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**TWENTY-FIFTH  
ANNUAL REPORT  
OF THE  
SECRETARY OF COMMERCE**

**FOR THE FISCAL YEAR ENDED JUNE 30**

**1937**

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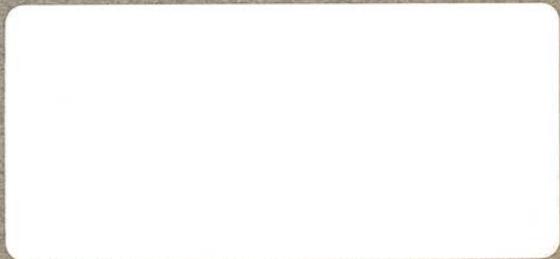
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TWENTY-FIFTH  
ANNUAL REPORT  
OF THE  
SECRETARY OF COMMERCE



1937



UNITED STATES  
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WASHINGTON: 1937

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**TWENTY-FIFTH ANNUAL REPORT**  
**OF THE**  
**SECRETARY OF COMMERCE**

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DEPARTMENT OF COMMERCE,  
OFFICE OF THE SECRETARY,  
*Washington, August 2, 1937.*

To the CONGRESS OF THE UNITED STATES  
(Through the President):

I am pleased to submit the Twenty-fifth Annual Report of the Secretary of Commerce, covering the fiscal year ended June 30, 1937.

**ECONOMIC REVIEW**

Economic conditions improved substantially during the fiscal year ended June 30, 1937, extending and broadening the recovery movement in progress during the past 4 years. The continued gains in the volume of industrial production, employment, and pay rolls, the material betterment in general agricultural conditions, and the moderate revival of construction activity were leading elements in this advance. The expansion in domestic business was accompanied by a further rise in activity in most of the principal countries of the world, a situation which was reflected in a marked advance in our foreign trade. Despite these real gains, many of the productive resources of the Nation were not being utilized and a large number of workers were still unable to secure employment in private industry. Outstanding industries in which activity was subnormal included construction, the railroads, and some lines of mining. As is shown in the accompanying table, the aggregate volume of industrial production during the year remained somewhat below that of 1928-29, and, if the 8 percent increase in population during the intervening years is taken into account, production on a per capita basis was even further below that of the predepression year.

**ADDENDA**

The national income produced is estimated to be somewhat in excess of \$68,700,000,000, the estimated national income paid out, as stated in the last paragraph on page v.

Aggregate income during the year, while about 10 percent above that of 1932-33, was one-fifth below that of 1928-29. Since prices were lower during the past fiscal year than in 1928-29, the deficiency in "real" income was probably no more than half of this

percentage. When the increase in population is taken into account, however, the per capita "real" income remained about one-fifth below the predepression high.

TABLE NO. 1.—Indexes of major economic changes

[NOTE.—Based on calendar-year average 1923-25=100, except cash income from farm marketings which is based on calendar-year average 1924-29=100 and wholesale prices which are based on average 1926=100]

Year ended June 30 and month	Industrial production <sup>1</sup>	Manufacturing production <sup>1</sup>	Cash income from farm marketings <sup>1</sup>	Net ton-miles of freight carried by class I railroads	Electric-power production	Department-store sales (value) <sup>1</sup>	Factory employment <sup>1,2</sup>	Factory pay rolls <sup>2</sup>	Wholesale prices	Construction contracts awarded (value) <sup>1</sup>
1920.....	89	91	-----	96	-----	88	112	113	153	77
1921.....	74	73	-----	90	70	92	92	98	124	51
1922.....	74	75	-----	79	72	84	84	74	94	70
1923.....	98	98	-----	96	88	94	99	95	101	83
1924.....	98	97	-----	98	95	99	102	102	98	89
1925.....	99	99	100	98	102	100	96	96	101	101
1926.....	105	107	103	105	116	104	101	103	103	130
1927.....	109	108	97	111	129	107	100	103	97	130
1928.....	106	106	100	104	138	107	98	100	96	133
1929.....	118	118	102	110	154	110	102	107	96	127
1930.....	110	110	100	104	163	108	101	102	93	107
1931.....	87	86	72	86	155	99	83	77	79	76
1932.....	70	69	50	66	146	80	71	56	68	40
1933.....	67	66	41	57	136	64	64	42	63	23
1934.....	83	82	53	67	149	72	81	61	72	34
1935.....	82	80	60	67	156	76	83	66	78	28
1936.....	96	96	68	75	176	82	88	76	80	49
1937.....	114	114	78	90	198	92	98	94	85	59
Percentage change:										
1937 from 1929.....	-3.4	-3.4	-23.5	-18.2	+28.6	-16.4	-3.9	-12.1	-11.5	-53.5
1937 from 1933.....	+70.1	+72.7	+90.2	+57.9	+45.6	+43.8	+53.1	+123.8	+34.9	+156.5
1937 from 1936.....	+18.8	+18.8	+14.7	+20.0	+12.5	+12.2	+11.4	+23.7	+6.3	+20.4
Months, 1936-37:										
July.....	108	109	88	83	193	91	93	80	81	59
August.....	108	110	75	86	196	86	93	84	82	62
September.....	109	110	78	89	194	88	94	84	82	59
October.....	110	111	76	100	203	90	94	89	82	57
November.....	114	115	78	91	195	94	96	91	82	58
December.....	121	121	79	91	210	92	99	95	84	66
January.....	114	115	75	89	202	93	99	91	86	63
February.....	116	116	71	86	184	95	100	96	86	62
March.....	118	117	82	98	204	93	101	101	88	56
April.....	118	118	89	86	197	93	102	105	88	53
May.....	118	118	78	91	199	93	102	105	87	56
June.....	114	114	85	85	201	93	101	103	87	61
Comparison final month of fiscal years 1929-37:										
June 1929.....	125	127	94	109	155	113	106	111	95	126
June 1932.....	59	58	39	50	131	68	63	44	64	27
June 1933.....	91	93	70	64	144	67	71	48	65	18
June 1934.....	84	83	66	68	149	73	85	66	75	26
June 1935.....	87	85	62	70	157	79	84	67	80	30
June 1936.....	104	105	80	77	183	87	90	81	79	52
June 1937.....	114	114	85	85	201	93	101	103	87	61
Percentage change:										
June 1937 from June 1929.....	-8.8	-10.2	-9.6	-22.0	+29.7	-17.7	-4.7	-7.2	-8.4	-51.6
June 1937 from June 1932.....	+93.2	+96.6	+117.9	+70.0	+53.4	+36.8	+60.3	+134.1	+35.9	+125.9
June 1937 from June 1936.....	+9.6	+8.6	+6.3	+10.4	+9.8	+6.9	+12.2	+27.2	+10.1	+17.3

<sup>1</sup> Monthly figures are seasonally adjusted, annual averages unadjusted; cash income from farm marketings does not include rental and benefit payments during the period such payments were made.

<sup>2</sup> Indexes have been adjusted to conform with the figures for employment and pay rolls for the years through 1933 as published by the Bureau of the Census, Department of Commerce.

Sources: Industrial production, manufacturing production, department-store sales, and construction contracts awarded, Board of Governors of the Federal Reserve System; cash income from farm marketings, Bureau of Agricultural Economics, Department of Agriculture; ton-miles of freight carried etc., Interstate Commerce Commission; electric-power production, Federal Power Commission; factory employment, factory pay rolls, and wholesale prices, Bureau of Labor Statistics, Department of Labor.

### Agricultural income higher.

Despite the condition of extreme drought which prevailed over the Great Lakes and Plains States during the late phase of the growing season of 1936 and drastically reduced production of all major crops, a more than proportional increase in prices raised aggregate cash income from farm marketings approximately 15 percent above that of the preceding fiscal year 1936-37. (The fiscal year rather closely corresponds with the marketing season.) Estimated cash income was \$7,956,000,000 in the past fiscal year as contrasted with \$6,899,000,000 in 1935-36, \$5,040,000,000 in 1931-32, and \$10,349,000,000 in 1928-29. Government payments during the period were slightly lower than in 1935-36 and were 34 percent below those in the fiscal year 1934-35. The preliminary estimate of cash farm income for the calendar year 1937 is \$9,000,000,000, an increase of about one-seventh over the preceding year.

The improvement in agricultural conditions, which is reflected in this expanding income, was due in no small measure to the improved demand for farm products occasioned by the higher rate of industrial and trade activity and the consequent improvement in employment and pay rolls. Agricultural production expenses have not increased as rapidly as has farm income; hence, the net income available to the farm operator for his labor, capital, and management continued to expand. During the year the exchange value of the farmers' income in terms of goods and services purchased reached a level about equal to that existing prior to the depression.

### Employment and pay rolls increased.

Total employment increased almost uninterruptedly during the fiscal year. Nonagricultural employment was about 5 percent higher in June 1937 than in June 1936 and was only 5 percent below that in June 1929, according to compilations of the Bureau of Labor Statistics. Unemployment declined considerably during the fiscal year, but it was still large in relation to predepression years, owing to an increase of about one-half million employables annually, as well as to the lower level of employment in 1937 than in 1929.

Industrial disputes during the year 1936-37 resulted in the loss of approximately 26 million man-days, almost 80 percent more than in 1935-36. About 18 million man-days were lost during the last 6 months of the period. The attention which these strikes attracted, however, should not lead one to give them too much weight in an appraisal of their direct effect on general production and distribution activity. The average number of workers involved in strikes from January through June was only about 1 percent of the total non-agricultural workers during the period, and the average loss of time was only about one-third of a month for each worker involved.

The improved bargaining position of labor has accelerated the rising trend of wage payments and affected existing cost-price relationships, introducing problems of management which are currently challenging entrepreneurs. The wage increases and the rise in costs of materials and other expenses of operations have resulted in reduced profit margins in certain industries. It has not been possible in all instances to pass the higher costs on to the consumer in the form of immediate increases in the prices of finished products. The extent to which later price increases may be effective, without sacrificing

volume, is tied up with changes in consumer purchasing power which will affect the degree of consumer resistance likely to be encountered.

#### **Rise in commodity prices renewed.**

The general level of commodity prices advanced sharply during the fiscal year 1936-37, after having fluctuated to only a minor extent in the preceding year. Agricultural prices began to rise rapidly, late in May 1936, when the drought began to appear serious in the trans-Mississippi area. The upward movement of agricultural prices carried the general price average with it in this early stage, but in November the movement broadened into a more universal price advance which continued until the recession in raw-material prices in early April 1937. The best crop prospects in several years for wheat, corn, rye, and other grains, as well as for cotton, were chiefly responsible for the declines in the prices of farm products subsequent to April, when it began to be apparent that the shortage of the previous year would be relieved. Finished products and manufactured items, reflecting the lag in the rising costs of materials, continued to advance after speculative raw-material prices had turned down in April. In June 1937, the "all commodities" index of the Bureau of Labor Statistics stood at 87.2 as compared with 79.2 in June 1936 and 65 in June 1933 (1926=100).

#### **Industrial output up about one-fifth.**

The physical volume of industrial production showed almost uninterrupted monthly increases throughout the first half of the fiscal year, according to the Federal Reserve seasonally adjusted index. Continuing a movement which began early in 1936, the index advanced with but slight interruption from June through March 1937. For the remainder of the fiscal year activity was maintained at a relatively steady pace, somewhat above the average for the first half of the fiscal year. The nondurable-goods industries showed a moderate increase during the year, while the durable-goods industries continued their rapid rise, bringing production of these two types of goods more nearly into line with the relationship which prevailed in the 1920's than at any time since the beginning of the depression.

Several industries operated at the highest level on record during the past year. Steel-ingot production in March, April, and May exceeded 5 million tons. Output has been of this volume in only 2 months in the past, March and May 1929. Textile production throughout most of the period was maintained at a new high level and for the whole period was about 10 percent above output for the year 1928-29. Production of boots and shoes, tobacco manufactures, and crude petroleum has also been at record levels, and automobile production was only slightly below the predepression maximum.

#### **Improvement in construction.**

Although showing marked improvement during the fiscal year, the construction industry continued to be one of the depressed segments of our domestic economy. The total dollar value of construction contracts awarded was 55 percent below the record 1927-28 year but was two and one-half times that of the low year of the depression. Of the major classifications the value of contracts awarded for residential construction recorded the largest percentage gain in 1937 over 1936. This type of work, however, in 1936-37 was still at a relatively

low level, possibly one-third of that during years of full activity. Thus, while total contracts awarded in the year 1936-37 increased about 20 percent over 1935-36, residential contracts were up more than 60 percent. The value of contracts for publicly owned projects receded during the year, although it was still relatively large. The value of privately financed contracts, which has been rising since 1934, was almost 60 percent larger in 1936-37 than in the preceding year and was more than three times that of the year 1932-33.

#### **Railroads experience some improvement.**

The financial condition of the railroads improved moderately during the year, but recovery in railroad earnings has been slow. Operating revenues of class I railroads were up more than 15 percent in comparison with those of the preceding fiscal year, and operating expenses increased a little more than 11 percent, with the result that net railway operating income increased more than 34 percent. Moreover, net income increased from \$35,000,000 to \$228,000,000. This improvement was largely the result of an increased volume of traffic, which in the case of freight was 20 percent and of passengers carried 22 percent. Passenger fares of eastern railroads were reduced materially just before the beginning of the past fiscal year, and the freight surcharge was removed December 31, 1936.

#### **Further growth in retail trade.**

An improvement in purchasing power resulted in a further substantial growth in retail trade during the fiscal year 1936-37. The dollar value of all goods sold at retail is estimated at approximately 12 percent above the total for the preceding fiscal year. A portion of this gain was accounted for by retail price advances.

Of the various lines of retail trade for which current data are available, sales of new passenger cars showed the widest increase for the year, a gain of almost 17 percent. Sales of general merchandise in rural areas continued to grow as farm income improved. The seasonally adjusted index of the Bureau of Foreign and Domestic Commerce, which had dropped to a low of 48 (1929-31=100) during the depression and had recovered to 112 in June 1936, advanced further during the year to 124 in June 1937. For several months the rural sales measured by the Bureau's index were in excess of the 1929 average. Sales in urban areas experienced a somewhat less marked increase. Department-store sales, which reflect urban conditions particularly but also present a fair picture of retail trade generally, showed a gain during the past fiscal year of more than 12 percent over the previous period.

This rising volume of retail trade continued to be financed in important measure by the rise of installment and open credit, with the largest percentage increase being recorded in the former classification, according to the data revealed by the Department's annual retail credit survey for the calendar year 1936. Installment sales in 1936 increased more than 25 percent over those in 1935 at a time when total retail sales were increasing about 14 percent. According to the estimates, however, the volume of installment sales was still below that in 1929—\$4,500,000,000 as compared with \$6,500,000,000 in 1929—but they made up approximately the same percentage of total sales in both years.

Some slackening in the rate of growth in retail sales became apparent in the latter part of the fiscal year. During the first 6 months of the period, total estimated retail sales showed an increase of more than 15 percent over the corresponding period of the preceding year. In the following 4 months of the fiscal year the margin of gain over the previous year dropped to 11 percent, and in the last two months of the period the percentage of increase was further reduced to about 5.

#### Foreign trade increased.

The foreign trade of the United States continued to expand during the fiscal year under review. The value of imports was about one-third larger than in the preceding year, while the value of exports showed a gain of almost one-fifth. The gain in the volume of trade was accounted for in large measure by the improved economic conditions, with the consequent expansion in purchasing power, in the leading industrial nations. The domestic drought in 1936 and ensuing shortage of certain crops resulted in the heavy inward movement of some agricultural products, and the extension of armament activity in some nations acted as a stimulus to export trade. A significant portion of the advance in values was due to the price increases of commodities entering the channels of trade. The average increase over the previous year in prices of goods imported was more than 11 percent, and the increase in the prices of export items was 6 percent. During this same period, the quantity of imports increased 19 percent, and the quantity of exports increased approximately 11 percent.

TABLE NO. 2.—Foreign trade of the United States

Fiscal year ended June 30—	Millions of dollars							Quantitative indexes (1923-25=100)	
	Exports		General im-ports	Imports for con-sumption	Excess of exports (+) or imports (-)			Ex-ports <sup>1</sup>	Im-ports <sup>1</sup>
	Total	United States mer-chandise			Mer-chandise	Gold	Silver		
1929.....	5,373	5,284	4,292	4,253	+1,082	-155	+17	<sup>2</sup> 136	<sup>2</sup> 125
1930.....	4,694	4,618	3,849	3,916	+845	-223	+18	121	121
1931.....	3,083	3,032	2,432	2,407	+651	-297	+5	98	101
1932.....	1,948	1,908	1,730	1,735	+218	+714	-5	80	91
1933.....	1,440	1,413	1,168	1,172	+272	-264	-27	65	76
1934.....	2,042	2,008	1,721	1,674	+320	-576	-29	75	91
1935.....	2,121	2,085	1,786	1,789	+335	-1,099	-154	72	93
1936.....	2,414	2,375	2,218	2,208	+196	-1,445	-373	82	111
1937.....	2,837	2,791	2,941	2,895	-104	-1,635	-96	90	132
Percentage change:									
1937 from 1929.....	-47.2	-47.2	-31.5	-31.9	-----	-----	-----	-33.8	+5.6
1937 from 1933.....	+97.0	+97.5	+151.8	+147.0	-----	-----	-----	+38.5	+73.7
1937 from 1936.....	+17.5	+17.5	+32.6	+31.1	-----	-----	-----	+9.8	+18.9

<sup>1</sup> Export indexes are based on domestic exports; import indexes are based on "General imports" through 1933 and "Imports for consumption" thereafter.

<sup>2</sup> Estimated by fiscal year, for calendar-year indexes see Statistical Abstract of the United States.

Sources: Bureau of Foreign and Domestic Commerce, Department of Commerce.

All economic classes of imports increased, but the gain was particularly large in the case of crude materials and foodstuffs affected by the drought. This was especially true of feed grains, meat prod-

ucts, and oilseeds—especially flaxseed. Other principal import items to show large percentage gains over the preceding fiscal year, due largely to the increased need for raw materials occasioned by enlarged industrial output, were crude rubber, tin, raw silk, and wool and mohair. The improvement in purchasing power during the year made itself felt in the import situation through increased dollar purchases of luxury and semiluxury items, such as diamonds, tobacco, cocoa, and alcoholic beverages.

Gains in the value of exports over those of the preceding fiscal year were shown mainly in shipments of manufactured articles, particularly of electrical and agricultural equipment and machinery, passenger cars and trucks, iron and steel mill products (and scrap iron and steel), petroleum and products, and copper. In contrast with the expansion of trade in these industrial products, the value of exports of our farm products experienced a moderate reduction. Cotton, fruits, unmanufactured tobacco, and meat products showed reductions in value ranging from 5 to 20 percent, but in the case of tobacco and meat products the decline was partly due to price recessions.

The active program of recent years for the relaxation of trade restrictions, which have greatly hampered trade, was continued during the past year.<sup>1</sup> Agreements were concluded under the Reciprocal Trade Agreements Act with 2 additional foreign governments during the year, bringing the total since the program was inaugurated to 16. Formal notice was given that this Government intends to negotiate agreements with Ecuador and with Czechoslovakia.

The civil war in Spain, which has been an unsteady influence on trade relations, and the recently revived disturbance in China indicate the possibility of reduced international trade in these regions. Blockades imposed by one party in the present conflicts on the trade of the other, as a military measure, will do much to stifle trade.

#### Financial developments.

The substantial revival of commercial lending operations, the reduction in bank holdings of United States Government obligations, and the continued inflow of gold, were the outstanding developments in the domestic banking situation during the year. This country was also affected by changes in economic and financial conditions in several leading foreign countries.

Gold continued to flow into the United States in large volume, continuing the movement which has been in progress since early 1934. From June 1936 through June 1937 the gold stock of the United States was increased \$1,710,000,000 to \$12,318,000,000, the largest stock on record. Of this total amount, \$1,087,000,000 was held in the inactive gold account in accordance with the policy of the Secretary of the Treasury announced in December 1936.

<sup>1</sup> A more complete report of the trade-agreements program is to be found on p. xiv.

The movement of capital funds to the United States during the past fiscal year was associated to a considerable extent with dishoarding of gold in Europe, according to the Board of Governors of the Federal Reserve System. The first important dishoarding movement took place in the fall of 1936 and probably reflected an increased feeling of security in regard to currency relationships following devaluation by the gold-bloc countries. Incoming funds were invested largely in the rising American security markets. The second dishoarding movement occurred in the spring of 1937 at a time when rumors were rife of impending reductions in the American gold price and when uncertainty was increasing in some quarters regarding the future of gold. Funds from this movement, for the most part, were held idle on deposit with domestic banks, as the American security markets were weak at the time.

Largely as a result of this inflow of gold and the consequent increase in the reserves of member banks, reserves in excess of those required by law were more than \$3,000,000,000 in July 1936. To meet this condition, which held a potential threat of excessive credit expansion, the Board of Governors of the Federal Reserve System, under authority of the Banking Act of 1935, increased member-bank reserve requirements 50 percent on August 15. The subsequent inflow of gold with the gain in excess reserves led to further increases in reserve requirements so that by May 5 the requirements in effect at the time of the passage of the act of 1935 had been doubled and excess reserves reduced to around \$890,000,000.

Although the excess reserves held by the member banks were rather widely diffused throughout the System, some readjustments in portfolios occurred in the latter phase of the movement, principally at New York City banks. These tended to accelerate the liquidation of holdings of United States Government securities by member banks that had begun in mid 1936. After advancing for several years to a peak of \$13,671,000,000, holdings by member banks of direct and fully guaranteed United States Government obligations declined rather slowly and steadily through the first 8 months of fiscal year, 1936-37, then fell off sharply in March. This decline occurred largely at New York City banks and accompanied withdrawals from these banks of balances of interior banks. For the remainder of the fiscal year the volume of holdings showed slight change. Total holdings aggregated \$12,689,000,000 on June 30, 1937.

At the time that holdings by member banks of United States Government obligations were decreasing, total loans of these banks increased with the general advance of business activity; and aggregate loans and investments were slightly higher at the end of the year than at the beginning. After having remained almost stationary at about one-half the predepression volume from mid 1933 to just before the beginning of the past fiscal year, borrowings from banks for commercial purposes (excluding loans on securities and on real estate, loans to banks, acceptances, and commercial paper bought) were resumed on a substantial scale during the year. These commercial loans to customers increased almost \$1,300,000,000 to \$6,700,000,000 during the period.

After advancing sharply for 2½ years through the first half of the fiscal year, the total adjusted demand deposits of member banks leveled off during the 6 months ended June 30, 1937. At the peak of

the upward movement, demand deposits were approximately \$21,600,000,000, while at the close of the fiscal year they were \$21,400,000,000. Interbank deposits, which had increased considerably from 1933 to 1936, with the large growth in excess reserves held by banks, were substantially reduced during the second half of the fiscal year, reflecting withdrawals by interior banks for purposes of meeting the increase in member-bank reserve requirements, as well as for expanding their loans and investments.

The domestic economic situation was influenced to some extent during the fiscal year by several financial crises in the gold-bloc countries. The outstanding development was the suspension of the gold standard by France, the Netherlands, and Switzerland in September 1936. Exchange stabilization funds were established by France and Switzerland with the provision that their respective currencies be maintained between about 66 and not more than 75 percent of their former gold parities. Subsequently, the currencies of Italy and Czechoslovakia were devalued. Late in September the Governments of Great Britain and the United States joined with France in declaring their intention to maintain, insofar as possible, equilibrium in international exchange. The Governments of Belgium, the Netherlands, and Switzerland later announced their adherence to the policies stated in this declaration.

After the establishment of the new alignment with other currencies, the exchange rate of the franc moved in a narrow range until March 1937. At that time a crisis developed which resulted from the persistent outflow of capital during the 4 preceding months. The difficulty was temporarily relieved by removing the restrictions on private dealings in gold which had been imposed by the law establishing the stabilization fund and by measures designed to improve the Government's financial condition.

These early measures were not entirely successful, and in June capital again began moving out of France in heavy volume. To meet this situation, the limitations imposed on the gold value of the franc by the law establishing the stabilization fund were removed. On July 1, 1937, the franc was quoted at 3.836 cents as compared with 6.629 cents for the corresponding time a year earlier. Announcement of the continuation of the tripartite agreement of September 1936 was made on July 1, 1937, by the treasuries of the governments concerned.

Bond prices continued to rise throughout the first half of the fiscal year. The high for the movement was reached around December and January, and, in the second half of the fiscal year, most of the gain of the 12 preceding months was canceled. Stock prices advanced strongly through early March, continuing the upward trend which began in 1935. In March prices declined, and by the end of June stocks had lost about one-fourth of the increase of the preceding 2 years. Prices for the final week in June 1937 were less than 5 percent above those of June 1936, according to the averages of the Standard Statistics Co.

Corporate earnings showed substantial improvement during the year 1936-37. According to data compiled by Standard Statistics, earnings of 161 large corporations increased about 45 percent over those of 1935-36. Class I railroads reported profits of more than five times the very low earnings in 1935-36, while industrial earnings, ac-

ording to a sample of 120 corporations, were up 42 percent and public utilities 26 percent. Reflecting these improved earnings and the stimulus arising from the undistributed-profits tax, dividend payments of the 600 corporations included in Moody's index for the fiscal year were more than one-third above those of the preceding period.

The volume of publicity offered securities, which had been increasing since 1933, continued to expand through January and February, after which time the unsettled nature of the securities market interrupted the movement. Total issues floated during the year were one-fifth below those of the preceding fiscal year. This decrease in the aggregate was largely accounted for by sharply reduced refunding operations. Security issues for new capital continued to increase during the fiscal year.

#### Federal finances.

Federal receipts continued to lag behind expenditures during the fiscal year 1936-37, resulting in a deficit of \$2,811,000,000, as compared with \$4,764,000,000 in the preceding fiscal year, according to the Daily Statement of the United States Treasury. The gross public debt, less net balance in the general fund, rose to \$33,871,000,000 on June 30, 1937, as compared with \$31,097,000,000 at the beginning of the fiscal year. Receipts for the year 1936-37 were \$5,294,000,000, almost 29 percent larger than in the preceding fiscal year and the largest total since just after the World War, while total expenditures of \$8,105,000,000 were approximately 9 percent less than in 1935-36 but were still more than double the average of yearly expenditures for the decade of the 1920's. Borrowing from governmental credit agencies continued, but in small volume; for the most part the year was one in which repayment predominated.

### RECIPROCAL TRADE AGREEMENTS PROGRAM

The Department of Commerce, through the Bureau of Foreign and Domestic Commerce, has maintained an unbroken association with the reciprocal trade agreements program since the inception of the program in 1934, and, in collaboration with other departments, will continue to furnish the President with the data and advice specified in the authorizing legislation, and which are intended to serve as bases for trade agreements with foreign countries.

In the interdepartmental organization for the work, functioning under the leadership of the Department of State, the Department of Commerce is expected to provide detailed analyses of the problems of American exporters in foreign markets; to develop similar facts concerning foreign countries' tariffs, and other trade barriers to the admission of American products; and to prepare basic data for the requests to be made of the other governments, in the course of negotiations.

During the year, in the manner described above, the Department assisted in concluding two additional agreements, those with El Salvador and Costa Rica, respectively; aided in the work preparatory to negotiations with Ecuador and Czechoslovakia, respectively, in accordance with the intention announced by our Government; and

contributed to the current exploratory studies regarding a number of countries with which negotiations are being contemplated.

A study of the effective agreements, and a general analysis of the trade resulting therefrom, as compared with trade relations with non-agreement countries during 1936 and previously, is contained in a review of the situation published in the spring of 1937 by the Bureau of Foreign and Domestic Commerce. Also, during the year there were issued jointly by this Bureau and other participating government agencies, studies covering the first 2 years under the Cuban-American agreement, and the first year under the Canadian-American agreement. Each of these studies includes a discussion of the trade changes in each of the principal commodities affected.

As of June 30, 1937, all but 1 of the 16 concluded reciprocal trade agreements were in operation. While there are still a considerable number of important countries with which agreements have not yet been effected, the substantial progress of the program is indicated by the fact that, within a period of 3 years, agreements have been negotiated and made effective with countries which normally account for more than one-third of the total exports and imports of the United States of America. During the calendar year 1936 alone, our exports and imports with the agreement-countries group increased more rapidly than our trade with the world generally.

From the facts at hand, it is evident that the trade-agreements program is a real stimulus to the increase of our foreign trade—exports as well as imports. This actual increase in our foreign trade, due to the trade agreements program, has caused increased employment and thus contributed to the prosperity of the United States. Present exploratory studies by the Department may lead to the conclusion of additional agreements, which should serve to further stimulate the growth of our foreign trade.

### RESEARCH DATA FOR BUSINESS

The increasing relative importance of trade and industry in the United States during recent decades has not been accompanied by an adequate understanding of the operation of many important aspects of our economic life. The experiences of the recent depression have particularly demonstrated the inadequacy of this understanding and the urgent need for improved knowledge in these fields.

Sixty years ago nearly one-half of our working population was engaged upon farms in supplying necessary foodstuffs and other products from the land. Today this proportion has decreased to approximately one-fourth. This trend has been accompanied by a marked increase in the number of our people dependent upon industry and commerce for their livelihood. The proportion dependent upon trade, transportation, and clerical occupations, for example, has increased from less than 10 percent to more than 25 percent over the period from 1870 to 1930. The increasing importance of these various fields of business places heavy responsibilities upon both government and private agencies engaged in business research.

Many business problems of a broad economic character, such as fluctuations in activity, trends in prices, and the availability of credit, influence not only single business enterprises but the entire structure of our economic life. These problems touch the employment and incomes of many groups and frequently influence the economic well being of all of our people, employer and employee, producer and con-

sumer, alike. In their broader aspects these problems are clearly beyond the reach of most individual business enterprises. Adequate investigations of such problems can be carried on only by government agencies and by universities or privately endowed institutes for economic research.

The Department of Commerce is attempting to meet many of these needs for better understanding of the operations of business, but its facilities for many phases of this work are notably inadequate. The fields in which more extensive research should be undertaken promptly are construction and related durable-goods industries; the compilation of statistics for the purpose of appraising broad trends in our national economy, such as measures of national income and national wealth; the compilation of more suitable statistics on production and on inventories of manufactured products; the compilation of statistics upon both long-term and short-term credit; studies in the cost of distribution; investigations of trade practices; investigations of the changes in price structures, and their effects upon commerce and industry. The urgent need for business research in these broad fields is clear both to those who are required to determine farsighted business and governmental policies and to those who have the immediate responsibility for the detailed conduct of individual business enterprises.

#### **FUNCTIONS OF THE DEPARTMENT OF COMMERCE**

In carrying forward its promotional and regulatory responsibilities the Department of Commerce has geared its facilities to meet the increasing needs of the business community and the general public through the service activities of nine bureaus.

These functions are classified under the general subdivisions of trade promotion, transportation, and science. The increase in the duties and responsibilities may be attributed to the present economic improvement of the country as well as to work superimposed by activities of other departments of the Government. The rapid development in the field of air commerce has prompted a far-flung program of airway extension and improvement with the objective of increased service and efficiency to the public with the maximum of safety. Appropriations and authorizations made by the Congress have enabled the Department to carry forward a long-range program of new and improved facilities for meeting the rapidly growing need in this field.

The interests of transportation and navigation have also been effectively served through the Bureau of Marine Inspection and Navigation, the Bureau of Lighthouses, and the Coast and Geodetic Survey. These activities look to the safety of navigation in the coastal waters, lakes, and all navigable inland waterways, as well as the safety of life at sea.

The opening of new waterways, the construction of dams and the improvement of streams have resulted in a great increase in the number of pleasure craft as well as commercial vessels. This has necessitated the extension of the system of aids to navigation in previously uncharted waters. Many new laws regulating the operation of merchant and passenger vessels have been put into effect

following the action of the Congress in ratifying the London conference program.

The demands of business and industry for assistance in their marketing and distribution activities have been reflected in the Bureau of Foreign and Domestic Commerce, the Census Bureau, and the Bureau of Fisheries. The Bureau of Foreign and Domestic Commerce, with the aid of its district offices in important American cities, and foreign offices in the principal countries of the world, is rendering a diversity of helpful services to American business. This Bureau is also cooperating in the development of the reciprocal trade agreements program.

The Bureau of Fisheries is meeting new problems created by the construction of the large power dams and by the development of new waterways, and is otherwise cooperating with the fishery industry and with sportsmen for the rehabilitation and conservation of our many species of fish, in the interest of sustained abundance, and in gathering and disseminating information as to marketing conditions.

The increasing need for statistical information, by the public and other governmental agencies, is being met by the Census Bureau through its various enumerations. One of the most important services of the Bureau at present is the furnishing of age information to thousands of people in connection with compliance with social security laws.

The year's improved business situation is also reflected in the demands that are being made on the Patent Office. The initiative of inventive genius, for which the Patent Office is a barometer, is continuously concerned with the consideration of patents and copyrights, and the increase in applications for the protection of the inventor reflect the trend in science and technology.

In carrying on its activities the National Bureau of Standards is steadfastly complying with the broad intent of Congress. The beneficiaries of the Bureau's scientific and technical research and testing work, and of its cooperative procedure in assisting business in the field of commercial standardization include not only governmental agencies, but the public as well.

Service activities of the Department of Commerce touch virtually all the people, and particularly have the demands of business increased for assistance in solving problems and exploring markets under the new and changed conditions of the times. Statistical information has come to be an indispensable ally of business management in solving production and distribution problems. It is thus that the Department is functioning as the central switchboard of American business.

## FINANCES

The Congress appropriated a total of \$35,085,870 for the regular expenditures of the Department of Commerce during the fiscal year ended June 30, 1937. In addition, funds were transferred to this Department from other Government departments and agencies in the amount of \$613,580, and funds were transferred from this Department to other Government departments and agencies in the amount of \$151,325, bringing our aggregate funds available for expenditure from regular appropriations to \$35,548,125. The disburse-

ments during the fiscal year 1937, from regularly appropriated funds, including unliquidated balances from prior years, amounted to \$39,795,015. As miscellaneous receipts totaled \$6,855,259, the net outlay was \$32,939,756.

### EMERGENCY FUND ALLOTMENTS

Table No. 3 shows all allotments from emergency funds made to the Department during the fiscal years 1934, 1935, 1936, and 1937, and the obligations incurred. The accomplishments through the use of these funds will be found discussed under the respective sections of this report pertaining to the bureaus receiving the allotments.

