The plant has been delivered at St. Paul Island, and construction and installation have proceeded so well that actual operations will begin during the autumn of 1918. It is expected that, with the demand for and prices of oil and fertilizer, this plant will more than pay for itself in the first year.

Minor Alaskan Fur-Bearing Animals.

The laws and regulations for the protection of the minor fur-bearing animals of Alaska have been enforced by a force of regular wardens, supplemented by special wardens employed by a reciprocal arrangement with the governor of Alaska.

The only change made in the regulations during the year was the extension of the close season on beaver until November 1, 1923. This action was taken on the recommendation of the local wardens, the governor of Alaska, and others. The beaver has increased in numbers as a result of the protection afforded by the Department, but the increase has been local rather than general; and the consensus of opinion among those having the best knowledge of the subject and the best interests of the Territory at heart was that it would be highly desirable to give this important fur bearer further protection for a period of five years.

Statistics of the furs from Alaska have been compiled as heretofore, through the cooperation of postmasters, customs collectors, shippers, and others. The figures for the year ending November

15, 1917, show a value of \$1,028,719, exclusive of the furs from the Pribilof Islands, and give an idea of the importance of the trapping industry. The leading fur bearers are blue, cross, red, silver-gray, and white foxes, lynx, mink, muskrat, and otter, the red fox and the lynx greatly predominating.

Personnel.

A serious curtailment of the Bureau's operations, particularly in its fish-cultural branch, arises from the extremely small compensation allowed by Congress for the lower grades. The matter has long been embarrassing; it has in the past few years become acute because of general industrial conditions. Now the Bureau finds it more and more difficult to obtain persons to fill statutory positions, or, having once secured them, to retain them. In consequence many of the lower positions at fish hatcheries have been vacant much of the time.

A step looking to correct this situation is the inclusion in the estimates of appropriations for 1920 of a provision for a readjustment of the salaries in the fish-cultural service.

BUREAU OF LIGHTHOUSES.

(GEORGE R. PUTNAM, *Commissioner.*)

This Service maintains aids to navigation on all coasts under the jurisdiction of the United States (except the Philippine Islands and Panama) and also on the principal lakes and rivers. It is charged with the maintenance of aids to navigation along 47,300 statute miles of coast line and river channel.

On June 30, 1918, there were 5,899 persons employed in the Lighthouse Service, including 120 technical force, 150 clerical force, and 5,094 employees connected with depôts, lighthouses, and vessels.

During the fiscal year there was a net increase of 446 in the total number of aids maintained, the total at the end of the year being 15,673. Of these 5,545 are lights of all classes and 587 are fog signals. The total number of aids in Alaska, comprising lights, fog signals, buoys, and daymarks in commission at the close of the fiscal year, was 439, including 168 lighted aids. Special attention has been given to Alaska; 11 new lights were established there; 3 lights were changed from fixed to flashing; 1 gas and bell buoy, 13 unlighted buoys, and 5 beacons were established. It is expected that 16 other lights and 2 gas and bell buoys will be established during this season (summer of 1918). Special appropriations aggregating \$290,000 will be asked of Congress to continue the work of general increase of lights and buoys in Alaska, for a light and fog signal at Cape Spencer, Cross Sound, and for repairs and improvements at existing light stations.

The work in Alaska is of urgent importance. The coast line is of vast extent and of a most dangerous character. The value of one fine ship lost for lack of safeguards (and many are so lost) would go far to make navigation in those waters secure. The future of Alaska depends on the safety with which its waters can be navigated.

Improvements in aids to navigation in the Service generally have been made during the year as follows: Flashing or occulting lights were installed in place of fixed lights at 13 stations; incandescent oil-vapor lights were substituted for oil-wick lamps at 3

stations; acetylene or electric incandescent lights were substituted for other lights at 41 stations, including 2 light vessels and 10 buoys.

A new light station was established at Navassa Island, West Indies; the light went into commission October 21, 1917, and is on the highest point of the island in the passage between Haiti and Jamaica. It is a reinforced concrete tower, with the light 395 feet above the sea, showing a double white flash every 30 seconds, 47,000 candlepower, visible 27 miles, and is an important aid for vessels bound to and from the Panama Canal; it is greatly appreciated by master mariners on that route.

The systematic methods of improvement and the use of modern apparatus in increasing the number and brilliancy of aids have been of great value to the safety of commerce.

In accordance with the established custom of the Service effort has been continued to consult the needs of maritime interests and to cooperate effectively with other branches of the Government in related work. The most important work of cooperation has been that with the War and Navy Departments in accordance with law and Executive order. The Naval Appropriation act of August 29, 1916, authorized the President, whenever in his judgment a sufficient national emergency exists, to transfer to the service and jurisdiction of the Navy Department, or of the War Department, such vessels, equipment, stations, and personnel of the Lighthouse Service as he may deem to the best interest of the country; and also provided that the Secretary of the Navy, the Secretary of War, and the Secretary of Commerce shall jointly prescribe regulations governing the duties to be performed, etc. These regulations were issued April 11, 1917. By executive orders of the President 46 lighthouse tenders, 4 light vessels, and 21 light stations have been transferred to the Navy Department, including a total of 1,132 persons employed thereon. These vessels and stations have since that time performed various duties under the Navy, and have also continued the maintenance of the aids to navigation and other work necessary for the Lighthouse Service.

In addition to the officers and employees directly transferred, the superintendents of lighthouses and various other officers of the several lighthouse districts (46 persons) have reported to the Navy and Army authorities and have rendered service in coordinating the military and lighthouse duties of the transferred portions of the Lighthouse Service.

The duties performed by the transferred units directly for the military and naval authorities are, of course, matters pertaining to

those departments, but they consist principally of work on submarine nets and buoyage in connection therewith, patrol and watch service, drill in mine laying, etc. Prior to the war, for a number of years, a large proportion of the lighthouse tenders had been equipped by the War Department with mine-laying equipment and had periodic drills in this work.

The regular work of the Lighthouse Service—the maintenance of lighthouses, lightships, buoys, and beacons—is of extreme importance in war time to safeguard and expedite the movement of both merchant ships and naval vessels. This work has been increased rather than diminished by war-time demands and difficulties. The Lighthouse Service had prior to the war no surplus of vessels, equipment, or personnel beyond that necessary for the efficient maintenance of the existing establishment. The regulations under the law and Executive order providing for cooperation with the War and Navy Departments, therefore, contemplated the continuance of lighthouse work by the transferred units, and this has been done. By strenuous work on the part of the whole Service, and particularly the district and vessel officers, the vast system of aids to navigation is being kept up in addition to the extra duties assigned to vessels and men.

In addition to the work done by the tenders and other units transferred to the direct jurisdiction of military and naval officers, the Lighthouse Service cooperates in a number of other ways. At the General Lighthouse Depot, Staten Island, N. Y., facilities are provided for the establishment of a naval base, including large dock frontage for berthing vessels and a large amount of building space for barracks, storage, and offices; repairs are made at this depot to naval and quartermaster vessels, and buoys and other supplies are issued. Repairs are made and supplies furnished at other depots also. Numerous buoys and other aids have been placed, changed, or discontinued, to meet special needs, and buoys and moorings have been purchased for the War and Navy Departments. Keepers of important coast lighthouses and masters of light vessels are instructed to keep a lookout for submarines and other enemy activities, confidential publications from the Navy Department have been furnished them, and reports are promptly forwarded. There has been cooperation with the Navy and Treasury Departments in the improvement of coast communication facilities by telephone and radio, and a large number of lighthouses, light vessels, and tenders have been provided with such facilities, under various appropriations.

The following additional work has been performed: Various investigations have been made at the request of the Department of Justice and the military and naval information services. Officers of the Marine Engineering Division of the Lighthouse Service have assisted the Shipping Board in various matters respecting the design and sea trials of various types of vessels, including concrete vessels. An officer of the Lighthouse Service is engaged on the work of the chain section, War Industries Board, having to do with the standardization and allocation of iron and steel chain for the different activities of the Government. The Commissioner of Lighthouses is serving as the representative of the Department of Commerce on the New York Harbor Wage Adjustment Board. A scientific assistant in the Lighthouse Service has assisted a naval technical board.

Up to October 1, 1918, a total of 147 persons from the Lighthouse Service, in addition to those transferred by Executive order, had entered the Army or Navy, making with those transferred a grand total of 1,279 employees who have entered the military services, or 22 per cent of the normal force of the Lighthouse Service.