TABLE NO. 3.—*Allotments to the Department of Commerce for work incident to emergency relief and obligations incurred thereunder during the fiscal years 1934 to 1937, inclusive.*

	1934	1935	1936	1937	Total
<b>Office of the Secretary:</b>					
N. I. R. A.:					
Allotments.....			\$947,000		\$947,000
Obligations.....			945,805		945,805
W. P. A.:					
Allotments.....			40,000	\$30,000	70,000
Obligations.....			19,074	50,917	69,991
Total:					
Allotments.....			978,000	30,000	1,017,000
Obligations.....			964,817	50,917	1,015,796
<b>Bureau of Air Commerce:</b>					
N. I. R. A.:					
Allotments.....	\$2,058,803	\$20,000	4,500		2,083,303
Obligations.....	425,062	1,336,976	258,891	54,819	2,075,748
P. W. A.:					
Allotments.....		973,075	14,700		987,775
Obligations.....		614,454	273,929	90,581	978,964
C. W. A.:					
Allotments.....	280,603	-81,000			199,603
Obligations.....	197,935	350			198,285
W. P. A.:					
Allotments.....			225,000	362,380	587,380
Obligations.....			200,637	349,336	549,973
Total:					
Allotments.....	2,339,406	912,075	244,200	362,380	3,858,061
Obligations.....	622,997	1,951,780	733,457	494,736	3,802,970
<b>Bureau of Foreign and Domestic Commerce:</b>					
C. W. A.:					
Allotments.....	372,275				372,275
Obligations.....	194,785	154,854			349,639
W. P. A.:					
Allotments.....			100,000		100,000
Obligations.....			36,793	63,175	99,968
Total:					
Allotments.....	372,275		100,000		472,275
Obligations.....	194,785	154,854	36,793	63,175	449,607
<b>Bureau of the Census:</b>					
C. W. A.:					
Allotments.....	2,261,346	263,390			2,524,736
Obligations.....	1,360,618	941,978			2,302,596
F. E. R. A.:					
Allotments.....		245,000	760,000		1,005,000
Obligations.....		134,057	472,695	238,209	844,961
W. P. A.:					
Allotments.....			8,231,948	2,785,500	11,017,448
Obligations.....			7,048,087	3,698,294	10,746,381
Drought relief in agricultural areas:					
Allotments.....		1,000,000			1,000,000
Obligations.....		999,570			999,570
Total:					
Allotments.....	2,261,346	1,508,390	8,991,948	2,785,500	15,547,184
Obligations.....	1,360,618	2,075,605	7,520,782	3,936,503	14,893,508

TABLE No. 3.—Allotments to the Department of Commerce, etc.—Continued

	1934	1935	1936	1937	Total
<b>Bureau of Marine Inspection and Navigation:</b>					
N. I. R. A.:					
Allotments.....	\$33,043	\$60,000	-----	-----	\$93,043
Obligations.....	28,393	62,581	\$1,065	-----	92,039
<b>Bureau of Standards:</b>					
N. I. R. A.:					
Allotments.....	100,000	-----	-----	-----	100,000
Obligations.....	87,690	11,911	-----	-----	99,601
P. W. A.:					
Allotments.....	-----	-----	70,000	-----	70,000
Obligations.....	-----	-----	69,997	-----	69,997
W. P. A.:					
Allotments.....	-----	-----	75,000	-----	75,000
Obligations.....	-----	-----	30,257	\$44,741	74,998
<b>Total:</b>					
Allotments.....	100,000	-----	145,000	-----	245,000
Obligations.....	87,690	11,911	100,254	44,741	244,596
<b>Bureau of Lighthouses:</b>					
N. I. R. A.:					
Allotments.....	5,620,334	-----	-----	-----	5,620,334
Obligations.....	2,706,548	2,684,952	197,934	17,088	5,606,522
W. P. A.:					
Allotments.....	-----	-----	20,000	-----	20,000
Obligations.....	-----	-----	19,029	-----	19,029
<b>Total:</b>					
Allotments.....	5,620,334	-----	20,000	-----	5,640,334
Obligations.....	2,706,548	2,684,952	216,963	17,088	5,625,551
<b>Coast and Geodetic Survey:</b>					
N. I. R. A.:					
Allotments.....	6,503,120	1,429,800	360,300	-----	8,293,220
Obligations.....	4,571,625	3,164,855	532,560	17,169	8,286,209
<b>Bureau of Fisheries:</b>					
N. I. R. A.:					
Allotments.....	638,955	1,500	20,000	10,000	670,455
Obligations.....	352,200	254,566	47,789	15,520	670,075
C. W. A.:					
Allotments.....	38,391	-----	-----	-----	38,391
Obligations.....	38,056	-----	-----	-----	38,056
W. P. A.:					
Allotments.....	-----	-----	151,372	-----	151,372
Obligations.....	-----	-----	123,760	27,612	151,372
<b>Total:</b>					
Allotments.....	677,346	1,500	171,372	10,000	860,218
Obligations.....	390,256	254,566	171,549	43,132	859,503
<b>Total—Department of Commerce:</b>					
N. I. R. A.:					
Allotments.....	14,954,255	1,511,300	1,331,800	10,000	17,807,355
Obligations.....	8,171,518	7,515,841	1,984,044	104,596	17,775,999
P. W. A.:					
Allotments.....	-----	973,075	84,700	-----	1,057,775
Obligations.....	-----	614,454	343,926	90,581	1,048,961
C. W. A.:					
Allotments.....	2,952,615	182,390	-----	-----	3,135,005
Obligations.....	1,791,394	1,097,182	-----	-----	2,888,576
F. E. R. A.:					
Allotments.....	-----	245,000	760,000	-----	1,005,000
Obligations.....	-----	134,057	472,695	238,209	844,961
W. P. A.:					
Allotments.....	-----	-----	8,843,320	3,177,880	12,021,200
Obligations.....	-----	-----	7,477,637	4,234,075	11,711,712
Drought relief in agricultural areas:					
Allotments.....	-----	1,000,000	-----	-----	1,000,000
Obligations.....	-----	999,570	-----	-----	999,570
<b>Grand total:</b>					
Allotments.....	17,906,870	3,911,765	11,019,820	3,187,880	36,026,335
Obligations.....	9,962,912	10,361,104	10,278,302	4,667,461	35,269,779

## FOREIGN AND DOMESTIC COMMERCE

The Bureau of Foreign and Domestic Commerce has increased its activity during the past year in serving the American business public.

### Foreign trade activities.

Demands made on the Bureau for information regarding our commerce have increased, and the Bureau has met these demands through working out a better utilization of its resources in personnel and equipment throughout the world rather than through increased appropriations.

Close cooperation with the Business Advisory Council of the Department of Commerce has resulted in keeping the program of the Bureau in harmony with the practical demands of business, and the divisions of the Bureau have worked closely with the subcommittees of the Business Advisory Council in carrying out the details of these plans.

In the foreign field, the offices of the Bureau have been enabled to furnish more useful service through modification of the coordination agreement with the Department of State, which permits foreign commerce officers to answer directly inquiries from the businessmen of the United States. This arrangement speeds the work of the Bureau in serving its clients.

In Washington, the industrial service divisions have been strengthening and widening their contacts with American exporters and importers throughout the whole range of American industry.

A number of important trade missions from foreign countries were aided by the Bureau in obtaining a broader and deeper knowledge of American industry and its potentialities.

The economic divisions of the Bureau engaged in the analysis of foreign trade have increased the number of their reports, among which may be cited the preparation of the first comprehensive investigation of foreign investments in the United States, an analysis of the foreign trade and domestic industry of the Japanese Empire, and the continued improvement of the international balance of payments estimates.

In addition, the Bureau has prepared for the State Department and other governmental agencies the basic analyses essential to the continuation of the trade-agreement program and the establishment of reciprocal treaties with foreign nations. This cooperation has resulted in a considerable amount of additional work for all sections of the Bureau. The industrial service and technical divisions in Washington, and the foreign offices have all been actively engaged in gathering data for the specific purpose of trade agreements, and a unit has been created in the Bureau for the purpose of compiling and presenting data thus gathered. The district offices of the Bureau disseminated information regarding reciprocal trade agreements, both as a part of their ordinary office routine and in answer to inquiries.

### Domestic trade activities.

In the domestic field, the Bureau has recognized the growing need for more complete information about the business economic structure and its functioning, and has taken preliminary steps toward the establishment of a broader program of industrial economic research. The

work of the Economic Research and the Marketing Research Divisions has been strengthened to this end. Notable among the contributions of the past year is the completion of an analysis of long-term debts in the United States, which supplements the study of the national income which has been improved and brought down to date.

In the field of marketing research, and in cooperation with national trade associations, important indexes of the monthly flow of retail trade for both chain stores and independents and for manufacturers and wholesalers have been expanded and strengthened. Information on the extension of commercial credit has also been secured, and the National Retail Credit Survey, which was issued much earlier than usual this year, contained an estimate of the volume of installment selling which has proved to be of great interest to the entire business community.

The work of the Bureau in the field of construction economics has continued, and several substantial contributions have been made, including chapter 9 of the Technological Trends and National Policy issued by the National Resources Committee on "The Construction Industries" by the chief of the Construction Economics Unit. In the same volume was an excellent contribution on the technical developments in the electrical field contributed by the chief of the Bureau's Electrical Division. The Construction Economics Unit worked in very close consultation with the Construction League of the United States in order to insure that its research would be practical and meet the needs of this vast industry.

Broadly, the Bureau has engaged in important economic research, fact-finding, analysis, and forward-looking investigations—all designed to enable the Nation better to cope with its major problems. The individual examples of work that have been mentioned in this brief summary may be considered as illustrating the character of many other services which cannot here be enumerated specifically.

### AIR COMMERCE

The rapid growth of air transportation in the United States within the past few years has made it necessary for the Bureau of Air Commerce to plan for a general revision of aids to air navigation upon which air operations are becoming increasingly dependent.

During the past fiscal year a comprehensive program of modernization of air navigation aids along the Federal airways was inaugurated. The most salient feature of this program involves the conversion of all existing airway broadcast and radio range stations to the simultaneous system of transmission, by means of which a pilot may be furnished at the same time radiotelephone information as to weather conditions and radio range signals. Detailed engineering specifications have been prepared covering all components of a complete standard facility of this type, incorporating all of the latest improvements, including a single transmitter, a new design of tower radiator, and a lighter and more efficient means of separating voice and range signals in simultaneous reception.

As a result of continued experiments on blind-landing system, agreement has now been reached by the various aeronautical agencies concerned as to the requirements for a service installation.

The transmission of weather information by radioteletypewriter has been developed to a point where reliability equal to that obtained with land wire installations has been attained. Now under investigation is the extension of this system to permit automatic transmission of meteorological and other information to aircraft in flight.

Further research into the utilization of ultra-high frequency equipment has resulted in the development of several forms of transmitters and special antennas for the purpose of furnishing precise indication of his position to the pilot as required by present instrument navigation practice and airway traffic control procedure.

A special type of remote-control receiving antenna was designed and procured during the year to provide more efficient and reliable radio reception from aircraft. Also a means of modifying a large number of radio transmitters, which would have otherwise required replacement, was developed.

Jurisdiction over airway traffic control, placed under the Bureau of Air Commerce on July 6, 1936, has been extended to include, in addition to airline operation, the operation of all itinerant aircraft whether engaged in Army, Navy, Coast Guard, or private flying. Regulations were established requiring that flight plans for all intentional instrument flights on civil airways be approved prior to departure.

The total number of traffic-control stations was increased to eight, with the addition of stations at Pittsburgh, Detroit, Washington, Burbank, and Oakland, to the original stations at Newark, Cleveland, and Chicago. Each station is now in operation approximately 16 hours a day.

A number of new airline operations and extensions to lines already in operation were inaugurated during the year and these were inspected by the airline inspection staff of the Bureau. A number of new, faster, and larger transport aircraft were placed in service to replace those in previous use on some routes, and it was necessary to check out pilots on the new aircraft and inspect fields to be used to ascertain their adequacy for the larger and faster types.

A survey of scheduled airlines under American jurisdiction operating outside of continental United States was commenced. This will be continued during the next fiscal year with a view to developing regulations similar to those to be adopted for domestic airlines, but applicable to the special conditions encountered in long flights over water.

Regular scheduled service between Bermuda and the United States was commenced by both British and American airlines. Exploratory flights were under way on the proposed North Atlantic route. Services on the Pacific route were extended to Hong Kong, giving direct service from the United States to the Orient.

In connection with these routes the Department of Commerce has the responsibility of designating civil airways to be followed and is represented on the Inter-Departmental Committee on Civil International Aviation.

This committee was organized in 1935 for the purpose of making observations and gathering information pertaining to civil international aviation in all its phases, and submitting such recommendations as may be called for. A number of conferences have been held with representatives of other countries with respect to the establishment of international air services.

The committee has endeavored to make all agreements on the basis of reciprocity, so that American airlines can compete on an equal basis with foreign airlines.

It is intended that the development of international air routes will be continued on this basis, and it is not the intention that any route shall be developed for the exclusive use of any one airline.

Insofar as it is possible for it to be arranged, all established routes are to be open to all American citizens who want to make use of them, just as are the airways within the boundaries of the United States.

The Bureau has continued its development work and research into special problems affecting flight. Plans were made to enlarge the scope of this activity to include practically the entire field of aeronautical research and development, with the exception of work carried out by other governmental agencies.

In connection with continued research into the problem of blind landing, a contract was placed with the Massachusetts Institute of Technology for the development of a new type of system. A compass intended for use in the development of an instrument to indicate to the pilot the presence of other aircraft in his flight path, was ordered during the year. Research studies into all phases of pilot fatigue were extended to include passenger comfort and safety, particularly from the standpoint of altitude effects produced by oxygen starvation and pressure change. Studies were conducted and a report prepared on the dangers of carbon monoxide in aviation, including methods of detection and elimination.

The Bureau continued its participation in the Works Progress Administration airport development and construction program. On June 30, 1937, a total of 937 airport and air-marking projects had been initiated. Of these, 363 have been completed or discontinued.

As a result of the air-marking program sponsored by the Bureau, 7,761 air markers have been completed in 46 States.

### LIGHTHOUSE SERVICE

Substantial progress has been made by the Lighthouse Service in applying the latest technological advances to the promotion of safety at sea, yet its chief reliance in marking the dangers along the coasts from Maine to California and the Gulf to the Great Lakes continues to be upon its devoted personnel and the qualities of dependability and service which have marked it from its beginnings. The lightships with all of their intricate signaling equipment still require skilled seamen and engineers to maintain them on their stations in the teeth of violent gales. Keepers still stand their watches at lonely outposts, for even the most modern of fog signals requires that human touch to insure its successful operation. Even the thousands of buoys with which the coasts and harbor approaches are marked would lose their effectiveness if it were not for the vigilance of the crews of the lighthouse tenders. The program of equipping all lightships with radiobeacons and the synchronizing of radiobeacons with sound signals for distance-finding purposes on these vessels, has been completed, and the number of radiobeacons has been increased by the commissioning of eight new stations during the year. The synchronous operation of radiobeacon signals and sound signals has also

been extended to suitably located shore stations, so that at the close of the year there were in successful operation 84 of these distance-finding stations operating according to uniform methods. The reaction of maritime interests to this additional facility has been notably prompt and favorable, and the general principle has already been adopted in certain foreign countries.

Important results have been accomplished in the reduction of interference between various radiobeacon stations and between these stations and other types of radio broadcasts, through the further development of monitoring stations in the Lighthouse Service and through the excellent cooperation received from the Bureau of Air Commerce and commercial maritime interests.

Arrangements have been made for the systematic use of a radiotelephone installation at Sault Ste. Marie for the collection and dissemination of information regarding emergency changes or defects in important aids to navigation. By cooperative arrangements this station has been made available for the dissemination of weather forecasts and other advices of an emergency nature.

The total number of aids to navigation maintained by the Lighthouse Service was 28,108, an increase of 1,448 over the previous year. This increase has been in great measure directly required by the development of new inland waterways. The substitution of gas and electricity for kerosene illuminant continues, although at a reduced rate. Two first-order lighthouses have been converted for the use of automatic apparatus, and a third is in progress. In connection with these changes, lighted buoys are established to supplement the service rendered by the lighthouses.

The recurrence of extreme flood conditions in the Ohio and Mississippi Valleys during the past year, together with the rapidly progressing improvement of navigational channels in the upper Mississippi, the Missouri, and the Tennessee, has directed attention more intensively to the need for carrying forward actively plans for further improving the facilities and organization of the lighthouse district having charge of these extensive waterways. A central operating base at St. Louis should be established for the warehousing and servicing of equipment, and a number of sub-bases should be established with appropriate mobile equipment to facilitate more prompt and frequent servicing of lights and buoys.

The further development of the most suitable types of aids to navigation and of methods for their adequate servicing on the 4,700 miles of navigable channels of this river system is a problem pressing for early solution.

The number of small motor-driven craft in use commercially, in the fishing industry, and for recreational purposes, continues to increase and to be extended into new areas. The total volume of such traffic is large, and while the cost of establishing the necessary aids has been reasonably provided for in localities where extensive interior waterway improvement has been undertaken, the cumulative and continuing demand upon the facilities and funds of the Lighthouse Service will in the aggregate require a substantial increase in the maintenance appropriations for the Service.

The most pressing needs to insure the continuance of adequate performance of the functions of the Lighthouse Service in the safeguarding of life and property at sea at present are in relation to the

maintenance of an adequate fleet of appropriately designed vessels and their manning and operation by trained and competent officers and men. The fleet of this Service now constitutes 103 vessels, the average age of which is 21 years. In 1938, 43, or about 42 percent of these vessels, will be 30 years old or over, and 15, or about 15 percent, will be more than 40 years old. The oldest of these vessels are beyond the age of further economic maintenance, being both inefficient in the performance of their necessary functions and requiring maintenance and repair costs disproportionate to their value. Living conditions on board some of them are unsuitable to present-day standards and hazardous to the safety of their crews. There is accordingly an emergency for the resumption of an adequate building program for vessels of this Service. As both lighthouse tenders and lightships have a life expectancy determinable within reasonable limits by long experience, and as they are special types of vessels requiring individual designs in most cases, provision should at once be made for the resumption of their replacement according to a regular program, there being at present no margin of safety.

Manning of these vessels by trained and competent officers and men becomes increasingly important due to advances in many technical lines, both as respects the equipment of the vessels themselves and the aids to navigation for which they care. The work on board these vessels is distinctly arduous and involves hazards of a character and degree not generally existent on other vessels either in public or commercial service, by reason of the fact that their regular duties require them to operate in localities and work close to shoals and rocks where no other vessels are supposed to go. The general and widespread rise in the wage level of officers and crews of vessels throughout the country, coupled very generally with provisions for reducing hours of labor and for overtime pay, have brought about a disparity between existing pay scales on these vessels of the Lighthouse Service and the prevailing wages in comparable fields of maritime employment which is militating against the maintenance of properly qualified crews on lighthouse vessels. Early remedial action is necessary as respects both pay and complements of these vessels to preserve the efficiency of the Service.

#### **ENFORCEMENT OF THE INSPECTION AND NAVIGATION LAWS**

During the fiscal year the Bureau of Marine Inspection and Navigation adapted its facilities, procedures, and routine activities to the many acts which were passed by the Seventy-fourth Congress amending the navigation and inspection laws and which became effective during the year.

While the consequent readjustments in respect to the details of office management, both in Washington and in the field, were being made as effectively as limited funds permitted, the Bureau's fundamentally important task of guarding persons while traveling as passengers aboard vessels, and in small passenger-carrying motor boats sustained no relaxation.

This efficiency is manifest in the Bureau's statistics which show that the safety-at-sea record of the fiscal year 1936 was maintained continuously into and throughout 1937. It can with satisfaction be

reported that there has been no loss of marine-passenger life for more than 24 months.

Public safety has been enhanced by the promulgation, under the provisions of Public 765, of a complete set of rules and regulations covering vessels engaged in the transportation of any inflammable or combustible liquid cargo in bulk. These regulations, which require rigid inspection for design, construction, operation, and manning, placed an additional 3,000 vessels—carriers of petroleum products in bulk—within the jurisdiction of the Department. Failure to meet the stated requirements has resulted in the complete withdrawal of many vessels from that particular trade, or major structural alteration of many others to enable them to pass the rigid inspection.

During the year the Department carried nearer to completion the program it started in 1935 for conservation of life and property on American vessels, by the installation thereon of additional fire protection and lifesaving equipment. While the dead line for the installation of some of the apparatus is July 1, 1938, American passenger vessels, in quick conformance with the laws and regulations which were promulgated during the past 2 years, and which in their rigidity exceed those inaugurated by the international convention, or those applied to passenger vessels by foreign countries, are equipping themselves with such safety devices as the following: Automatic sprinklers, automatic fire detectors, manual alarms, supervised fire patrols, smoke detectors, public-address systems, mechanically lowered lifeboats, and fire-smothering systems for boiler and engine rooms, radio-equipped lifeboats, augmented buoyant apparatus, not to mention many other requirements of like character.

The Marine Casualty Investigation Boards, as established under the terms of Public 622, of the Seventy-fourth Congress, have assisted the Bureau to understand more completely the causes that underlie marine accidents. In consequence of this, corrective measures have often been undertaken.

The Technical Division, also created by Public 622, has rounded out its organization and has aided the Bureau in the matter of passing on plans for new construction, and plans for major alteration of existing tonnage, and is now supervising load-line regulations, which now affect coastwise and Great Lakes vessels of more than 150 gross tons, with a resultant reduction in hazards to life and property.

The Department has sponsored and financed a series of tests of fire-resistant materials as installed on board ship. In this connection our National Bureau of Standards and this Bureau have actively collaborated in conducting exhaustive experiments and in assembling accurate scientific data. These data will serve as the basis for regulations governing the fire-resistant construction of new passenger ships.

The Bureau is examining and certificating all merchant seamen, and is insisting upon an increase in the percentage of American citizens in the crews of merchant vessels, as provided in recent legislation.

As summarized above, the Department is doing its utmost to quickly enhance the protection of life and property at sea, and on all navigable waters of the United States. This progress, through this Bureau, has been made in a highly acceptable manner in spite of the fact that the Service is underpaid and undermanned.

## SURVEYING AND MAPPING

The Coast and Geodetic Survey is the agency which carries on the surveying and charting of all coastal waters under the jurisdiction of the United States, having been organized for this purpose in 1816. In recent years, the activities of this Bureau have been extended to include the production of aeronautical charts of the United States which provide a similar service to navigators of aircraft.

Field operations required for charting purposes include coastal hydrographic and topographic surveys, geodetic control surveys, tide and current observations, and magnetic investigations. As an outgrowth of its geodetic control work along our coasts this Bureau has the further duty of extending such surveys throughout the interior of the United States and Alaska in order to provide basic data for topographic mapping, aeronautical charting, and other engineering projects. In cooperation with other agencies it is also engaged in a moderate program of seismological investigation for the purpose of securing information for use in the design of buildings and other structures to reduce the damage resulting from earthquakes.

With the territorial expansion of the country and the growth of its commerce there has been over a long period a steady increase in the need for the products of this Bureau. During recent years, the normal rate of increase has been augmented by recovery from the depression with the result that during the past fiscal year the Coast and Geodetic Survey was called upon to render an unprecedented volume of service. Orders for navigational charts and related publications received during the year amounted to 666,184 copies, an increase of 27 percent over the preceding year and 125 percent over the issue 10 years ago.

This has required a greater output of both field and office work, a condition which has been met to a considerable extent by the further development and improvement of methods and equipment, making possible a greater return from expenditures, and by a moderate increase in appropriations. The latter, however, has been inadequate for all purposes, and consequently there is a growing deficiency in the Bureau's work which, if allowed to continue, cannot fail to have serious results. The existing situation is made more difficult by material increases in operating expenses resulting from rising prices. The desirability of providing this agency with such additional resources as will enable it to maintain a production schedule consistent with the demand therefor is apparent.

One of the important accomplishments of the year is the completion of a series of 87 sectional aeronautical charts which now enables the Bureau to provide the aviator with air-navigation charts for all parts of the country. Each chart covers an area of about 150 by 300 miles; joined together the entire series would form a gigantic map of the United States 32 feet wide and 20 feet high.

The Bureau also began coastal topographic surveys with its new nine-lens aerial camera. It is estimated that the use of this camera, together with auxiliary apparatus, will reduce the cost of such surveys to less than half the expenditure formerly required when ground methods only were available and, furthermore, will enable the Bureau to accomplish the survey of intricate coastal areas the cost of which by older methods would have been prohibitive.

Extensive cooperation was continued with other governmental and private organizations and individuals, resulting in the receipt of a large amount of valuable data affecting the charts and other informational publications and enabling the Bureau in turn to supply results of its field and office operations in considerable variety and volume as required by other agencies for various special purposes.

### FISHERIES

The commercial fisheries of the United States are in many respects in a stronger economic position than for any other recent year. Available data show increased production of many varieties of fresh and processed fishery products, and prices for these commodities usually were maintained during the year or reached higher levels.

In the important New England fisheries, the landings at principal ports were the largest in history, although the yield of mackerel, haddock, and cod declined as compared with the preceding year. The increased total landings in this area were largely the result of more intensive fishing effort, which increased the landings of rosefish from 17 million pounds in 1935 to 66.6 million for the calendar year 1936 and vessel-caught whiting from less than 2 million pounds to nearly 18 million.

Total catch statistics collected for the important shrimp fishery of the South Atlantic and Gulf coasts have revealed that the yield is not increasing in proportion to the increase in fishing effort. This fact, considered in relation to the scarcity of spring shrimp that has prevailed during the past three seasons, indicates a heavy drain on the fishery.

In Alaska and in the Columbia River area, the collection and analysis of records of the catch of salmon have been continued to determine the condition and trend of the commercial fishery, and to establish a basis for its proper regulation. Excellent progress has been made on the stream survey program in the Columbia River Basin, out of which is emerging a clear picture of the extent of available spawning areas, the location of barriers which may be removed or modified to permit the passage of fish, and the number of unscreened irrigation outlets that menace downstream migrants.

During the past year biological investigations were pursued on the control of natural enemies of shellfish. The Bureau's studies are proving of definite benefit in controlling the common oyster drills, or screw borers, which cause an estimated annual damage of several million dollars to the oyster industry.

The results of the Bureau of Fisheries' 3-year study of fish protection at Bonneville Dam on the Columbia River were apparent during the year with the virtual completion of the system of ladders and elevators for the passage of migrating salmon. The Bonneville fishways constitute the most elaborate system of fish protective devices ever constructed. They consist of four fish ladders, each as wide as a four-line highway, which the salmon will ascend by making short leaps from one pool to the next; three sets of double fish locks, similar in their operation to navigation locks; and three collecting traps through which the salmon will be passed to ladders and locks. Since the dam is expected to be completed about January 1, 1938,

the spring runs of that year must surmount the dam by means of these fishways.

After the \$10,000,000 salmon industry of the Columbia River has taken its 25 million pounds of fish, it is estimated that a million or more salmon remain to ascend the river to the spawning grounds. Probably 75 percent of this number must pass Bonneville Dam. The preservation of this great spawning run is therefore dependent upon the successful operation of the Bonneville fishways.

Studies of water pollution and its effect on aquatic life have been continued in 22 States. One of the striking finds in the investigations of natural pollutants has been the demonstration of the high toxicity of minute quantities of selenium. Besides selenium, several substances that occur in small quantities in some waters and soils such as boron, fluorin, titanium, and others have been found to present previously unrecognized hazards to fish and other aquatic life.

During the year the Bureau distributed 7,919,000,000 fish and eggs from its hatcheries. Fish listed as fingerlings to adults in size totaled 136,000,000 in comparison with 157,000,000 distributed during the previous year. The only species of game trout produced in greater numbers than the previous year was the brook trout. There was a material increase in the number of largemouth black bass produced, and special attention was given to the propagation of shad. Most of the hatchery production of fish adapted to interior waters are planted in waters of the national forests, national parks, or other regions under the jurisdiction of the Federal Government. In the marine fish-cultural work, which is confined largely to the fertilization and planting of eggs of commercial species, increased numbers of haddock and pollock eggs and fry were handled by the Bureau's forces. The artificial propagation of lobsters was resumed in the New England States with an output of 3¼ million fry.

The fur-seal herd of the Pribilof Islands, numbering about 1,690,000 animals, increased 8.95 percent over the preceding year and 52,446 pelts were taken last season. The selling price of the skins has increased substantially during recent years, and operations are being conducted on a profitable and satisfactory basis.

Studies in the general field of food technology as applied to fishery products were continued during the year. The chemical, pharmacological, and bacteriological investigations dealing with the preservation of fishery products and studies on the vitamin potency of fish oils, fish-liver oils, and fish meals progressed. In the experimental studies in canning special attention was given the development of improved methods for canning fishery products in the home or under noncommercial conditions.

There is great need and corresponding opportunity for the stabilization of production of the commercial fisheries, and the investigations of the Bureau of Fisheries, both in the field of biology and technology, are directed toward this end. Biological studies of the variations in supply frequently permit economically useful predictions of future abundance or scarcity, and technological studies that prevent waste and encourage more economical utilization of the fishery harvest aid in the wise use of the available stocks. Tentative experiments have been conducted in the past by cooperation in the fishing industry to stabilize yields through voluntary regulation of fishing

effort. Voluntary stabilization boards have been established in the North Pacific halibut industry and in the North Atlantic mackerel fishery to regulate times of sailings of fishing vessels in order to distribute landings at the major ports. Mackerel regulation was very short lived and it cannot be said that the effort to regulate the halibut fishery has been entirely successful. But these efforts are suggestive of the possibilities for the future.

Valuable as the short-time stabilization of yield may be, the chief responsibility of the Government at the present time is the wise management of the fishery resources and their exploitation on a long-time basis in order to achieve the objectives of conservation.

### NATIONAL STANDARDS

The importance of standards in commerce is coming each year to be more clearly recognized, because without standards of measurement, quality, and performance, contracts become indefinite, and dissatisfaction and delay in the settlement of commercial transactions are bound to result. Only on the basis of clear-cut definite standards can satisfactory contracts be written. The work of the National Bureau of Standards in this field thus becomes of direct interest to not only all branches of industry and commerce, but to Government agencies and the public as well. The Bureau's efforts to establish standard methods of testing materials; to facilitate the use of specifications which set forth the essential qualities of a commodity; and to assist industry in making successful their programs for eliminating superfluous variety of product, are worthy of generous encouragement.

Standards are essential not only in our national commerce but are equally important in international trade. The recent efforts of the Bureau to bring about international agreement with reference to electrical standards of measurement as well as a standard of brightness (candlepower), on an absolute basis, have been met by a cordial response on the part of standardizing laboratories of other countries. This work is now well advanced and will be presented to the Ninth International Conference on Weights and Measures in 1939 for final consideration and approval. The new international standard of illumination is particularly noteworthy, because heretofore discrepancies as great as 10 percent have existed in the candlepower standard of different countries.

The history of the industrial development of the world shows that our industries have been founded on the results of basic research that extended our knowledge into new unknown fields. If we hope to extend our industries to provide employment for all our people, we must provide new basic discoveries upon which new industries may be founded. Legislation is now pending in Congress authorizing the support of basic research of this character at the National Bureau of Standards and in our universities and colleges. This program should be generously supported. Research that provides the foundation for the building of new industries is the best form of insurance against economic instability.

## CENSUS

The Bureau of the Census occupies the position of fact gatherer and accountant of the Nation's social and economic life. The gathering of social statistics of a census character dates back to the First Census of Population in 1790. The First Census of Manufactures was taken in 1810, and the First Census of Business was taken in 1929.

This Bureau is mapping a broad program of development designed to meet the increasing statistical needs of business and industry today. In any country so large as ours, adequate planning and policy building for every private organization, as well as State and National Governments, must be dependent upon unbiased facts regularly collected by a national statistical organization such as the Census Bureau.

During the past year the census of business, 1935, was brought to a close with the publication of some 35 volumes of valuable business facts. During the same year the census of agriculture, 1935, was completed, and publication of the data resulting from the census of manufactures, 1935, neared completion. These three censuses, along with the current statistics already collected by the Bureau, provide the most complete picture of our economic life ever made available.

A thorough reorganization of the Manufactures Division is well under way, with three definite objectives in mind—(1) improvement and extension of industrial statistics. (2) increased timeliness, and (3) close coordination of current data with those collected at regular census periods.

One of the most interesting developments of the year has been the service rendered by the Census Bureau to residents of the country in the matter of furnishing proof of age. Since the passage of the Social Security Act and similar State legislation, the Bureau has been burdened heavily with requests for proof of age from persons unable to secure such information locally and who have turned to the National Government records as a last resort. The volumes of the Bureau form the only documentary birth record of many Americans, since registration of births by local authorities was not general prior to 1915.

Applications for proof of age are being received by the Census Bureau at the rate of about 300 a day. These requests are checked carefully against the records and age certifications issued. These certifications are accepted as official proof of age by all courts and old-age pension administrators. In addition to aiding persons to qualify for various types of social security benefits, census age certifications are used in securing passports, in the settling of estates, and in similar circumstances where it is necessary to furnish proof of age.

To meet the increased demand, the Census Bureau has embarked upon a two-point program to speed up its age searches. First, the Bureau set up a mammoth card file containing 33 million cards on which are inscribed the 76 million names returned in the census of 1900. Second, specially built microfilm equipment has been installed and the Bureau has started copying on film its population records which date back to 1790.

Cameras 11 feet high are doing the major copying job. Two are designed for photographing loose sheets. A suction roller carries

the pages under the lens of this apparatus as rapidly as they can be fed down a sloping tray, and the sheets are filmed "on the move." The other two cameras photograph pages in bound volumes, with a carriage moving the large books back and forth automatically to let each of the two facing pages be "shot" successively.

The film used in these unique cameras is of standard motion-picture size. However, a special type film had to be developed which is extremely fine in "grain" and which is "panchromatic," that is, sensitive to any color of ink used by census enumerators throughout the years.

The cards transcribed from the 1900 census are being copied by photographic apparatus of a type standard with banks and business houses for recording large numbers of checks, statements, and correspondence. The film for these smaller machines is 16-millimeter.

The microphotographic laboratory of the Census Bureau is considered the most complete in the Nation. Its establishment has enabled the Bureau to better perform an essential function for thousands of people, to preserve the original documents of our human history from the wear and tear of constant handling and will help to solve the serious problem of storage.

After careful study of the statistical needs of the country, in cooperation with other governmental and nongovernmental agencies, new census legislation is soon to be introduced as the Sixteenth Decennial Census bill.

Plans for the next census of population, to be taken in 1940, the census of manufactures, 1937, and the census of agriculture, 1940, are already well under way. These plans are being made with the advice and aid of special advisory committees drawn from the many fields under consideration.

The 1936 census of religious bodies, the fourth of its kind, is now in progress. This census gives data on membership, denominational affiliations, property, and other fiscal matters, as well as a history of each religious sect.

The Division of Vital Statistics, reorganized 2 years ago, has built up an extremely cordial relationship with local vital statisticians throughout the country. Considerable gains have been made in timeliness, and several special studies and experiments, directed toward the improvement of our vital statistics, have been carried out during the year.

## PATENTS

Receipts of the Patent Office in the fiscal year 1936-37 were the largest in its history, and all but one of its major activities recorded increases. The receipts of the Office were \$4,565,501.69, and notwithstanding heavier expenditures, there was a surplus of \$73,228.22. The excess of receipts over expenditures during the last 4 years has averaged \$153,207.56, despite a deficit of \$78,364.52 in 1935-36. In the 11 years beginning with 1923 annual deficits ran from a minimum of \$85,535.71 to \$827,342.81.

The significant increases shown in the volume of business during the year may be accepted as indicating a corresponding improvement in industry and general business of the country. Applications for patents (including reissues and designs) and for registration of

trade-marks, prints, and labels, numbered 89,980, a gain of about 5½ percent over the total filed in 1935-36, when the greatest aggregate since 1932 was received. Applications for design patents received in 1936-37 were 6,617, an excess of 74.63 percent over those received in 1934, the year in which the Design Division was established as a separate unit of the Office.