By a decision of the Bureau of War Risk Insurance the personnel of the Lighthouse Service transferred to the service and jurisdiction of the War and Navy Departments are within the terms of the War Risk Insurance act of October 6, 1917.

During the fiscal year 51 tenders and 67 light vessels were in commission. New vessels under construction are light vessels *No. 99* and *No. 103* for duty on the Great Lakes, and a working barge for use on the Hudson River has been practically completed.

On March 3, 1918, the Thirty-Five Foot Channel Light Vessel *No. 45, Va.*, was damaged by fire at the works of the Colonna Marine Railway Corporation, Norfolk, Va. The vessel was laid up for repairs when fire broke out on the ferryboat *Castleton*, and before the light vessel could get clear of the dock the ferryboat had drifted out and penned her in.

The schedules of pay established from time to time by the United States Shipping Board for officers and crews of vessels, while they do not apply directly to vessels of the Lighthouse Service, are considered standard wages in the localities in which they have been placed in effect, and it has been necessary to adjust the pay of complements of lighthouse vessels as far as appropriations admit, both in justice to employees and in order to keep up a proper efficiency. The wage scale for certain mem-

bers of deck and engine departments, announced by the Shipping Board on May 18, 1918, for vessels sailing from Atlantic and Gulf ports of the United States is now being paid to crews of lighthouse vessels, and licensed officers were granted increases to meet, as far as possible, new rates authorized in the month of June, 1918, by the Shipping Board for this class of persons. This action has necessitated large increases in the estimates for salaries on vessels of the Lighthouse Service, and estimate for additional increase will be submitted in order to bring the pay of officers of the vessels more nearly up to current rates of pay in the mercantile marine.

Systematic inspections have been continued in the various lighthouse districts of the technical work, business methods, and property accounts. The standard method of costkeeping has been continued, which is useful in preparing estimates, planning work, effecting economies, and comparing relative efficiencies.

A number of important items of construction work were in progress at the close of the year, including a new light and fog signal at Chicago Outer Harbor, Ill., Chester and Marcus Hook Ranges, Delaware River, and a light and fog signal at Conneaut, Ohio.

A temporary lighthouse depot is now rented at Ketchikan for \$3,900 per annum. It is too small for the work of the Service, is constructed wholly of wood, and contains many inflammable supplies, thus constituting a dangerous fire hazard. Practically no machinery or power tools are available, and the greater part of repair work must be performed at Seattle, 650 miles distant. An appropriation of \$90,000 for providing a new depot was made by the act of July 1, 1918, and work is now in progress on a reservation a short distance south of Ketchikan, made under Executive order of April 20, 1912. The plans contemplate a well-constructed wharf protected against the teredo, a fireproof storehouse, and the necessary shops and outbuildings.

An allotment was made from the fund for the national security and defense of the sum of \$175,000 for alterations at the general lighthouse depot at Tompkinsville, N. Y. The proposed changes will permit more rapid and economical coaling of vessels and provide more efficient repair facilities. Both will be available to the naval flotilla, which makes its base at this point.

During the fiscal year 1918, services in saving life and property were rendered and acts of heroism performed by employees of the Lighthouse Service on 158 occasions.

A severe hurricane visited the Gulf coast on September 27 to 29, 1917, damaging lighthouse property severely from the Mississippi River passes east to Pensacola Bay, and during the months of January and February, 1918, the unusually cold winter, the most severe of record since 1856, occasioned a large amount of ice damage on the Atlantic coast as far south as the Cape Fear River, S. C. Cross Rip Light Vessel No. 6, Mass., was lost in the ice, with six men on board. On August 6, 1918, Light Vessel No. 71 was sunk on her station on Diamond Shoals by an enemy submarine; the crew took to their boats and reached shore without injury.

The general lighthouse act approved June 20, 1918, contains provisions of much importance to the Lighthouse Service, including a retirement system for the field force, need for which has been pointed out from the first annual report of the Commissioner of Lighthouses in 1911 and emphasized in each succeeding report. Other important features of this act included more equitable compensation for the officers in charge of lighthouse districts, whose designation was changed from "lighthouse inspector" to "superintendent of lighthouses" and their salaries increased from \$2,400 to \$3,000 per annum, except in the third district, where the salary is \$3,600 per annum; for the raising of the pay of keepers of lighthouses and an increased ration allowance for them. Provision for the payment of travel and subsistence expenses of teachers instructing the children of lighthouse keepers and arrangements for the sale of publications of the Lighthouse Service were also included in this act, which authorizes a number of valuable special works of construction. The act as a whole is a great advance.

The appropriations for the maintenance of the Lighthouse Service for the fiscal year 1919 are \$6,150,430, being \$811,750 in excess of those for the preceding fiscal year. In addition there are special appropriations aggregating \$723,000 for various new works.

An urgent need of the Lighthouse Service is new vessels. There are no surplus ships in the Service—no reserve vessels on which to call. The seagoing tenders have all been under extra service since the war began, adding important naval duty to their regular tasks. It is necessary to add several ships a year to the fleet merely to replace the wastage from work. This does not enlarge the fleet nor make it adequate to the growing demands upon it. Three lightships have been lost during the year—one by fire, one by ice, one by the act of the enemy. The sum of \$760,000

will be included in the estimates for new vessels. This is authorized by the act approved June 20, 1918. It provides merely for replacing vessels worn out in service in the third, fifth, and eighth lighthouse districts. It will not enlarge the fleet. It is all urgently required, and more will be necessary unless the important work of the Service is to fall behind.

The act of June 20 last also authorizes two matters of special importance not only to the commerce of the country but to the naval and military services. These are the enlarging and improving the lighthouse depot at Portsmouth, Va. (adjoining the navy yard there), or establishing a new depot there at a cost of \$275,000, and the improving the aids to navigation and installing new aids in the Potomac River to cost \$95,000. It is a constant waste of money to continue the use of the old Portsmouth depot. The vessels of the Service which use it as a basis are constantly delayed and their cost of operation increased through the insufficient and antiquated accommodation there afforded. The ships there must lie several deep because the wharf there is too small to give them individual dock space. Every day the old outfit is used involves a waste of public money. This matter is treated at length on page 183 of my last report.

The Potomac River is the poorest equipped, from a lighthouse standpoint, of our great eastern streams. The commerce on the river is increasing, and great sums have been spent for military and naval purposes at Quantico, at Camp Humphreys, and at Indianhead, all of them involving an increase in navigation. Naval vessels, sometimes with the nation's guests, navigate the river at night. Connecting, as it does, the nation's capital with one of our greatest harbors (Hampton Roads), it should be safeguarded better.

It is earnestly hoped that funds for the above purposes may be allowed at the next session of Congress, so that the work may be promptly begun in the spring.

The past year has been an unusually eventful and active one for the Service. The establishment of the retirement system for the field force and the furnishing of more adequate compensation for the light keepers and district officers mark a great step forward. I am glad to acknowledge the wise liberality of Congress in this respect.

To save space details are not given this year of the saving of life and property by the vessels and employees of the Lighthouse Service during the fiscal year. Many such cases have occurred, and the records of them appear in the files of the persons concerned.

COAST AND GEODETIC SURVEY.

(R. L. FARIS, *Acting Superintendent.*)

During the past year the activities of the Coast and Geodetic Survey have been directly connected with the war. Its principal finished product, navigational charts, has chiefly gone to Government war services. Its field operations throughout have been in response to specific calls from the military services for immediate surveys needed in the execution of their war programs. It has furnished to the Navy 5 ships (3 on the Atlantic and 2 on the Pacific). It has supplied the Navy with 42 commissioned officers, 10 other officers, and 79 men, a total of 131. It has supplied the Army with 25 commissioned officers, 26 other officers, and 58 men, a total of 109, making 240 men in the combined military services. This is 30 per cent of its force.

The war functions carried on by the remaining force are thus summarized:

Work for the Army through the Signal Corps and the Engineer Corps, and for the Navy through the Bureau of Operations, Bureau of Ordnance, Hydrographic Office, Bureau of Navigation, and Board of Inspection and Survey. For the Army the work was making control surveys, locating positions, and giving elevations in the States from Texas to Virginia, inclusive, as a basis for topographic maps. This is the basic or control work. The detail topographic work is being done by the Geological Survey. The Survey also fixed the location of towers for ordnance-test ground at Aberdeen, Md., and did other similar work.

For the Navy the work was in the form of wire-drag surveys and special surveys. Among such are the wire-drag surveys in Long Island Sound and in York River (Chesapeake Bay). A topographic survey of the Virgin Islands is under way for the Navy.

Special surveys included such work as the location of points for naval fire-control experiments, the reestablishment of the speed-trial course at Lewes, Del., for torpedo-boat destroyers, the location of the Port Jefferson trial course in Long Island Sound, and the Block Island (R. I.) trial course.

An important work was the preparation and production of charts, coast pilots, and tide tables for all vessels, new and old, of the merchant marine, including those operated by the United States Shipping Board and by the United States Railroad Administration. These charts and other publications are also supplied to the Army for the vessels of the War Department and in the coast fortifications; to the Navy for all vessels, both transports and ships of war. This work included supplying charts to the Navy officers generally, including vessels of Lighthouse Service and the Coast Guard, both now under naval control, and the supplying of special charts for the Signal Corps, the special board of the Navy Department, and others. This work was continuous, both in field and office, because of the constant corrections required and because new charts are always in preparation.

A war function of the Coast and Geodetic Survey was the use of its instrument shop for producing instruments at the request of the Bureau of Standards for artillery and aviation work in Europe, making original instruments for the National Advisory Committee for Aeronautics, furnishing sextants and other instruments, and repairing sextants for the Bureau of Navigation, Navy Department, through the Naval Observatory, etc.

Officers of this service are attached to the Naval Observatory to inspect navigational instruments for the Navy and are sent to factories manufacturing instruments to inspect them. A Survey officer is in charge of the naval hydrographic office in Norfolk, and others are detached for similar special duties, for instructing in navigation, etc.

The surveys accomplished for the military services during the year were necessarily limited to the remaining field officers and vessel equipment available for the work. The Bureau was unable to carry out all the work it was requested to do.

Field Work.

From the standpoint of units of classification, the field work done by the Bureau during the fiscal year ending June 30, 1918, may be expressed as follows:

Hydrography.—(1) Ship and launch hydrography, (2) wire-drag surveys, (3) revision work, (4) current observations, (5) tidal observations, (6) topography.

Geodesy.—(1) Triangulation, (2) precise levels, (3) magnetic observations.

Hydrography.

1. *Ship and launch hydrography.*—The vessels of the Bureau in commission within the year were as follows: *Surveyor*, *Bache*, *Isis*, *Matchless*, *Hydrographer*, *Patterson*, *Explorer*, *Yukon*, *Taku*, *Pathfinder*, *Fathomer*, *Marinduque*, *Research*, and *Romblon*.

The *Surveyor*, *Bache*, and *Isis* were requisitioned by the Navy Department as auxiliaries to the naval fleet and taken over by Executive order on September 24, 1917. Since that time they have been under the control of the Navy Department.

The *Explorer* was on field duty only during the first month of the fiscal year, the *Patterson* from the beginning of the year to the close of September 23, and the *Taku* less than a month. During 1918 the Navy Department felt the need of additional vessels to patrol the waters of the Pacific coast, and on May 16, 1918, the *Patterson* and the *Explorer* were transferred to the naval fleet by Executive order. The surveying seasons of the *Explorer* and *Taku* were necessarily prematurely closed because of the lack of crews, and the *Patterson*, *Explorer*, and *Taku* were not sent to the field in the spring of 1918 because of the lack of officers and difficulty of enlisting crews owing to labor conditions.

The *Taku* has been condemned and sold because it was worn out. The *Patterson* is old and weak, the *Explorer* structurally weak. Neither vessel is safe to send to the open sea again. In my last report, on page 214, the facts concerning these vessels are stated.

Of the five vessels that have been used by this Bureau in surveying the waters of the Philippine Islands, four belong to the insular government—namely, the *Fathomer*, *Marinduque*, *Research*, and *Romblon*. The officers of these were of the technical force of this Bureau. When the need for men with the technical qualifications of these officers in the Army and Navy became manifest more than half of this technical force was transferred to the military branches by Executive order. This required withdrawing many officers from service on the vessels loaned by the Philippine Government. In view of this and of the fact that the *Research* has nearly completed the survey of all sheltered waters where it is safe for her to go, and also on account of her age and weakened condition, it was considered unsafe to send her to survey exposed waters, and she was turned back to the insular government in December, 1917. The *Marinduque* was transferred back temporarily to the insular government on March 19, 1918.

The Service has fewer vessels than it had available 12 years ago. It has but one ship built for its duty, the *Surveyor*, and but two ships that can be said to be modern and in sound condition, the *Surveyor* and the *Isis*. With the vast amount of work ahead on which human life and property depend the vessel equipment is not only insufficient but most of it very poor. The Coast and Geodetic Survey is not responsible for the loss of life and property in unsurveyed waters. It has repeatedly requested the means for making these waters safe. Until those means are given it the loss of life and property must and will continue.

The survey of Sewalls Point, Va. (3 square statute miles), was asked by the Navy Department. It was accomplished in small boats and may be classed as launch hydrography.

The revision surveys of Pamlico, Croatan, and Roanoke Sounds, N. C. (395 square statute miles), were made, using launches and pulling boats.

The surveys in the York River, Va. (4.5 square statute miles), were made at the request of the Navy Department. This was all launch work.

The need of surveys of Mississippi Sound and Mobile Bay (1,690 square statute miles) and other surveys along the Gulf coast is shown in my report for 1917. About half of this may be classed as ship hydrography; the remaining half is launch hydrography.

Chesapeake Bay: Thirty-five miles of soundings were made; all ship work.

Approaches to Cross Sound, Lisianski Inlet and Strait, Alaska (2,317 square statute miles): About seven-eighths of this work may be classed as ship hydrography. The remainder was launch hydrography.

Northward from Cape Muzon, Alaska (3.8 square statute miles): About two-thirds of this work may be classed as ship hydrography. The remainder was launch hydrography.

Prince William Sound, Alaska (32 square statute miles): All launch hydrography.

Approaches to Burdeus Bay, Polillo Island, north coast of Polillo Island, and Cuyo Islands, Philippine Islands (1,516.5 square statute miles): About seven-tenths of this work was done by the vessel and the remainder by launches.

West coast of Busuanga Island, Philippine Islands (2,443.6 square miles): Nine-tenths of this was done by the ship and the remainder by launches.

South-east coast of Palawan Island, Philippine Islands (1,312 square miles): About half of this was done by the ship and half by launches.

East coast of Palawan Island, Philippine Islands (1,134.4 square statute miles): About half of this was done by the ship and half by launches.

Manila Bay, Philippine Islands (315.5 square statute miles): About nine-tenths of this was done by the ship and the remainder by launches.

2. *Wire-drag surveys.*—There were five wire-drag parties in the field within the year.

Wire-drag party No. 1 operated in the approaches to Portsmouth Harbor, N. H., and in the vicinity of Block Island. This party was in the field from July 1 to September 27, 1917, and from May 6 to June 30, 1918. Ninety-seven square statute miles were dragged.

Wire-drag party No. 2 operated in Block Island Sound, Narragansett Bay and approaches, Long Island Sound, and vicinity of Eastport, Me. The party was in the field from July 1 to November 27, 1917, and from May 7 to June 30, 1918, and covered 167 square miles.

Wire-drag party No. 3 operated in Frederick Sound and Cook Inlet, Alaska. The party was in the field from July 1 to September 28, 1917, and from May 3 to June 30, 1918, and covered 230.2 square miles.

Wire-drag party No. 4 operated in the vicinity of Juneau, Alaska. The party was in the field from July 1 to September 11, 1917, and covered 72.7 square miles.

Wire-drag party No. 5 operated in the vicinity of Dry Tortugas, off the southern coast of Florida. The party was in the field from July 1 to September 29, 1917, and covered 140 square miles.

3. *Revision work.*—Revision work was done in the localities named below.

Plymouth, Mass.: 217.5 miles of sounding lines run.

Buzzards Bay, Mass.: 5 miles of triangulation and 3 square miles of hydrography.

South shore of Long Island Sound: 11 triangulation stations occupied 34 miles of shore-line run, 27.5 miles of railroads and other roads.

Vicinity of Seattle, Wash., Lake Washington Ship Canal: 3 triangulation stations occupied; 14½ square miles of topography and 3.75 square miles of hydrography completed.