There were 39,412 patents granted, a decline of 566 from the total issued in the preceding year. The explanation of this decrease is twofold. It was due, first, to the heavy inflow of new business, and secondly, to the fact that there is normally an interval of some 2 years between the date of filing and the granting of an application. In consequence of the larger number of new applications with which the Office had to cope, the disposition of earlier cases was somewhat retarded. Patent applications awaiting action on June 30, 1937, were 38,121, or 4,581 more than at the close of the preceding year. Final disposition was made of 58,091 applications in 1937, compared with 61,990 in 1936. The number of cases pending on June 30, 1937, was 109,735, or 5,640 more than on the same relative date of 1936.

The work of classifying patents, an undertaking of great importance to inventors, attorneys, and industry and one not adequately prosecuted until recently, was continued throughout the year, but under difficulties. Classes comprising many thousands of patents were revised or re-revised. A new class of "air conditioning" to contain approximately 4,000 patents was in process of formation as a step necessitated by the rapid development of that art.

Of prime utility to industry and to the efficiency of the Office is the progress made in the task of curtailing the pendency of applications, long recognized as a serious evil and one frequently sought to be corrected. Of the large total of cases pending on June 30, 1937, only about 2,200 had been pending more than 5 years. This was a reduction from 4,000 such cases in the Office 5 years ago. The total of applications pending for periods of from 2 to 3 years also was greatly diminished, and those pending from 3 to 5 years were decreased from 8,388 on June 30, 1936, to 6,357 on June 30, 1937. The great majority—about 72,000 of a total of 109,735 applications pending on June 30, 1937—were less than 2 years old.

Continuous progress in the improvement of practice and procedure within the Patent Office has been accomplished by the Patent Office Advisory Committee appointed by the Secretary of Commerce in July 1933. This Committee met on 2 or more days each month, except July and August, to study problems and appraise suggestions referred to it by the Commissioner of Patents, and submitted to him numerous recommendations for the further clarification of the Rules of Practice. In conformity with these recommendations important changes in procedure have been adopted. By thus expediting the prosecution and grant of applications for patents these modifications have effected the saving of both time and money for applicants and indirectly served industry. A significant evidence of the benefits resulting from various improvements introduced by the Committee in collaboration with the Commissioner is the decrease in the number of suggestions coming from the patent profession and those representing industry.

The names of the members of the Patent Office Advisory Committee follow:

George Ramsey, New York, N. Y., chairman.	Herman Lind, Cleveland, Ohio.
John J. Darby, Washington, D. C.	Robert Lund, St. Louis, Mo.
John A. Dienner, Chicago, Ill.	John D. Myers, Philadelphia, Pa.
Dean S. Edmonds, New York, N. Y.	Col. C. O. Sherrill, Washington, D. C.
Thomas Griswold, Jr., Midland, Mich.	Milton Tibbetts, Detroit, Mich.
Franklin E. Hardy, Pittsburgh, Pa.	Charles E. Townsend, San Francisco, Calif.
Delos G. Haynes, St. Louis, Mo.	

### FOREIGN-TRADE ZONES

The Foreign-Trade Zones Board, as established by legislation, consists of the Secretary of Commerce, chairman, the Secretary of the Treasury, and the Secretary of War.

The foreign-trade zone established by the municipality of New York at Stapleton, Staten Island, on municipally owned piers and land, under authority granted by the Foreign-Trade Zones Board, was opened for business on February 1, 1937. This was the first zone to be placed in operation under the provisions of the act of Congress approved June 18, 1934 (48 Stat. 998, 1001). Commodities such as woolen goods, straw and hemp braid, paper cloth, copra, iron and steel goods, lumber, tapioca and sago flour, watchmakers' supplies, tobacco, and optical goods have been handled at the zone. The commissioner of docks of the city of New York, who is in charge of the operation of the zone, reports that there is a definitely growing interest on the part of business men in the utilization of the new facility.

The Board has also issued a grant to the Alabama State Docks Commission for the establishment of a zone at Mobile, Ala. This zone will be the second one to be established in the United States. It is expected that the zone will be in operation early in 1938.

Applications have been received from the following public and private corporations, but have not met all of the requirements of the Board as set forth in the law; the Governor of Puerto Rico, for a zone at San Juan, P. R.; the board of State harbor commissioners, for a zone at San Francisco, Calif.; and the American Foreign-Trade Zone, Inc., for a zone at Jersey City, N. J.

A number of other municipalities and localities are considering the question of filing applications for the establishment of foreign-trade zones. In some instances, delays in making applications have been due to the necessity of obtaining approval of State legislatures, and of making detailed surveys in order to develop the data necessary for the applications.

Because of a lack of familiarity on the part of the public with the purposes of foreign-trade zones, and with the details of operation, and because of the experimental nature of such facilities in this country, the establishment of such areas has proceeded slowly. However, it has been clearly indicated that a number of port cities are vitally interested in the possibilities of "expediting and encouraging their foreign trade" through the establishment of foreign-trade zones. The fact that the establishment of these zones has not been rapid up to the present time is not to be considered as indicative of a lack of interest on the part of those having the establishment of zones under consideration, but rather as representing their desires to proceed slowly with the expenditure of funds for the establishment of a new and hitherto untried facility in this country. A study of the estab-

lishment of free ports in foreign countries discloses the fact that in many instances from 4 to 8 years, or in some instances an even greater period of time, were required, after passage of the enabling legislation, to establish a free port and place it in operation.

### COMMITTEE OF INDUSTRIAL ANALYSIS

The Committee of Industrial Analysis, which was created under an Executive order of the President, signed March 21, 1936, continued its activities during the year. This Committee was composed of the Secretary of Commerce as chairman, the Secretary of Labor, the Secretary of Agriculture, and four additional members who were not officers of the Federal Government: John M. Clark, William H. Davis, George M. Harrison, and George H. Mead.

The four persons appointed from outside the Government were specifically charged to "prepare for the President an adequate and final review of the effects of the administration of title I of the National Industrial Recovery Act." There was also created under the Executive order, a Division of Industrial Economics which was constituted for the purpose of assisting the Committee of Industrial Analysis in preparing its report, and was subject to the general supervision of this Committee.

The Committee instructed the Division of Industrial Economics to make a general comprehensive summary of the many and detailed reports of the Division of Review of the National Recovery Administration. During the period of its existence, which was June 14, 1935, to March 31, 1936, the Division of Review had completed 154 reports bearing upon National Recovery Administration organization, administration, trade-practice regulations, wage and hour provisions, and various studies of a legal and statistical nature. It had also completed 787 histories of the codes of fair competition. The Committee of Industrial Analysis authorized the completion of 130 additional code histories and the publication of 24 reports which had been completed but theretofore had not been available. Based on these and other materials, the Division of Industrial Economics prepared for the Committee five reports: Pre-National Recovery Administration Background; National Recovery Administration and Organization; National Recovery Administration Trade Practice Experience; National Recovery Administration Experience with Labor Provisions; and Legal Studies.

During the year the Committee devoted much time and gave careful consideration to the preparation of its report which was presented to the President February 17, 1937. This report of the President's Committee of Industrial Analysis giving a complete summary of the results and accomplishments of the National Recovery Administration and a report thereon is now publicly available.

### BUSINESS ADVISORY COUNCIL

Under the provisions of the enabling act of the Congress, authorizing the Department of Commerce "to foster, promote, and develop foreign and domestic commerce," a business advisory council, composed of representative leaders of industry and commerce, was organized in June 1933. The purpose of the Council was to make

available to the Department of Commerce the careful judgment and practical experience of industrial leaders on matters affecting the relation of the Department and business.

The Council devotes itself primarily to questions referred to it by the President, or by the Secretary of Commerce, in addition to its regular activity as a clearing house and coordination center for industrial views on governmental matters which affect business. The recommendations of the Council's committees and of the Council as a whole with reference to Federal activities affecting trade and industry have been of valuable assistance in the conduct of the Department's affairs. The Council has been considering and advising on more problems than ever before, thereby rendering increasingly effective service in furthering cooperation between Government and business.

The practical value of a sober presentation, through the proper channels, of the businessman's point of view on problems in such significant fields as social security, foreign trade, air commerce, housing, and taxation—to mention only a few—is a matter of gratification both for business and the administration.

The Council has functioned in a much broader way than was originally contemplated in its relationships with other Government agencies. Originally the Council's functions were limited primarily to an advisory relationship to the Department of Commerce, but as the work continued it was expanded considerably from its original basis. Committees of the Council have reported directly to the heads of other Federal agencies.

Since the Council was organized in 1933, more than 75 formal written reports have been made, and there is ample evidence that these reports have been extremely beneficial contributions to the subjects which they have covered.

In view of the past record and the present vigorous activity of the Council, which still retains a full and representative membership, the Department is confident of its continued invaluable assistance.

In acknowledgment of the hearty cooperation of these businessmen, their generosity in devoting valuable time to these important conferences at the Department despite the exacting demands of their own affairs and in defraying their own expenses without Government reimbursement in any respect, I believe that the names of the members of the Council should be recorded in this report. Mr. W. A. Harriman is at present chairman of the Council.

*General council members*

F. B. Adams, New York, N. Y.  
 Shreve M. Archer, Minneapolis, Minn.  
 Wm. L. Batt, Philadelphia, Pa.  
 John D. Biggers, Toledo, Ohio.  
 Jas. F. Brownlee, Louisville, Ky.  
 Charles A. Cannon, Kannapolis, N. C.  
 Wm. L. Clayton, Houston, Tex.  
 David R. Coker, Hartsville, S. C.  
 William H. Danforth, St. Louis, Mo.  
 Henry S. Dennison, Framingham, Mass.  
 R. R. Deupree, Cincinnati, Ohio.  
 Wm. C. Dickerman, New York, N. Y.  
 Thomas A. Dines, Denver, Colo.  
 Gano Dunn, New York, N. Y.  
 Col. R. G. Elbert, New York, N. Y.  
 Dr. W. Y. Elliott, Cambridge, Mass.  
 John H. Fahey, Washington, D. C.  
 Lincoln Filene, Boston, Mass.  
 T. Austin Finch, Thomasville, N. C.  
 Ralph E. Flanders, Springfield, Vt.  
 Robert P. Fleming, Washington, D. C.

James F. Fogarty, New York, N. Y.  
 M. B. Folsom, Rochester, N. Y.  
 Clarence Francis, New York, N. Y.  
 H. B. Friele, Seattle, Wash.  
 A. P. Greensfelder, St. Louis, Mo.  
 Rolland J. Hamilton, New York, N. Y.  
 Henry I. Harriman, Boston, Mass.  
 W. A. Harriman, New York, N. Y.  
 Henry H. Heimann, New York, N. Y.  
 Charles R. Hook, Middletown, Ohio.  
 Frank C. Jones, Passaic, N. J.  
 William A. Julian, Washington, D. C.  
 H. P. Kendall, Boston, Mass.  
 Fred I. Kent, New York, N. Y.  
 de Lancey Kountze, New York, N. Y.  
 Morris E. Leeds, Philadelphia, Pa.  
 Dr. C. K. Leith, Madison, Wis.  
 Paul W. Litchfield, Akron, Ohio.  
 Earl M. McGowin, Chapman, Ala.  
 Geo. H. Mead, Dayton, Ohio.  
 Kermit Roosevelt, New York, N. Y.

Geo. A. Sloan, Greenwich, Conn.  
 E. T. Stannard, New York, N. Y.  
 E. R. Stettinius, Jr., New York, N. Y.  
 R. Douglas Stuart, Chicago, Ill.  
 Gerard Swope, New York, N. Y.  
 Walter C. Teagle, New York, N. Y.  
 J. T. Trippe, New York, N. Y.  
 Thomas J. Watson, New York, N. Y.

Sidney J. Weinberg, New York, N. Y.  
 Samuel P. Wetherill, Philadelphia, Pa.  
 W. H. Wheeler, Jr., Stamford, Conn.  
 H. Hyer Whiting, San Francisco, Calif.  
 S. Clay Williams, Winston-Salem, N. C.  
 Gen. Robert E. Wood, Chicago, Ill.  
 R. W. Woodruff, Atlanta, Ga.

### FISHERY ADVISORY COMMITTEE

For the purpose of advising the Secretary of Commerce and the Commissioner of Fisheries on the problems of development, promotion, and regulation of the fisheries of the United States and its territories, the Fishery Advisory Committee was organized on March 22, 1935.

All segments of the fishery industry and related fields of activity are represented on the Committee. The membership consists of prominent fishermen, processors, canners, and distributors of fishery products, as well as representatives from the fields of science, medicine, refrigeration, and transportation.

In January of this year the Committee became affiliated with the Business Advisory Council and has operated as a committee of this body through the activities of six regional committees and the executive committee.

The Committee has been most cooperative, and much of the credit for the establishment of the new fishery marketing service and the assistance in enabling the Bureau of Fisheries to undertake the needed survey of the pilchard fisheries should be given this group of men who received no remuneration and bear all expenses which they incur incidental to attending meetings.

Among the subjects of interest to the fishery industry and general public now before the Committee are: Education and extension service; protection of game and migratory fish; fishery surplus; international relations; fishery research; marketing and distribution; and fishery standards.

Following the Committee meetings a report, including an account of the business session, reports of the subcommittees, and recommendations, is presented to the Secretary of Commerce. These suggestions are studied by the Bureau of Fisheries with a view to seeing how the desired results may be realized.

The names of the members of the Fishery Advisory Committee follow: Gardner Poole, chairman; L. H. Smith, vice chairman.

#### *Great Lakes and inland waterways region*

O. L. Carr, Kansas City, Mo.  
 L. H. Smith, Port Washington, Wis., chairman.  
 Chas. W. Triggs, Chicago, Ill.  
 Fred Westerman, Lansing, Mich.  
 E. L. Wickliff, Columbus, Ohio.

#### *Gulf region*

C. W. Gibson, Corpus Christi, Tex.  
 John La Nasa, New Orleans, La.  
 Francis Wm. Taylor, Pensacola, Fla., chairman.

#### *Middle Atlantic region*

O. G. Dale, Jr., New York City.  
 W. A. Ellison, Jr., New York City.  
 Geo. T. Harrison, Tilghman, Md.  
 Capt. Thomas H. Hayes, Brooklyn, N. Y.  
 J. H. Matthews, New York City, chairman.  
 H. A. McGinnis, Philadelphia, Pa.  
 Capt. Sven Marthin, Wildwood, N. J.

#### *Middle Atlantic region—Continued*

Dr. Lewis Radcliffe, Washington, D. C.  
 Dr. R. V. Truitt, College Park, Md.

#### *South Atlantic region*

Frank D. Fant, Jacksonville, Fla.  
 Sol Fass, Portsmouth, Va., chairman.  
 Dr. William Weston, Columbia, S. C.

#### *New England region*

Thomas J. Carroll, Gloucester, Mass.  
 E. H. Cooley, Boston, Mass., chairman.  
 Capt. M. G. Magnusson, Winchester, Mass.  
 Gardner Poole, Boston, Mass.  
 Rufus H. Stone, Portland, Maine.

#### *Pacific region*

H. J. Anderson, San Francisco, Calif.  
 Lawrence Calvert, Seattle, Wash.  
 Arch E. Ekdale, San Pedro, Calif.  
 H. B. Friele, Seattle, Wash., chairman.  
 E. B. McGovern, Seattle, Wash.

**NEW LEGISLATION RECOMMENDED**

The heads of the bureaus of the Department are not only greatly interested in measures now before the Congress for study, but they also believe certain new legislation is desirable, in the light of specialized experience in their respective fields. The views of these officials are respectfully submitted herewith for the consideration of the Congress.

**Air Commerce.**

A committee composed of governmental agencies has been appointed by the Secretary of Commerce, at the request of the President, to review present air legislation and all pending bills. Upon completion of this study a bill looking toward suitable legislation that will provide a permanent American aviation policy, including both domestic and international aviation activities, will be prepared for consideration of the President.

**Census.**

The Census Bureau is preparing for submission to the Bureau of the Budget this fall, and for introduction at the next regular session of Congress, the necessary legislation to provide for the next decennial census of the United States which will be taken in 1940.

**Foreign and Domestic Commerce.**

Two measures already drafted for congressional consideration are of interest to this Bureau. The retirement bill for Foreign Commerce Service officers (S. 988), amending an act approved March 3, 1927, as amended, was passed by the Senate and is now pending in the House Committee on Interstate and Foreign Commerce. A second bill (S. 2940), "to make confidential certain information furnished to the Bureau of Foreign and Domestic Commerce, and for other purposes," was passed by the Senate and is now awaiting action by the House of Representatives.

**National Bureau of Standards.**

Two bills are pending before Congress that are of direct and immediate interest to this Bureau. Both measures were presented by the Department of Commerce.

The first measure (H. R. 7869) is concerned with fixing the standards of weights and measures of the United States. It is a remarkable fact that the customary system of weights and measures now so generally used throughout the United States has never been officially authorized by Congress. The proposed legislation seeks to correct this situation, establishes the standard meter bar and the kilogram as official standards of the Government, and defines the inch and the pound in terms of these standards by means of specified ratios. The inch, for example, is defined as equal to 25.4 millimeters, exactly. This bill has been reported favorably by the Committee on Coinage, Weights, and Measures and awaits the action of the House of Representatives.

The second measure covers title 1 of H. R. 7643 introduced by Mr. Eicher and provides for the further development of industry and commerce through research in the physical sciences. It authorizes Federal support of basic research in physics and chemistry at the

National Bureau of Standards and in universities, colleges, and non-profit research agencies throughout the country, in accordance with a coordinated program. It has been presented in the belief that the development of new industries in this country must rest in a large measure upon new basic discoveries in physics and chemistry and that Federal support of such research is justified in the interest of national development. Hearings on this measure have been held by the Committee on Interstate and Foreign Commerce and the bill is now in the hands of this committee.

#### **Bureau of Fisheries.**

The Commissioner of Fisheries believes that H. R. 7309, designed to cover the making of loans to fishery cooperatives, and to provide for service in connection therewith by the Bureau of Fisheries, should aid materially in improving the economic welfare of fishermen.

Pending legislation to create a division of water pollution control in the Bureau of the Public Health Service, and for other purposes embodied in H. R. 2711, likewise merits favorable action. This would prove beneficial not only to public health, but to fisheries of interior waters as well, especially if the pending bill were amended to provide for the inclusion of a fishery expert, as well as one versed in industrial and agricultural uses of water in the membership of the board of engineers of the Public Health Service which will approve designs for pollution abatement works.

The Bureau desires authority to design, construct, maintain, and operate fish-protective works such as screens and ladders, in irrigation projects constructed by any branch of the Federal Government, and authority to conduct necessary preliminary surveys for such structures, with the limitation that the major purposes of the irrigation projects will not be impaired. Future projects should provide sufficient excess water for operating fish protective works.

Also, authority is desired, and the necessary funds, to construct a fishery research vessel capable of exploring the fisheries of the high seas of the Northern Pacific Ocean for the purpose of acquiring scientific data which will aid in solving the increasingly acute problems resulting from the threatened exploitation of the Alaska fisheries by foreign nations.

#### **Lighthouse Service.**

Legislation is considered advisable to secure availability of lighthouse appropriations for the following objects: (1) Traveling expenses to and from isolated light stations of keepers of lighthouses on authorized leaves of absence and of new appointees to first post of duty at isolated light stations. Suggested limit of \$2,000 in any fiscal year; (2) transportation under regulations to be prescribed by the Secretary of Commerce of the children of lighthouse keepers where necessary to enable such children to attend school; (3) construction, improvement, or repair of roads, bridges, etc., and communication lines on property adjacent to light stations, to facilitate access to or communication with such stations. Suggested limit of \$5,000 per annum.

There is also recommended an amendment of the act of August 29, 1916 (39 Stat. 602), to confer proper military or naval status on personnel of the Lighthouse Service upon transfer to the Navy Department or the War Department in time of national emergency.

Legislation is also desired to authorize purchase of a site for a lighthouse depot at St. Louis, Mo.; and to exempt commuted funds in the messes of lighthouse vessels from the provisions of the act of June 26, 1934, relating to trust funds.

#### **Coast and Geodetic Survey.**

There is need for legislation to regulate the distribution and promotion of the field engineers of the Survey, a group of 171 commissioned officers who administer the Bureau, direct its field operations, and are responsible for its engineering accomplishments. The purpose would be to make it possible to promote to higher classification after reasonable periods of service, independent of vacancies occurring as a result of retirement or death. At present this is not possible. A condition of intolerable stagnation inevitably must result from an excessive number of officers in the lower grades and too few in the higher.

#### **Marine Inspection and Navigation.**

Owing to the inadequacy of present laws governing motorboats, a draft of a new bill, to cover the defects disclosed by experience, has been prepared in the Bureau and it is hoped this new legislation will be introduced at an early date.

#### **Patent Office.**

Several bills affecting the grant of patents and the registration of trade-marks were introduced in the Congress, but none of direct importance to the Patent Office was enacted. Two of these proposed measures were regarded by the Commissioner as promising necessary and salutary improvements in the patent system and therefore as helpful to individual inventors, to industry, and to the public. They are: S. 1883 designed to amend section 9 of the Trade-Mark Act of February 20, 1905, so as to provide that section 4915, Revised Statutes (U. S. C., title 35, sec. 63), "shall not apply to trade-mark cases." S. 475, believed by the Patent Office Advisory Committee, to be of prime significance, contemplates the creation of a single court of patent appeals as a means of preventing the conflict and confusion now resulting from divergent and incompatible decisions rendered by the several Federal courts having jurisdiction of litigation involving the ownership, validity, and scope of patents.

Sincerely yours,

DANIEL C. ROPER,  
*Secretary of Commerce.*

## REPORT BY BUREAUS

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### CHIEF CLERK AND SUPERINTENDENT

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Notwithstanding the performance of 866 days of overtime work during the year and the necessity of borrowing help from other branches of the Department, the various Divisions of the Secretary's Office were hard pressed to keep the work current. The employees responded cheerfully and cooperatively, but the lack of adequate personnel produced a situation far from satisfactory. The nature of the work performed by these Divisions requires expeditious handling, and delay in many instances retards and congests the work of the Department and its Bureaus. Added employees in all Divisions are absolutely necessary for prompt dispatch of business and good administration.

#### INTERNATIONAL CONFERENCES AND EXPOSITIONS

*Paris International Exposition.*—The Congress having authorized representation at the International Exposition at Paris (May to November 1937) and appropriated funds therefor, this Department cooperated with other agencies in participating. Animated maps from the Bureaus of Air Commerce and Foreign and Domestic Commerce, transparencies, pictures, and a few models from other Bureaus completed the Department's contribution.

*Great Lakes Exposition.*—Renewed representation in the exposition at Cleveland, which reopened May 29 for 3 months, was authorized by Congress. The exhibit was much improved by the addition of an animated map of the Great Lakes area, showing branch offices of the Department, and installation of a central information booth surrounded by cases displaying important publications of all bureaus. The Coast and Geodetic Survey installed an interesting diorama and the Bureau of Foreign and Domestic Commerce modified its exhibit. All other displays were left intact.

*Greater Texas and Pan American Exposition.*—The Congress authorized renewed participation in the Texas Centennial Exposition (Dallas, June 12 to October 31), which, as indicated by its new name, stresses inter-American relations. A diorama portraying graphically a section of a Federal airway and one depicting trade of the United States with Latin America were installed. All other units were left intact.

*International conferences.*—The Department was interested, also, in approximately 30 international conferences in the fields of science, education, commerce, and industry. It was active in the selection, either from its own personnel or appropriate unofficial organizations,

of nominees for membership on the official delegations to these meetings, and also cooperated with other agencies in the preparation of agenda.

#### DIVISION OF ACCOUNTS

The following table shows the amounts appropriated by Congress for the bureaus and offices of the Department for the fiscal year ended June 30, 1937, the amounts transferred to this Department from other Government Departments and agencies and the amounts transferred from this Department to other Government Departments and agencies, exclusive of funds appropriated under the several emergency appropriation acts:

Bureau or office	Annual appropriation acts	Deficiencies and supplements	Special expositions	From other departments	To other departments	Total
Office of the Secretary	\$931,500	\$240,000	\$22,057.74		-\$11,325.72	\$1,182,232.02
Bureau of Air Commerce	6,527,000	80,000		\$20,000	-140,000.00	6,487,000.00
Bureau of Foreign and Domestic Commerce	2,847,400			180,000		3,027,400.00
Bureau of the Census	1,865,500					1,865,500.00
Bureau of Marine Inspection and Navigation	2,203,860					2,203,860.00
National Bureau of Standards	1,854,500	89,400		305,323		2,249,223.00
Bureau of Lighthouses	9,475,600	181,890				9,657,490.00
Coast and Geodetic Survey	2,505,300			86,200		2,591,500.00
Bureau of Fisheries	1,563,920	60,000				1,623,920.00
Patent Office	4,660,000					4,660,000.00
Total	34,434,580	651,290	22,057.74	591,523	-151,325.72	35,548,125.02

Disbursements during the year ended June 30, 1937, from appropriations and from funds transferred from other Departments were as follows:

Bureau or office	Appropriation for—			
	1935	1936	1937	Total
Office of the Secretary	\$75.57	\$188,537.75	\$1,057,533.26	\$1,246,146.58
Bureau of Foreign and Domestic Commerce	1,611.53	98,906.65	2,858,981.13	2,959,499.31
Bureau of the Census	7,601.04	282,292.45	1,853,038.78	2,142,932.27
Bureau of Marine Inspection and Navigation	127.24	46,459.76	2,062,605.12	2,109,192.12
Patent Office	47.00	130,061.23	4,371,369.29	4,501,477.52
Coast and Geodetic Survey	947.31	356,752.63	3,408,125.26	3,765,825.20
National Bureau of Standards		137,452.17	2,410,458.35	2,547,910.52
Bureau of Lighthouses	2,717.97	767,457.97	11,689,588.26	12,456,764.20
Bureau of Fisheries	77.32	127,767.19	1,501,296.61	1,629,141.12
Bureau of Air Commerce	28,983.46	403,386.09	6,000,756.20	6,433,125.75
Total	42,188.44	2,539,073.89	37,213,752.26	39,795,014.59

#### MISCELLANEOUS RECEIPTS

Office of the Secretary:	
Sale of Government property	\$1,382.39
Other	369.88
Bureau of Air Commerce:	
Fines, violation of air-traffic regulations	970.00
Sale of Government property	10,090.27
Other	4,117.07

## MISCELLANEOUS RECEIPTS—continued

Bureau of Foreign and Domestic Commerce:	
Fees under China Trade Act.....	\$1, 175. 00
Sale of publications.....	59, 036. 35
Sale of Government property.....	465. 13
Other.....	27. 45
Bureau of the Census:	
Work done.....	3, 834. 79
Other.....	210. 00
Bureau of Marine Inspection and Navigation:	
Sale of Government property.....	1, 667. 04
Tonnage tax.....	1, 633, 903. 32
Navigation fines.....	45, 331. 08
Navigation fees.....	202, 777. 16
Assessments, overtime service.....	27, 552. 51
National Bureau of Standards:	
Testing fees.....	76, 128. 39
Other.....	38. 13
Bureau of Lighthouses:	
Sale of Government property.....	18, 694. 42
Other.....	8, 595. 90
Coast and Geodetic Survey:	
Sale of charts.....	72, 061. 12
Sale of maps.....	30, 396. 73
Sale of publications.....	8, 121. 63
Sale of Government property.....	1, 986. 31
Other.....	1, 199. 07
Bureau of Fisheries:	
Sale of furs.....	483. 71
Sale of sealskins.....	251, 112. 33
Sale of foxskins.....	19, 002. 27
Sale of Government property.....	8, 795. 06
Permits, fishing and hunting.....	9, 250. 00
Other.....	153. 42
Patent Office:	
Fees, 1936.....	379, 244. 60
Fees, 1937.....	3, 977, 086. 59
Total, Department of Commerce.....	6, 855, 259. 12

## DIVISION OF PERSONNEL

At the close of the fiscal year 1937, exclusive of 473 persons paid from emergency funds, the personnel of the Department numbered 14,698. Of that number, 4,584 were employed in the District of Columbia, and 10,114 in the field. The total personnel as of June 30, 1936, exclusive of 1,254 persons paid from emergency funds, was 15,533. Of that number 4,912 were employed in the District of Columbia, and 10,621 in the field.

The number of employees retired on annuity during the year under the Civil Service Retirement Act was 75—37 by reason of age, 35 on account of disability, and 3 by optional retirement. Under the Lighthouse retirement system, 27 were retired for age and 45 on account of disability. A total of 2,022 civilian employees have been retired under applicable statutes to the close of June 30, 1937.

## DIVISION OF PUBLICATIONS

The following statement shows for the fiscal year 1937 the amounts available for printing and binding, the amounts expended, and the unused balances:

## REPORT OF THE SECRETARY OF COMMERCE

Appropriation	Available	Expended	Balance
Printing and binding:			
Services other than the Patent Office.....	\$450,000	<sup>1</sup> \$446,377.69	\$3,622.41
Same, deficiency, to continue available until June 30, 1938.....	205,000	102,970.51	102,029.49
Patent Office.....	1,015,000	<sup>1</sup> 905,170.00	109,830.00
General expenses, Bureau of the Census.....	35,000	35,000.00	-----

<sup>1</sup> Estimated; exact figures cannot be given until all work ordered in that year is completed and billed.

Receipts from sales of the Department's publications for the fiscal year 1936 (the latest period for which complete data are available) were \$589,331.44, compared with \$557,174.47 for 1935. The following table presents a comparison for the 2 years by selling agencies:

Sales	Receipts	
	1935	1936
By the Superintendent of Documents: Miscellaneous sales and subscriptions....	\$141,943.65 <sup>1</sup>	\$142,826.24
By Coast and Geodetic Survey: Coast pilots, inside route pilots, tide tables, current tables, charts, and airway maps.....	73,432.17	92,332.35
By Patent Office: Specifications of patents, reissues, etc., trade-mark section and decision leaflet of Official Gazette, and classification bulletins and definitions.....	341,798.65	354,162.85
Total.....	557,174.47	589,331.44

## DIVISION OF PURCHASES AND SALES

During the fiscal year 1937 there were placed 12,171 purchase orders, which, including freight, travel, rent, and miscellaneous accounts, involved the expenditure of \$1,118,303. These amounts show a decrease in orders of 379 from the fiscal year 1936. However, the total expenditures was increased over the fiscal year 1936 by the amount of \$41,126. This increase in expenditures was due to increased activities in the Bureaus of Air Commerce and Marine Inspection and Navigation.

There were 552 contracts approximating \$2,411,445 submitted to this office for examination and forwarding for departmental approval by the various field offices of the Department. In addition to the above there were 32 formal contracts amounting to \$406,119 prepared by this Division, making a total of 584 contracts examined and prepared, involving a total expenditure of \$2,817,564.

Through the cooperation of the Procurement Division of the Treasury Department, there has been obtained by transfer, without exchange of funds, surplus and forfeited property valued at approximately \$130,000.

*Traffic Office.*—The Traffic Office of the Department was transferred to the Division of Purchases and Sales.

The fiscal year 1937 continued to be one of unsettled transportation conditions: Rates, fares, and charges have been on a sliding basis; some eastern fares have again been lowered; western carriers are using short-limit round-trip rates; mileage factors are being extended on freight rates, while "exception" tariffs are being more extensively used.

The travel of field employees of the Department to local points by bus is increasing, thus effecting savings over railroad fares. They are, also, when more economical, frequently using their own automobiles on a mileage basis for longer distances.

#### DEPARTMENT LIBRARY

At the close of the fiscal year the number of books and pamphlets in the Library was 230,859, and periodicals and newspapers, 1,645. The number of books and pamphlets cataloged was 7,766; cards added to the catalog, 36,876; number of books circulated, 39,945; books prepared for shelf, 7,673; books bound, 1,369; books borrowed from the Library of Congress and other libraries, 1,441; books loaned to other libraries, 568; N. R. A. hearings circulated, 1,260.

Especially to be noted in the work of the year just closed was the completion of the indexing and shelving of the transcripts of N. R. A. hearings. An index of the hearings held before special boards and commissions was completed. The circulation of these hearings attests to their continued active use.

## OFFICE OF THE SOLICITOR

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During the fiscal year ended June 30, 1937, there were 814 formal opinions rendered; 422 contracts totaling \$2,136,106, together with 75 contracts of indeterminate amounts; 600 leases amounting to \$110,168; 17 insurance policies amounting to \$673,140; 65 revocable licenses; 194 contract bonds amounting to \$1,370,992; 85 annual bonds and performance bonds; and 70 official bonds amounting to \$409,000 were examined, approved, disapproved, redrafted, or modified.

Legislative matters handled which concern the Department of Commerce numbered 265.

This office handled the Federal Register work for the Department.

There were many miscellaneous matters embracing all phases of administrative law and procedure handled. This office was frequently called upon to confer with representatives of the various Bureaus and render informal advice for the guidance of these Bureaus. In this connection, a great many oral and informal opinions were handled, embracing everything submitted for the advice or suggestion of the Solicitor, or for the formulation of departmental action, not included in the foregoing items.

## BUREAU OF AIR COMMERCE

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A new plan of organization for the Bureau of Air Commerce, perfected the latter part of April, placed all activities of the Bureau under a Director, aided by an Assistant Director, with supervision over seven principal divisions as follows: Airways Engineering, Airways Operation, Safety and Planning, Administrative, Information and Statistics, Certificate and Inspection, and Regulation and Enforcement.

A Policy Board, composed of the Director, Assistant Director, and heads of the seven divisions with the Technical Assistant to the Director acting as secretary, was formed to deal with all matters affecting policy within the Bureau.

In addition, an Advisory Board to the Bureau, consisting of civilian and other representatives of all aviation interests, was appointed.

### THE FEDERAL AIRWAYS SYSTEM

*Radio.*—The Bureau-sponsored Radio Technical Committee for Aeronautics continued actively as the recognized radio-coordinating agency for the aviation industry, radio manufacturers, research organizations, and the aeronautical branches of military, naval, and other governmental departments. Technical subcommittees met at frequent intervals for preparation of engineering recommendations on various radio technical problems which were considered in meetings of the main committee. International exchange of ideas on aeronautical radio was effected through a meeting at Bucharest of the Radio Consulting Committee of the International Telecommunication Union.

A program of modernization of ground aids was inaugurated during the year, involving conversion of all existing airway broadcast and radio range stations to the simultaneous system of transmission. Detailed engineering specifications were prepared covering all components of a complete standard facility of this type. Incorporated therein were all of the latest improvements, including a single-unit transmitter, a new design of tower radiator with special counterpoise for reduction of the course instability, sometimes experienced with earlier types of antennas, and a lighter and more efficient filter for separation of voice and range signals in simultaneous reception.

Experimental work on the blind-landing system installed at Indianapolis was continued and an experimental installation was also made of the Lorenz (German) blind-landing system. As a result of the tests, agreement was reached by the various interested aeronautical agencies regarding the requirements for a service installation.

The development of transmission by radio teletypewriter has been continued to the point where reliability equal to land wire operation

has been attained. Extension of this system to permit automatic teletype transmission of meteorological and other information to aircraft in flight has been under investigation.

Design was completed on several forms of ultrahigh-frequency transmitters and special antennas for the purpose of furnishing the pilot precise indication of his position as required by present instrument-navigation technique and airway-traffic control procedure. Two service-type, crystal-controlled transmitters, operating on 75 megacycles (the new frequency recommended by the Radio Technical Committee for Aeronautics) have been service-tested, and have been ordered for quantity installation. Ultrahigh-frequency radio receivers for use in receiving the signals from these markers have also been developed.