4. *Current observations.*—The following are the general localities of the principal current observations made during the year and the number of stations occupied at each of these localities:

Locality.	Number of stations.
Block Island Sound.....	7
Coast of Maine.....	7
Long Island Sound.....	26
The Race, Long Island Sound.....	4
Port Jefferson, N. Y.....	2
Hampton Roads, Va.....	1

5. *Tidal observations.*—Tidal observations were made throughout the year at the following permanent tidal stations:

- | | |
|-------------------------|-------------------------|
| 1. Portland, Me. | 8. Key West, Fla. |
| 2. Fort Hamilton, N. Y. | 9. Cedar Keys, Fla. |
| 3. Atlantic City, N. J. | 10. Galveston, Tex. |
| 4. Philadelphia, Pa. | 11. San Diego, Cal. |
| 5. Baltimore, Md. | 12. San Francisco, Cal. |
| 6. Fernandina, Fla. | 13. Craig, Alaska. |
| 7. St. Augustine, Fla. | |

Important tidal observations were made at the following stations:

- | | |
|--------------------------|--------------------------|
| 1. New London, Conn. | 7. Petersburg, Alaska. |
| 2. New Haven, Conn. | 8. Canoe Cove, Alaska. |
| 3. Port Jefferson, N. Y. | 9. Miner Island, Alaska. |
| 4. Gloucester Point, Va. | 10. Auke Bay, Alaska. |
| 5. Pascagoula, Miss. | 11. McClure Bay, Alaska. |
| 6. Bay St. Louis, Miss. | 12. King Cove, Alaska. |

6. *Topography in connection with hydrographic work* was executed as follows:

Narragansett Bay and east end of Long Island Sound: 41.3 square miles.

Sewell Point, Va.: 1 square mile.

North Carolina sounds: 15 square miles of topography, 71 miles of shore line, and 18½ miles of railroads and other roads surveyed.

Mississippi Sound and Mobile Bay: 140 square miles of topography and 194.5 miles of shore line.

Cross Sound, Alaska: 32 square miles.

St. Thomas, Virgin Islands: 10 square miles.

Prince William Sound, Alaska: 40 square miles.

Stephens Passage, Alaska: 14.9 square miles.

Frederick Sound, Alaska: 126.25 square miles.

Coast of Alaska north of Cape Muzon: 10.5 square miles.

Knik Arm, Alaska: 2 square miles.

East Coast of Palawan, P. I.: 57 square miles.

Burdeus Bay, P. I.: 32.5 square miles.

Southeast coast of Palawan, P. I.: 45 square miles.

Manila Bay, P. I.: 47.2 square miles.

Northwest coast of Busuanga, P. I.: 4.5 square miles.

Geodesy.

Triangulation.—Primary triangulation was accomplished in the following localities: Along the Rio Grande in Texas, and in the vicinity of Stephens Passage and Lynn Canal, southeast Alaska; the total linear extent of this triangulation is 639 miles. Primary traverse was carried on in the following localities: Mostly in Georgia, but also in South Carolina and Virginia; the extent of this traverse is 940 miles. Tertiary triangulation was executed in the following localities: Along the Cape Fear River in North Carolina; the extent of this tertiary triangulation is 70 miles.

Precise levels.—During the year 2,367 miles of precise levels were run as follows: In Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia.

Magnetic observations.—In continuation of the magnetic survey of the United States, observations were made during the year at 275 stations in 21 States, of which 118 were new primary stations, 114 auxiliary stations, 34 repeat stations for the determination of secular change, and 9 new stations in old localities. Meridian lines were established when they were requested by the local authorities. The number of county seats at which magnetic observations have not been made were reduced from 163 to 138.

The observatories at Cheltenham, Md.; Vieques, P. R.; Tucson, Ariz.; Sitka, Alaska; and near Honolulu, Hawaii, were in operation throughout the year. Continuous photographic records were secured of the variations of declination, horizontal intensity, and vertical intensity. Absolute observations were made at least once a week and scale-value determinations once a month. Beginning with January, 1918, horizontal-intensity observations as well as dip and declination were made both in the morning and in the afternoon on the same day to secure additional data regarding the relation between the variation and absolute instruments.

Need for Survey Vessels.

The most important class of hydrography is ship hydrography. There are thousands upon thousands of square miles of this class of hydrography that should be executed without further delay.

These are areas removed from the sight of land, exposed waters in extensive bays and sounds, and waters of these regions nearer shore where there is no refuge to permit using smaller craft. In such places results can be secured in no other way. These surveys are of the utmost importance to maritime commerce; in many instances the development of industries is retarded or prohibited because of the lack of these surveys. The Bureau is in need of proper ships with which to do this work.

This lack of adequate surveys is keenly felt by the shipping interests that risk their vessels in Alaskan waters. There are regions in which industries are awaiting development where these companies will under no consideration send ships because of certain but unknown dangers. This caution is grounded on experience, as is shown by a letter received from the general manager of the Pacific Steamship Co., under date of May 2, 1918, wherein he says in part:

At the present moment the Pacific Steamship Co. has two passenger steamers in trouble in southeastern Alaska as the result of "unavoidable strandings." First, the *Admiral Evans*, which struck an uncharted rock in the entrance of Hawke Inlet, as a result of which it was necessary to beach her immediately, where she now lies with her stern in 11 fathoms of water. Thirty days' salvage operations have failed of results and the best we can hope for is the loss of the use of the vessel for six months and a total expense of from \$300,000 to \$400,000 for recovery and repairs. After the accident a survey vessel was sent to the spot and discovered and buoyed the rock, thus adding one more expensive unit to the accidental survey of Alaskan waters.

Our steamer *Admiral Farragut*, while steaming north from Petersburg on April 26, struck an unknown obstruction, but where the chart showed 3 and $3\frac{1}{4}$ fathoms of water and the tide one hour to go; with the vessel drawing 19 feet 6 inches aft, probably not over 16 feet forward. Nos. 1, 2, 3, and 5 tanks are leaking. The pumps were able to keep her afloat until she arrived at Juneau, where she is now discharging cargo, and it will undoubtedly be necessary to bring her to Seattle for extensive repairs. I understand some of the Coast and Geodetic Survey people were aboard the *Admiral Farragut* when she struck, and you will probably be apprised of the details.

Here the loss of a single company operating steamers in Alaskan waters has been in two instances in excess of the entire appropriations for the Coast and Geodetic Survey by this Government for the current year for surveying the waters of Alaska, Washington, Oregon, California, the Philippine Islands, and Hawaii.

The annual loss of ships and cargoes in the waters of Alaska alone averaged \$490,000 for the 10-year period from 1906 to 1915, inclusive. This is more than enough at present prices to build a new surveying steamer every year and maintain her in full operation. A sum less than the cost of the wrecks for any two years of this 10-year period if spent in survey ships and crews would have prevented the other wrecks. Stated differently, there would have

been an approximate saving in eight years of \$3,920,000 in wrecks for the investment of less than \$960,000. This is at the rate of over 50 per cent per annum on the investment, but takes no account of the salvage of life.

While the results of the unsurveyed or partly surveyed waters bordering Alaska present a striking example of retarding a country's development when it could be stimulated so as to return a profit far beyond the cost of proper surveys, this condition is not peculiar to Alaska. Ship-borne commerce which is traversing some coastal waters of the continental United States escapes destruction more through the experience and knowledge of the navigator than by the guidance of charts that are supposed to contain all the information necessary for safety.

I may sum up the situation by comparing the area surveyed by the vessels of the Coast and Geodetic Survey in the waters of the three Pacific Coast States and Alaska during one year with the total area of these waters that remain to be covered by ship surveys. The table below gives a summation of the areas covered by the different vessels.

Name of vessel.	Field of operations.	Area covered in square statute miles.
Explorer.....	Richs Passage, Washington.....	0.5
Do.....	Cape Muzon, Alaska.....	574
Do.....	Dall Island, Alaska.....	209
Patterson.....	Kashevarof Islands, Alaska.....	90
Do.....	Cross Sound, Alaska.....	5.9
Taku.....	Orca Inlet and Copper River, Alaska.....	111.5
	Oregon.....	None.
	California.....	None.
Total.....		990

The total area in square statute miles of waters adjacent to Alaska, Washington, Oregon, and California that can not be surveyed by other than vessels of seagoing size and of which surveys are immediately necessary to make navigation safe is as follows:

	Square statute miles.
Alaska.....	587,000
Washington.....	11,500
Oregon.....	15,200
California.....	35,400
Total.....	649,100

The conclusion is inevitable that if these conditions are going to be remedied more surveying vessels must be put into the field in these waters. These ships are not an expense, but an investment. They pay large annual interest on their cost and maintenance. The present condition is a national reproach, a reflection on the humanity and sober business sense of our country.

Wire-Drag Launches.