Development has been started on ultrahigh-frequency radiotelephone communication for airport traffic control to relieve the intermediate frequency band and reduce interference between airport stations.

A special type of remote-control receiving antenna was designed and procured to provide more efficient and reliable radio reception from aircraft. An economical means was also worked out for modifying a considerable number of radio transmitters which would otherwise have required replacement to meet new requirements. Greatly improved frequency stability of radio transmitters was also made possible by the development of low-frequency quartz crystals which are essentially independent of frequency variations accompanying changes in temperature.

*Communications.*—During the fiscal year Pittsburgh and Chicago were added to the list of stations broadcasting weather reports on 236 kilocycles, to permit operation of radio range stations continuously except for interruption during emergency broadcasts to specified aircraft. Interference between stations broadcasting on the frequency of 236 kilocycles prevents the extension of this operating principle to all stations.

Arrangements were made to receive communications from aircraft on the working frequency of 3120 kilocycles, after the establishment of contact on the calling frequency of 3105 kilocycles. Arrangements were also made for the reception of communications from aircraft on the frequency of 6210 kilocycles on prearranged contact schedules during daylight hours.

Continuous receiving watch on the frequency of 3105 kilocycles was established at Bureau of Air Commerce radio stations which previously guarded this frequency only upon request. All Bureau stations equipped for radiotelephone communication with aircraft now maintain continuous receiving watch on 3105 kilocycles.

A study was made of teletypewriter communication circuits and necessary plans were completed to increase the speed of message transmissions from 40 words a minute to 60 words a minute.

*Airway traffic control.*—On July 6, 1936, the Bureau of Air Commerce assumed entire responsibility for the operation of the three airway-traffic control stations at Newark, Cleveland, and Chicago, these stations having previously been established and operated by the airlines in cooperation with the Bureau of Air Commerce. Under Federal control, the jurisdiction of the airway-traffic control organi-

zation has been extended to include, in addition to airline operation, the operation of itinerant aircraft, including those engaged in Army, Navy, Coast Guard, and private flying. Regulations were established requiring that flight plans for all intentional instrument flights on civil airways be approved prior to departure.

Additional airway-traffic control stations were established and placed in operation at Pittsburgh, Detroit, Washington, Burbank, and Oakland, making a total of 8 stations, with each station in operation approximately 16 hours a day during the period of most traffic.

Major additions to station equipment included the installation of recording equipment for the purpose of recording all interphone conversations, and the development of semiautomatic blackboards showing the sequence of arrivals at an airport and over radio-marker fix points.

*Lighting.*—As a result of information obtained in the previous year on various types of lighting units available for use in an airport approach system, a service unit was designed and produced, consisting of a 5-foot neon tube mounted in a troughlike housing in front of a parabolic reflector, which gathers and projects all the light in the direction of an approaching plane. The development of runway illuminators was continued and 1 set of 10 service-type units has been fabricated for test installation.

*Airway extension.*—The scope of the airway system at the beginning and end of the fiscal year is shown in the following table:

Item	July 1, 1936	June 30, 1937
Airway mileage:		
Lighted.....miles.....	21,868	22,399
Day (unlighted).....do.....	71	176
Lighted routes on day airway status (lights not operating).....do.....	482	441
New routes under construction.....do.....	10	437
Intermediate landing fields.....number.....	289	280
Beacon lights in operation.....do.....	1,893	1,916
Radio communications stations.....do.....	82	82
Radio range stations.....do.....	147	164
Radio marker stations.....do.....	56	55
Teletypewriter circuits.....miles.....	13,325	13,885

<sup>1</sup> Some final details of construction were still under way on the Nashville-Washington and Seattle-Twin Cities routes.

#### TRANSOCEANIC ROUTES

The trans-Pacific air route operating from San Francisco was extended from Manila to Macao (Portugese colony in Asia) and Hong Kong during the year, giving through service for mail, passengers, and express from the United States to the Orient. Exploratory flights were being made looking toward the provision of service to Australia and New Zealand.

Exploratory flights were also being made with a view to opening service across the North Atlantic, which offers some of the most troublesome problems in air navigation, due to the long overwater stretches and treacherous weather. Regular passenger service was opened between the United States and Bermuda with an American airline and a British company each providing schedules.

## REGULATION OF AIR COMMERCE

*Airline inspection.*—Inspections were made on a number of new services and extensions to airlines already in operation. Owing to the fact that a number of new, faster, and larger aircraft replaced those previously in operation on some routes, it was necessary to check-out pilots and inspect fields to be used by the new craft.

Regulations governing the operation of scheduled airlines were revised and redrafted to become a part of the new Civil Air Regulations, and conferences were held with those affected by the changes.

A comprehensive survey of scheduled airlines under American jurisdiction operating outside of the continental United States was started and will be continued into the next fiscal year with a view to developing regulations similar to those to be promulgated for domestic airlines but applicable to the special conditions encountered in long overwater flights, absence of airway aids, and weather reporting. Inspections were made of the Oakland-Philippine Islands, Alaskan, and South American operations.

*General inspection.*—The air commerce regulations governing the licensing of airmen and aircraft, and nonairline civil flying, were redrafted for inclusion in the Civil Air Regulations. Activities have increased approximately 25 percent during the fiscal year.

*Airworthiness of aircraft and equipment.*—The airworthiness requirements for airplanes, engines, propellers, and equipment, which form a basis for the rating of designs presented for approval, were redrafted to become a part of the new presentation of all requirements, the Civil Air Regulations. Through several meetings and the preparation of additional publications, the Bureau continued as an active member of the Army-Navy-Commerce Committee on Aircraft Requirements.

The volume of work received, expressed in new designs, was practically doubled. Included in this work, handled by the west coast branch and the Washington office, are several projects for giant flying boat and stratosphere landplane aircraft. These projects, although started in the last fiscal year, are still in process of being examined for approval. In order to accommodate requests for expedition of approvals, steps were taken to enlarge the engineering staff and establish a branch office at Kansas City, Mo.

*Airway coordination.*—Owing to the greatly increased volume of business requiring analysis and coordination before issuance of clearance, an airway coordination section was created to clear proposed changes and additions in air navigation aids on the Federal Airways System. Its activities during the year included the computation of air-mail contract mileage for the Post Office Department, preparation of airline maps showing regular and alternate routes, preparation of civil airway maps and designations, clearance of proposed radio tower locations for the Federal Communications Commission, and recommendation of painting and lighting specifications for all obstructions to air navigation.

*Instrument flight training.*—A number of airline, school, and Bureau flight personnel were given instruction in the Bureau's instrument trainer and in a course developed for training pilots to fly by instruments. The practicability of this type of equipment for pri-

mary instrument training was demonstrated and plans were made to give such instruction to all Bureau of Air Commerce flight inspectors.

*Legal.*—During the fiscal year a comprehensive regulatory program was initiated concerned with the revision and codification of the civil air rules and regulations embracing the following 8 major titles which, in turn, cover almost 100 different subjects; aircraft, airmen, air navigation facilities, air carriers, air agencies, air navigation (within the United States), air navigation (without the United States), and miscellaneous. This work is being continued and every effort is being made to perfect a comprehensive and complete codification of rules and regulations covering every phase of the Bureau of Air Commerce under the 1926 statute and amendments.

The Bureau has continued active participation in the activities of the Interdepartmental Committee on Civil International Aviation which has been concerned mainly with the establishment of air routes and services in foreign air commerce. It has also continued its interest in matters pertaining to international air law, principally in the work of the International Technical Committee of Aerial Legal Experts.

*Accident analysis.*—Statements were issued covering the probable cause of 11 airline accidents and 15 accidents in miscellaneous flying operations. Public hearings were held on seven airline accidents and one accident in miscellaneous flying.

#### DEVELOPMENT

*Aircraft.*—A small twin-engined transport plane was delivered during the year for experimental use and the instruction of inspectors. This airplane, developed as a result of a competition held by the Bureau, was designed to fill the need for a small airplane having the performance and equipment available on the larger transport type. Contracts were also made for a tailless airplane, incorporating radically new design features, and for an aircraft powered with a modified automobile engine, to be equipped with both a conventional undercarriage and a new type of undercarriage incorporating the safety features of the tricycle type. An amphibious float gear for attachment to land planes, to permit operation from both land and water, was delivered during the year.

*Miscellaneous.*—An arrangement was entered into with the Massachusetts Institute of Technology for the development of a new type blind landing system. One version of this system will have a straight inclined radio beam characteristic of other radio blind landing systems. Another version will incorporate an inclined path defined by a source of infra-red light energy.

A special type radio compass was ordered during the year. This compass is intended for use in the development of an instrument which will indicate to the pilot the presence of other aircraft in his flight path to guard against collision while engaged in instrument flying in conditions of poor visibility.

Research was started into all phases of pilot fatigue for the purpose of determining and eliminating possible sources of pilot error. At the same time these studies were extended to include passenger com-

fort and safety, particularly from the standpoint of altitude effects produced by oxygen starvation and pressure change. A contract was entered into with a research scientist of Columbia University for a detailed study of over 200 subjects, representative not only of all the usual types of passengers, but of pilots also, under various stages of oxygen starvation. The staff of the Fatigue Laboratory of Harvard University has also collaborated in this research. Studies were conducted and a report prepared on the dangers of carbon monoxide in aviation, including methods of detection and elimination.

### AIRPORTS

In the interest of developing a long-term program of airport and airway development, surveys were initiated in connection with a project for the photographing and making of prints to scale of each airport in the United States. Surveys were also started to determine existing facilities at all airports and to collect financial information concerning them. Tests were being made at major airports in different sections of the United States with a battery of four synchronized motion-picture cameras to determine exact take-off and landing distance required by various types of airplanes in different atmospheric conditions and at varying altitudes, together with the rate of climb immediately after take-off. The results of these surveys, together with recommendations of the Post Office Department, Navy Bureau of Aeronautics, Army Air Corps, private flyers, scheduled airlines, and commercial operators will form the basis for future airport planning.

The Bureau continued its participation in the Works Progress Administration airport development and construction program. Airport projects undertaken by the Works Progress Administration require the approval of the Bureau of Air Commerce as to the technical aeronautical features of the work on completion, the aim being to secure satisfactory and safe aeronautical facilities. As of June 30, 1937, a total of 937 airport and air marking projects had been initiated, involving \$93,983,426 of Federal funds.

*Air marking.*—As a result of the air marking program sponsored by the Bureau of Air Commerce under the works program, 7,761 markers have been completed in 46 States. The Bureau has maintained constant supervision over these projects and in addition has promoted other sponsors where Works Progress Administration assistance was not available.

*Airport rating regulations.*—Regulations governing the rating of airports were in process of preparation during the year.

*Seaplane facilities.*—The Bureau actively participated in the establishment or improvement of seaplane facilities throughout the United States by furnishing engineering and technical advice to sponsors of these projects.

### ADMINISTRATION AND DISSEMINATION OF INFORMATION

The Administrative Division, in addition to handling its regular routine duties, effected further simplification in methods, particularly with respect to procedure incident to leasing real estate and maintenance of records, keeping of accounts, and standardization of clerical

organization in airways district offices. The aeronautics information section continued its duties of disseminating information through printed bulletins, special articles and correspondence, photographs, compilation of statistics, and supplying of information on airports.

### APPROPRIATIONS AND PERSONNEL

A tabulation showing amounts that have been appropriated for the work of the Bureau of Air Commerce since it began to function follows:

Fiscal year—	Departmental salaries	Aircraft in commerce	Safety and planning	Maintenance of air navigation facilities	Establishment of air navigation facilities	Traveling expenses	Total
1927.....		\$250,000.00		\$300,000.00			\$550,000.00
1928.....		700,000.00		3,091,500.00			3,791,500.00
1929.....		885,850.00		4,689,550.00			5,575,400.00
1930.....		1,143,000.00		5,533,320.00			6,676,320.00
1931.....		1,263,430.00		7,944,600.00			9,208,030.00
1932.....		1,369,660.00		8,992,640.00			10,362,300.00
1933.....		1,000,000.00		7,553,500.00			8,553,500.00
1934.....		1,070,570.00		6,590,210.00			7,660,780.00
1935.....		676,249.54		5,004,782.45			5,681,031.99
1936.....		734,800.00		5,189,600.00			5,924,400.00
1937.....	\$390,000	733,000.00		4,844,080.00	\$882,920		6,850,000.00
1938.....	628,000	1,582,000.00	\$292,000	5,698,700.00	3,037,800	\$437,813	11,676,313.00

<sup>1</sup> The act provides that, in addition to this amount, contracts for the purchase, construction, and installation of air navigation aids totaling \$2,000,000 may be entered into prior to July 1, 1938, and \$2,000,000 prior to July 1, 1939.

Statistics on personnel employed by the Bureau of Air Commerce on June 30, 1937, and on the corresponding date of the preceding year follow:

Item	June 30, 1936			June 30, 1937		
	District of Columbia	Field	Total	District of Columbia	Field	Total
Salaries, Bureau of Air Commerce.....				204		204
Aircraft in commerce.....	110	114	224	180		180
Establishment of air navigation facilities.....				81		81
Maintenance of air navigation facilities.....				1,457		1,457
Air navigation facilities.....	55	1,765	1,820			
Total.....	165	1,879	2,044	204	1,718	1,922

<sup>1</sup> In addition on June 30, 1936, there were 74 employees engaged on projects sponsored by Works Progress Administration and Public Works Administration, and 5 on development work.

<sup>2</sup> In addition on June 30, 1937, there were 81 employees engaged on projects sponsored by the Works Progress Administration.

## BUREAU OF THE CENSUS

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### INTRODUCTION

During the past fiscal year the Bureau has completed several large projects, among which special attention should be called to the Census of Business, the Census of Agriculture, and the Census of Manufactures, all for 1935. These major statistical inquiries provide a more complete picture of the economic life and resources of our country than has ever before been available at one time. New base lines have been established in the statistics of business, industry, and agriculture from which, by the use of current reports of the Census Bureau and other agencies, it will be possible to measure more accurately the trends for several years to come. Our present need is for a more complete coverage of current data—coverage both as to the lines of economic activity reported and the number of establishments reporting. This is especially true as regards wholesale trade, retail trade, service establishments, amusements, construction, etc., subjects covered in the Census of Business.

*Legislation for the Sixteenth Decennial Census.*—The Bureau has studied carefully the needs of other Federal agencies and the demands of sound public policy in relation to the next decennial census which will be taken in 1940. The past 8 years have brought such epochal changes in the functions of government and the organization of American life as to make imperative a revision of census law. Among the more apparent needs for basic data on a national scale may be noted the following: (1) Population details by small areas should be secured at 5-year rather than 10-year intervals; (2) employment data as well as unemployment and occupations should be gathered at the time of a population census; (3) housing data in addition to that usually secured in the decennial census should be obtained to serve the Federal, State, and local housing agencies; (4) certain basic facts on farms must be secured more often than every 5 years; and (5) some fundamental data on the activities of business and industry should be obtained at least on an annual basis, still leaving the more complete picture to be obtained quinquennially through complete national censuses, such as those now published for 1935.

The Bureau is now preparing recommendations to meet these most urgent needs through a revision of census legislation. After administrative clearance, and with the cooperation of other agencies, suggestions for the Sixteenth Decennial Census legislation will be presented at the next session of Congress.

*Preparations for the next decennial census.*—Preparations for the next decennial census are already well under way. The Bureau's mechanical laboratory is rebuilding the 24-column card machines used

in 1930 to tabulate the 45-column cards which will be required in 1940. New maps are being prepared for all areas in which there have been major political unit boundary changes since 1930. Trial schedules have been prepared for the 1940 farm census and will be experimentally used by the Department of Agriculture during the coming year. Work on the population schedule will begin this fall. Foreign censuses are being studied for suggestions as to improvement in methods; the Chief Statistician for Population will visit several European countries while he is abroad as a delegate to the International Population Congress in Paris this summer. But, preparations for the next census must be limited to the more general aspects of this work until the framework of legislation is definitely established.

*Advisory committees.*—In attaining and maintaining a high standard of work the Bureau seeks the technical advice of recognized authorities in all fields of social and economic life reported in our statistical services. Correspondence and occasional conferences have brought advice and constructive criticism for all aspects of census work since the origin of the Bureau. However, the need for a standing census advisory committee was early recognized, and in 1918 such a committee was appointed by the American Statistical Association and the American Economic Association at the request of the Secretary of Commerce. After 19 years of service the Census Advisory Committee was reorganized in 1937 as a special committee of the American Statistical Association. To this committee are referred all the general technical problems of the Bureau and all reports and recommendations of such groups as may be organized for intensive consideration of particular aspects of our work.

The Census Advisory Committee is now composed of the following statisticians:

MURRAY R. BENEDICT, acting director, Giannini Foundation, professor of agricultural economics, College of Agriculture, University of California, Berkeley, Calif.

ROBERT E. CHADDOCK, professor of statistics, Columbia University, New York City.

PAUL T. CHERINGTON, Cherington and Roper, New York City.

J. FREDERIC DEWHURST, economist, Twentieth Century Fund, New York City, and director, Committee on Social Security, Social Science Research Council, 726 Jackson Place, Washington, D. C.

FREDERICK C. MILLS, professor of economics and statistics, Columbia University, New York City, and member of the Research Staff of the National Bureau of Economic Research, New York City.

WILLIAM F. OGBURN, professor of sociology, University of Chicago, Chicago, Ill.

A special advisory committee on vital statistics, appointed by the Secretary of Commerce, has been formed to consider the problems peculiar to census work in this field. The membership of this special committee is as follows:

HAVEN EMERSON, College of Physicians and Surgeons, Columbia University, New York City.

LOUIS I. DUBLIN, Metropolitan Life Insurance Co., New York City.

ROBERT E. CHADDOCK, Fayerweather Hall, Columbia University, New York City.

LOWELL J. REED, school of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md.

ROBERT OLESEN, Assistant Surgeon General, United States Public Health Service, Washington, D. C.

EARLE G. BROWN, State health officer, Topeka, Kans.

STEWART G. THOMPSON, State registrar, Jacksonville, Fla.

The statistical and accounting problems involved in the compilation of financial statistics of States, cities, and other governmental units are especially difficult. To handle these problems and make the Bureau's reports of maximum value to officials and researchers, the Secretary of Commerce has recently appointed the following special Advisory Committee on Financial Statistics:

FREDERICK L. BIRD, municipal service department, Dun & Bradstreet, Inc., New York City.

WELLES A. GRAY, finance department, United States Chamber of Commerce, Washington, D. C.

A. M. HILLHOUSE, National Committee on Municipal Accounting, Chicago, Ill.

DAN O. HOYE, city controller, Los Angeles, Calif.

CHARLES J. FOX, city auditor, Boston, Mass.

#### CENSUS OF BUSINESS

The Census of Business, designed to provide a picture of essential items of business information concerning most lines of business activity in the United States in 1935, was completed and all final reports were issued by June 30, 1937. Much broader in scope than either the Census of Distribution for 1929 or the Census of American Business for 1933, it included retail and wholesale trades, service businesses, amusement enterprises, hotels, broadcasting stations, banking and other financial institutions, advertising agencies, real estate agents, bus transportation, motor trucking for hire, public warehousing, contract construction, and distribution of manufacturers' sales through primary channels. In cooperation with the Bureau of Mines, data comparable with that for other business enterprises were also made available for mines and quarries, including the extraction of sand and gravel.

The 1935 census of retail and wholesale trade and of hotels represented a continuation of the statistical service started in 1929 in connection with the Fifteenth Decennial Census, and, together with 1933, it provides comparative data for a third period. Insofar as possible, comparability was maintained for the various area and trade classifications, thus furnishing a measure of trends and tendencies in business development for each trade and in every State, county, and city in the United States.

The data of this census, when considered with the Census of Manufactures for 1935 and the agriculture census for the same year, permit a fairly complete analysis of American economic life. Extensions in scope over 1929 or 1933 were inaugurated in order to include important fields regarding which reliable statistical information was limited or not available. These extensions were designed to cover activities not included in other census studies or for which comparable data were not available from other agencies.

Funds to defray the expenses of this project were made available in 1935 by the Works Progress Administration. In September of

that year the national headquarters were established in Philadelphia, in order to utilize an adequate number of security wage workers competent to perform the necessary tasks.

The field enumeration for the Census of Business was started in January 1936, but owing to difficulties in securing qualified security wage workers in sufficient numbers, it was not completed during that fiscal year. On June 30, 1936, there remained 2,692 out of a maximum of 16,331 enumerators in the field doing clean-up canvassing—approximately 165,000 of the 3,000,00 reporting establishments were enumerated during July, August, and September.

*Releases and reports.*—The results of the various phases of the census were made available as promptly as the field work was completed, first in the form of preliminary releases and later in the nature of final reports. Preliminary releases for the country as a whole were issued on radio broadcasts in July, on retail trade and on service establishments in October, and on wholesale trade in November. For retail and wholesale trade and for service establishments the summary reports were preceded by preliminary releases for States.

The first of the final reports, that on radio broadcasting, was issued in October, followed by two volumes on retail trade in December. In all, 41 separate volumes of final reports, 245,683 copies in addition to numerous releases, were published and distributed.

Basic data on the number of places of business, employment, and pay rolls were published for States, counties, and cities, where possible without disclosing individual operations. For most phases of the census, additional information (such as sales or receipts, operating expenses, credit business, and employment by occupational groups) was provided which was designed to enable individual operators to compare their accomplishments with others conducting their businesses under substantially similar circumstances. Numerous items of information of special interest to business establishments in each particular field were also included. The intent was to make the data as useful and practicable as possible.

*Mines and quarries.*—In keeping with the chief purpose of the Census of Business, namely, a reasonably complete and comparable analysis of business activity in the United States for 1935, data were needed on mines and quarries, corresponding to those developed in the regular decennial censuses. As the canvassing of these industries by census enumerators offered considerable possibility of duplicating the effort of the Bureau of Mines, a cooperative arrangement was effected whereby that Bureau, in connection with its annual study, became the sole collecting agency. The census inquiries were made a part of a single questionnaire, the results of which were tabulated by the Bureau of Mines and turned over to the census for publication. The added expenses were paid from the Census of Business funds. Altogether 52 industry reports were issued, of which a total of 142,000 copies were distributed.

*Summary of personnel and pay roll by counties.*—In order to bring together in convenient form all data on employment and pay roll a special report entitled "Personnel and pay roll in industry and business, and farm personnel, by counties" was issued. This volume presents a summarization by counties of employment, pay roll, and

proprietorship data, which were collected in connection with the various phases of the 1935 Census of Business; employment and pay roll data compiled from the results of the Biennial Census of Manufactures for 1935; and data on farm personnel from the 1935 Census of Agriculture.

This study, which was the first of its kind to be published by the Bureau, proved to be of great value to governmental agencies interested in employment by areas and by character of the business houses. It also serves as a convenient manual for chambers of commerce and similar civic organizations in analyzing their communities. For businessmen, it furnishes a new basis for establishing a purchasing power index, a factor which is extremely important in the establishment of sales quotas.

*Intracity business census statistics.*—Since the inception of the Census of Distribution in 1929 there has been a growing realization that for the larger cities of the United States, intracity statistics are needed as a refinement for city-wide publications. In recognition of this need, studies were made to determine the problems of providing intracity business statistics. Experiments were based on the retail census schedules for Chicago, Philadelphia, Cleveland, and Atlanta, in order to evolve a tenable method for breaking the larger cities into business areas. The results of the study for Philadelphia were released in report form. In the Philadelphia report are studied separately the five major types of retail structure possessed in common by the principal cities, namely: (1) The central business district; (2) the outlying business center; (3) the principal business thoroughfare; (4) the neighborhood business street; and (5) the isolated store cluster.

*Retail trade survey.*—As a part of the Census of Business, a study was made of the feasibility of a sample census of retail trade. In the absence of special funds, such as those made available in 1933 and again in 1935, no provision is made by present census law for further complete enumerations of retail distribution, except in connection with the regular decennial censuses. For most practical purposes, a gap of 10 years is too long. Marketing technicians, governmental bureaus, and businessmen would be compelled to rely on data which would be obsolete within 2 or 3 years. On the other hand, annual or biennial canvasses of retail stores would involve large expenditures.

Consideration was given to a procedure less expensive than complete enumeration but which might provide the user of census material with more important information usually afforded by a complete canvass. This procedure has been designated as a sample census, by which is meant the complete canvass of a limited number of areas, cities or counties, less than the United States as a whole. This study is rapidly nearing completion.

*Demand for business data.*—The demand for business data is varied and widespread. Some of the more common uses of business census data are: (1) Market analysis—selecting key markets, selective selling by kind of business, measuring market potential, detecting and measuring trends in a market, measuring competitive effort; (2) evaluation of distribution channels and methods; (3) budget and quota building; (4) building sales territories and routing salesmen; (5)

allocation and measurement of advertising effort; (6) control of publication circulation; (7) development of trading areas to meet individual requirements; (8) selection of location; and (9) comparison of individual accomplishment with the standard for the group.

#### CENSUS OF MANUFACTURES

The field canvass on the 1935 Census of Manufacturers was terminated in October 1936, but the work of collecting outstanding returns by correspondence, by telephone, and by telegraph was not finished until late in November. As the canvass was made by business census enumerators, practically all of whom were inexperienced in manufactures census work, it progressed more slowly than in former censuses, and a large proportion of the returns were incomplete and otherwise defective, necessitating an unusually large amount of correspondence for the purpose of obtaining the additional data needed to correct and complete them.

The first preliminary industry report was issued under date of June 8, 1936, and the last appeared on June 3, 1937. Summaries by industries and by geographic divisions and States have been released. Although the preliminary industry reports did not include State figures, reports on approximately 50 industries are now available with State summaries.

Work on the final industry reports (for publication in the form of printed pamphlets) was begun in the latter part of the fiscal year. These reports will be issued in 53 octavo pamphlets, covering 329 industries, each pamphlet comprising a group of reports on cognate lines of activity. The manuscript for the first of these pamphlets was sent to the Government Printing Office about the close of May 1937, and the remaining pamphlets will be completed in July and August.

In addition to taking the biennial census of manufactures and preparing its results for publication, the Division of Manufactures makes special inquiries pertaining to the following subjects, covering activities in the even-numbered years (the years intervening between biennial censuses): Production and stocks of clay products; pulp-wood consumption and wood-pulp production; production of paper and paperboard; production of lumber, lath, and shingles, and stocks of lumber. The canvasses were made early in the calendar year 1937. Preliminary reports on lumber and clay products were published before the close of June; and the remainder of the preliminary reports and all the final reports of this series will be issued early in the fiscal year 1938.

#### CENSUS OF AGRICULTURE

The compilation of the returns of the 1935 Census of Agriculture, which was taken as of January 1 of that year, established a new record for a census of this size. As stated last year, within 12 months from the receipt of the first agricultural schedule in the Washington office tabulations had been completed for all States, counties, and minor civil divisions of the first series data. All State bulletins and volume I, which consists of the first series bulletins bound in one volume, were printed before June 30, 1936. The last of the second

series tabulations were completed in July 1936, the major portion having been finished in the preceding fiscal year. Volume II of the 1935 Census of Agriculture reports, an assembly of the second series State bulletins bound in one volume, was released in February 1937. Volume III, the General Report on Agriculture, consisting of an introduction, six chapters, and an appendix, came from the press in May 1937. A special bulletin entitled "Descriptive Supplement—Technique of Tabulation" was prepared and printed in which is explained in a brief way the method of handling schedules, punching cards, and sorting and tabulating by means of the Bureau's electric machines. A special study or monograph, "Part-Time Farming in the United States," will be ready for distribution early this fall.

The unusual demands for 1935 Census of Agriculture data reported last year have continued during the present year. Various governmental agencies engaged in planning work in connection with the agricultural program have continued to use these data. Most of the information collected at the 1935 Farm Census was tabulated by minor civil divisions but publication of the data for these small areas was impossible. Through the cooperation and financial assistance of the Resettlement Administration and the Agricultural Adjustment Administration which desired minor civil division data for their program planning work it was possible to make transcriptions of most of these data. Photostat copies of all tables were made available to these agencies for their use in Washington and in the States. These data are likewise being made generally available for the mere cost of photostating.

Special tabulations of 1935 Farm Census data needed in their work were made and paid for by the Social Security Board, Resettlement Administration, and the Bureau of Agricultural Economics of the Department of Agriculture.

*Preparations for the 1940 Census of Agriculture.*—A special committee has been appointed by the Secretary of Agriculture to work in the closest cooperation with the Bureau of the Census in the plans and preparations, including the make-up of the schedule, for the 1940 Census of Agriculture as well as to assist in the plans for tabulation and preparation of the reports. Because of an increasing demand for current county statistics, bills have been introduced at several sessions of Congress calling for a limited annual survey by the Department of Agriculture. The two Departments being vitally interested in this legislation have worked out a plan whereby the Department of Agriculture would do most of the field work in connection with the so-called limited census and the Bureau of the Census would do the office and tabulating work. Provisions for this restricted type of census along the lines mentioned above are to be included in the bill providing for the 1940 Census of Agriculture.

Some preparatory work for the 1940 Census of Agriculture has been done during the year just closed. A committee, consisting of representatives of the Department of Agriculture, the Central Statistical Board, and the Bureau of the Census, held meetings to consider the farm schedule to be used at the next decennial census. All suggestions received as to the make-up of the schedule and items to be included were given careful consideration. A tentative schedule was drawn up which is to be printed and given a trial in the next

fiscal year. It is to be tried out in the field and also mailed to the crop reporters of the Department of Agriculture, and the schedules edited and results tabulated by the Bureau of the Census. By means of these trial censuses there should be available at the 1940 census a schedule which will have fewer difficulties for the enumerators, yet will cover items for which there is the greatest demand.

The Bureau cooperated with the International Institute of Agriculture, Rome, Italy, in preparing and checking the data for the two bulletins containing agricultural statistics for the United States and the outlying territories and insular possessions of the United States, published by the institute. These two bulletins contained data comparable to that published by the institute for more than two score other nations in the carrying out of its publication program for the First World Agricultural Census.

#### CURRENT INDUSTRIAL REPORTS

There has been considerable expansion in the Bureau's work in the field of current industrial and business reports, and every effort has been made to bring the inquiries into line with recent developments. Current statistical reports are now issued for 58 industries (or commodities), 49 being published monthly, 7 quarterly, and 2 annually. These reports were compiled from the returns made by 13,690 manufacturers and other organizations having 15,501 plants or mills. Important improvements in scope, coverage, and accuracy were made in a number of these reports, notably cotton and leather garments and allied products; mechanical stokers; steel office furniture, shelving, and lockers; fire-resistive safe industry products; steel boilers; plastic paints, cold-water paints, and calcimines; and porcelain-enameled products. Changes were also made in the inquiries relating to railroad locomotives, underwear and allied products, and wool, to meet recent developments or to provide for new products.

Schedules have been prepared for the new monthly inquiries on knit fabric gloves and imported dates packed and shipped, and arrangements have been made for compilation of data beginning with June 1937.

Annual summaries compiled from monthly reports were published for the following industries: Boots, shoes, and slippers, other than rubber; underwear and allied products; hosiery; cotton and leather garments and allied products; men's, youths', and boys' clothing; wheat ground and wheat milling products; and wool consumption. For the surveys based on a specified number of identical establishments, the data for the year are summarized and published in the December reports.

*Red-cedar shingles.*—In order to provide official Government statistics on the production and shipments of red-cedar shingles in the United States, for use in connection with the reciprocal trade agreement with Canada, the Bureau of the Census began a canvass of the manufacturers of red-cedar shingles during May 1936, on a quarterly basis. On May 25, 1937, Congress enacted a law directing the monthly collection and publication of statistics for red-cedar shingles.

*Automobile trailers.*—The first special canvass of the automobile-trailer industry was made during the year. The canvass, which was conducted almost exclusively by mail, was begun on March 17 and completed on May 29, 1937. The report, based on returns of 357 manufacturers, showed, by States, the number of manufacturers, number of trailers sold, and the total factory value.

*Manufacture and sale of farm equipment.*—Statistical data on the production and sale of farm equipment and related products for the year 1936 covered 1,005 manufacturers with 1,103 plants. A preliminary report on tractors, combines, and grain threshers was issued on April 3, 1937, and a preliminary report for the entire industry on May 5. The printed report was ready for distribution by June 30.

#### COTTON AND COTTONSEED

During the past season the Bureau received reports of cotton ginned to 12 specified dates from 14,364 ginneries. Monthly reports of cotton held were received from 2,800 storage places, such as independent warehouses, compresses, and public cotton yards. The Bureau employed 775 special agents in collecting the domestic cotton reports, while export and import data were furnished by the Bureau of Foreign and Domestic Commerce.

Cottonseed received, crushed, and on hand and cottonseed products manufactured, shipped out, and on hand were received each month from 550 cottonseed-oil mills. Three hundred and fifty refiners and consumers reported monthly on crude cottonseed oil refined and stocks of crude and refined oil held.

Closely related to cottonseed oil because of their competitive market are other vegetable and animal fats and oils. Quarterly reports were received from 4,000 factories producing and consuming these other oils and from 100 storage establishments.

#### FINANCIAL STATISTICS OF STATE AND LOCAL GOVERNMENTS

Preliminary work has been done on a general revision of revenue and expenditure classifications for financial statistics of cities, in cooperation with the National Committee on Municipal Accounting, and certain of these were incorporated in the 1936 schedules. A special advisory committee to the Director on financial statistics of States and cities has been named by the Secretary of Commerce, and its initial meeting has been held.

Although the law provides for the annual publication of financial statistics of cities with a population of over 30,000, of which there are 310, by Executive order, beginning with the 1932 report, only cities with a population of over 100,000, of which there are 94, have been covered. The 1936 press releases for 27 of the 94 cities were issued by June 30, 1937, somewhat earlier than in prior years.

A sampling inquiry on State and local indebtedness is being carried on in cooperation with the Treasury Department, covering all States, 943 cities, 607 counties, and approximately 265 special districts. An inquiry is also being carried on in cooperation with the Bureau of Foreign and Domestic Commerce, on chain-store tax collections in 17 States. Digests of State taxation and revenue laws are being revised and brought up to date for all States.

A municipal reference service has been organized, in which comprehensive data on municipal governmental operations in American cities of 50,000 or more population are being assembled and currently made available to public officials and others interested.

#### VITAL STATISTICS

The reorganization of the Division of Vital Statistics, commenced in June 1935, was completed during the past year by internal readjustment of the sectional work of the Division. Without dropping new features introduced into the divisional work in 1935, the routine coding and release of vital statistics was advanced about 2 months during the course of the year. Special experiments have been started during the year on the transcribing of birth and death information by microfilm rather than by hand methods. If these experiments are effective, it will be possible eventually to advance the work of the Division to within 4 months of a current basis.

The Instruction Manual for the routine coding and tabulating of vital statistics was revised. The second edition of this manual incorporates all changes in the coding procedures of the International List of Causes of Death since the fourth edition (1930) of this list. The manual also contains the extensive geographical code used by the Division of Vital Statistics.

*Publications.*—In addition to the annual Mortality volume, and the annual Birth, Stillbirth, and Infant Mortality volume, the Bureau has developed several current publications in vital statistics: the Weekly Health Index, the Monthly Automobile Summary, the Weekly Accident Bulletin, the Monthly Vital Statistics Bulletin, the Vital Statistics—Special Reports series, and the Registrar. The Weekly Accident Bulletin is a new series which reports automobile accidents each week on a number of the cities of 50,000 and over. By the end of the fiscal year, 121 cities were reporting automobile fatalities for this bulletin. The Registrar is a cooperative official news service of the Division of Vital Statistics and its special agents in the States and local bureaus of vital statistics. Volume 1 of the Vital Statistics—Special Reports series, 406 pages in length, has been completed. It deals with birth, death, infant mortality, and stillbirth statistics. These facts are released in this publication at least a year before they would customarily have been made available to the public. Volume 2 of this series deals entirely with individual State releases. These State summaries for the year 1935 contain the more important vital statistics of interest to each State and are released as soon as the tabulations for a particular State are available. Since the tables in all these summaries are uniform, comparisons can be made between States more easily than was heretofore possible.

*Research.*—Several special studies in vital statistics have been carried on during the year. The Bureau has developed an institution code in cooperation with the American Medical Association, which has checked the Bureau's code with the institutions included in their files on hospitals. Numerous small studies in connection with fatal accident statistics have been released, and a pocket reference accumulation of census information on accidental deaths has been prepared. In addition, considerable field work has been carried out in the prep-

aration of supplementary accident schedules which will integrate the statistical work carried on by different States in this field. A number of special statistical tabulations, some international in character, have been made in connection with causes of death. The international study, started in 1935 to compare the differences of coding of joint causes of death in various nations, was completed and will soon be published. Joint cause tabulations have been made for all causes of death in the State of Maryland and for all maternal causes throughout the entire United States in the year 1935. These tabulations will also be of assistance in the work of revising the International List of Causes of Death preparatory to the 1938 International Conference in Paris.

An extensive test to prove the effectiveness of the post-card method of testing birth registration completeness was conducted in Maryland. A policy of testing completeness of birth registration by counties rather than by States was inaugurated, and several counties in Nebraska and Maryland were so tested. The entire State of Louisiana was tested for completeness of birth registration, and several months of field work were conducted to aid registration completeness in the States of Oklahoma, Arkansas, North Carolina, and Nebraska. Closer working relationships in connection with field problems of vital statistics are being established with such groups as the United States Public Health Service, the Children's Bureau, the Office of Education, the Social Security Administration, Works Progress Administration, and the Coroners' Association of America, etc.

#### ESTIMATES OF POPULATION

Because of the great shifting in population since the last decennial census, due to the depression, much research work has been required to compile and check data on which to base estimates. A press statement was issued October 28, 1936, giving the estimated population of the United States as of July 1, 1936, with the estimates by States for each year from 1930 to 1936. In addition to the new estimates for 1936, the 1934 and 1935 provisional figures previously issued for 10 States were revised. On January 21, 1937, a statement was released showing the estimated population of the United States by 6-month periods from January 1, 1930, to July 1, 1936, and estimates for States as of January 1 for each year. This statement answered the widespread demand of various bureaus of the Federal Government, and other organizations, for January 1 estimates.

A release on February 18, 1937, gave the estimated population of the United States by age as of April 1, 1935, with comparative figures for each census from 1900 to 1930; estimates by age and sex as of April 1, 1935, with ratio of males to females; and cumulative age groups, 45 years old and over, estimated as of April 1, 1935, with census figures for 1900 to 1930.

#### INSTITUTIONAL POPULATION

Annual reports on patients in hospitals for mental disease and mental defectives and epileptics in institutions were issued during the year for both 1934 and 1935. These reports covered, like the

report for 1933, private and "other public," as well as State, institutions.

At the request of the National Committee on Mental Hygiene certain changes have been made in the schedules for hospitals for mental disease for 1937. Considerable revision and expansion has also been made in the 1937 schedules for institutions for mental defectives and epileptics, one of the outstanding changes being the separation of the reports for mental defectives from those for epileptics.

#### CENSUS OF PUERTO RICO

Work was practically completed during the year on the special census of Puerto Rico, taken as of December 1, 1935, under the auspices of the Puerto Rico Reconstruction Administration and the immediate direction of an official of the Census Bureau. The compilation of the data on population was done in Washington while the tabulation of the statistics on agriculture was made in Puerto Rico. The final scrutiny and text for both inquiries are being handled at the Census Bureau. The clerks employed in the Bureau on the tabulation and compilation of the results of the census of Puerto Rico are paid by the Puerto Rico Reconstruction Administration.

Three bulletins (bilingual in form) will present the results of this special census. Bulletin No. 1, giving the number and distribution of inhabitants, was issued December 3, 1936; copy for Bulletin No. 2, giving the composition and characteristics of the population, including data on occupations and unemployment, will be sent to the printer on July 16, 1937; and copy for Bulletin No. 3, giving the results of the farm census, will be ready to go to the printer in September.

#### SPECIAL POPULATION CENSUSES

A special census of Crestwood, Cook County, Ill., was taken under the supervision of a representative of this Bureau as of July 29, 1936, and a certificate of population was issued August 3, 1936. This census showed a total population of 410.

A special census was also authorized under Bureau supervision of the cities of Sterling and Rock Falls, Ill., together with some township areas, the work of enumeration having been commenced on June 30, 1937.

#### STATISTICS OF CRIME

Reports on prisoners in State and Federal prisons and reformatories were issued during the year for both 1934 and 1935, and a report on Judicial Criminal Statistics, covering 27 States, for 1934. Copy for the 1935 report on Judicial Criminal Statistics, including 30 States, has been sent to the printer.

The year 1935 is the fourth for which the Bureau of the Census has collected judicial criminal statistics. The States that cooperated in the investigation for 1935 contained 55.8 percent of the 1935 estimated population of the United States. They included each New England State; each Middle Atlantic State, except New York; each East North Central State; each West North Central State, except Missouri; each Mountain State, except Nevada; each Pacific State; and the District of Columbia.

**CENSUS OF RELIGIOUS BODIES**

The permanent Census Act, passed in 1902, made provision for a decennial census of religious bodies. Several foreign countries require information on religious affiliation as part of their national censuses of population. This has never been done in the United States. Instead, our statistical information has been secured from and is related to churches, missions, and other primary religious organizations. The 1936 census, now in progress, will be the fourth of these decennial inquiries giving data as to the membership, denominational affiliation, property and other fiscal matters, and an authentic summary of the history of each sect.

A card index was made from the church schedules for the last census of religious bodies, taken in 1926, from denominational directories, yearbooks, and from information furnished through correspondence with the heads of those denominations for which yearbooks or other printed material were not available. With this index of approximately 245,000 churches as a guide, schedules were sent to each church, mission, or chapel. It is expected that the church reports will be received somewhat slowly because of starting the census late in the spring. Many pastors are absent from their charges during the summer months and assistants or substitutes are unable to furnish the information necessary to complete the questions.

**ALPHABETICAL CARD INDEX**

The alphabetical card index was completed on April 23. The office in St. Louis was closed and satisfactory disposal was made of the equipment. This index of the population of the United States recorded in the Census of 1900 consists of approximately 76,500,000 names on nearly 34,000,000 cards. The value of this index will grow year by year with the increased number of requests which will be received for individual information in connection with the Social Security program, genealogical research, and the many other uses of census data.

**SEARCHES FOR AGES**

During the past fiscal year approximately 60,000 applications for age certification and other personal information contained in census records were received in the Bureau. In addition, more than 5,000 visitors examined those records which are open for public inspection. From 400 to 600 letters a day are now being received, a number so great that it is not possible to handle them with the force now available in the Bureau. There were on hand at the close of the fiscal year approximately 37,000 applications, which were being answered as rapidly as the small force available would permit. Owing to the efficiency of the 1900 card index, the Bureau is urging each State, county, and welfare organization to advise all applicants to furnish their place of residence in 1900, if possible.

More than 2,250,000 persons will pass their sixty-fifth birthday during the next 3 years. The majority of these will be without positive legal proof of age for pension purposes except such as is available

in old public records. The original population census returns from 1790 to 1930, preserved in bound volumes and on films in the Bureau of the Census, are the most accessible and authentic public records available for proof of age. In addition, these records are used for purposes such as the establishment of claims to estates, securing of passports and work permits, etc.

#### RECORD PRESERVATION BY MEANS OF PHOTOGRAPHIC EQUIPMENT

The work of preserving the records of the Bureau on microfilm is progressing most satisfactorily. The population censuses for the years 1840 and 1850, comprising 947 volumes with approximately 1,100,000 pages, have been finished and the Bureau is now engaged in doing similar work for 1860. This work is being done on the two large book machines employing 35-millimeter film. The Bureau is also engaged in placing on 16-millimeter film the card index made of the 1900 census of population. To date approximately 3,000,000 cards have been filmed and there remain about 31,000,000 more to film. When completed, this work will represent a reduction of at least 90 percent in the storage space which these cards now occupy, will insure a longer preservation, and enable a larger group to examine the records. The microphotographic laboratory of the Bureau is considered one of the most complete in the United States.

#### PUBLICATIONS

The Bureau printed and published 169,100 copies of 80 separate reports, bulletins, and pamphlets, at a cost of \$64,891.78, during the fiscal year ended June 30, 1937. In addition, the Census of Business published 41 final reports with funds of the Works Progress Administration.

Following is a list of the more important publications issued during the past fiscal year:

##### *National censuses*

Census of Agriculture, 1935—48 State reports, second series.	
Census of Agriculture, 1935—Volume II for the United States.	
Census of Agriculture, 1935—Volume III for the United States.	
Census of Agriculture, 1935—Descriptive supplement—technique of tabulation.	
Census of Business, 1935—Reports on the following subjects:	
Retail trade.	Advertising agencies.
Wholesale trade.	Distribution of manufacturers' sales.
Service establishments.	Retail trade survey.
Banking and finance.	Nonprofit organizations, office buildings, etc.
Insurance.	Real estate agencies.
Hotels.	Tourist camps.
Places of amusement.	Personnel and pay roll, by counties.
Construction.	Intracity Business Census statistics.
Bus transportation.	Public warehousing.
Motor trucking for hire.	
Radio broadcasting.	

##### *Annual reports*

##### Vital statistics:

Birth, stillbirth, and infant mortality statistics, 1934.  
 Mortality statistics, 1934.  
 Vital statistics—Special reports—Volumes I and II.  
 Financial statistics of cities of over 100,000, 1934.  
 Financial statistics of cities of over 100,000, 1935 (preliminary report).  
 Judicial criminal statistics, 1934.

Institutional statistics, 1934.  
 Cotton production and distribution—Season of 1935-36.  
 Cotton production—Crop years 1935 and 1936.  
 Animal and vegetable fats and oils, 1931-1935 and 1932-1936.  
 Factory sales of automobile trailers, 1936.  
 Manufacture and sale of farm equipment and related products, 1936.

*Monthly business and industrial reports*

Air-conditioning systems and equipment.	Methanol.
Automobiles.	Oil burners.
Automobile financing.	Paint, varnish, lacquer, and fillers.
Bathroom accessories.	Paperboard.
Boots, shoes, and slippers (other than rubber).	Plastic paints, cold-water paints, and calcimines.
Cellulose plastic products.	Plumbing brass.
Commercial steel castings.	Porcelain-enameled products.
Convection-type radiators.	Prepared roofing.
Cotton and leather garments and allied products.	Public merchandise warehousing.
Distillate oil burners.	Pulverizers.
Domestic pumps, water systems, and windmills.	Pyroxylin-coated textiles.
Domestic water-softening apparatus.	Railroad locomotives.
Electric industrial trucks and tractors.	Red-cedar shingles.
Fabricated steel plate.	Steel barrels and drums.
Fire-extinguishing equipment.	Steel boilers.
Floor and wall tile.	Steel office furniture, shelving and lockers, and fire-resistive safe industry products.
Galvanized range boilers and tanks for hot-water heaters.	Structural-clay products.
Hosiery.	Sulphuric acid.
Knit wool gloves and mittens.	Superphosphates.
Leather gloves and mittens.	Terra cotta.
Malleable iron castings.	Underwear and allied products.
Measuring and dispensing pumps (gasoline, oil, etc.).	White-base antifriction bearing metals.
Mechanical stokers.	Wheat ground and wheat-milling products, by States and capacity groups.
Men's, youths', and boys' clothing cut.	Wool consumption.
	Wool machinery activity.

*Quarterly business and industrial reports*

Edible gelatin.	Wheat and wheat-flour stocks.
Electric (mining and industrial) locomotives.	Wheat ground and wheat-milling products (merchant and other mills).
Electrical goods.	Wool stocks.
Lacquers.	

**WORK DONE FOR OTHER FEDERAL OFFICES AND OUTSIDE ORGANIZATIONS**

Because of its large fund of original data and its special tabulating equipment, the Bureau is called upon by many agencies for special tabulating services. All census data are protected by law against any use which might reveal the identity or activities of any individual informant. Therefore, all special tabulations of original census returns must be done in the Bureau by its own employees. The largest purchasers of such special tabulations of census data are research and trade organizations. On the other hand, the Bureau serves as a "tabulating service" agency for many other offices of the Federal Government, and for private organizations as well, in cases where noncensus data are submitted for tabulation. The Bureau's unique "unit counter" machines, developed for population censuses

and other inquiries where categories rather than quantities must be tabulated, are especially useful in such special services.

During the past fiscal year the Bureau's work in mechanical tabulation represented the handling of the equivalent of 734,135,998 cards one time. Regular census inquiries, including the census of business, accounted for 78 percent of this work, while 22 percent (or 155,730,627 card units) was chargeable to work for others.

Special tabulations were made for the Food Research Institute of Stanford University, Massachusetts State Planning Board, National Association of Leather Glove Manufacturers, Inc., National Association of Wool Manufacturers, New England Council, Tanners Council of America, United Shoe Machinery Corporation, and the Underwear Institute. Monthly summaries for certain industries were also prepared for the Federal Reserve Board, the Bureau of Foreign and Domestic Commerce, and the Federal Reserve banks at Boston, Philadelphia, and San Francisco.

*Civilian Conservation Corps.*—Monthly tabulations of the personnel and of the work done in all Civilian Conservation camps in the United States and outlying possessions, which began in July 1933, were continued during the year. The camps are under the direction of the Director of the Civilian Conservation Corps and the immediate technical supervision of 16 cooperating agencies. These tabulations, which are prepared each month from approximately 3,000 schedules, present detailed statistics on personnel, the amount of work completed, and man-days, by services and by type of job, for new construction and maintenance. A tabulation of the census of enrollees for Civilian Conservation Corps camps in the United States was prepared during the year from returns of 2,139 camps, with 350,350 enrollees. The tables presented statistics by race, type of enrollee, number of dependents, monthly allotments made by enrollees, the kind of work the service and training of enrollees fitted them for in private employment, and personal information concerning the enrollee, such as age, weight, height, and physical condition.

#### BUREAU PERSONNEL

In recognition of the demands upon the Bureau of the Census for increased scientific methods of collecting, tabulating, and distributing statistics, the training courses inaugurated in 1935 were continued during the past year, with the same arrangements of affiliations with a local university to allow academic credits for the students enrolled for the training courses in the Bureau. Courses have been offered during the past year in the following subjects: Elementary statistics; statistical methods applied to census data; principles of statistical research; and economic geography. Approximately 90 workers participated in these courses. Coincident with the academic year of the university these and additional courses will be offered during the coming year and will be taught by members of the technical staff of the Bureau.

*Appointments and separations.*—In addition to the number of employees shown in the following table, there were on the rolls on June 30, 370 temporary special agents (142 in the Washington office and 228 in the field) appointed for limited periods, at \$1 per annum

or without compensation (employees of other Government services). There were 282 appointments of this character made during the fiscal year to the Washington office and 77 in the field, and 345 and 48 separations, respectively.

	Bureau total	Washington office	Field
Total employees on roll, June 30, 1937.....	2, 532	1, 284	1, 248
Permanent.....	1, 488	713	<sup>1</sup> 775
Temporary.....	1, 044	571	<sup>2</sup> 473
Total appointments, fiscal year.....	1, 451	867	584
Permanent.....	190	83	107
Temporary.....	1, 261	784	<sup>3</sup> 477
Total separations, fiscal year.....	7, 913	1, 073	<sup>4</sup> 6, 840
Terminations.....	5, 200	219	4, 981
Expirations of appointments.....	1, 518	579	939
Transfers.....	197	169	28
Resignations.....	960	82	878
Retirements.....	19	19	-----
Deaths.....	19	5	14

<sup>1</sup> Includes special agents for cotton and vital statistics, and the Bureau's advisory committee.

<sup>2</sup> Includes 87 administrative employees and 365 security wage workers on the Census of Business project in Philadelphia.

<sup>3</sup> Includes 24 administrative and 67 security wage workers on the Alphabetical Index project in St. Louis; 65 administrative employees and 239 security wage workers on the Census of Business project in Philadelphia.

<sup>4</sup> Includes 32 administrative and 2,687 security wage workers on the Alphabetical Index project in St. Louis; and 97 administrative employees and 1,034 security wage workers on the Census of Business project in Philadelphia.

### APPROPRIATIONS

*Appropriations and other funds made available to the Bureau of the Census, by source, fiscal year ended June 30, 1937*

Purpose	Total	Source of funds		
		Bureau appropriations	Allotted or transferred from other Federal agencies	Non-governmental
All Bureau work.....	\$4, 665, 243	\$1, 865, 500	\$2, 875, 513	\$14, 230
Regular salaries and expenses.....	<sup>1</sup> 1, 865, 500	1, 865, 500	-----	-----
Work relief projects:				
Census of Business.....	1, 325, 000	-----	1, 325, 000	-----
Alphabetical index.....	1, 400, 500	-----	1, 400, 500	-----
Census of religious bodies.....	60, 000	-----	60, 000	-----
Work for other Federal agencies:				
Allotments.....	<sup>2</sup> 71, 928	-----	71, 928	-----
Transfers.....	18, 085	-----	18, 085	-----
Work for outside organizations or individuals.....	14, 230	-----	-----	14, 230

<sup>1</sup> Appropriation for 1937 was \$1,900,500. Figure shown excludes \$35,000 made immediately available for expenditure in the fiscal year 1936.

<sup>2</sup> Of this amount \$20,438 was allotted to the Bureau of the Census by other Federal agencies from emergency relief funds for special classifications, studies, etc.

## BUREAU OF FOREIGN AND DOMESTIC COMMERCE

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### NOTABLE ADVANCES IN THE EXTENT AND TIMELINESS OF BUREAU'S SERVICES

The Bureau of Foreign and Domestic Commerce has responded vigorously, throughout the fiscal year just ended, to the rapidly rising demand for trade-promotional data and services—a demand that has been greatly augmented by the forces of economic recovery within this country and elsewhere; by the heightened optimism and initiative of merchants and producers; and by the accelerated tempo of change in business conditions and requirements in most of the nations of the world. For our businessmen, all of these factors have involved the imperative necessity of obtaining, to an ever-increasing degree, such precise and timely information as the Bureau is able to provide.

Even more important has been the growing recognition on the part of businessmen of their need for basic fundamental analyses of business trends and economic forces. The Bureau has met this growing demand by providing a plan for industrial economic research and initiating a number of projects designed to chart the course of industrial activity. An acute need exists for a comprehensive and well-integrated program of business fact-finding and analysis in both the foreign and domestic field as a basis for business planning and legislative reform. Definite progress has been made in studying the national income, long-term debts, the construction industry, and the balance of international payments.

The expansion of the Bureau's services, and the enhancement of their value, during 1936-37 is apparent from a variety of figures. Typical among these is the increase of 32 percent in the number of informational letters sent and visitors aided by one of the industrial divisions. The number of specific Foreign Trade Opportunities made available to American businessmen showed a 100 percent gain. There was more than a threefold increase in the Bureau's sales (at 10 cents each) of its lists of foreign buyers, sellers, and agents. About 10,000 more of the Bureau's Sales-Information Reports on individual foreign firms were sold than in the preceding year—representing an increase of one-third.

A salient characteristic of the Bureau's activity during 1936-37 has been the timely emphasis on products and problems that embody new developments; for example, particular attention has been given to collecting and disseminating data on new products with great potentialities of expansion, such as tourist trailers, Diesel-engine vehicles, and the novel "scoot-a-cars."

Timeliness, again, has been the keynote in the Bureau's prompt issuance of pertinent data on many topics that are engaging the active attention of American businessmen today. In this field one may

mention the publication of a special bulletin on the expansion of Japan's foreign trade and industry, the issuance of a special circular on the cooperative systems of Scandinavia and the Baltic States, and similar undertakings of immediate interest.

#### SIGNIFICANT CONTRIBUTION TO TRADE-AGREEMENTS PROGRAM

The trade-agreements program was carried on actively during the year. Personnel of the various sections of the Bureau continued in close cooperation with the Department of State throughout the year and participated actively in the work of the various interdepartmental committees in connection with this work. On March 1, 1937, the act of June 12, 1934, authorizing the program, was renewed for a further period of 3 years, and, in addition to work on trade agreements concluded or announced during the year, preparatory work was undertaken covering various important countries of Europe, South America, and Asia, including a number of countries connected with the British Empire. While much of the labor involved in these preliminary studies will show results only as the program advances, the added burden placed on the various divisions and sections of the Bureau has been considerable.

The particular contribution of this Bureau consists of developing the basis for the requests to be made of the other governments in the course of such negotiations in the interest of American export trade. As previously, the nature of the trade-agreement work has required the close cooperation of all the services of the Bureau.

The Bureau's district offices, through their constant and direct contact with American industries and with foreign-trade interests, have also rendered valuable service in furthering the trade-agreements program by (a) making available the information required by firms in their communities desiring to submit briefs to the committee for reciprocity information, and (b) by disseminating the official analyses and texts of the various trade agreements, as well as by providing additional information on tariff concessions and trade benefits granted to the United States which affected products of particular interest to firms in their respective districts.

#### INDUSTRIAL DIVISIONS

##### GENERAL CHARACTER OF SERVICES

Through the industrial divisions the Bureau of Foreign and Domestic Commerce establishes direct and effectual contacts with American businessmen who are seeking to enlarge their markets or enhance the efficiency of their operations.

Every industrial division renders significant service to other departments and agencies of the United States Government and also, upon occasion, to the governmental units of the several States. These other branches of government have come generally to recognize that the industrial divisions of this Bureau are exceptionally well qualified—by reason of long experience, intimate contacts, and the accumulation of great funds of specialized information—to render aid and advice on problems involving the production or marketing of any class of commodities.

The industrial divisions work constantly to stimulate American export and import trade in the respective lines of merchandise that come within their purview. For special data relative to such matters as foreign trade restrictions, commercial laws, finance, the standing of individual firms, etc., they draw upon the information available in the technical divisions of the Bureau—but the industrial divisions have, themselves, a wealth of data designed to enable our foreign traders to augment their business. These data are disseminated through the medium of printed or processed publications, correspondence in response to inquiries or upon the Division's own initiative, contributions to trade journals, personal interviews either in Washington or in the field, addresses before trade gatherings, exhibits at conventions or fairs, and through other appropriate channels. Specific Trade Opportunities for the sale of definite kinds of American goods to individual foreign firms are passed upon, evaluated, and effectively publicized by the industrial divisions.

Particularly worthy of mention has been the great assistance rendered by the industrial divisions in the furtherance of this Government's program of reciprocal trade agreements.

These divisions are active, also, in endeavoring to enhance the efficiency and profitability of the domestic business enjoyed by the firms in their several lines. They are well equipped to afford such aid, because they are staffed, for the most part, with experts in the given line. The industrial divisions are intimately familiar with the organizational set-ups of their industries; they are acquainted with the executives responsible for major decisions; they have studied the industry's outstanding problems in the field of domestic business; they know its traditions and trends and have accumulated statistics of its progress. Contacts based upon such knowledge have proved singularly productive during the fiscal year 1936-37.

#### AUTOMOTIVE-AERONAUTICS TRADE

In addition to the publication of periodical bulletins and regular and special distribution of Trade Opportunities, the following special surveys were completed during 1936-37 by the Automotive-Aeronautics Trade Division:

- World Registration of Motor Vehicles.
- World Production and Exports of Motor Vehicles.
- Highways of the World.
- Foreign Markets for Aviation Radio Equipment.
- World Air Services.
- Tourist Trailer Market in Latin American Countries.

Special studies of the Division included the following: Budget information regarding foreign highway programs; taxation of motor vehicles and gasoline for highway purposes in Latin American countries; important international and main routes in Asia, Africa, and South America; list of officials and use of road-building materials and equipment in foreign countries; exports of road-building machinery, aeronautic, and automotive products; registration of new passenger cars by price classes; motor-vehicle industry in Michigan and New York; and motor-vehicle inspection regulations.

The highways section continued its excellent contact and cooperation with the Bureau of Public Roads, and with the Pan American

Union, in the program of developing the Inter-American Highway. This section also distributed a large number of good-roads publications in foreign countries through the representatives of the Bureau and the State Department.

The Division maintained close contact with the various associations and trade papers. Exhibits were prepared and presented at the National Aircraft Show at New York and at the American Road Builders' Association Convention and Road Show at New Orleans.

Because of the increased interest in tourist trailers, Diesel-engine vehicles, and scoot-a-cars, particular attention was given to assembling and disseminating both domestic and foreign data on these products.

#### CHEMICAL

Comparing the year just closed with the preceding year, the Chemical Division records the fact that its informational letters and visitors increased 32 percent to a total of 11,645 in the 1936-37 year, while the number of subscribers to its periodic services rose by 22 percent to 3,095. United States exports of chemical products increased 13 percent to \$154,000,000, and imports rose 24 percent to \$149,000,000.

A few of the classes of the Division's service to the trade at home and abroad are: the publication of records of new products entering commerce; the furnishing of data on new markets, new connections, and establishment of branch plants; seeking new raw materials or sources; guiding the beginner, and counseling the experienced trader.

Chemical news items—averaging 40 each number—were released in the Division's four-section weekly bulletin issued for the eleventh consecutive year, to 800 subscribers; each number contained an average of 3 charts, and a list of Foreign Trade Opportunities. An innovation of the year was the issuance of a weekly news letter to 4,000 contacts.

A demand has grown up over the years, to the extent of 3,000 clients, for an epitomized annual review, culminating in this year's publication, *World Chemical Developments in 1936*.

The outstanding instance of cooperation with trade associations was the joint sponsorship of a monthly *Digest of Trade Hints for Paint and Varnish Merchants*, mailed to 9,000 retailers, wholesalers, and manufacturers who had requested such a service.

Foreign government representatives, missions, and trade representatives were aided in getting a better appreciation of the American chemical industry, through the Division's counsel and contact.

#### ELECTRICAL

The *World Power Manual and Electrical Exporters' Handbook*, published by the Electrical Division on a sales basis, has completed its second year. It has provided industry with data regarding the generation, transmission, and distribution of electricity, and particularly concerning market possibilities in many countries. Nineteen additional country numbers and 13 supplements were issued during the fiscal year 1937—bringing the total now available to 39, with a total of 14 supplements.

Three times each month Electrical Foreign Trade Notes is issued to a substantial subscription list throughout the industry. It brings to their attention current topics and market opportunities from countries all over the world.

The radio section has now completed its published series on World Radio Markets; that is, a report is now available on every country where radio sales or facilities are of any importance.

Special publications during the year included A Guide to Reception of Short-Wave Broadcasting Stations—a general guide for the user of short-wave sets—and a bibliography of Radio References, both of which have had considerable demand.

Throughout the year the radio section has secured from the industry and published each week an advance schedule of all American short-wave radio programs. These broadcasts are intended largely for foreign reception. The announcements are secured well ahead of the time for broadcasting and are sent to all foreign offices of the State and Commerce Departments. In return, programs of foreign stations have been sent to the radio section and, through cooperation with the industry, have been reproduced in newspapers throughout the United States.

The motion-picture section, during the past year, has kept the industry informed of the changing conditions in the foreign market and of new legislation affecting its activities. The section issued 62 press releases and 24 foreign-market bulletins under the caption "Motion Pictures Abroad." A set of foreign theater charts was also prepared and made available to the industry.

For the first time, this section released a Review of Foreign Motion-Picture Markets During 1936 in booklet form, comprising 172 pages. The brisk demand for copies, which are on a sales basis, indicates that it was very successful. During the month of August 1936, a special publication was issued entitled "Brief History and Statistics of the Motion-Picture Industry."

The motion-picture unit has been raised to the rank of a Division and will so function hereafter. The revision of the statistical summary of the industry and of the Composite List of Non-Theatrical Film Sources are contemplated by this new division.

#### FOODSTUFFS

The Foodstuffs Division inaugurated a monthly analysis of United States export and import trade in food products. This service, in the form of a press release, gives to those food industries interested in foreign trade, within 2 days after the figures are received in Washington, detailed statistics on imports and exports of a long list of food products, together with a textual analysis of the trade.

The success which attended the early publication of foreign-trade statistics on three groups of food products during the preceding fiscal year led to the publication during the second and third months of 1937 of year-end reviews—detailed export and import figures, and foreign-market analyses ranging from 10 to 20 multigraphed pages each—on the following food groups: Meats and meat products; fats and oils; fruits and vegetables; sugar, confectionery, and nuts; grains and grain products; tropical products; canned and dried foods.

A new beverage section was established to take care of increased demands for domestic and foreign-trade information on the part of the rapidly growing alcoholic and nonalcoholic beverage and juice industries.

The Foodstuffs Division continued the domestic research projects which it has been conducting for some years. These include the annual Confectionery Survey, published as a 40-page printed bulletin; the annual Mayonnaise Survey, published as a 10-page multi-graphed bulletin; the monthly Confectionery Sales Report; and the quarterly Canned-Foods Stock Report. The last-named was expanded considerably during the year.

The Foodstuffs Division made numerous foreign-market surveys ranging in coverage all the way from one country to practically world-wide surveys on certain commodities. Some of the outstanding surveys were the one on wine published as a trade-information bulletin entitled "Foreign Markets for Wine and Other Grape Products"; the one on Fishery Cooperatives and Grading Regulations in the more important countries of the world, conducted on behalf of the Bureau of Fisheries; the realignment of the cable service on oil-seeds from Manchuria, which is particularly significant because of soybean development in this country; and a survey of Caribbean Markets for Fresh and Frozen Milk, a new product developed by the Bureau of Dairy Industry in cooperation with the dairying interests.

#### FOREST PRODUCTS

With continued marked improvement in general business, the Forest Products Division (lumber and allied products; pulp and paper products) has pursued various new policies; outstanding among these was a successful effort to prevail upon industry to engage in new trade-promotional activities.

A new system of charts on foreign business trends, covering exports and imports of forest products, was prepared for the industry.

With the general improvement of foreign markets, the new practice of making market surveys and securing lists of specialized agents resulted in new business in Greece, the United Kingdom, Cuba, and Belgium.

As a result of a market investigation of paper by this Division, the Procurement Division of the Treasury Department was enabled to save thousands of dollars in its purchasing of several specialty articles, in consequence of the anticipation of marked increase in prices. In cooperation with the California Redwood Association, the Division actively assisted in supplying basic data that ultimately resulted in a final decree placing redwood lumber on the free list in Cuba, thereby reversing the previous tariff decision. The industry credits this Bureau and the Forest Products Division as directly responsible for this action.

With the new trend in the movement of pulp and paper plants to the South, there are now under construction or in operation in that area approximately 13 such plants. The Division has assisted several of these plants in finding new markets for pulpboard in Mexico, Ecuador, and other Latin American countries. As a result of cooperation with and assistance to the National Wooden Box Associa-

tion, in a study of foreign markets for boxes and shooks, there has been established a Webb-Pomerene Corporation which so far has been very successful in building up new export markets.

Constant contact has been maintained with lumber associations, and aid has been afforded them in such matters as customs hearings, discriminations against American lumber in foreign countries, and tariff violations, by securing for them basic data and reports.

In line with the policy of creating increased trade-promotional activities, the Division is publishing a series of new-type trade-promotional publications. One of these, American Douglas Fir Plywood and Its Uses, has already been issued. The initial run of 10,000 copies was sold within a week. Another, California Redwood and Its Uses, is now being printed, and three similar bulletins are projected. The bulletins cover both the foreign and domestic market possibilities for forest products.

#### LEATHER AND RUBBER

During late 1936 the rubber supply and price situation became threatening, and the Bureau's Leather and Rubber Division was largely instrumental in bringing about closer cooperation between the industry and representatives of the Department of State and the Department of Commerce, while continuing to give general publicity to conditions obtaining in foreign producing and consuming centers.

The regular annual survey was made of 1936 consumption and year-end stocks of crude and reclaimed rubber in the United States; in addition, a special survey of the capacity for production of reclaimed rubber was carried out in June 1937, for the benefit of the industry, and plans were made for its extension up to January 1, 1938.

Although interest of the leather and leather-goods industries in foreign trade had dwindled during the depression, there has been a marked revival, largely as a result of Division activities, and the past year has seen a considerable increase in the quantity and value of the exports. The Division has been partially responsible for larger sales of upper leathers to South American markets, increased shipments of shoes to various markets, and improved foreign sales of handbags and shoe polishes.

The industry has commended the Division for leather trade promotion in South America, for reports on the greater foreign demand for American styles of women's shoes, for a world-wide survey of the trade in shoe polishes, for providing information regarding synthetic-rubber developments, for the high informational value of the Rubber News Letters, for the special analyses of trade in goatskins, and for prompt and efficient handling of numerous requests.

A world-wide survey of production and international trade in leather footwear, prepared during the year, is now being printed. Regular periodicals have been maintained. Paid subscriptions to processed bulletins and statistical statements for the year, to date, increased 14 percent. The special series of bulletins on International Trade in Goatskins, issued as supplements to the Leather Raw-Materials Bulletin, is chiefly responsible for increasing its number of subscribers.

## MACHINERY

With world-wide economic revival had come greatly increased competition from nationally organized machinery builders of other countries in our export markets, and the Machinery Division took the steps necessary to protect American interests. Representations to foreign governments were instituted to remedy situations unfavorable to the sale of equipment of United States manufacture. Technical data on American equipment were translated into Spanish to match the vigorous efforts of European suppliers in the markets of Central and South America. Information was gathered on hundreds of specific opportunities to sell American machinery abroad. The staff of the Machinery Division cooperated with representatives of other governments in working out plans for modernization of their industrial and agricultural economies, gave wide notice of these developments to the 130 branches of the American machinery industries, and rendered assistance and advice to associations and individual firms on a great many occasions.

The Division completed the first year of publication of *World Machinery News*, in which are currently distributed to equipment builders advance market data and information on sales trends in foreign countries. This bulletin, from the time the fourth issue was published, paid its own way three times over.

A series of broad and thorough surveys of foreign sales possibilities was begun, called the *Export Market Series*. This program contemplated an adequate coverage of the major part of American-built equipment in 12 studies. The first two, *World Markets for Diesel Engines* and *A World Review on Printing-Equipment Markets*, were published during the year. Two others, on pumps and farm equipment, are in process of preparation.

Foreign-trade problems were discussed at group meetings of machinery exporters, and feature articles and interviews on special subjects were printed in machinery journals.

A revision of the present statistical service of the Division has been begun; included in this project is a change in the import compilations, a cumulative and always current total on exports of all types of industrial and farm equipment by countries of destination, and a thorough collation of adequate current information on the machinery industries of the important machinery-producing countries of the world.