While surveys of water area removed from the sight of land, exposed waters in extensive bays and sounds, and waters nearer shore, where there is no harbor for smaller craft, must be made by surveying ships, another class of hydrographic surveys can only be made with special power launches and special equipment—viz, the wire-drag survey. This is the only method of making effective surveys where prevailing depths are in excess of the needs of navigation, and yet there are obstructions projecting from the bottom which would damage or wreck a vessel that struck them.

The following table, which gives the wire-drag work now completed and that yet to be done, shows the necessity of proper equipment for wire-drag work:

Region.	Wire-drag surveys completed (square statute miles).	Wire-drag surveys to be made (square statute miles, approximated).
Coast of New England.....	1,739	1,800
Coast of Florida.....	216	500
Coast of Porto Rico.....	14	2,300
Coast of Alaska.....	1,638	50,000
Entrance to Canal Zone.....	200	200
Total.....	3,807	54,800

The above table gives the principal areas where wire-drag surveys must be made; but there are many smaller localities where examinations are needed with the wire drag (such as San Francisco Harbor) and other extensive water areas where wire-drag work must eventually be done (such as the coral-infested waters of the Philippines, Hawaii, and Guam).

Enlistment of Seamen.

Three vessels available for certain surveys in Alaskan waters were forced to lie idle at the docks in Seattle during most of

the fiscal year, the *Explorer* and *Taku* being in the field but a month each and the *Patterson* less than three months. This was because of the lack of officers and the difficulty of getting seamen to man the vessels. The vessels, such as they were, could have done more in protected waters if we had been able to get men.

The causes that lead to this state of affairs are many. The bad results have not been so manifest during normal times, though then matters were not going in a harmonious way. During the stress of war, however, when conditions were abnormal and an important arm of the Government service was thus crippled, the need of some remedial measures was keenly felt.

It is believed that there is a solution of this difficulty certain to result in efficiency and ultimately in great economy, though it involves an increased initial expenditure and a departure from present methods.

High efficiency can not be had in a service where the duties of its seamen are so different from the usual ones as to require months of special training and instruction before the seamen can become proficient, when such seamen are only employed for the surveying season of some six or seven months, are then discharged, and an entirely new crew recruited when the succeeding season opens.

Attention has been called to the need for additional surveys of the waters of Alaska and on the coasts of Washington, Oregon, and California.

The remedy suggested is this:

1. That surveying vessels be provided of a type sufficiently staunch to make surveys in Alaskan waters during the summer months and in the waters of Washington, Oregon, and California during the winter months and so equipped as to provide comfortable quarters for seamen throughout the year.
2. That the appropriations for manning the vessels of the Coast and Geodetic Survey be so increased that a standard wage can be paid the seamen on the vessels of this Service throughout the year.
3. That authority be granted to enlist seamen for service in the Coast and Geodetic Survey for a period of one year that will be binding upon them during the period of the enlistment, as are enlistments in the Navy and the Coast Guard.

From such an arrangement benefits are bound to accrue to both the seamen and the Government. The suggestion is predicated on the advantages being mutual. Employment for seamen will be

continuous under conditions that are agreeable, the Government will have trained complements of men on its vessels familiar with the intricate details of making surveys and will be able to draw to the Service competent and suitable seamen who will have before them prospects of continuous service and advancement in pay. Furthermore, surveys that are of vital importance to the protection of life and property will be accelerated far in excess of possible accomplishment under present conditions.

Additional Hydrographic and Geodetic Engineers.

While the regular work of the Coast and Geodetic Survey is now curtailed by war conditions, and the energies of those remaining in civil employment with the Bureau are directed toward accomplishments requested by the Navy and the Army, it is necessary to consider the needs of the Bureau for field officers to adequately perform the normal duties of the Service.

In the report of the Bureau for 1916 it was urged that 48 additional commissioned officers were needed to properly carry on its field work. In partial recognition of this need 20 new positions have been granted. This added personnel has been of great assistance in putting new life into the Service. The Bureau is, however, yet short 28 officers to put it on such a footing that the commissioned personnel will be sufficient to care for the field work.

Office Needs.

Draftsmen.—Stated in the order of the Bureau's present requirements, the classes of personnel where relief is urgently needed are as follows:

1. Draftsmen.
2. Computers.
3. Clerks.

The term "draftsmen" applied to the employees of the Coast and Geodetic Survey who compile the charts is a misnomer. The mechanical drawing of the characteristics shown on the published chart is by far the least duty of the force engaged. The more serious work is the examination of the mass of data from all sources, some of which are unquestionably accurate, others doubtful, and still others of uncertain character, and from these produce a chart that represents true conditions.

The military services have drawn some of our most experienced draftsmen, and others are on leave doing special war work. This only emphasizes a condition that has existed for years, namely,

that there is and has long been a great mass of information that has not and can not be applied to the charts of the Bureau at the time the information is current because there is not the necessary force of cartographers to digest and apply it as it comes in.

Because of the high attainments required of those engaged on this work the salaries should be higher than at present, especially in the lower grades. Indeed, if the positions are to be filled and conditions continue as at present these salaries must be increased, because candidates can not be found to fill them. Some of the lower paid positions have been vacant for months.

Computers.—The services of computers are required and used in three divisions of this Bureau.

1. In the division of geodesy in the computation of the results of geodetic surveys.

2. In the division of hydrography and topography in making computations for the annual tide tables and discussion of current data.

3. In the division of terrestrial magnetism in the computations of the field and observatory observations, and the discussion of the results therefrom.

While conditions are not as bad in these divisions and the masses of data from field observations, etc., are not so great as those before the draftsmen, yet there are many folios of results of field observations (geodetic, tidal, and magnetic) containing information that can only be effectively presented for public use in printed form that have not been reached by the computing force.

With the present scale of salaries, it is not possible to secure new computers of the required training and ability, nor to hold the old computers experienced in the work. Of the entire force (authorized) of 31 computers, there are only 6 now in the Service who were here at the beginning of 1907. In the division of geodesy, to which 22 of the computers are assigned, there are now only 2 who were there in 1907. Twelve places are either vacant or filled by temporary appointees.

Recently four men took the examination and all four men were offered positions at \$1,200 per annum, the regular entrance salary. One of these wanted \$2,000, another \$1,700, as an entrance salary, and the other two refused the position.

There has recently been a call for computers in the Ordnance Department, the requirements being substantially the same as for computers in the Coast and Geodetic Survey, the salaries ranging

from \$1,400 to \$1,800 a year. For master computer, with additional requirements of at least two years of experience in engineering or similar pursuits, salaries ranging from \$1,800 to \$2,400 a year are offered.

Clerks.—This Bureau in relation to its clerical force has few parallels in the Government service. The work of the Bureau is specialized. The clerical force is not large (42 in number). No two clerks in the Bureau have duties that are exactly similar, and the duties of many are highly technical. From this it follows that when a vacancy occurs in the clerical force the new appointee is assigned to duties which are different from any clerical experience he has had, and there is no clerk in the division to which he is assigned to assist him to learn his duties. He acquires this information only at the expense of a great loss of time of the chief of the division, who must teach him the details of the work. Consequently, frequent changes in the clerical force not only hinder the prompt answering of the inquiries of the public but retard the technical work of the Bureau.

Owing to the disparity between the statutory salaries in this Service and those paid in other branches of the Government, the changes in the clerical personnel are in excess of the average in other Government services.

The statutory salary of half of the clerical force of the Bureau is not in excess of \$1,000 per annum. There are 42 clerks in the Bureau. The statutory salaries of 21 of these are as follows:

Six at \$720 per annum.

Ten at \$900 per annum.

Five at \$1,000 per annum.

The result was that during the fiscal year no less than 27 persons occupied 5 of the statutory places at \$720 per annum and 33 persons occupied the 10 statutory places for clerks at \$900 per annum. The general average has been that these positions have been held less than three months, there being many intervals when candidates could not be found willing to accept such salaries.

While the Government has thus really paid from its salary rolls a minimum price for clerical help, it has lost an immense amount of time of highly skilled technical employees who have instructed during one year each of these 60 different incumbents of different clerical positions, and the net result has been a financial loss far in excess of salaries that would retain a permanent force.

Instrument Makers.