## METALS AND MINERALS

The Metals and Minerals Division is the source of 28 monthly statistical services and of 4 bulletin services issued on a regular basis. The newly-started *Construction Abroad* has been made a semi-monthly publication and established on a sales basis. The *Iron and Steel Fortnightly* has been changed somewhat by cutting down the space given to each individual item; the result is a concise coverage of a much broader field than formerly was possible. The other periodical publications of the Division—*Foreign Metals and Minerals* and *The Hardware Trade Bulletin*—have increased in demand considerably.

The fuels section's work with the trade associations, the trade press, and with individual petroleum and coal companies has produced substantial results.

The new field opened up by the Hardware News Letter is constantly growing, and the resulting business is beginning to take tangible proportions.

#### SPECIALTIES

The Specialties Division is rendering service to more than 30 related and unrelated industrial groups generally termed "specialty" industries. Included in this category are some very large industries, such as the graphic arts (printing, publishing, and allied industries), furniture, glass, office equipment, and smaller industries producing commodities of a highly technical and specialized character. The Division also compiles and disseminates a large amount of data on foreign advertising media and methods.

More than 150 detailed surveys of individual foreign markets for specific products were compiled and published in 1936-37.

As it exports approximately 30 percent of domestic production, the office-machinery industry is vitally concerned with developments in foreign markets. By an annual series of Foreign Market Bulletins, the Division keeps this industry currently informed of trends in the principal importing and producing areas.

A comprehensive survey was made of the production of and international trade in sponges for the United States and foreign countries.

At the request of the domestic industry, a complete study was made of the production of and trade in glass and glass products for Latin American areas, which will be issued as a Trade Information Bulletin.

During the past 18 months it became apparent that the available supply of domestic fresh-water shell was decreasing and that additional sources of supply must be found. At the request of the button industry, the Division instituted a world-wide inquiry for fresh-water shell suitable for pearl button manufacture.

An extensive revision of data on foreign advertising media (news-papers, magazines, periodicals, etc.) was completed, which data are in constant demand from exporters and advertising agencies for use in export trade promotion. Complete media lists are maintained covering 70 foreign areas. Several bulletins were prepared and published on advertising conditions and methods in a number of foreign areas.

The manuscript was completed for a Trade Information Bulletin covering foreign graphic-arts industries; this represents the first comprehensive and detailed study of this kind ever made by either private or Government organizations. This material will be combined in published form with surveys of world markets for printing and bookbinding machinery, printing inks, and printing papers made by other Divisions of the Bureau. This publication is designed as a basic information source for printers, lithographers, book publishers, and other producers of graphic arts seeking information on world markets for their products.

A substantial amount of preliminary work has been done on a study of international production and trade in cork and cork products, which will be completed during the next year. At the request of the domestic pottery industry, an extensive survey will be made of potential foreign sales outlets for American pottery, particularly in Latin America. Also in progress is a world-wide study of the production of and markets for meteorological instruments.

#### TEXTILE

Developing a new initiative based on a better and more complete knowledge of world conditions in the textile field, the American textile industry has utilized the facilities of the Bureau and the Department to a greater extent than for some years past.

There were a number of developments which afforded the Textile Division an opportunity to expand its usefulness by supplying pertinent reports, statistical tabulations, research data, and recommendations. For example, during the year under review there was a record production and distribution of textiles and textile products; several forms of legislation aiming to regulate and rationalize the industries were introduced; the International Labor Conference on the textile industries convened in Washington; "gentlemen's agreements" limiting importations of textile commodities were consummated; Government purchases of textiles for relief purposes were maintained; and new reciprocal agreements including textile items were negotiated.

The Division's cooperative relations with other Federal Departments and agencies have been extended in several directions. For example, the Labor Relations Board was provided with information and data on the finishing industry, and a member of the Division qualified as an expert witness in a case before the courts. During the winter floods along the Ohio and its tributaries the Red Cross purchased great quantities of blankets for the refugees. At the request of the Red Cross a member of the Textile Division was designated to inspect and appraise deliveries. A large portion of the blankets were found unfit for use, and of a value far below that claimed by the vendor. As a result, savings were effected amounting to about two-thirds of the invoiced total.

Among the special publications and surveys prepared during the year were:

The Raw Cotton Industry of the United States. This report covers the development of the use of cotton as a textile fiber, the cotton plant, cultivation, grading, marketing, and foreign trade. It is supplemented by statistical tables and a bibliography.

Lanital. Covering the development, chemical content, method of production, and characteristics of the new artificial wool made from casein.

World Survey on the Supply and Distribution of Raw Cotton.

Many Federal specifications covering textile fabrics and products were devised or revised by the Textile Committee of the Federal Specifications Executive Committee, of which members of the Textile Division are chairman and secretary.

## TOBACCO

The generally unfavorable tobacco export situation in 1936-37 was accepted by the industry as inevitable; therefore it required of the Tobacco Division advice in individual transactions only.

During the year the Division analyzed 688 Foreign Commerce reports and 587 consular reports, passing the important phases of the data contained therein to the industry through Tobacco Markets and Conditions Abroad. The export situation was outlined to the trade each month, and an annual statement of exports and imports, covering the calendar year 1936, was published in February.

## FOREIGN COMMERCE SERVICE

A marked revival of interest in international trade has resulted in increased demands on the Foreign Commerce Service for assistance. Foreign Commerce officers now make direct replies to trade inquiries from American firms. This resumption of direct trade-promotional effort has been the occasion for wide commendation by American businessmen.

In 1 week the volume of trade letters mailed directly from abroad to American firms reached a total of 701 letters. The resumption of this duty, so inseparably a part of the Bureau's function of promoting American commerce, has opened up new sources of vital information and in general greatly increased the Bureau's usefulness.

The Bureau's foreign representatives have continued active in the matter of economic and industrial reporting. During the past fiscal year Foreign Commerce officers submitted more than 22,000 reports on developments and conditions in their respective countries. During the same period they transmitted more than 1,200 specific Trade Opportunities for the sale of American products abroad.

Information and advice supplied by Foreign Commerce officers during the period under consideration have resulted in the sale of American products running into thousands of dollars. These officers have effected proportional savings through cautioning American firms against expending sums of money in attempting to develop markets where their best efforts would inevitably meet with failure because of special conditions. Some of the outstanding accomplishments of the Bureau's field personnel are registered in those areas where trade-restrictive measures of foreign governments have tended to prohibit or severely limit the sale of American products and where a thorough and specialized knowledge of the restrictive mechanisms is of paramount importance.

As an example of the way in which the Foreign Commerce Service aids American business, the following case may be cited: A manufacturer of fruit crates approached one of the Bureau's offices in a southern city for assistance in finding an outlet for his products abroad. This inquiry was relayed to our office in Johannesburg, South Africa, with the result that a direct sale of about \$70,000 worth of citrus-fruit crates was effected, with possibilities of large future sales. This case is in no sense unusual; it is, in fact, duplicated many times each year.

Fifteen Foreign Commerce officers were brought back to the United States during the year under review. These officers visited the principal industrial and commercial centers of the United States and conferred with businessmen concerning developments and economic conditions abroad; they also addressed chambers of commerce, foreign-trade clubs, and similar organizations.

The system of duplicating reports from Foreign Commerce offices inaugurated a year ago has proved most successful, and several other Government agencies regularly receive complete copies of all reports submitted by the Bureau's field representatives.

The Bureau appreciates keenly the hearty cooperation afforded this organization and its field representatives by other agencies of the American Government, and especially the Foreign Service of the Department of State, which has so ably supplemented the Bureau's efforts in the field of trade promotion.

#### FOREIGN TRADE STATISTICS

The principal work of the Division of Foreign Trade Statistics is the compiling of statistics relating to the foreign trade of the United States and the preparation of statements, publications, and analyses in regard thereto. Continually improving business conditions at home and in foreign countries have resulted in greatly increased volume of work.

The annual report on Foreign Commerce and Navigation, the Monthly Summary of Foreign Commerce, and the statement Trend of United States Foreign Trade were issued as usual. Monthly analyses of foreign trade were prepared and released prior to the Monthly Summary, and analyses were also prepared for Commerce Reports and for the Survey of Current Business. Annual statements of foreign trade were prepared for the Statistical Abstract of the United States, and an annual summary of foreign trade in 1936 was prepared and issued as Trade Information Bulletin No. 837, and a detailed analysis of the foreign trade of the United States during 1935 was issued as Trade Promotion Series No. 166.

A new monthly statement, District Summary Statement of Imports and Domestic Exports, has been supplied to district offices of the Bureau for all the customs districts in their territory. This statement shows the export and import trade at each customs district of each commodity by countries and will enable businessmen and others to study the foreign trade of their particular customs district.

The compilation of the weekly and monthly reports on gold and silver imported and exported, undertaken at the request of the Treasury Department, was continued, and, in compensation therefor, the work of compiling the statement of entrances and clearances of vessels was transferred to that Department.

More than 200 mimeographed statements showing exports and imports of certain commodities were issued each month and sent to more than 6,000 paying subscribers representing hundreds of different industries, and about 230 special monthly typewritten statements were prepared for about 400 paying subscribers.

Largely because of the trade-agreements program, the statistical classifications of exports and imports were again revised and enlarged.

As in previous years, various members of the staff of the Division have assisted employees of the Departments of Agriculture, State, and Treasury, the United States Tariff Commission, the Bureau of Mines, and other Federal offices when the work of such agencies required information concerning the foreign trade of the United States.

#### REGIONAL INFORMATION

A considerable part of the time of the Division of Regional Information has been devoted to continued cooperation with the Department of State in the compilation of statistical data and market analyses for the negotiation of reciprocal trade agreements. The Division has been represented on all trade-agreements subcommittees dealing with specific countries.

The Division was also represented on the following interdepartmental committees: (1) Interdepartmental Trade Agreements Committee; (2) Interdepartmental Philippine Committee; (3) Joint Preparatory Committee on Philippine Affairs; and (4) Committee on Japanese Trade Relations.

General work has been continued on international economic movements, including the study of American branch factories in foreign countries, problems of international trade, national and international cartels, and current economic conditions throughout the world. Information pertaining to various phases of economic conditions abroad and interpretations of markets in foreign countries for American products, furnished by the Division, assisted American business.

The foreign section of the World Economic Review, covering the year 1936, was completed and for the first time is to be published separately from the United States section. The 1936 Foreign Commerce Yearbook was released and work on the 1937 volume started. The circulation of the subscription services of the Division, including economic and trade reports on China, Japan, Southeastern Asia, the Philippines, Canada, and France, increased during the fiscal year.

The continued study of Japan's industrial and trade expansion, begun the previous year, resulted in the publication of a Trade Information Bulletin on the subject, for which numerous requests have been received from the general public, educational institutions, and Government departments. A number of circulars were issued on respective countries of the Far East—those on the Philippines, particularly, being used by several Government departments in connection with investigations of the Philippine situation. Material services were contributed to several Far Eastern economic missions and to studies made by the National Foreign Trade Council on United States commercial relations with the Far Eastern countries.

Responding to a heavy demand, a special circular was prepared on the Cooperative Systems of Scandinavia and the Baltic States. To meet a similar need for information, circulars were also published to describe current conditions in Turkey and Iran, as well as an economic review of Albania. An increasingly large number of inquirers obtained advice as to the resumption of trade by Italy and problems connected with the Spanish trade situation.

Numerous business organizations sending representatives to Latin America called for assistance in planning itineraries and to familiar-

ize themselves with conditions in the individual Latin American areas. A new circular on the Changing Character of American Exports to Brazil, and several on living and office-operating costs in some of the Latin American countries were in demand.

The Russian section has maintained its usual close cooperation with the Department of State and other Government agencies and has been of service to American business and private individuals interested in the Soviet economy.

#### FOREIGN TARIFFS

During the year frequent changes were made by many countries in import duties and charges, quotas, and import-license restrictions. These changes were currently announced by the Division in Commerce Reports, and a large volume of trade inquiries from American foreign-trade interests affected by these developments were answered by the Division during the year. As a part of its regular activities, the Division also prepared and published several studies for the information of Americans engaged in foreign trade, besides issuing revisions of various circulars previously published by the Division. The annual review of trends in foreign tariffs and commercial policies appeared as a special article in Commerce Reports.

A considerable amount of time was devoted by various members of the Division to studies required by the trade-agreements program, and to active participation in various of the interdepartmental committees engaged in trade-agreement work.

Close cooperation was continued with the Department of State, the Tariff Commission, the Department of Agriculture, and other Government agencies, both in the routine day-to-day work of the Division and in the studies made in connection with the trade-agreements program. Close contact was also maintained with trade organizations, representing extremely varied industrial, agricultural, and mining interests, with a view to rendering exporters the most efficient service possible, in meeting the many highly technical problems arising from the controls and restrictions placed upon foreign trade in other countries. Particular attention was given to expediting tariff information through district offices, notably those on the Pacific coast.

#### FINANCE

The outstanding achievement of the Finance Division was the completion of a study of foreign investments in the United States which was initiated 2 years ago. This is the first comprehensive investigation of the subject that has ever been made.

Work was begun on a new study of American direct investments abroad. Since extensive changes have occurred in recent years in the scope and value of these investments, there has been an urgent need for revising the first bulletin on the subject which was based on conditions prevailing as of the close of 1929.

During the year another special research, related directly to the balance of international payments but also of general interest, was completed. This study was published under the title "Insurance Transactions in the Balance of International Payments of the United States, 1919-35" (Trade Information Bulletin No. 834).

These and other research activities carried on during the year have provided improved bases for many of the estimates employed in the Division's study of the Balance of International Payments, whose importance has been heightened in recent years by the practical use that has been made of these studies, as a whole, and in their principal parts, by various agencies of the Government.

The Division, as the chief official source of information on foreign-trade financing and on foreign-exchange restrictions, exchange clearing agreements, etc., in foreign countries, continued to devote special attention to these subjects.

Special assistance has been given at frequent intervals to the Export-Import Bank in the consideration of applications by American exporters for aid in financing export shipments.

Members of the Division's staff have served on several subcommittees of the Executive Committee on Commercial Policy.

#### FOREIGN COMMERCIAL LAW

The steady advance of American world interests, in the face of many legal uncertainties and complexities abroad, has been made possible only through closest attention to current changes and careful safeguarding of remaining legal privileges. Outstanding is the question of the status of our industrial-property rights abroad and the harmonizing of our own patent, trade-mark, copyright, and unfair-competition laws with those of other countries.

It is the province of the Division of Commercial Laws to forewarn American business concerning these problems, to study the infinite variety of business expedients arising from them, and to promote safe practice in doing business abroad. Reviews of new laws are published weekly in Commerce Reports, or in the Division's periodical entitled "Comparative Law Series: A Monthly World Review of Laws Affecting American Foreign Commerce." Special monographs published during the year include Copyright Protection Throughout the World and Industrial-Property Protection Throughout the World; Trading Under the Laws of Venezuela was completed and sent to press.

The Trade Adjustment Service, which offers good offices for the elimination of friction and dispute in foreign trading, has operated at the peak of capacity.

The Division of Commercial Laws is charged with the study of the insurance industry abroad as a field for American enterprise, and it also seeks to foster the best interests at home of this industry, which directly affects the security of 64 millions of Americans and, through marine risks, is a necessary accessory to the promotion of our foreign trade and shipping.

#### COMMERCIAL INTELLIGENCE

American foreign traders made much greater use of the improved facilities of the Commercial Intelligence Division during the year than at any time since 1932. The great reservoir of specific Sales-Information Reports, covering more than 600,000 foreign buyers, sellers, and agents, maintained in the Division was found essential

to American business in 40,254 instances. These reports supplied the American exporter or importer with up-to-the-minute data on the foreign firms which sought business connections in this country. They told him of the size and importance of such firms; listed their present agency and sales connections so that reliable estimates of their credit standing could be obtained directly from those references; and brought this information to him from unbiased, official sources abroad. Nearly 10,000 more of these reports were sold at the nominal price of 25 cents each than during the preceding year, when 30,320 of them were called for.

For the convenience of American foreign traders our officials abroad revised 1,811 lists of foreign buyers, sellers, and agents and compiled 664 new lists; 1,270 requests for special lists were also filled. These lists, arranged by commodities and countries, furnish the basis for direct-by-mail sales campaigns; they constitute ready-made calling lists for our traveling salesmen abroad. They show what lines the merchant handles, whether he is a sales agent, direct importer, wholesaler, or retailer, and what sales outlets he maintains. Taken together with the individual Sales-Information Reports available generally on each name listed, the foreign trader has a complete and accurate picture of the distributing facilities available for his product in a given market. The value of these lists to American business is attested by the fact that approximately 44,000 of them were sold last year at 10 cents each—more than three times the number sold in the preceding year.

Not only were these services rendered American business in greatly increased volume during the year but they were performed more expeditiously. Every effort is made to handle requests for Sales-Information Reports in Washington the same day that they are received by mail, while requests by telegraph and teletypewriter permit receipt of the essential information by the inquirer within a few hours. Moreover, the Sales-Information Reports on hand are being constantly supplemented by revised reports from abroad. Our fund of sales information on foreign firms was augmented by 49,795 new and revised reports last year, 10,000 more than were received during the previous year.

Definite opportunities for our exporters and importers to engage in profitable business abroad were made available to them in twice the volume of last year; 4,238 of these Trade Opportunities brought to our business men complete details as to foreign firms anxious to take on American agencies or to buy specified American goods.

A credit map of the world was published every other month during the year. This was compiled from reports received from about 80 foreign markets and showed exporters and importers the general credit and collection trends in these markets. Detailed reports on which the maps were based appeared each week in Commerce Reports.

#### DISTRICT OFFICES

The district offices are the principal points of contact of the Bureau with the business interests of the country. Through these offices, located in 25 important commercial centers, most of the Bureau's large and varied amount of commercial information on both foreign

and domestic trade is made available to business. There are also a number of cooperative offices located in chambers of commerce which assist in disseminating the information released by the Bureau. These offices are under the jurisdiction of the district offices in whose territory they lie and cooperate with them in serving their business communities.

There was a greater demand during the past year on the district and cooperative offices for service by manufacturers and exporters interested in foreign trade, as well as by those engaged in developing the domestic market. The reciprocal trade-agreements program (as noted elsewhere) also continues to occupy the attention of the district offices to an increasing degree.

Commencing with January of this year the Department inaugurated a series of weekly radio talks on American industries, and the district and cooperative offices were very helpful in disseminating a wide knowledge of these talks in their respective territories.

Increased interest on the part of sales and advertising executives, the management of manufacturers' and distributing organizations, banks, newspapers, trade publications, and others utilizing the domestic marketing data of the Bureau resulted in greatly expanding the work of the district and cooperative offices in distributing the numerous bulletins and publications prepared at the Bureau on the various phases of domestic marketing. This Division of the Bureau's activities was further brought to the attention of business through the Business Information Service file set up in our branch offices and also in some chambers of commerce that meet the requirements for its use by their business communities. This service is a comprehensive classified file of information in the field of domestic marketing, and the material for it is systematically gathered and analyzed from governmental and other sources. It is also available to private organizations on an annual subscription basis, and its use in this respect is constantly increasing.

The retail sales-reporting program inaugurated in the district offices during the past year in connection with the Marketing Research Division has proved highly successful, and reporting firms have cooperated well in furnishing the data asked of them. Another important activity in the domestic field was the assistance rendered by the district and cooperative offices in collecting information for the 1936 Retail Credit Survey.

#### ECONOMIC RESEARCH

Besides the monthly Survey of Current Business and its weekly supplement the chief publications prepared and issued by the Division of Economic Research during the fiscal year 1937 were as follows: World Economic Review, 1936: Part I—United States; National Income in the United States, 1929-35; National Income, 1929-36; 1936 Supplement to Survey of Current Business; Long-Term Debts in the United States, 1912-35; Statistical Abstract of the United States, 1936.

The Division has carried forward the compilation and publication of factual data relative to industry, commerce, and finance, and also its researches relative to the national income and public and private long-term debts in the United States, not to mention numerous less

extensive special studies for congressional committees, members of both houses of Congress, Government departments and agencies, and others.

The Survey of Current Business carries more than 2,100 regular series of basic economic statistics, business indexes, and summaries of economic trends. During the past year it has been furnished to more than 5,000 subscribers, over 4,000 of which are paying subscribers—mostly business organizations, the free subscribers being chiefly governmental and public or semipublic offices and private agencies which receive the Survey on an exchange basis. In addition to the current reports published in the Survey, the Division has continued to prepare a Weekly Review of Business Conditions, primarily for the use of the Secretary of Commerce and other Government officials and departments.

This year, for the first time, the World Economic Review, 1936: Part I—United States, has been published separately from Part II, which deals with foreign countries.

National Income, 1929–36, is a relatively brief interim report coming between the more extensive volume, National Income in the United States, 1929–35, and the still more comprehensive monograph planned for publication during the calendar year 1938. Besides making various other extensions and refinements, it is hoped that a satisfactory monthly index of income and a breakdown of income by States may be contained in the next volume.

The 1936 Supplement to the Survey of Current Business is the first comprehensive volume in this series since the annual supplement for 1932. This latest volume carries the statistical record by months for the years 1932–35, inclusive, together with monthly averages, or indexes, back to 1913 where available.

With its Long-Term Debt monograph the Division has made a substantial contribution in a field where few careful, comprehensive studies have been made heretofore.

An effort is being put forth to enlarge the scope of the data in the next annual edition of the Statistical Abstract of the United States and to publish it earlier than in recent years. This should make this standard an invaluable work of reference even more useful than heretofore.

#### MARKETING RESEARCH

Much of the basic economic and business research referred to in the opening statement on the Bureau's activity has been done in the Division concerned with domestic-commerce problems—the Marketing Research Division. The field of industrial economic analysis requires a more thoroughgoing treatment than it has yet received. The major problems which face the Nation are business or economic problems. Only by first finding the facts about such momentous developments as business cycles and their causes can progress be made in ameliorating their ill effects. The Bureau is cooperating closely with other Federal agencies, with business groups, and with universities and other research agencies in planning its future course in this field.

The Marketing Research Division has continued to improve and expand its work throughout the year 1936–37. The market data section has prepared and published two new indexes—one for grocery

chain-store sales in the United States and the other covering general-merchandise sales in rural areas by regions. The sample has been materially expanded in the annual Retail Credit Survey, and in the last edition particular attention was given to installment credits.

Monthly releases on independent-store sales in five Mid-Western States and in the city of St. Louis were added. The sample for chain drug-store sales has been increased until it now represents about 80 percent of total sales, and the men's-wear chain-store sample now represents about 40 percent of the total volume in that field. Close cooperation with the Board of Governors of the Federal Reserve System and the Federal Reserve banks has resulted in material improvement of the wholesalers' and manufacturers' sales and collections series, particularly in the drug trade.

The Wholesale Grocery Atlas is nearing completion and will be published early in the next fiscal year. Plans are also under way for the publication of a revised Consumer Market Data Handbook for 1938.

The construction economics section has completed several studies on various aspects of this industry. A report on the social and economic aspects of technical developments in the construction industries, prepared by this section, was published by the National Resources Board in its report on Technological Trends and National Policy. The section has prepared for general public release three articles: Economic Factors Related to Residential Building, Construction Trends and Related Factors, and The Position of the Construction Industry. It also prepared material for a new chapter on construction for the World Economic Review, involving special studies on the financing of construction and on the market conditions for residential and other construction. During the last few months of the year this section has been engaged upon an extensive statistical analysis of construction activity in the United States, particularly covering the years 1915 to 1936.

The consumer market section made substantial progress in developing new material for the practical use of producers, distributors, and others, through its series on Consumer Use of Selected Goods and Services, by Income Classes. A report covering a second group of 9 cities, evenly distributed throughout the United States, was issued during the year, and similar tabulations for 32 other cities were completed. Reports already issued, together with the tabulations for 32 cities to be published in the summer of 1937, provide information obtained from a total of approximately 230,000 families in 50 cities.

Close contact with retailers was maintained during a period of significant developments in the trade, in the Division's studies dealing with organization, type of operation, and State and Federal legislation affecting retailers.

Trade and business groups and individual retailers have received advice in matters dealing with distribution costs, operating policies, and methods. Annual estimates of the volume of retail trade were published. A field survey was made and a report published on the extent of store-modernization needs. An analysis showing the effect of State sales taxes on retail trade was published, and several economic maps were prepared providing a graphic analysis of retail demand based on the relation of population, stores, and sales.

Other Government agencies (notably the Resettlement Administration and the Social Security Board) have been assisted in problems of retail management, operating costs, store location, and personnel.

The trade association section issued a directory, *Selected Trade Associations of the United States: 1937* edition, covering approximately 2,400 trade associations of national and interstate scope. The first of a series of lists of State and local associations, to be issued by States and to cover some 3,000 trade groups, was published. Lists of leading trade associations in the food field and the lumber industry were prepared and published in cooperation with industrial divisions of the Bureau.

The wholesale trade section has issued several important publications. Two of these studies, *Markets for Electrical and Gas Facilities in Residences* and *Markets for Plumbing and Heating Facilities in Residences*, based on original data obtained in the Real Property Inventory of 64 selected cities, were designed to aid in the fullest utilization of this factual information by manufacturers and distributors of the commodities covered.

Three studies in the Basic Industrial Markets series, covering the textile, the iron and steel, and the electrical-utilities industries enable industrial marketing executives to determine quickly and accurately the size and location of those sections of their market represented by the industries covered. Another study in this series, covering the pulp and paper industries, is completed and will be published during the summer of 1937. A publication giving the *Sources of Current Trade Statistics* has been completed and will be published early in the next fiscal year.

During the past fiscal year the marketing service section has continued to supply information on business and economic questions to contacts from all sections of the country and from the Government.

An aggressive policy of searching for new sources of marketing research data for use in the 1938 edition of *Marketing Research Sources* has been followed. New material collected has been currently announced in the periodical *Domestic Commerce*.

The Business Information Service, which provides businessmen with data on their current problems has shown a steady growth.

The simplicity of format and the short intervals between issues makes it possible for *Domestic Commerce* to render an almost day-to-day service in apprising readers of the current developments in the field of marketing.

#### TRANSPORTATION AND COMMUNICATIONS

During the year the work of the Foreign Trade Zones unit was consolidated with the Transportation and Communications Division, and the following five-point program was developed: (1) The dissemination of its analyses of domestic transportation services, including terminal and transit problems, which reveal the complexities of the national transportation problem as a whole and their effect on the distribution problems of commerce and industry, in order to afford interested parties a better national concept of what a coordinated transport policy should achieve; (2) the promotion of the sale of railway and floating equipment; (3) advice to manufacturers and exporters regarding their transporting, packing, and communications problems; (4)

economic analyses of the financial and physical aspects of all forms (excluding air) of foreign transport; (5) carrying out the administrative work of the Foreign-Trade Zones Board created by act of Congress (48 Stat. 998, 1001).

Much of the material developed in connection with these subjects is released through the three Division news letters, (a) Foreign Shipping News, (b) Foreign Railway News, and (c) Foreign Communications News.

Work was completed on the European, Asiatic, and African sections of the study of foreign telecommunications, and plans are being made for its release. The revision of the world survey of foreign railways, issued in 1933, was practically completed and will be kept current through issuance of supplements. A review of domestic rail and highway transportation was issued. It is expected that the Division will inaugurate a domestic-transportation news letter, and during the coming year it plans to issue such publications as: Brief History of the Merchant Marine; Inland Waterways in the United States; Control of Ocean Freight Rates in Foreign Trade; and a revision of its study made in 1935, at the request of the President's Transportation Committee, on coordination of rail and highway services in foreign countries. Because of the insistent demand for copies of Packing for Foreign Markets, issued in 1924, work on its revision will be initiated. During the year data were developed showing the various inland and intercoastal waterways with their connecting channels in the United States, and it is expected that this report, in processed form, will be released soon.

The creation of the Maritime Commission, and the transfer to it of the functions of the Shipping Board Bureau of the Department, has increased the Division's responsibility in assisting to develop the Department's shipping policy as it relates to our foreign commerce. During the year detailed memoranda were furnished the Secretary's office on pending maritime legislation. The Maritime Commission received considerable assistance through the use of the shipping and ship-subsidy files in the Division, and an arrangement was worked out with it for the filing of ocean bill-of-lading forms at all of the Bureau's district offices. The War Department was supplied with traffic data on various foreign and domestic seaports, foreign inland waterways, foreign port facilities, and merchant marines. The Navy Department was supplied with reports on bunkering facilities at world ports, as well as data on the world tanker fleet and the value of American seaborne commerce. Material was supplied to several Bureaus of the Department of Agriculture, the Interstate Commerce Commission, the Federal Communications Commission, the Tariff Commission, and the Business Advisory Council on transportation subjects. Data were supplied to the Export and Import bank in connection with several shipments of rolling stock and locomotives. The Division reviewed, for the Central Statistical Board, six Works Progress Administration traffic-research projects on behalf of the Port of Boston and suggested certain changes in the standardization of shipping statistics. The Tennessee Valley Authority was provided with data on ocean transportation costs, foreign inland waterways developments, foreign railway legislation affecting highway and railway coordination, domestic inland waterway costs, etc.

The Division continued to advise exporters as to the best methods of preparing shipments. Through the Bureau's foreign offices, approximately 40 foreign manufacturers submitted exhibits for the annual packaging conference held by the American Management Association at New York.

In the industrial field the Division continued its cooperation with the railway-supply manufacturers, in promoting the sale of their equipment abroad; with the various rail and motor carriers' associations, which were furnished with detailed information concerning the efforts being made in foreign countries to coordinate transportation services; and with various waterway associations, including the National Rivers and Harbors and the Mississippi Valley Association.

Indicative of the Division's services during the year, there may be mentioned the rendering of assistance to a firm interested in the establishment of a branch plant to serve South Atlantic States; determining for a large organization the trends in shipping and shipbuilding with respect to Dieselization; supplying financial reports on various railway and steamship companies; developing data for a large wood-pulp concern as to the possibility of navigation on the intercoastal waterways for the transportation of wood pulp by barge; providing information on various forms of transit services to a large city, which was contemplating a change and eventually adopted a new method for transit purposes; aiding an American firm to represent as purchasing agents in the United States a railway construction project in Latin America, etc.

#### ADMINISTRATION OF THE FOREIGN-TRADE ZONES ACT

During the year the Director of the Bureau continued to serve as alternate for the Secretary of Commerce on the Foreign-Trade Zones Board. This Board, which consists of the Secretary of Commerce as chairman, the Secretary of the Treasury, and the Secretary of War, is authorized under the law to grant to public and private corporations the privilege of operating and maintaining foreign-trade zones. The Chief of the Transportation Division is the executive secretary of the Board.

The committee of alternates held nine meetings during the year to review and prepare material for the Board in connection with the administration of the act. The Division arranged these meetings and prepared material for consideration by the committee of alternates.

Through its foreign-trade zones section, the Division engaged in field examinations of the applications of the Board of State Harbor Commissioners of California, and the Alabama State Docks Commission, for the privilege of establishing and operating foreign-trade zones in the ports of San Francisco, Calif., and Mobile, Ala., respectively.

With the opening of the foreign-trade zone at Stapleton, Staten Island, N. Y., on February 1, 1937, the Division entered on a new phase of this administrative work. Under the act, all foreign-trade zones must be operated as public utilities, and all tariffs and charges of this recently opened zone will be reviewed by the Division during the current year.

### CONFERENCES AND EXPOSITIONS

The conferences and expositions section of the Bureau, the functions of which include coordination of activities of all bureaus in the Department of Commerce in the furtherance of conferences, fairs, expositions, and related enterprises, has been engaged on a larger number of projects than usual. There has been close cooperation between this section, all units of the Department, and numerous Federal and nongovernmental agencies.

The agenda of the 30 or more international conferences—for the most part held in other countries—in which the Department of Commerce was actively interested, covered scientific, educational, and commercial subjects. Approximately 100 conferences and conventions varying in size and character, held in the United States, also engaged the attention of the section. Many of these were in fields in which the Bureau of Foreign and Domestic Commerce has a primary interest and is equipped to perform valuable service. In this group were such conferences as the twenty-third National Foreign Trade Convention, which took place at Chicago from November 18 to 20, 1936.

### ADMINISTRATION OF CHINA TRADE ACT

At the close of the fiscal year, there were 85 companies actively functioning under China Trade Act charters, with a total paid-up capital approximating \$14,000,000 United States currency. The China Trade Act was passed by Congress in 1922 to give American firms a uniform Federal incorporation law for the purpose of engaging in business within China exempt from Federal income taxes, so as to place American interests on a basis of equality in competing with British and other nationals not subject to home taxation. The administration of this act is placed by law in the Secretary of Commerce, and the Registrar is one of the trade commissioners of the Bureau of Foreign and Domestic Commerce, stationed at Shanghai. The Registrar's office at Shanghai daily receives innumerable inquiries from these enterprises regarding features of the act and the regulations under it; the activities of the Registrar also relate to applications for certificates of incorporation, certificates of amendment to articles of incorporation, certificates of authorization for voluntary dissolution, annual reports, revocation proceedings through the United States Court for China, etc.

### NEGRO AFFAIRS

The Division of Negro Affairs supervised Negro participation in the Texas Centennial Exposition. Personnel had been engaged and exhibits set up prior to the beginning of the fiscal year, but the exposition continued through November 30, 1936, after which time the Division was concerned with forwarding the materials to the respective exhibitors or placing them for permanent exhibit at various institutions. The total attendance at the Negro exhibit was 403,227, about equally divided between Negroes and whites. Many statements from the public press and from outstanding citizens testified to the educational value and the attractiveness of the exhibit.

The Division gathered and disseminated information relative to the Negro's economic status and his business activities. The definite requests for information requiring research or the gathering of mate-

rial totaled 1,120, while 276 governmental and 268 nongovernmental callers sought information in person, and 3,108 letters required direct replies and mailing of 2,764 parcels containing printed matter.

The following studies were completed and distributed: Negro Chambers of Commerce, Negro Trade Associations, and Causes of Negro Insurance Company Failures. The last-named study proved of special interest to executives of Negro insurance companies and was sought widely for special use by administrative officers in these companies.

The following compilations have been made and given general distribution: Convention Dates of Negro Organizations; Negro Newspapers and Periodicals in the United States; The Negro in Business—A Bibliography; and Negro Aviators. Two issues of Notes and Comments From the Division of Negro Affairs have been sent to the Negro press.

The miscellaneous activities of the Division cover a variety of services such as suggestions to students, writers, and publicists of source material for essays, dissertations, articles, and books dealing with various subjects pertaining to the Negro; advice to young people on the lines of business which they might profitably enter; and suggestions as to agencies to which persons may turn for assistance or counsel in the many problems that Negroes face in their struggle for social and economic security.

#### EDITORIAL AND PUBLICATION WORK

The Editorial Division has continued its customary work of preparing for the printer the publications of the Bureau, both monographs and periodicals. In point of quantity its work registered an appreciable increase over the preceding year—responding to the availability of somewhat larger funds for printing and binding.

In the case of each printed publication the Editorial Division has been called upon to evaluate the general worth of the material, to devise the best ways of handling it typographically, to check and revise the phrasing from the standpoint of correct expression and concise presentation, and in some cases to recast the arrangement or even to write new matter. To the Industrial and Technical Divisions the Division gives day-by-day advice on a variety of technical printing problems. All the Bureau's processed publications are scrutinized by the Editorial Division and given such editorial attention as seems necessary before being reproduced.

During the year the publications distribution section was incorporated in the Editorial Division and continued its active endeavors to increase the circulation of all Bureau publications by making the business community fully aware of their value and timeliness. These efforts have resulted in substantial increases in the number of subscriptions (and renewals) to the Bureau's periodical publications—notably Commerce Reports and the Survey of Current Business—as well as in augmented sales of numerous special monographs. The section has cooperated with committees for such activities as Foreign Trade Week, by developing special circulars to be mailed to many business groups. A campaign has now been undertaken to develop the use of the Survey of Current Business as standard text material in the schools of commerce and business administration of university grade.

## NATIONAL BUREAU OF STANDARDS

### GENERAL ACTIVITIES

A new scientific section was set up in the Chemistry Division during the year to handle the research on the thermochemical properties of petroleum.

*Finances and personnel.*—The appropriation for the Bureau for 1937 was \$1,943,900 (including \$89,400 to cover delayed reclassification of positions to higher grades), a total increase of \$141,400 over funds available for expenditure in 1936. The regular staff at the close of the year (including temporary employees) numbered 842. In addition, 54 research associates, supported by national engineering societies and trade associations, were engaged in technical problems of mutual interest to the Government and industry.

*Testing.*—One of the important functions of the Bureau is the testing of supplies and material for the Federal Government. This work shows an increase of about 17 percent over the preceding year. This service which the Bureau renders for practically every Governmental agency is of great value in insuring that the quality of supplies purchased meets the requirements of the Federal specifications.

*Publications.*—The results of the year's work have been made available through 287 publications and articles. In addition, approximately 90 letter circulars and mimeographed notes on subjects of general interest have been prepared and distributed on request.

*Visiting committee.*—The members of this committee are: Morris E. Leeds, president of the Leeds & Northrup Co.; Dr. Karl T. Compton, president of the Massachusetts Institute of Technology; Gano Dunn, chairman of the J. G. White Engineering Corporation; Dr. William D. Coolidge, director of the research laboratories of the General Electric Co.; and Dr. Frank B. Jewett, president of the Bell Telephone Laboratories. As in the past, the committee's advice has proved most helpful.

*International scientific relations.*—At the ninth session of the International Commission for Uniform Methods of Sugar Analysis held in London, August 31 to September 5, 1936, the Bureau was represented by Frederick Bates, who had been reelected president of the Commission. Mr. Bates also attended the session of the International Union of Chemistry at Lucerne, August 16 to 22, as a representative of the National Research Council.

At the request of the Department of State, J. H. Dellinger served as chairman of the American delegation to the session of the International Radio Consulting Committee in Bucharest, May 21 to June 8, 1937.

The regular biennial meeting of the International Committee on Weights and Measures was held in Paris, June 23 to 29, 1937, and

was preceded by sessions of related committees. Assistant Director E. C. Crittenden represented the Bureau at these important meetings, which included international advisory committees on electricity and on photometry and a special committee on units and standards appointed by the International Commission on Illumination. Definite agreement was reached to adopt a single new system of photometric units, as proposed by the Bureau, to supersede both of the two systems now in use in different countries. This change is proposed to be effective January 1, 1940, when values of electrical units based upon absolute measurements are also to be substituted for the present international units based upon arbitrary standards. Mr. Crittenden was also designated by the State Department as an official delegate to the Ninth International Conference on Large High-Tension Electrical Systems, June 24 to July 3, and to an International Conference on Applied Metrology called by the French Government for July 3 to 5, 1937.

*Twenty-seventh National Conference on Weights and Measures.*—This conference was held at the Bureau on June 1 to 4, 1937, with weights and measures officials in attendance from 32 States and the District of Columbia, together with representatives of other Government Departments and manufacturers of weighing and measuring devices. An important item for discussion was the amendment of specifications and tolerances relating to highway scales for weighing motortrucks. The experience of the Bureau in testing this type of scale indicated that the tolerances were unnecessarily severe on light loads. The data in this connection were made available to the conference through the Committee on Specifications and Tolerances, and liberalizing amendments were adopted. One of the features of the conference was a complete demonstration test of a motortruck scale, utilizing the new portable testing equipment of the Bureau which carries fifteen 1,000-pound weights.

*Proposed legislation regarding weights and measures.*—It is a singular fact that the system of weights and measures now in customary use throughout the country has never been formally legalized by Congress, despite the fact that the metric system was legalized 70 years ago. A bill to remedy this situation is now before Congress (S. 2785 and H. R. 7869) with the endorsement of the National Conference on Weights and Measures. The best material standards in the possession of the National Bureau of Standards are the national prototypes of the meter and the kilogram, which are made of a platinum-iridium alloy. These standards have proved to be remarkably constant in value during the past 40 years, and the bill provides that the inch and the pound shall be derived from them by means of specified ratios. For the inch, the relation is 1 inch equals 25.4 millimeters, exactly. This simple relation differs by 2 parts in a million from the ratio used in the past, but the difference is so minute as to fall far within the tolerances of industrial measurements.

*Conference of public utility engineers.*—The engineers of the utility commissions of 21 States and the District of Columbia met with the representatives of the Federal Government concerned with the technical aspects of regulation of public utilities in their fifteenth annual conference at the Bureau on May 19 to 21, inclusive. Eight formal papers were presented and discussed. These annual conferences are constructive and helpful.

*American Standards Association.*—The Bureau takes an active part in the work of this association. In addition to representation on about 100 sectional committees dealing with technical projects, and the primary responsibility for 17 of them, it is represented on the following coordinating agencies of the association: The board of directors, the Standards Council, the Safety Code Correlating Committee, the Electrical Standards Committee, the Mechanical Standards Committee, the Advisory Committee on Ultimate Consumer Goods, and the Building Code Correlating Committee. The Bureau's safety-code work is conducted under the procedure of the association, and all of its safety codes have been issued as standards of the association. All of the building-code and plumbing-code requirements thus far formulated under the auspices of the Bureau have been accepted as a basis for the development of building and plumbing codes under American Standards Association procedure. Two members of the staff of the association are located at the Bureau to facilitate the cooperative work of the two organizations.

*Federal specifications.*—The Bureau makes many investigations and tests in connection with the development and use of purchase specifications by the Federal Government. The Director serves as chairman of the Federal Specifications Executive Committee, under the auspices of which 1,132 specifications have been prepared for the use of executive departments and establishments of the Government.

#### ELECTRICITY

Although the maintenance of the basic electrical units, the ohm, the ampere, and the volt, is a fundamental duty of the Bureau, it is no less important that these units should be suitably extended and applied to practical problems of measurement. In industrial applications, means must be provided for accurate measurements over the range from one-millionth of 1 volt to 300,000 volts or more. The process of building up or stepping down from the basic unit to such values requires refined auxiliary apparatus and a large number of steps in the procedure, each of which must be closely checked to minimize the error in the final result. For many years the Electrical Division has devoted much thought and effort to these problems.

Electrical interconnection of power plants reduces the cost of generation and promotes reliability of service to all consumers. This exchanged energy is always measured with the help of metering transformers which reduce the current and the voltage of the line, in known ratios, to lower values which can be readily metered.

To obtain an independent check on the accuracy of the results of the methods and instruments used in building up high-voltage measurements, the Division has completed an absolute electrometer for measuring high voltages directly. The high voltage to be measured is applied directly to the instrument and is evaluated in terms of the fundamental units of length, mass, and time.

This absolute electrometer is now erected in a small low-ceiling building which is entirely inadequate, and it can, therefore, be used only to one-third of its range—that is, up to 100,000 volts—despite the fact that some generating stations are transmitting power at 285,000 volts. This illustrates the urgent need for a high-voltage laboratory to meet modern requirements in electrical measurement.

Two technical papers on this subject are nearly completed; one describes the electrometer in detail and gives the results of tests; the other suggests the use of multicoil step-down transformers for extending the range of precise high-voltage measurements, and the confirmation of these results by the use of the electrometer.

*Radio.*—The standard-frequency service was expanded by the inauguration of regular broadcasting of standard time intervals; these are highly accurate intervals of 1 second duration. Daily broadcasting of the standard of musical pitch was begun. The research on the characteristics of the ionosphere demonstrated correlations between terrestrial magnetism, ionosphere properties, and radio-transmission conditions. A comprehensive study of sudden fadeouts of long-distance radio transmission led to their explanation in terms of ionosphere effects and to the discovery that they are due to sudden eruptions on the sun. Because of widespread interest in the ionosphere data, new arrangements were made for its rapid dissemination, both in print and by radio broadcasting. A practical radio system was developed for continuous transmission of data on temperature, pressure, humidity, light intensity, etc., from instruments carried by small unmanned balloons. Complete records have been obtained from ground level up to heights of 15 or more miles. This work, which has been carried on in cooperation with the Weather Bureau and the Bureau of Aeronautics, gives promise of being of great practical importance to aeronautics.

*Standard cells.*—On April 2, 1937, the Bureau's reference group of primary cells was increased to 26 cells. The value assigned to this group is, however, precisely the same as the value of the original group of 18 cells. Ten saturated cells were carried to the International Bureau, measured there, and brought back. One cell developed a defective terminal, but nine cells had an average value of 1.0182624 volts before being measured at the International Bureau and 1.0182626 volts after their return here, showing remarkable constancy.

*Other investigations.*—Other investigations which are either completed or have made noteworthy progress are: The completion of a new standard of inductance; apparatus to extend the range of capacitor testing from 50 to 250,000 micromicrofarads; a new design of fixed coils for the current balance; studies of the electrical properties of rubber as insulating material; construction of a new permeameter for magnetic measurements; publication of results on nonferrous pipe specimens, and of bituminous pipe coating after 12 years in the earth; black-body primary standard of light; and new standard incandescent lamps.

#### WEIGHTS AND MEASURES

*Recomparison of National Prototype Kilogram.*—National Prototype Kilogram No. 20 was returned this year to the International Bureau of Weights and Measures for recomparison with the international standard. As a result, the mass of Kilogram No. 20 has been provisionally certified as 0.99999998 kilogram; that is, its mass is 0.02 milligram less than 1 kilogram. This is the first time Kilogram No. 20 has been returned to the International Bureau, and it is of interest to note that in nearly 50 years its mass has changed by

only 1 part in 50 million, the value as originally certified being 0.99999996 kilogram. This high degree of constancy over a long period of years is very reassuring.

*Thermal expansion of solids.*—The thermal expansion of lead-antimony alloys, containing 2.9 to 98 percent antimony, has been studied over a temperature range of  $-12^{\circ}$  C. to  $+200^{\circ}$  C. and equations derived which give the relations between percentage composition and coefficient of thermal expansion (RP938). It was found that the coefficients of expansion, and also the density, of these alloys decrease linearly with increase in the atomic percentage of antimony. As a result of this work it is possible to select a lead-antimony alloy having a coefficient of expansion that matches that of iron, nickel, gold, copper, silver, aluminum, magnesium, and many of their alloys, as desired.

Work on the coefficient of expansion of cemented tungsten carbide has also been completed and the results published (RP960). This material, known in industry as carboloy, is in the class of superhard materials and is used as the cutting element in machine tools. Because of its low coefficient of expansion, cemented tungsten carbide undergoes only small dimensional changes when subjected to the changes of temperature incident to cutting operations, grinding, etc.

*Dental research.*—These researches, carried on in cooperation with the American Dental Association, have continued to yield highly gratifying results. During the past year attention has been given largely to studies of denture base materials, silicate cements, and tooth pastes, to the preparation of specifications, and to the testing of dental materials for compliance with specifications. The study of proposed substitutes for denture base rubber has shown these materials to have characteristics which seriously limit their serviceability. The work on silicate cements has been concluded and the results presented in a report at the annual meeting of the American Dental Association.

*Testing railway track scales.*—Fourteen of the 18 master track scales in the United States were calibrated during the year. Eight as found were within the adjustment tolerance, while four were slightly outside the adjustment tolerance but well within the maintenance tolerance. Adjustments were made so that all scales, as left, were weighing well within the adjustment tolerance of 0.01 percent. The master scales of the country are in excellent condition.

One thousand and seventy-one commercial track scales were tested in 38 States and the District of Columbia and on the tracks of some 121 railroads. Eight hundred and six of these, or 75.3 percent, were found within the tolerance allowed ( $\pm 0.2$  percent). The corresponding figure for the last fiscal year was 73.1 percent.

*Testing of vehicle scales.*—Of all the tests of commercial weighing and measuring equipment made by State and local departments throughout the United States, in the enforcement of weights and measures laws, perhaps the tests of large-capacity scales, and especially vehicle scales, are the least satisfactory, due to lack of adequate testing equipment. In an effort to remedy this situation the Bureau has put into service a vehicle-scale testing unit, consisting of a truck carrying 15,000 pounds of standard 1,000-pound

test weights and equipped with a power-operated crane for handling them. The unit is being used in cooperation with the States in surveys to develop conditions existing in respect to vehicle scales and to determine whether they require special testing equipment; and to make tests on Government-owned scales, the great majority of which have never been adequately tested.

The equipment was put into service in November 1936 and during the remainder of the fiscal year tested 432 vehicle scales. Eighty-nine scales, or 20.6 percent of the total, were found to be accurate, while 343 scales, or 79.4 percent of the total, had errors greater than  $\pm 0.2$  percent of the applied test load. Cooperative programs covering the following States have been completed: Virginia, North Carolina, South Carolina, Georgia, Florida, and Maryland; a similar program is now under way in Delaware.

*Research on flow nozzles.*—The cooperative research on flow nozzles under the sponsorship of the fluid meters committee of the American Society of Mechanical Engineers has been continued, and data have been secured on nozzles in pipes ranging from 3 to 24 inches in diameter. Tests have been made with water, oil, and steam.

*Identification.*—Fifty-six cases relating to the identification of signatures and documents have been handled during the year, and the Bureau's findings have not been successfully opposed in a single case. This work has saved the Federal Government many thousands of dollars.

*Test and certification of apparatus.*—In view of the fact that about 80 percent of the funds allocated to this Division are expended in the test and certification of weighing and measuring apparatus, it is appropriate to mention specifically some of this testing. In general there was a marked increase in the number of pieces of apparatus submitted for test over the number submitted during the preceding year. Some of these increases were as follows: Analytical weights, 24 percent; glass volumetric apparatus and hydrometers, 12 percent; line standards of length, 9 percent; limit gages, 20 percent; documents for identification, 15 percent; thermal expansion specimens, 162 percent. There was a decrease of 27 percent in the number of timepieces submitted for test.

#### HEAT AND POWER

*Thermal properties of water and steam.*—For several years the Bureau has participated in an international program to obtain more accurate data on the properties of water and steam, and to extend the measurements to higher temperatures and pressures than had been reached previously. During the past year one part of the program, the measurement of the properties of water and saturated steam from 100° C. up to the close vicinity of the critical point (347° C. and a pressure of 225 kg/cm<sup>2</sup>), has been completed by publication of the results (RP983). Special apparatus was used, and it was found that even at the higher temperatures, the reliability of the heat measurements was not greatly inferior to that attained at ordinary temperatures. As the temperature neared the critical point where water and steam are no longer distinguishable from each other, the accuracy became less, but it was possible to obtain satisfactory measurements within 1° C. of the critical temperature. The results have been tabu-

lated in a form convenient for use in the preparation of the tables used in steam engineering, and provide a substantial part of the data required for a complete table.

*Ignition temperature of materials.*—It has been recognized that for mixtures of combustible materials with air or oxygen, self-heating of the mixture begins at a temperature considerably below that at which the mixture passes into a state of visible combustion or explosion. This lower temperature has been defined by various terms and test conditions, but it has appeared to be so dependent on its surroundings that the mixture itself, without qualification, could not be considered as having a definite self-ignition temperature.

During the past year experiments were made to determine the effect of surroundings on the temperature of ignition. For materials that are initially in the liquid state and are vaporized before ignition, the size of the sample tested is the most important condition influencing ignition temperature. The samples were heated in air at atmospheric pressure in flasks ranging from 200 to 15,000 cc capacity. Careful control was exercised over the temperature uniformity on the surface of the flask, and effects such as catalytic action of thermocouple wires were eliminated or their magnitude determined.

With this large range in size of sample, only a minor range in ignition temperature was found, so far as the hydrocarbons (of which a particular study was made) were concerned. Thus for a sample of kerosene the range was from 228° to 237° C.; for aviation gasoline, from 255° to 266° C.; for motor gasoline, from 240° to 256° C., and for cleaners' solvent, from 245° to 251° C. The lower temperatures were obtained in all cases with the largest sample. Considering the greater difficulty in obtaining temperature uniformity for the larger samples, it is possible that the differences may be actually smaller than indicated, since higher temperatures than those measured may have been obtained at points in the larger flask. Accordingly, it appears that for these liquids the ignition temperature depends more upon the properties of the material or mixture than on surrounding conditions.

Some heavier oils have self-ignition temperatures even lower than those given above. Apparently some of the more complex hydrocarbon molecules have lower self-ignition temperatures than the simpler ones. The self-ignition temperature has no connection with the flash-point, the temperature at which the vapor ignites when exposed to a flame.

*Automotive engineering.*—The Bureau's service to other departments of the Government in matters relating to motor vehicles is increasing. Fuels and various appliances such as governors, air and oil filters, spark plugs, and ignition equipment have been tested, and new tests have been developed where needed. Specifications have been prepared for special motor vehicles, and tests devised to determine their suitability for the purpose in hand. The Bureau has continued its active cooperation with outside agencies in the further improvement of motor fuels and in the development of tests for Diesel fuels.

*Control of water evaporation in storage reservoirs.*—The use of thin films of oil has been found from laboratory studies to be very effective in reducing evaporation from water surfaces. Some materials have been found which will maintain an unbroken oil film on the

water for 2 weeks or more. During this period, the evaporation is reduced to a small fraction of that occurring from an unprotected surface. The subject deserves further study in connection with the conservation of limited water supplies for stock.

*Testing thermometers.*—The number of laboratory thermometers received for test has been gradually increasing since the low of 1,757 for the year 1934. During the past year 2,721 laboratory thermometers were received, the largest number since 1931; 60 percent were for the public and 40 percent for the Federal and State Governments. Of the 141,603 clinical thermometers tested, 95 percent were for Government departments.

*Primary standard of light.*—The primary standard of light developed at this Bureau 6 years ago has been studied by several other national standardizing laboratories and now is being proposed as an international standard. The brightness of the interior of a hollow inclosure immersed in a bath of molten platinum at its freezing point ( $3,224^{\circ}$  F.), as seen through a small opening, will be defined as 60 candles per square centimeter. Nine carbon-filament standard lamps of this Bureau have been rated in terms of this primary standard. It is planned to rate tungsten standard lamps in terms of the brightness of a black body at the freezing point of iridium ( $4,449^{\circ}$  F.) as an independent check on the filter method of rating tungsten standards from carbon standards.

#### OPTICS

*Spectrographic analysis.*—The possibility of making chemical analyses by means of emission spectra was emphasized by the German scientists, Kirchhoff and Bunsen, 75 years ago, but full recognition and development of such a possibility has been delayed until the present time. For more than 20 years the Bureau's spectroscopy section has used emission spectra for the identification and quantitative estimation of chemical elements. Identification rests upon measurements of wave lengths which are unique physical constants of the elements, and quantitative determinations are based on intensity comparison of such radiations. Owing largely to modern improvements in apparatus and methods for measuring spectral line intensities, spectral analysis has come to be applied in hundreds of research and industrial laboratories. The sensitiveness and reliability of the method, and the economy of time and material growing out of its use have been amply demonstrated in spectrum analysis of metals and alloys. Spectral methods are employed to guide chemical purification of metals, to test materials of specified purity, to sort scrap metal, and to control the composition of alloys. In the Bureau's laboratory, besides purity tests of metals, semiquantitative analyses of a great variety of materials are made, such as salts, precipitates, ashes, rocks and minerals, glasses, dental cements, and other technical products.

In addition to thousands of identifications for the chemical and metallurgical divisions of the Bureau, tests have been made for the Bureau of the Mint, the Federal Bureau of Investigation, the Tennessee Valley Authority, and the Bureau of Chemistry and Soils, and advice on the design, equipment, and operation of spectrochemical laboratories has been given to many Government and industrial laboratories.

In the past decade, nearly 1,000 papers have been published on applications of emission spectra to chemical analysis, and because these developments have been largely empirical, there have been many variations of methods and technique, and differences of opinion as to the proper apparatus or procedure. Believing that the correct answers to such disputed questions are to be found in the principles of physical optics and in the mechanism of radiation, the Bureau is seeking a physical basis for spectrochemical analysis through the correlation of empirical facts with the structure of spectra. The partial spectra of synthetic mixtures are being systematically observed and interpreted in terms of spectral and atomic structure. It has been demonstrated that the absolute and relative sensitivities of various spectral lines are related to atomic structure, and that electron configurations of valence electrons and excitation energies of the atoms are fundamental factors.

*Ultraviolet radiation.*—By using an ultraviolet meter—consisting of a suitable photoelectric cell and radiation filters to measure the spectral component intensities—and a radio wave signalling device which transmits the photoelectric response to a ground station, quantitative measurements of the spectral quality and intensity of the ultraviolet were obtained, for the first time, from carrier balloons at altitudes ranging from sea level to 80,000 feet.

*Reflectance and opacity.*—A simplified theory associating reflectance and opacity with thickness of the layer has been verified for vitreous enamel, cold-water paint, dental silicate cement, and paper. It has been found that the two constants, reflectivity and coefficient of scatter, give an adequate and practical specification of the reflectance and opacity of layers of these materials. This form of specification has been adopted for vitreous enamels, and is also being used to some extent in specifications for paper and paper-making materials.

*Automatic spectrophotometer.*—Colorimetric research and testing have been greatly facilitated by an automatic spectrophotometer which delivers the transmission or the reflection curve of a material in a few minutes' time, as compared with from one to several hours by manual methods.

*Eclipse photographs.*—In connection with the National Geographic-United States Navy Eclipse Expedition, photographs of the solar eclipse of June 8 were made at Canton Island in the South Pacific, using the 9-inch astrographic lens designed and constructed at the Bureau. Satisfactory black-and-white negatives and color-separation photographs were obtained.

*Standards of planeness.*—The Bureau's set of three standard true planes (fused quartz disks 11 inches in diameter and 2 inches thick) were resurfaced; and a set of four, 9 inches in diameter, was made. The variation from planeness across any diameter of these proved less than 5 ten-millionths of an inch. To insure this accuracy in use, a study was made of their bending on supports of various types.

*Shrinkage of film.*—In cooperation with the American Society of Photogrammetry and governmental agencies engaged in aerial surveying, a study has been made of the shrinkage characteristics of aero-mapping film and photographic papers used in this work. Ap-

paratus and methods of testing have been developed by the Bureau and these are being incorporated in specifications.

*Recombination coefficient.*—The recombination coefficient for electrons and ions under low pressure discharge conditions has been measured for the first time by a direct method.

*Improved radiometerograph.*—In cooperation with the United States Weather Bureau, a radio meteorograph has been perfected which will measure pressures to within  $\pm 2$  millibars, temperatures to  $\pm 0.5^\circ$  C., and humidity to 5 percent in the upper atmosphere. A special radio receiver insensitive to local electrical disturbances has been developed for use with this radiometerograph. Radio equipment for investigating conditions, such as cosmic rays, at very high altitudes, above 20 miles, has been perfected and tested successfully to altitudes of 25 miles.

*Radium and radioactive materials.*—At the request of the United States Post Office Department, a complete survey of conditions under which radium could cause fogging of photographic films while in transit in the mails has been made. An investigation, in cooperation with express and radium companies, has been conducted to determine safe conditions for distribution of radium by express. Over 1,500 radioactive preparations, with a total content of approximately 10,000 milligrams of radium, were measured, and 25 samples of luminous material were tested for brightness.

*Research on sugar and related subjects.*—The Bureau investigated the French "sugar scale" and developed a method whereby that scale could be brought into agreement with the international sugar scale. Its recommendations were adopted by the International Sugar Commission at its ninth session held in London.

A study of the extraction of artichoke juices by diffusion has resulted in valuable data, applicable to commercial processes. This method is widely used in large-scale operations, such as the extraction of sucrose from sugar beets.

An improved method for the manufacture of the rare and biologically important sugar, ribose, was developed, which reduces the cost from \$40 to \$2 a gram. The specific rotation and mutarotation for polarized light were determined at  $20^\circ$  and  $0^\circ$  for 35 different sugars, and the relative rates of reaction with bromine were measured for 27 sugars. Two new sugars and 10 sugar derivatives were prepared; licenses for manufacture of calcium lactobionate were issued to several large concerns.

#### CHEMISTRY

*Methods of analysis.*—Two important sources of error in gas analysis have been studied: The transfer of nitrogen and oxygen through solutions not intended for their absorption, and the occurrence of conditions of unsaturation in compensators. An explanation has been found for the baffling variations in the formation of carbon monoxide by potassium pyrogallate, the reagent most used in determining oxygen. The substitution of chromous solutions for this reagent has been investigated.

In the field of platinum metals, a drastically revised procedure for the complete analysis of dental gold alloys has been substantially completed. Much of this work is intimately related to the develop-

ment of methods for the analytical separation of platinum metals from other metals which accompany them in natural and manufactured platiniferous materials.

Among other methods of analysis that were developed and published are a method for the determination of sulphur occurring as sulphide in cement (RP968), and a new method for the determination of phosphoric anhydride in phosphate rock, superphosphate and metaphosphate (RP1010).

*Chemistry of rhenium.*—In a study of certain reactions of rhenium it was found that: Rhenium apparently forms a compound in which it has a valency of minus 1; rhenium yields slightly contaminated deposits when electrodeposited from dilute sulphuric acid solutions; and the deposited metal can be oxidized directly to perrhenic acid by exposure to moist air or oxygen (RP999).

*Physical constants of pure substances.*—Precise determinations of the normal boiling points and their changes with pressure have been made on a series of specially purified substances of industrial and scientific importance, including benzene, dioxane, isoprene, normal aliphatic hydrocarbons, and normal aliphatic alcohols.

The difference between the isotopic composition of normal atmospheric oxygen and oxygen in normal water has been redetermined by a new method and found equivalent to a difference of 0.00014 atomic weight unit.

The relation between the boiling point and composition of aqueous solutions of heavy water has been found to be linear over the lower range of concentrations. The composition of the vapor phase in equilibrium with these solutions at their boiling points has also been determined.

The preparation of a quantity of benzoic acid of extraordinary purity needed for the determination of important physical constants led to the critical study of the determination of freezing ranges of pure substances. The freezing range, if properly determined, will be of great value as a criterion of purity.

In cooperation with the University of Illinois, X-ray diffraction patterns of rubber, crystallized by stretching, by freezing, and from solution, were found to be similar. The metamorphoses of rubber hydrocarbon during the freezing and melting of stressed and unstressed samples were studied by means of microtome sections and the polarizing microscope.

Work on the physical constants of pure iridium led to the discovery of a very convenient procedure for the separation of iridium from ruthenium.

*Thermochemistry.*—The heat of combustion of propylene was measured, and values were calculated for the heats of combustion and of formation from the elements of all the gaseous normal olefin (alkene-1) hydrocarbons. There has now been determined accurate heating values for the following industrially important fuels: Hydrogen, carbon monoxide, methane, ethane, propane, *n*-butane, isobutane, *n*-pentane, ethylene, propylene, *n*-butene-1, isobutene, *n*-pentene-1, methyl alcohol, ethyl alcohol, and sulphur.

*Constitution of petroleum.*—Work on the identification of the chemical constituents of petroleum being carried on in cooperation with the American Petroleum Institute led to the following contributions:

The separation for the first time of 2-methyloctane, 3-methyloctane, 4-methyloctane, and isononane, and a nonanaphthene from the "gasoline" fraction; the separation from the "lubricant" fraction by extraction, crystallization, adsorption, and distillation of "homogeneous" fractions of a "water-white" oil, the constituents of which were shown to be naphthene or saturated cyclic hydrocarbons with from 1 to 4 rings per molecule, with no purely paraffin hydrocarbons present in significant amount.

*Combustion of gas.*—A study of the effect on the operation of gas burners of changing the depth of metal through which ports are drilled was completed and reported in RP988 as an aid to the designers of gas appliances. An investigation is being made for the Bureau of Lighthouses of the failure of pilot lights, the extinction of which in lighthouse and airway beacons may be dangerous. Methods have been developed for determining "flame velocity", which is an important element in the design of gas-burning equipment and a factor in the service rendered by gas companies.

*Electroplating.*—Results obtained in cooperative exposure and laboratory tests on plated coatings of nickel and chromium on copper, brass, zinc, and zinc-base die castings, such as are used on plumbing fixtures, household appliances, and hardware for houses and automobiles, indicate that on brass about two ten-thousandths of an inch of nickel (as now required in Federal specifications) is necessary to furnish protection against tarnish and corrosion. On zinc-base die castings somewhat thicker coatings of nickel are required.

A new nondestructive magnetic method and instrument have been devised (RP994) for measuring the thickness of nickel coatings on brass and zinc-base die castings. This method is quick and inexpensive and therefore may be applied to a large proportion, or even to all, of the plated products of a plant or of a delivery. Through such tests the thickness and quality of the plated coatings can be more assuredly certified to meet any appropriate specification.

*Special investigations.*—An investigation of asphalt shingles showed that all of the types of failures encountered in long outdoor exposures (10 years or longer) can be produced by accelerated weathering in 7 months or less.

Experience gained from 10 years of actual road tests of traffic paints resulted in the development of specifications and of a machine for measuring the relative wear of such paints. This has led to a distinct improvement in durability and has clearly shown that specifications for traffic paint should be based on physical and performance tests instead of on chemical composition.

The distribution of particle sizes of dusts collected in the radio stations of the Bureau of Air Commerce was determined, and advice concerning the probable effectiveness of air filters in the various stations was given.

The properties of rubberlike plastics for experimental airship fabrics were studied. Fifteen hundred yards of cloth were coated with a rubber substitute recommended by the Bureau.

*Standard samples.*—During the year the Bureau added standard samples of low-carbon and of high-carbon ferro-titanium to its stock of 110 standards and prepared the usual renewal samples to replace exhausted stocks. Approximately 8,600 of these standards were sold.

## MECHANICS AND SOUND

In cooperation with the National Advisory Committee for Aeronautics and the Bureau of Aeronautics, Navy Department, the strength of tubes under simple loading conditions, and the strength of welded joints in tubes have been studied. Reports have been completed on three divisions of the general program: Torsion of tubes, column strength of tubes with free and restrained ends, and the strength of welded aircraft joints.

The torsion tests on several hundred tubes of chromium-molybdenum steel and of 17ST aluminum alloy show the dependence of the torsional strength on the dimensions of the tube and the mechanical properties of the material. Three types of failure were found to be important for sizes of tubes frequently used in aircraft construction: (1) By elastic two-lobe buckling; (2) by plastic shear; and (3) by a combination of (1) and (2), buckling taking place after some yielding of the tube material. Adequate theories are available for failure by (1) or (2). Most of the tubes tested failed by (3). It was found that the torsional strength of these tubes could be expressed by an empirical formula, involving only their dimensions and the tensile properties of the material.

Compression members in riveted or welded structures are columns with elastically restrained ends. Column tests were made on about 200 specimens, some of which were freely supported while others had restrained ends. The specimens included round and streamline tubing of chromium-molybdenum steel, duralumin, stainless steel, and heat-treated chromium-molybdenum steel. Empirical formulas were developed to represent the column strengths in terms of the tensile yield-strength, a rational method was used for computing the free lengths of columns with restrained ends, and a more accurate method than any previously available was developed for designing compression members of this kind.

The strength of tubular welded joints in chromium-molybdenum steel has been determined both "as welded" and in the heat-treated condition under tensile, compressive, and bending stresses. Tests were made on three kinds of welds: (1) by the usual process with neutral flame and low-carbon steel welding rod; (2) with chromium-molybdenum steel welding rod; and (3) by the recently developed "carburizing flux" process. The results of these tests, published as Technical Report 584 of the National Advisory Committee for Aeronautics, make possible a more efficient and safe design of aircraft structures.

*Rigid frames.*—In view of the growing appreciation of the convenience, economy, efficiency, and beauty of steel rigid frame construction for bridges, hangars, warehouses, armories, and similar structures, and the lack of data on the stress distribution in and around the knees of rigid frames, the Bureau has cooperated with the American Institute of Steel Construction in the experimental determination of the stresses for several specimens designed and furnished by the Bethlehem Steel Co., the American Bridge Co., and the Lukens Steel Co.

*Scour of river bed.*—One consequence of the construction of Boulder Dam in the Black Canyon of the Colorado River is the creation

of a great lake nearly 115 miles long, which serves as a giant stilling basin in which the river will drop its load of sand and suspended silt. The Bureau was asked to determine by laboratory studies whether the clear water below the dam would produce more or less scour of the river bed than the mud-laden stream that flowed there before the dam was built. The results, given in Research Paper RP906, indicate that greater scouring may be expected with clear water.

*Other hydraulic studies.*—Investigations were completed of pressure losses for fluid flow in curved pipes (RP965) and of the performance of a water current meter in water and in air (RP981), and of the strength of flashboards on dams.

Semiannual bulletins on current hydraulic laboratory research have been distributed to interested services of the Federal and State Governments and to hydraulic laboratories in the United States and abroad.

*Engineering instruments and appliances.*—The number of engineering instruments calibrated during the fiscal year was 1,338. Investigations and tests were made of a large number of appliances, including: Fire-extinguishing equipment presented for the approval of the Bureau of Marine Inspection and Navigation for use on vessels; automatic mail-metering devices and stamp-vending machines for the Post Office Department; elevator safety devices for the Federal and State Governments; pin-ball and claw-machines for the District Attorney; numbering machines and electric fans for the Procurement Division; and certain heating appliances for various Federal bureaus.

*Aerodynamic investigations.*—Fundamental studies of air flow have been continued with the cooperation of the National Advisory Committee for Aeronautics. N. A. C. A. Technical Report 581 describes studies of the relation between the intensity and scale of turbulence in wind tunnels and the critical Reynolds number of spheres.

*Aircraft instruments.*—For the Bureau of Aeronautics, Navy Department, development work continued on an aerograph test apparatus for field use with special reference to measurement and control of relative humidity. Further progress has been made in developing a satisfactory synthetic lubricant for fine mechanisms. Laboratory tests have been developed and specifications prepared on fuel-air mixture indicators for aircraft engines. An airspeed-acceleration recorder and a helium purity meter utilizing a porous plug were designed and constructed.

In cooperation with the National Advisory Committee for Aeronautics, a study of the performance of venturi tubes used for operating air-driven gyroscopic instruments was completed and an investigation of the effects of vibration on aircraft instrument performance is in progress.

*Acoustics.*—A considerable amount of time has been spent on tests of materials and in furnishing engineering advice to governmental agencies. A new activity is the examination of emergency announcing systems required on certain passenger ships by the recent safety-at-sea legislation. The large Rayleigh disk chamber has been completed and considerable progress made in setting up an absolute standard of sound intensity.

*Acceleration of gravity.*—The absolute determination of the acceleration of gravity at Washington has been completed and the report published (RP946).

#### ORGANIC AND FIBROUS MATERIALS

*Standardization of methods of physical testing.*—Standard testing methods are the fundamental basis of any intelligible discussion or contract between buyer and seller. They are therefore vital to the industry concerned.

Such methods should be subjected to continual review and revised whenever this is found necessary. It sometimes happens that one industry adopts a method from another, and experience shows it to be inadequate. In other instances an industry progresses to the point where greater precision than is possible with the standard method becomes an everyday need. Commercial testing laboratories would be helped if all industries could be induced to use the same method for measuring the same property of different materials, and the cost of testing would be reduced.