There is another need in the office personnel that has a direct effect on field work. This is an increased number of and higher entrance salary for instrument makers. These must be specially skilled men in repairing and making of the intricate parts of delicate surveying instruments, such as theodolites, sextants, levels, etc. We need men of higher attainments than are usually found in quantity-production instrument shops of manufacturers of surveying instruments. In those places men are generally skilled only in the production of special parts in numbers of a given instrument. The men in the Coast and Geodetic Survey shop must be able to make necessary parts for and repairs to any delicate surveying instrument and with high precision. An inaccuracy in the instrument would bring inaccuracies in the results from surveys made with it.

The entrance salary of \$1,200 does not attract men of the requisite experience to fill these positions. One of these positions was created July 1, 1917. It was only after a solicitation by correspondence and personal inquiry covering nearly six months that an incumbent was found. Another of the \$1,200 positions has been vacant for months. The Bureau is unable to induce anyone with mechanical ability to accept an appointment to fill the vacancy.

Retirement for Commissioned Officers.

In earlier reports mention has been made of the need of some system of retirement in order to bring about the maximum of results with the greatest economy. The Coast and Geodetic Survey is the oldest scientific bureau of the Federal Government, and naturally the defects attendant on superannuation are quite apparent.

The commissioned officers in the Coast and Geodetic Survey now number 124. Of these 10 are more than 64 years of age and have had an average service of over 44 years; 16 are over 60 years old and have had an average service of 42 years. To retire those above 64 years of age on three-fourths pay would have required an appropriation of but \$16,650 for the current year, and would have enabled us to bring into the service 10 new field officers who are sorely needed.

The fact that the pay of these officers during their long service has been too small to permit laying aside a competence for old age

is not, however, the principal consideration in urging retirement for them. The stronger reason is the privations they have to endure and the risks incident to the service. The surveys made by the Coast and Geodetic Survey ought to and usually do precede commerce, and often civilization. The surveying vessels of the service must enter, explore, and survey unknown waters in advance of commerce or of the vessels of the Navy, the Coast Guard, and of all other vessels. The hydrographic parties must go into unexplored waters and make examinations in order that the commerce to follow may be safe. In doing this work these parties are cut off from settlements and even from communications for weeks and months at a time. Often in the Philippines they live and work in direct contact with the uncivilized natives of the tropical forests bordering the waters where surveys are made.

The surveying work of this Service covers a wide field. Its officers are exposed to the tropical diseases and dangers of the Philippines and sent into the desolate Arctic regions. In connection with such work as the determination of the one hundred and forty-first meridian, the boundary line between Alaska and Canada, they have been for self-preservation forced to assume civil charge of the native population and exercise strict authority to stamp out smallpox.

In making surveys of Alaskan waters, officers are particularly exposed to dangers. The vessels they have had to use, small, old, and weak, are no match for the gales that are common to that country. It is only through foresight in selecting harbors of refuge and by good seamanship that disasters have been averted.

Though it is not the regular function of the Bureau, its officers play no small part in saving lives and property. Word often comes of assistance lent vessels in distress or lives and property saved. Persons have been rescued from stranded ships in all our waters by these officers. These risks and hardships are normal to the civil employment of the officers of the Coast and Geodetic Survey. In military activities also they have taken their part. In the Civil War 55 took an active part in the Army and 48 in the Navy, and their services are shown to have been highly prized by the testimonials of the military and naval officers under whom they served. They were in the Army and Navy without any military status and if captured would not have been accorded the protection of prisoners of war, but would have been subject to treatment as spies. Permanent legislation has been enacted authorizing the

President to commission and to transfer by Executive order to the Army or Navy the officers of the Coast and Geodetic Survey as necessity demands, in effect making the Service a military reserve force. In this way 25 commissioned officers have been transferred to the Army and 42 to the Navy. These officers are to-day taking all risks of military service.

The commissioned officers of the Coast and Geodetic Survey to be of normal efficiency must be a permanent force. That is to say, the work of the Bureau is so specialized in particular branches of the field of engineering that the young men that come to the Service from universities, where they are highly trained in the science of engineering, must have a long course of special training by the officers of the Coast and Geodetic Survey before they become proficient and are able to carry on the specialized work of the Bureau. It is only after years of experience and training that they become of the greatest value. Therefore, the young engineer must early determine either that he will cast his lot with the Coast and Geodetic Survey during his professional career or he must early seek other fields of service because his engineering work with the Bureau is highly specialized, and long training in it rather tends to make him less fit for successful effort in broader engineering fields. It, therefore, is true that those who have been in the Service more than a very few years are devoting their lives to the advancement of this special service.

These reasons justify a claim for retirement for the commissioned officers of the Coast and Geodetic Survey.

Recent Legislation.

The following is a summary of legislation contained in the sundry civil act of July 1, 1918, affecting the Coast and Geodetic Survey:

Among the important pieces of enabling legislation for the Service is the authorization of the payment of not to exceed \$1 per day as extra compensation to employees of the Lighthouse Service while observing tides or currents. Lightships are peculiarly well situated to collect tide and current data, but such observations are not part of the duty of the Bureau of Lighthouses and can not justly be imposed on the light keepers of that Service without additional compensation. The appropriations for the Coast and Geodetic Survey could not be used to recompense them for such additional duties without this authorization. It is expected that predictions can be made as the results of data collected on

lightships which will directly benefit navigators and save vessels from loss by providing knowledge of the direction and strength of ocean currents.

Other items are the authorization of the running of lines of precise levels in the interior of Alaska; the employment of draftsmen in the preparation of plans and specifications for vessels, and especially the reimbursement of officers of the Bureau for food, clothing, medicines, and other supplies furnished for the temporary relief of distressed persons in remote localities and to shipwrecked persons.

On March 16, 1918, the War Department requested the services of Dr. E. Lester Jones, Superintendent of the Coast and Geodetic Survey, in connection with the work of the supply division of the Signal Corps. Dr. Jones was temporarily released from his duties at the Coast and Geodetic Survey and was appointed by the War Department and given the rank of major and later promoted to lieutenant colonel, and since then has been commissioned colonel.

On August 16, 1918, Mr. William Bowie was transferred from the Coast and Geodetic Survey to the War Department and given the rank of major.

The personnel from the Coast and Geodetic Survey has received the following commissions in the War and Navy Departments:

WAR DEPARTMENT.		NAVY DEPARTMENT.	
Colonel.....	1	Lieutenant commanders.....	5
Major.....	1	Lieutenants.....	24
Captains.....	3	Lieutenants, junior grade.....	17
First lieutenants.....	18	Ensigns.....	4
Second lieutenants.....	10	Assistant surgeon.....	1

STEAMBOAT-INSPECTION SERVICE.

(GEORGE UHLER, *Supervising Inspector General.*)

Organization.

The following positions were embraced in the Steamboat-Inspection Service at the close of business on June 30, 1918:

At Washington, D. C.:

Supervising Inspector General.....	1
Chief clerk (who is acting Supervising Inspector General in the absence of that officer).....	1
Clerks.....	9
Messenger.....	1
	<hr/> 12

In the Service at large:

Supervising inspectors.....	10
Traveling inspectors.....	2
Local inspectors of hulls.....	48
Local inspectors of boilers.....	48
Assistant inspectors of hulls.....	64
Assistant inspectors of boilers.....	64
Clerks to boards of local inspectors.....	73
	<hr/> 309
Total.....	321

Nineteen permanent positions were added to the Service during the year, as follows:

One clerk in the office of the Supervising Inspector General, Washington, D. C.

A board of local inspectors was established at Tampa, Fla., consisting of a local inspector of hulls and a local inspector of boilers.

Three assistant inspectors of hulls and three assistant inspectors of boilers at the port of New York, N. Y.

One assistant inspector of hulls and one assistant inspector of boilers at each of the following ports: Seattle, Wash.; Philadelphia, Pa.; and Boston, Mass.

One additional clerk in each of the following offices: San Francisco, Cal.; Seattle, Wash.; Cleveland, Ohio; and Tampa, Fla.

Summary of Activities and Statistics.

Following is a summary of activities and statistics for the fiscal year 1918:

The force inspected and certificated 7,015 vessels, with a total gross tonnage of 8,464,696, of which 6,788 were domestic vessels,

with a total gross tonnage of 6,846,356, and 227 were foreign passenger steam vessels, with a total gross tonnage of 1,618,340. Of the domestic vessels there were 5,532 steam vessels, 695 motor vessels, 18 passenger barges, and 543 seagoing barges. There was an increase of 31 in the total number of vessels inspected and an increase of 1,215,107 in the total gross tonnage of vessels inspected as compared with the previous fiscal year. Letters of approval of designs of boilers, engines, and other operating machinery were granted to 33 steam vessels, with a total gross tonnage of 978. There were inspected for the United States Government 84 hulls and 1,716 boilers. There were 1,798 reinspections of passenger and ferry steamers. The two traveling inspectors traveled 17,872 miles, inspected 277 vessels, and found and reported 46 deficiencies of various kinds.

Licenses were issued to 32,458 officers of all grades. There were examined for visual defects 11,715 applicants for license, of whom 206 were found color blind or with other visual defects and rejected. Certificates of service were issued to 8,334 able seamen, and 600 were rejected. Certificates of efficiency were issued to 5,101 lifeboat men, and 786 were rejected.

Steel plates for the construction of marine boilers to the number of 9,605 were inspected at the mills, and a large amount of other boiler material was inspected. There were examined and tested 319,259 new life preservers, of which number 5,474 were rejected.

The total number of accidents resulting in loss of life was 217. The total number of lives lost was 500, of which 77 were passengers. Of the lives lost, 147 were from suicide, accidental drowning, and other causes beyond the power of the Service to prevent, leaving a loss of 353 as fairly chargeable to accidents, collisions, foundering, etc. There was a decrease of 92 in the number of lives lost as compared with the previous fiscal year. Passengers to the number of 335,141,118 were carried on vessels required by law to make report of the number of passengers carried. Dividing this number by 77, the total number of passengers lost, shows that 4,352,482 passengers were carried for each passenger lost. The number of lives saved by means of the life-saving appliances required by law was 1,356.

Part in the War With Germany.

The Steamboat-Inspection Service occupies an active position in the prosecution of the war against Germany, and everything possible has been done by the Service to make it more

efficient. Methods of administration have been improved, regulations adaptable to war conditions have been adopted, prompt investigations of instances of alleged disloyalty on the part of licensed officers have been held, and Congress has enacted important legislation for the Service, which has tended to efficiency.

The Steamboat-Inspection Service was so organized that there has been no delay whatever caused by administrative methods since the beginning of the war. Where improvements could be made they were made, and where short cuts could be taken they were taken. The work of the Service has increased enormously, but the personnel has not increased commensurately. It was, therefore, only by adopting effective methods that the Service was able to meet the demands upon it. The correspondence has been heavy since more business interests are giving their attention to maritime affairs and more persons wish information in regard to the merchant marine.

The office of the Supervising Inspector General was called upon to answer many questions relating to these matters. All information requested was furnished promptly, usually upon the same day. In some cases telegraphic instructions have been given to inspectors, that there might be no delay.

While the spirit of the Service is to adjust difficulties, as far as possible, by administrative authority, there are instances that require the adoption of regulations to meet situations that can not be so adjusted. Therefore, the Board of Supervising Inspectors has promptly adopted regulations with reference to the inspection of vessels and the licensing of men that have resulted in making conditions on board ships as safe as possible under war conditions, and at the same time have enabled men to obtain licenses who could not have been licensed under former rules. The work of the executive committees of the Board of Supervising Inspectors has been very effective in this connection as the committees meet when the board is not in session. The elasticity of this organization has proven very effective.

Ever since the war started the office of the Supervising Inspector General has been in correspondence with the Office of Naval Intelligence of the Navy Department concerning cases where that office reported instances of alleged disloyalty of persons holding licenses from the Steamboat-Inspection Service. In every such instance the local inspectors having jurisdiction have followed

down the reports and investigated the rumors. In those cases which were proven the licenses were promptly revoked.

In connection with the cooperative work of the Steamboat-Inspection Service of this Department with the United States Shipping Board it is interesting to note letter received from Mr. Edward N. Hurley, chairman of the Shipping Board, dated August 29, addressed to the Secretary of Commerce. The letter is as follows and calls particular attention to the need for additional inspectors and clerks, due to the constantly increasing demands made by the Shipping Board:

The attention of the Shipping Board has been directed to the need for increased personnel in the Steamboat-Inspection Service, through the letter from the Supervising Inspector General of that Service under date of August 28, 1918.

The urgent need for additional inspectors and clerks in the Steamboat-Inspection Service, we realize, is largely due to the constantly increasing demands made by the Shipping Board in the matter of new construction and in the training of new officers and engineers.

The Shipping Board desires to make acknowledgment of the efficient service rendered in the past by the Inspection Service, and it is loath to see a curtailment of this service or of the promptness of its execution due to a shortage of inspectors. It is essential in order that new construction be made available promptly that your continued cooperation be made available by adequate facilities.

Examination of Interned Vessels.

A tabulated statement follows, showing the places at which examined, the number, and the nationality of the vessels belonging to Germany and Austria which were interned and later seized by this country.

Port.	German.	Austrian.	Port.	German.	Austrian.
San Francisco.....	20	.....	Charleston.....	4	.....
Seattle.....	4	.....	New Orleans.....	7	2
Honolulu.....	10	.....	Mobile.....	2	1
New York.....	19	2	Galveston.....	.....	1
Philadelphia.....	2	1	Boston.....	3	1
Norfolk.....	2	1			
Baltimore.....	3	.....	Total.....	76	9

There were a few more vessels interned and taken over by the Government than appear in the table above; the figures show only those that were examined by inspectors of the Steamboat-Inspection Service.

Reference has been made in the press to the fact that there were certain interned vessels that were to be taken over, but unless one were familiar with the immense amount of work incident

to the examination of these vessels, the machinery of which was attempted to be ruined by men working under the direction of a foreign power, one can not appreciate the immense problem that confronted the inspectors of the Steamboat-Inspection Service in making an examination of the vessels.

It was necessary that the examination should be most thorough to ascertain exactly what was necessary to put these vessels into first-class condition. That the work of the Service was effective is proven by the very successful manner in which these ships have been operated since they have been flying the American flag.

Important Legislation.

During the fiscal year, by the act of Congress approved March 29, 1918, section 4472, Revised Statutes, was so amended as to provide that kerosene and lubricating oils made from refined products of petroleum, which will stand a fire test of not less than 300° F., may be used as stores on board steamers carrying passengers, under such regulations as may be prescribed by the Board of Supervising Inspectors, with the approval of the Secretary of Commerce.

The act of Congress approved June 10, 1918, has made it possible for appeals to be taken in practically every instance to the Supervising Inspector General, and when that officer's decision is approved by the Secretary of Commerce the action is final. The effect of the enactment of this law will be to result in a more centralized administrative authority and in increased efficiency.

The act of Congress approved July 2, 1918, resulted in a substantial increase of pay for the inspectors of the Service. Congress took timely action in enacting this law, because the Steamboat-Inspection Service faced practical disorganization. Prompt action should now be taken with reference to increasing the pay of the clerks of the Steamboat-Inspection Service. The persons who do this work have to be peculiarly qualified, and it is believed that unless prompt relief is given the machinery of the Service will be much impaired by the loss of competent clerks and the inability of the officers of the Service to obtain competent persons to take their places.

The Spirit of the Service.

The Steamboat-Inspection Service does things. In time of war or during crises men look for practical results. In such times men tie to leaders who act. Vessels have to be inspected, and that

promptly, and men must be licensed without delay. With this Service it is not a question of finding how not to do things, but how to do things. The time of day or night does not matter, nor do the hours of work. The clerks in the Steamboat-Inspection Service have responded splendidly to the unusual demands made upon them, because certificates of inspection have to be prepared and licenses have to be written out, not at convenience or several days after, but immediately when the necessity arises. An enormous amount of work has had to be done in the compilation of reports and data for other branches of the Government, and this has been done without delay. There has been no complaining, but there has been a cheerful response on the part of everyone to the unusual demands that have been made upon them.

BUREAU OF NAVIGATION.

(E. T. CHAMBERLAIN, *Commissioner*.)

American shipping registered for the foreign trade and enrolled and licensed for the coasting trade, including the fisheries, on June 30, 1918, comprised 26,711 vessels of 9,924,518 gross tons, compared with 26,397 vessels of 8,871,037 gross tons on June 30, 1917, an increase of 314 vessels and 1,053,481 gross tons. The following statement shows at a glance the total of our tonnage at the close of each of the last five fiscal years and indicates the great changes which have taken place within that period:

June 30—	Foreign trade.	Coasting trade.		Total.
		Great Lakes.	Sea and rivers.	
1914.....	1,076,152	2,882,922	3,969,614	7,928,688
1915.....	1,871,543	2,818,000	3,699,886	8,389,429
1916.....	2,191,715	2,760,815	3,517,119	8,469,649
1917.....	2,446,399	2,769,824	3,654,814	8,871,037
1918.....	3,603,706	2,708,523	3,612,289	9,924,518

These figures for June 30, 1918, must be supplemented by others outside of customhouse records to show adequately the situation. Thus, between April 6, 1917, when the United States declared war, and June 30, 1918, a total of 54 vessels of 404,760 gross tons were placed under control of the Army and Navy as transports and for other military and naval purposes, giving up for the time their registers and commercial character. Most of our seagoing ships, though still under register, have given up to a great extent their mercantile character and are owned or requisitioned by the Government of the United States as a necessary instrumentality for the prosecution of the war overseas. Thus, on June 30, 1918, the seagoing ships of over 1,000 gross tons each comprised 315 sail vessels of 518,216 gross tons and 965 steamers and motor ships of 3,788,676 gross tons. Of the total of 1,280 vessels of 4,306,892 gross tons the United States Shipping Board owned 265 ships of 1,031,564 gross tons and had under requisition 447 ships of 2,341,117 gross tons; in all 712 of 3,372,681 gross tons. The

power of requisition is a war power granted for war purposes, and the Shipping Board fleets are thus as essentially a war instrumentality as the Army transports, though in fact portions of the requisitioned fleet are still operating under direction of their owners as agents of the Shipping Board, in the trades in which they were engaged before the war. During the year 64 American ships of 163,254 gross tons were destroyed by German torpedoes and mines, with the loss of 326 lives.

The vessels built in the United States and documented as vessels of the United States during the fiscal year ended June 30, 1918, numbered 1,528 of 1,300,868 gross tons, compared with 1,297 of 664,479 gross tons during the year ended June 30, 1917, which was the record American output up to that date. Of the total 17 ships of 75,685 gross tons were built under contracts by and documented for the United States Shipping Board, including 2 wooden steamers of 6,068 gross tons. While the year's shipbuilding results may be below the popular expectations, they are in fact satisfactory in view of the difficulties under which the work was long prosecuted. Simultaneously with merchant shipbuilding our shipyards, especially those on the Atlantic coast, have carried on a larger amount of work on warships of various types than ever before in our history. Early in the fiscal year acts of Congress and large appropriations took effect which radically changed the nature of the shipbuilding industry in the United States. Some of these acts and appropriations were passed by Congress before June 30, 1917, but their full effect was not felt until the fiscal year began. The Government of the United States entered into contracts for the construction of great fleets of merchant ships, steel and wooden, in private shipyards, it aided in the establishment of new shipyards in various ways, and it took possession of a large tonnage in various stages of completion or under contract for American, British, French, Norwegian, and other shipowners. So radical a change in the industry naturally was not brought about without some delays and confusion, the effects of which in diminished production during the first part of the fiscal year are reflected in the year's output. During the ten months ended October, 1918, we built 2,082,251 gross tons, and if the present rate of construction is maintained, we shall build during the calendar year 1918 double the tonnage built during the fiscal year ended June 30, 1918. In the fiscal year we also built and delivered to foreign owners 22 vessels of 48,531 gross tons.

Shipping Commissioners.

During the year 457,248 officers and men have been shipped and discharged, including repeated shipments and discharges, by United States Shipping Commissioners, compared with 506,941 during the previous fiscal year. Nearly all the ports show a slight increase for the year, but at New York there was a decrease of 56,526, due to the change in policy by which enlisted men of the Navy to an increasing extent have been employed, instead of merchant crews, to man ships engaged in the transportation overseas of troops, supplies, and munitions of war.

Navigation Receipts.

The receipts from tonnage duties during the fiscal year amounted to \$1,171,418.36 (including \$4,633.14 Philippine Islands fund and \$3,362.50 alien and penal tonnage duties and light money). The total is \$222,324.80 less than the amount for the previous year. The reduction is due almost wholly to the great extent to which the transportation overseas of troops, munitions, and supplies has taken the place of mercantile navigation. Such Government ships, of course, do not pay tonnage duties. As the Government's ownership and operation of ships under register increases, the receipts from tonnage duties may become somewhat illusory, because in fact one branch of the Government will in the last analysis be paying these duties to another, and essentially the transaction will be one of bookkeeping rather than of revenue.

Receipts from navigation fees amounted to \$146,508.02 compared with \$159,808.03 for the previous year, navigation and small miscellaneous fines amounted to \$32,097.68 compared with \$49,962.37 for the previous year, and excise tax of \$1,468.60 under the former yacht excise law was collected, navigation receipts thus amounting in all to \$1,351,492.66 compared with \$1,603,489.32 for the previous year.

Radio Communication.

Upon the declaration of war 18 of the 25 men in the radio-inspection force volunteered and were commissioned at once as officers in the Army and Navy. They have served with credit in responsible positions with our expeditionary forces in France, on the seas, and wherever assigned to duty. During the year the work has been continued by substitutes, who are also gradually leaving for military and naval service. They have made 4,341

inspections of ships out of 9,706 clearances compared with 6,103 inspections out of 12,139 clearances for the previous year. The demand of the Navy for wireless apparatus has been so great, coupled with the demand to equip increasing numbers of registered ships, that the distribution of apparatus has been under direction of the Navy Department. As the apparatus at times under the conditions can not fully comply with the law, it has seemed proper to arrange that the Navy Department which has allotted apparatus, should also inspect it, thus modifying the enforcement of the law. During the year the Bureau has licensed 1,942 commercial operators of various grades, compared with 680 during the previous year. The demand for skilled operators is very heavy, and to help meet it the radio inspectors, in addition to their statutory duties and with the cordial cooperation of collectors of customs and others, have opened schools of instruction for operators. From the Boston Customhouse School 200 students have entered the Army or Navy and 131 from the Detroit school.

Enforcement of the Navigation Laws.

During the year 4,749 violations of the navigation laws were reported and acted upon compared with 7,569 during the previous year. The decrease of 2,323 violations by motor boats may be attributed in part to the thorough inspection work of recent years, in part to the diminished use of such boats, and in part to rigid war regulations along the seaboard. Of the total violations, 2,654 were reported by customs officers, 1,422 by navigation inspectors, 809 by the motor vessel *Tarragon*, and 84 by the motor vessel *Kilkenny*, the motor vessel *Dixie* serving throughout the year as a naval dispatch boat at an important naval base. While the number of reported violations of law is less than last year, the inspections, especially so far as they involve safety to life, have been fully maintained.

To prevent overcrowding of passenger and excursion boats navigation inspectors during the year have made 13,576 counts of 4,916,772 passengers compared with 15,566 such counts of 6,796,441 passengers during the previous year. War activities have reduced the extent of passenger and excursion business at nearly all ports. On 385 occasions the inspectors stopped the boarding of passengers when limits were reached. During the year 32 owners of small vessels, mainly members of the United States power squadrons, gave their time and the use of their

boats at the nominal consideration of \$1 per annum in aiding in enforcing the navigation laws, and have rendered useful service to the Government which is appreciated.

Tonnage Admeasurement.

During the current calendar year the United States will build a larger tonnage of merchant ships than any other nation has ever built within a year, and at the present rate of construction during the calendar year 1919 our output will exceed any annual output of the rest of the world. Most of this shipping is seagoing, subject in the ports of the world to various charges based on tonnage admeasurement ascertained under the direction of the Bureau of Navigation. While at some ports the work is performed carefully and accurately by trained admeasurers, at others it is done by customhouse clerks temporarily detailed for the purpose. The rational way to meet the situation would be to group ship-building plants into districts for the purpose regardless of customs district lines, and create a small trained force to deal with the matter of admeasurement and also with the matter of load lines on which action can not be much longer deferred.

Motor Boats.

The act of June 7, 1918, requiring the numbering of undocumented motor boats will take effect December 7, 1918, but under war powers exercised by the Treasury and Navy Departments the regulations of the Bureau of Navigation at important seaports are already to an extent in effect. The act serves to identify small boats as automobiles are identified, and where the States have laws upon the subject satisfactory cooperation has been arranged. When the law is in full operation its benefits to all will be manifest. Incidentally, it is serving to render more workable some of the provisions of the internal revenue tax act which impose taxes on water transportation. The Bureau of Navigation and the Bureau of Internal Revenue have agreed on a mutually satisfactory way in which the motor vessels of the former shall cooperate in the collection of taxes by the latter while these vessels are performing their customary work.

CONCLUSION.

The foregoing is respectfully commended to your attention and to that of Congress.

Respectfully,

WILLIAM C. REDFIELD,
Secretary.

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