The present demand from the consumer for information about the serviceability of articles has emphasized the need for developing new testing methods designed to measure those properties in which the consumer is particularly interested.

The revision of old methods or the development of new ones requires research. During the past year active work along these general lines has been conducted as follows:

The tire-testing equipment of the Bureau has been completely redesigned and rebuilt. Formerly all tires were tested by the same method, but the differences between bus, truck, and passenger car tires are now so great that this is no longer practicable. Tires are now being tested on the new equipment to get the data required for a revision of the Federal specification. This also involves the development of a new method for measuring the abrasive resistance of the tread, a property not covered in the present specification. The specification for brake-linings is undergoing similar revision.

A method for measuring the shearing strength of rubber insulation on wires was developed in cooperation with the Coast Guard, and has proved useful as an acceptance test.

The method developed by the Bureau for measuring the resistance to wear of carpets has been generally accepted by the manufacturers, and is in use for mill control. Before it can be used as a basis for purchase, it must be checked against a service test. This is now under way: 25 different kinds of carpets are being tested on the machine and will be laid in one strip in a hall in the Federal warehouse. A machine similar to the one used for testing carpets has been found satisfactory for measuring the abrasive resistance of sole leather.

Tests of other flooring materials—concrete, wood, asphalt, magnesite, linoleum, rubber—have been made in cooperation with the Procurement Division of the Treasury Department. Interest lay in the relative suitability of these materials for the floors of post office workrooms. For testing purposes they were laid as segments of a circular track and a steel-tired post office truck loaded to 1,500 pounds

was rolled over them continuously for several weeks, until marked differences in wear developed.

The method used for measuring the thermal conductivity of insulating materials was found to be unsuitable for testing textiles because it involves holding the specimen between two plates, whereas in use one surface of the textile is exposed to the air. A new method was developed and the equipment is now in regular use, testing flying suits for the Navy, and policemen's uniforms for the District of Columbia.

An instrument is being designed to measure the uniformity of color of a dyed or printed article. This is intended for mill control, with the hope that the question of how well the product matches the standard will no longer be a matter of personal opinion.

A tentative specification for washable cotton gloves was prepared. This involved the development of new methods for measuring the shrinkage of the gloves when washed, and the abrasive resistance of the finger tips.

Apparatus for measuring the crumpling resistance of paper is in regular use in testing the value of compounds which are claimed to increase the life of paper money. This work is being done in cooperation with the Bureau of Engraving and Printing.

A machine for measuring the durability of shoes—not the abrasive resistance of the sole but the durability of the whole shoe—was completed during the year and is now being tried out. Already there is evidence that it may provide the answer to such problems as the relative merits of fiber and leather inner soles and the harmful or preservative character of polishes.

Organic plastics, used directly as windshields in airplanes or as cementing material in safety glass, may lose their transparency with age. A haze meter has been developed to measure this property and is now in regular use. This work is in cooperation with the National Advisory Committee for Aeronautics.

The development of new testing methods is being conducted in cooperation with the American Society for Testing Materials, the American Association of Textile Chemists and Colorists, the Technical Association of the Pulp and Paper Industry, the American Leather Chemists Association, and several committees of the Federal Specifications Executive Committee.

*Other examples of the year's work.*—From the other accomplishments of the Division during the past year, the following items have been selected as of special interest: Thermodynamic properties of isoprene (RP951); serviceability of silk dress goods; constitution of wool and collagen; factors affecting the permanence of book papers and photographic film; dimensional changes of printing papers; dressing of furs; measurement of the ionization constants of malonic acid, formation of furfural by hydrolysis of pentoses; and effect of the composition of airplane dopes on the tautness of the fabric.

#### METALLURGY

*"Gases in metals."*—The contention that "analysis is not the whole story" is familiar to all steel users. For many years, various claims, sometimes apparently well founded but often clothed in mystery,

have been advanced that certain products were decidedly superior to competing materials of essentially the same nominal composition. Advances in the study of steel in the past decade or so have served to substantiate some of these claims and in addition to establish the underlying reasons. To "gases in steel", particularly oxygen, have been ascribed some of these mysterious influences, and the determination of gases evolved from metals is now regularly employed in research on the composition of steel. However, lack of uniformity in the analytical methods employed, leading to variable results, has been a serious handicap.

During the year an extensive study on this subject was completed. This work, cooperative in nature and international in scope, was sponsored jointly by the Bureau and the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers. The active direction of the work was vested in the Bureau.

This project, started 3 years ago, was based on tests of a series of eight steels of different composition, prepared under extremely careful supervision in such an amount that all cooperators could be assured of an ample supply of identical material. The study, involving over 2,000 determinations and representing all the methods employed for determining "gases in metals", was carried out in 35 research and standardizing laboratories located in the United States, Great Britain, Canada, Germany, Sweden, Russia, Italy, and Japan, identical samples from each of the eight steels being supplied to each. A summarizing report has been published in the *Journal of Research of the Bureau* (RP976).

The results have strikingly demonstrated the variability in testing methods and the lack of agreement in results reported for the same material. The need for a rigid definition of the details in the test procedure is outstanding. Of the various methods used, the one depending on the evolution of gas when the sample is melted in vacuo, a method long advocated by the Bureau, has been shown to be definitely superior to the others in reproducibility of results. Of the various wet methods, the one in which an aqueous iodine solution is used ranked next. However, accurate results on all the steels were not obtained by this method, whereas they were by the vacuum-fusion method. This method bids fair to become the generally accepted method for determinations of this kind.

Hitherto, the methods for oxygen in steel have been restricted to plain carbon steel. Work in progress indicates that the vacuum-fusion method can probably be used without essential change for alloy steels.

*Aircraft materials.*—Continuous exposure of samples to the weather for 4 years has demonstrated the relative superiority for structural purposes of aluminum alloys containing magnesium as the major alloying constituent, and has also developed the best protective-coating methods. Preparations are in progress for similar tests on stainless steel sheet. Study of the subzero properties of aircraft metals has given reassuring results with most of the materials. Some steels show decreased impact-resistance at subnormal temperatures. Work is being continued, however, to develop a suitable treatment to withstand this; the subzero properties of welded metals are also under

study. Many aircraft metals depend for their high strength on cold-rolling, which gives a material of indefinite elastic properties. More precise definition of these properties is desirable, particularly with respect to overload, and work is in progress to this end. Study of the possible deleterious influence of long-continued fatigue stressing (below the endurance limit) on impact resistance and tensile properties of aluminum propeller alloys has failed to show any serious effect.

*Iron and steel.*—Continued efforts to produce small lots of iron as pure as can possibly be made have given very promising results (RP996). Studies of the fundamentals of oxidation of steel, the basis of coloring methods, and also the hardenability or critical quenching rate of pure iron-carbon alloys have reached the stage of publication. Recognition by the engineering profession of the excellence of the work done on defective bridge-cable wire was shown by the medal awarded by the American Society for Testing Materials to two members of the Bureau staff for their work on this subject. As part of the extensive welding program of the Navy Department, the Bureau is applying the metallographic method in studying the relative weldability of structural steels.

*Foundry.*—The effect on the elastic properties of cast iron of superheating prior to casting has been studied on three grades of iron. In cooperation with the Non-Ferrous Ingot Metal Institute, basic information on the effect of antimony and silicon in nonferrous alloys has been obtained as a preliminary to the ultimate standardization of ingot metals.

*Silver in industry.*—In cooperation with the American Silver Producers, an extensive study of new uses for silver is in progress. This is on a research-associate basis. A great deal of the work is being done in the university laboratories, with the Bureau acting as the coordinating agency and clearing house.

*Miscellaneous.*—The first phase of the study of methods for inhibiting corrosion in air-conditioning equipment is nearing completion. The significance of the ductility requirements in specifying the physical properties of metals has been studied at the request of the Bureau of Aeronautics of the Navy Department. Long-time load tests of soldered joints in copper tubing have been continued throughout the year to determine their merits and limitations in plumbing service.

#### CLAY AND SILICATE PRODUCTS

*Materials for house construction.*—Some special funds for the investigation of leaky masonry walls, wallboards for plastering, caulking materials, expansion joints for roofs, durability of lime plaster, and the nature of the weathering processes of masonry, enabled the Bureau to carry on certain work covering these subjects. Reports on all the work accomplished have been made available to Government agencies interested in housing. In connection with some of these investigations a large number of specimens were placed under observation. These are still at hand and have been so stored as to be subjected to long-time service conditions. Consequently, later

reports will be issued when the conditions of the specimens indicate that further information of value has been obtained.

*Masonry investigations.*—The work on leaky walls, described in last year's report, has been continued, and the most important factor affecting wall performance was found to be the method of filling the mortar joints. All of the walls with poorly filled joints leaked, whereas most of those with well-filled joints did not allow the passage of measurable amounts of water. Aids in obtaining walls resistant to moisture penetration were: The wetting of absorbent bricks before laying, the use of mortars of moderate or high water retaining capacity, and the tooling of the face joints. Treating the surfaces of walls with colorless waterproofing materials was not effective in reducing permeability unless accompanied by the sealing of openings in the joints with other materials. The performance of walls which leaked readily was improved greatly by repointing or filling openings in the joints with a cement-sand grout. Surfacing of portland-cement stucco were highly resistant to the penetration of moisture, and coatings of cement paint greatly improved the performance of walls of hollow concrete masonry units.

The work on the durability of brick has shown that there is a fairly satisfactory correlation between the resistance of bricks to freezing and thawing and certain easily measured strength and absorption properties. Other work has shown that the number of cycles of freezing and thawing are directly proportional to the mean pore diameter and inversely proportionate to the ratio of the water absorbed and the total pore volume. For the purpose of obtaining more data on the weathering properties of masonry exposed to the weather, 125 panels approximately 4 feet high, 3 feet long, and 1 foot in thickness have been exposed. The panels include 18 different types of brick and 10 different kinds of mortar.

Marbles and granites have been studied with particular reference to weathering defects, and a portable apparatus has been constructed for the Procurement Division of the Treasury Department, to be used in determining the wear of stone tile.

*Optical glass.*—Seventy-three experimental melts of optical glass were made and from these enough first-quality glass was obtained to make 31,403 blanks weighing 7,530 pounds. All the blanks were "fine-annealed" and most of them were delivered to the Navy Department. Four kinds of glass were made, their indices of refraction being 1.517, 1.574, 1.620, and 1.650. A new type of pot in which the glass is melted was developed. This resulted in a decided improvement in the quality of at least one kind of glass and also made it possible to reduce the melting time for a pot of such glass from 46 hours to 23 hours. Although the new type of pot costs more than the old, this increase is more than offset by the combined increase in yield of good glass and the reduction in the cost of melting.

Studies relating to changes in physical properties of glass with changes in composition involved the preparation of glasses containing soda, potash, and silica over a wide range, the compositions being changed by small amounts at a time (even as small as 0.2 percent). During the course of this work improvements were made which give greater accuracy and reproducibility in measurement of ex-

pansivity and refractivity. The relations between density and refractivity of all glasses have been found to depend on the ionic radius of the metallic ions in the glass and their concentration.

The testing of safety glass for automobiles has been continued for the information of the State motor-vehicle regulatory officials. In addition to the 32 different kinds tested during the fiscal year 1936, 10 new varieties were tested during the year just closed. Of the latter, three were of foreign origin (England and Canada). Reports of all tests were sent to 28 State and other regulatory authorities who requested them.

*Other ceramic investigations.*—Information has been made available on the plastic deformation at elevated temperatures of high-heat-duty fire-clay brick tested in flexure, and the relation of size of coarse aggregate and flux to silica ratio. Air-setting refractory cements are being investigated for the purpose of establishing a Federal specification.

The surface tension of typical vitreous enamels at and near firing temperatures was determined, and a commercial test and a research test for the acid resistance of vitreous enamels were developed. Specifications for enameled sheet-iron sanitary ware and for enameled-iron wall tile were developed for the Procurement Division, Treasury Department.

Certain lead-borosilicate compositions have been found to have low maturing temperatures and high resistance to moisture crazing and thermal shock. The glasses in fire-clay refractories and white-ware bodies were studied under different conditions of heating. Boiler furnace slags with about 10 percent iron oxide and 55 percent silica become increasingly fusible with increases in lime above 8 percent.

*Cement and concrete.*—A portable machine for determining the abrasive hardness of concrete has been developed and is now being used to study floor hardeners. The apparatus to determine the amplitude and frequency of vibration induced in newly placed concrete by vibration has been completed and found to work successfully. Studies of vibrated concrete have shown that a wide range of amplitude and frequency can be used to develop the same strength provided the proper duration of vibration has been used. The testing of cement, concrete materials, and concrete products for the various Federal departments has amounted to more than in any previous year. The improvement of test methods for portland cement has continued. The investigations on the nature of portland cement have centered around methods to identify the glass present, its amount, and its control in commercial production. Applying metallographic microscopic and X-ray methods to the study of cements, progress has been made in identifying the free magnesia and in determining the nature of the soda and potash compound, and the extent of the solid solution in the various compounds. The hydrothermal synthesis of lime-silica-water compounds has been continued as well as studies of the heat of solution and hydration of cements.

The Cement Reference Laboratory, a cooperative project of the American Society for Testing Materials and the Bureau, has been continued. A fifth tour of inspection of cement testing laboratories

throughout the country is practically completed. Many more laboratories were included in this tour than in any of the preceding ones. An extensive series of tests of certain special cements was undertaken for committee C-1 on cement of the American Society for Testing Materials.

*Branch laboratories.*—The Bureau's laboratories at Seattle, Wash.; San Francisco and Riverside, Calif.; Denver, Colo.; and Allentown, Pa., have all been very busy in testing portland cement and other commodities for the Government. The work at Seattle in connection with the testing of cement for the Grand Coulee Dam is at a peak, with inspection and testing amounting to over 400,000 barrels of cement a month.

#### SIMPLIFIED PRACTICE

Two types of products result from the work of this Division, one of which is intangible, the other tangible.

The intangible product consists of written and verbal assistance to individual firms, concerning the practical application of simplification, and of advice to consumer organizations in matters pertaining to the preparation and use of specifications.

The tangible product is a steadily increasing series of printed pamphlets which show newly promulgated or revised Simplified Practice Recommendations, and the continuance of certain other recommendations in their current form. Each of these recommendations presents a record of retained stock items of a specific commodity after the superfluous variety of that article has been eliminated by the voluntary action of manufacturers, distributors, users, and others interested.

During the year 24 new and revised Simplified Practice Recommendations were printed and placed on sale. Five of these contain reports of work commenced prior to the fiscal year under review, 4 present newly promulgated simplification schedules, and 15 show the changes that have been effected in existing recommendations. Twelve recommendations were officially reaffirmed in the year just ended.

These results show the reliance industry is placing in effective Simplified Practice Recommendations. Industry is not only identifying its products with specific recommendations, but shows an increased tendency actually to revise and change existing simplified lists of sizes and varieties instead of simply reaffirming those lists without change.

In comparing the results of 1937 with those of 1936, it is clear that Federal Government establishments are continuing their customary interest in simplification. Such comparison also shows that the effective recommendations are enjoying added consumer support, notably on the part of State and municipal governments.

For example, 25 State governments and 63 local governments aided in the last revision of Simplified Practice Recommendation R1, Vitri-fied Paving Brick. Three State governments are represented on the standing committee for this recommendation, as are the American Society of Municipal Engineers and the American Association of State Highway Officials. The Federal specification for paving brick is regularly amended to show conformance with the Simplified Practice Recommendation. In the case of another recommendation, 39

States and 97 municipalities were intimately concerned with the details of revision and change.

Further evidence of consumer interest in simplification is shown by the number of requests for information concerning the purpose, application, and actual results of applied simplified practice. Educational institutions—faculty and student body alike—economists, statisticians, and authors are continually inquiring into the fundamentals of this element of business management.

So many requests for actual results of simplified practice have been received that, to meet this demand, there has been prepared a list showing the reduction in superfluous variety that has been made possible by the individual Simplified Practice Recommendations. The most spectacular reduction in variety, though not necessarily the most important example in this list, resulted from the adoption of Simplified Practice Recommendation R45, Grinding Wheels. Before simplification there were 715,200 different sizes and varieties of this commodity. Afterward, there were 254,400, a reduction of 64 percent.

Simplified Practice Recommendation R157-37, Steel Horizontal Firebox Heating Boilers, is included in the 1937 edition of the Guide, published by the American Society of Heating and Ventilating Engineers, a volume that is consulted by a great many engineers and architects. The variety survey upon which this recommendation is based revealed that 2,328 sizes of boilers were listed by 30 manufacturers. Of this total number of sizes, 340 were cataloged by more than a single manufacturer. Through the adoption of the simplified list of 38 sizes, 98 percent of those formerly carried as stock items have been eliminated. A special metal label on each boiler identified the product with this Simplified Practice Recommendation. An official of the Steel Heating Boiler Institute has advised the Bureau that it is now possible for the boiler manufacturers to make up stock during the slack season with reasonable assurance that this stock can be distributed during the busy season. Prior to the establishment of this simplified list, such a variety of sizes was produced that it was impossible for any manufacturer to acquire an appreciable stock, because of the prevalence of "custom-made" boilers.

The recommendation for loaded paper shot shells, just revised for the fifth time, illustrates a consistent downward trend in variety of product. In 1924 the variety was 4,067. Since then the diversity has been reduced 93 percent.

The recommendation for counter, window, and radiator brushes actually had its beginning in Simplified Practice Recommendation R88, Floor Sweeps, which was first promulgated in 1928. It is interesting to note that the long-continued success of the one stimulated a need for the other.

The fact that simplified practice is as applicable to business methods as it is to commodities is well exemplified in Simplified Practice Recommendation R166-37, Color Code for Marking Steel Bars.

#### TRADE STANDARDS

The services of this Division have been extended to those industries and groups that have requested aid in the establishment of com-

mercial standards of quality as a guide to production, distribution, and sale.

Consumer interest is steadily growing toward a realization that nationally recognized commodity standards, underwritten with quality-guaranteeing labels, are a more reliable guide to economical purchasing than the exaggerated advertising claims made for some products.

Many industries are cognizant of this tendency and are squarely meeting it and building good will for their own product at the same time, by the establishment of nationally accepted commodity standards under the guidance of the Bureau.

The past fiscal year has been marked with a great deal of activity in this field. Twenty-five conferences were held with groups interested in the establishment of standards for a wide range of commodities including water-resistant plywood, upholstered furniture, mattresses, wool fabrics, dress sizes, cotton yard goods, buttons, colors for brick, women's shoes, etc.

Four general conferences or public hearings, made up of interested consumers, distributors, and producers of the commodity in question, were scheduled during the year, in which viewpoints were exchanged concerning the formulation of standards for venetian blinds, concrete burial vaults, walnut veneers, and colors for kitchen and bathroom accessories. In each case the proposed standards were modified by the conferees and recommended for acceptance by the entire industry.

The acceptance of new commercial standards was recorded for hardwood dimension lumber and Douglas fir plywood (export grades), and four existing standards were brought up to date by revisions in the light of actual experience. These revised standards, which were also accepted by consumer groups, distributors, and producers, include hosiery lengths and sizes, mirrors, Douglas fir plywood (domestic grades), and wool and part-wool blankets.

Two standards of special interest to consumers are those for venetian blinds and colors for kitchen and bathroom accessories. The rather sudden wave of popularity for venetian blinds brought in its wake a great many blinds that were decidedly inferior both in workmanship and materials. The manufacturers of high-grade products were anxious to maintain and encourage favor toward venetian blinds and they were vigorously supported by dealers and prospective buyers when standards of quality were suggested.

A proposed standard was drafted by the manufacturers of blinds and a general conference was called by the Division of Trade Standards for consideration of the standard by interested consumers, distributors, and manufacturers. The conference reviewed, modified, and approved the standard, and recommended it for acceptance by the entire industry. The commercial standard covers essential points regarding the workmanship, materials, and construction of wood-slat venetian blinds, and is in effect a minimum specification of quality that will become a guide for the purchase of this commodity.

The development of standard colors for kitchen and bathroom accessories is an outgrowth of the success attained by use of Commercial

Standard CS30-31, Colors for Sanitary Ware. Housewives interested in adding a note of color to kitchens and bathrooms were frequently disappointed by the clashing of shades; shopkeepers were disturbed by the wide range of colors necessary to meet demands; they were annoyed by the return of goods that did not fit the purchaser's color scheme; and manufacturers were groping in the dark as to the most acceptable colors for their wares.

At the request of a prominent national association of retail merchants, the Division of Trade Standards cooperated toward the establishment of 10 standard colors for kitchen and bathroom accessories. Those interested in the matter met in public conference on April 30, 1937, at which time the standard colors were selected.

The movement has met with enthusiastic support from practically every interested source. The householder's problem will be simplified, the distributor can stock his wares in confidence, and the manufacturer may produce according to the standard colors, using as his guide a set of reference samples which have been carefully compared with a master standard maintained at the Bureau and certified for accuracy. The use of these standard colors is entirely voluntary and their establishment places no restrictions on the color range of any manufacturer. Interest in the program has spread far beyond the scope of kitchen and bathroom accessories, and has extended into the field of paint, wall coverings, kitchen cabinets, structural glass, etc., bringing into practical application certain new equipment for the accurate measurement of colors that has been recently developed in the Bureau's Optics Division.

#### CODES AND SPECIFICATIONS

Information available at the Bureau on the general subject of building materials has been assembled and arranged in the form of brief digests, principally for the guidance of the architectural and engineering staffs of the various agencies in the selection of materials for use in low-cost housing. During the year 30 digests were issued, while 12 more are in various stages of preparation. This work was carried out in harmony with the wishes of, and in cooperation with, 9 Federal agencies represented on the Central Housing Committee. To the effectiveness of the work can be attributed, in part, the fact that these agencies individually and through the Central Housing Committee endorsed the Bureau's request for funds in the 1937-38 fiscal year for investigating the properties and suitability of building materials for low-cost housing, for which \$198,000 was appropriated by Congress "at the instance of the Central Housing Committee and various housing agencies."

*Building and safety codes.*—Federal housing agencies have been supplied with information bearing on the relation of building and plumbing codes to the structures coming under their control. In reaching decisions on what constitutes sound construction, the housing agencies have used freely the reports prepared at the Bureau. A member of the staff has been appointed to represent the Department of Commerce on the recently organized Federal Interdepartmental Safety Council. Special aid has been given to the National Park

Service and the Architect of the Capitol in designing elevator installations for new Federal buildings and in inspecting and testing completed equipments.

Coordination of building- and safety-code requirements has continued during the year under the general auspices of the building-code and the safety-code correlating committees functioning under the procedure of the American Standards Association. Five new sectional committees have been authorized to deal with specific subjects to provide a sound basis for assuring safety to those in and about buildings. Under the Bureau's sponsorship, the work of revising the National Electrical Safety Code, the Code for Protection Against Lightning, and the Safety Code for Elevators, Dumbwaiters, and Escalators, has been actively carried on. In cooperation with a committee of the National Fire Protection Association, detailed attention was given to the task of revising the National Electrical (Fire) Code.

*Facilitating the use of specifications.*—The lists of sources of supply of commodities have been augmented by 2,461 separate requests for listing from manufacturers willing to certify to compliance with Federal specifications and commercial standards; the total number of such lists has increased to 591 and the separate requests for listing to 23,612. The completed lists have been brought up to date, and assembled in 12 parts for convenience in distribution. They are also used effectively in connection with the Index of Federal Specifications issued as a part of the Federal Standard Stock Catalog. During the year 2,384 copies of the lists of sources of supply were sent, upon request, to Federal, State, county, municipal, and other tax-supported purchasing agencies.

*Services to tax-supported agencies and consumers.*—During the year manuscripts were prepared for two pamphlets entitled "Services of the National Bureau of Standards to the Consumer" and "Services of the National Bureau of Standards to Governmental Purchasing Agencies." Information relating to commodity standardization was sent, upon specific request, to approximately 100 municipalities, to State agencies in 25 States, and to about 150 educational institutions. In cooperation with the United States Conference of Mayors and the National Education Association, material relating to standards and specifications for supplies and equipment was sent to 500 key city officials and 400 purchasing agents of public schools in various parts of the country.

An active part was taken in movements, launched during the year, looking to the unification of specifications for consumer goods, and to the appropriate and adequate representation of consumer interests in connection with the New York World's Fair, 1939.

#### GENERAL FINANCIAL STATEMENT

The amounts and objects of each appropriation for the past fiscal year, together with disbursements, liabilities, and balance for each appropriation, are shown in the following table:

*Disbursements, liabilities, etc., 1937, 1936, and 1935 appropriations*

Appropriations	Total appropriations <sup>1</sup>	Disbursements	Liabilities	Balance
1937				
Operation and administration <sup>2</sup> .....	\$273,932.56	\$261,026.15	\$12,432.67	\$473.74
Testing, inspection, and information <sup>3</sup> .....	1,168,471.62	1,061,872.55	85,027.36	21,571.71
Research and development <sup>4</sup> .....	715,197.36	681,577.09	31,057.51	2,562.76
Standards for commerce <sup>5</sup> .....	115,397.74	112,414.19	2,390.61	592.94
Appropriations transferred from other departments which are available for the current year:				
Advisory Committee for Aeronautics.....	63,300.00	62,893.56	73.12	333.32
Aviation, Navy <sup>6</sup> .....	127,813.70	124,629.76	2,084.35	1,099.59
Construction and repair, Bureau of Construction and Repair.....	6,052.00	5,895.09	36.50	120.41
Distinctive paper for United States securities.....	2,000.00	1,988.33	-----	11.67
Salaries and expenses, Bureau of Engraving and Printing.....	9,000.00	8,933.88	-----	66.12
Salaries and expenses, Weather Bureau.....	3,000.00	2,957.48	35.25	7.27
Air Corps, Army <sup>7</sup> .....	9,370.75	9,269.21	-----	101.54
Engineering, Bureau of Engineering.....	10,000.00	9,983.82	-----	16.18
Geological Survey, Department of Interior.....	1,500.00	1,483.28	-----	16.72
Incidental expenses of Army.....	10,000.00	9,706.30	45.44	248.26
Salaries and expenses, Soil Conservation Service.....	1,500.00	1,416.64	-----	83.36
Aircraft in Commerce.....	3,000.00	2,673.48	280.65	45.87
Establishment of Air Navigation Facilities.....	4,800.00	4,730.90	34.50	34.60
Maintenance of Air Navigation Facilities.....	13,500.00	13,347.59	90.37	62.04
International Exposition, Paris, France.....	250.00	198.24	-----	51.76
Appropriations transferred from other departments under the provision of the Legislative Act approved June 30, 1932:				
Working Fund { Navy, increase of Navy.....	21,000.00	19,212.40	12.84	1,774.76
{ Navy—Ordnance.....	21,000.00	20,967.51	-----	32.49
{ Treasury—Internal Revenue.....	6,000.00	5,802.42	-----	197.58
{ Naval Supply Account Fund.....	3,000.00	2,831.96	-----	168.04
Total, 1937.....	2,589,085.73	2,425,811.83	133,601.17	29,672.73
Total, 1936.....	2,496,834.72	2,434,434.98	3,118.43	59,281.31
Total, 1935 <sup>8</sup> .....	1,964,825.52	1,952,751.79	550.00	11,523.73

<sup>1</sup> Includes transfers from other departments and also reimbursements received and pending as shown under the following footnotes:

<sup>2</sup> \$32.56.

<sup>3</sup> \$317,571.62.

<sup>4</sup> \$8,997.36.

<sup>5</sup> \$2,497.74.

<sup>6</sup> \$13.70.

<sup>7</sup> \$70.75.

<sup>8</sup> Transferred to Procurement Division, Treasury Department, \$8,100.

## BUREAU OF FISHERIES

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The calendar year 1936 was one of considerable activity among commercial fishery interests. Available data show increased production of many important varieties of fresh and processed fishery commodities, and as a rule prices for these commodities were maintained during the year or actual increases evidenced. In fact, economic conditions were such that considerable optimism prevailed among members of the industry.

Based on available statistics for 1935, there was a large increase in the catch of fishery products in the United States and Alaska as compared with that of 1933. Statistics of the catch were collected for both 1933 and 1935 in the important New England, Middle Atlantic, Chesapeake, and Pacific sections and in Alaska, and when considering the combined catch of these sections alone, an increase of 45 percent in the volume and 34 percent in the value of the catch is indicated over 1933. Only three sections were surveyed in both 1934 and 1935. These were the Chesapeake, Pacific States, and Alaska. The Pacific States showed increases in both the quantity and value of the catch in the more recent year, while decreases were reflected in the catches of the other two sections.

On the basis of the most recent surveys our fisheries gave employment to about 125,000 fishermen, whose catch amounted to 4,152,349,000 pounds, valued at \$80,121,000. The output of canned fishery products in 1935 amounted to 672,756,000 pounds, valued at \$74,999,000, representing a decrease of 4 percent in volume and 6 percent in value as compared with 1934; the output of fishery byproducts was valued at \$29,520,000, representing an increase of 30 percent; and the production of frozen fishery products, excluding packaged fishery products, amounted to 93,566,000 pounds estimated to be valued at \$8,600,000.

The production of fresh and frozen packaged fish and shellfish as based on the most recent surveys amounted to 191,273,000 pounds, valued at \$25,379,000; and cured fish 120,516,000 pounds, valued at \$15,691,000. It is estimated that about 675,000,000 pounds of fresh fishery products (excluding packaged fish and shellfish) valued at about \$53,000,000 were marketed during 1935. Thus the total marketed value of all fishery products to domestic primary handlers in 1935 was about \$210,000,000.

Imports of fishery products for consumption during the calendar year 1935 were valued at \$36,232,000, which is 18 percent more than in 1934, while exports were valued at \$14,374,000, or 4 percent more than in the previous year.

### FISHERY ADVISORY COMMITTEE

The Fishery Advisory Committee was consolidated with the Business Advisory Council on January 18, 1937, in keeping with the policy of the Secretary of Commerce of having the various departmental

advisory committees associated with the Business Advisory Council. A number of new members have been appointed; and under a rotational arrangement Gardner Poole was elected chairman of the Committee succeeding E. B. McGovern.

During the year, the committee studied problems of national importance as well as those of local interest to the fishery industry. Among these are: legislation for the protection of game and migratory fish, scientific research, food standards, marketing, and distribution. A program of suggested topics for consideration by regional committees has been drafted for the subjects of reports at later meetings.

#### SOCKEYE SALMON TREATY

The Sockeye Salmon Fisheries Convention signed at Washington on May 26, 1930, was ratified by the Canadian Parliament in that year and on June 16, 1936, it was ratified with three reservations by the United States Senate. These reservations were accepted by the Canadian Government and ratifications have been exchanged. The treaty provides for the establishment of a commission of six members to be known as the International Pacific Salmon Fisheries Commission whose duty it will be to investigate the natural history of the sockeye salmon runs and to make recommendations to the two Governments as to the best measures for the regulation of the fisheries with a view to conservation and restoration.

The Convention originally provided for certain specific regulations to be prescribed and enforced by the Commission. This power, however, was withheld from the Commission by the reservations of the United States Senate, which provided that the Commission shall have no power to authorize any type of fishing gear in Convention waters which was prohibited by Washington or British Columbia; that no regulations of fishing should be promulgated or enforced until scientific investigations had been conducted for a period of 8 years; and that an advisory committee from each country, representing the various branches of the fishing industry, be established to work with the Commission.

The American members of the International Pacific Salmon Fisheries Commission have not yet been appointed by the President.

#### CONSTRUCTION ACTIVITIES

During the latter part of 1936 the Bureau began construction of a small byproducts laboratory building located on the grounds of the main laboratory building in Seattle, Wash. This building was completed early in the spring of 1937.

The development and improvement of buildings at fish cultural stations in progress, at the close of the previous fiscal year, were continued in a number of instances. This was almost entirely prosecuted by W. P. A. allotments. Activities at Uvalde, Tex., and Smokemont, N. C., were brought to completion and an enlargement of the San Angelo station was effected. Work continued at various points including the stations at Walhalla, S. C., Rochester, Ind., Natchitoches, La., and Lake Mills, Wis. In the Upper Mississippi Wild Life and Fish Refuge, an extensive acreage of bass ponds is being developed.

The Bureau has also been the beneficiary of C. C. C. labor at a number of stations, including that at Lamar, Pa., and York Pond, N. H.

In the western region, a number of minor improvements have been made at several locations. The construction of hatcheries at Norris Dam, Tenn., and Hoffman, N. C., under the auspices of the Tennessee Valley Authority and the Resettlement Administration, respectively, has been actively prosecuted and the former has been completed. Both of these new establishments are now being operated and maintained by the Bureau as far as fish cultural activities are concerned. At the close of the year, a special appropriation of \$60,000 had become available providing for the relocation of the Little White Salmon, Wash., salmon hatching station. This action was necessary because of the fact that the pool created by the Bonneville Dam would flood out part of the existing station and limit fish cultural activities. At the close of the year work had just started on the relocation of this hatchery at a point on the Wind River in the National Forest area.

#### COOPERATION WITH OTHER FEDERAL AGENCIES

Integration of the work of the various Federal conservation agencies, insofar as the stocking of waters on Federal lands is concerned, has had a practical trial of several years' duration. It is working out very satisfactorily and the provision of fish for the National Forests, National Parks, and other federally controlled areas is on a much more sound and intelligent basis. The United States Forest Service has established several additional rearing ponds and nurseries both for bass and trout and the Bureau has supplied the fish and, where necessary, provided the services of experienced caretakers. The United States Forest Service has constructed a new hatchery and rearing unit in the Pisgah National Forest and this has been taken over for operation by the Bureau. The Bureau is also working in active cooperation with the Tennessee Valley Authority toward the construction by that agency of a new hatchery on the Elk River. It is expected that this hatchery will be operated and maintained by the Bureau on completion as has been done with a smaller unit located at Norris Dam. Effort is being made in cooperation with the Park Service to secure a tract of land suitable for the erection of a new hatchery for supplying Glacier National Park. While these comprise the outstanding instances of coordinated Federal conservation work, there have been numerous contacts with other agencies interested in the maintenance of fish life and in almost all instances practical beneficial results have been forthcoming.

During the past year the technologists of the Division of Fishery Industries engaged in a cooperative study with the Bureau of Chemistry and Soils and the Food and Drug Administration, United States Department of Agriculture, for the development of standards for halibut liver oil essential in the administration of the Federal Food and Drug Act and for other purposes. Some practical studies on the freezing of oysters also were carried on in the Seattle laboratory of the Bureau of Chemistry and Soils. The National Bureau of Standards cooperated with our technological staff in the development of net measuring devices for experimental use in the fisheries of the Great Lakes. In conjunction with the United States Department of Agri-

culture Extension Service, technologists in the Bureau's Washington laboratories gave courses in canning fishery products to State Extension Service workers. Members of the economic and technological staffs of the Division of Fishery Industries worked with the International Fisheries Commission, Seattle, Wash., on various problems of mutual interest. The Bureau of Foreign and Domestic Commerce cooperated in obtaining data on the extension of the cooperative movement among fishermen and information on the grading and standardization of fish in many foreign countries.

#### COOPERATION WITH STATES AND OTHER AGENCIES

In furtherance of the original plan, the fourth annual meeting of the National Planning Council of Commercial and Game Fish Commissioners was held in Chicago on April 28, 1937, at which Commissioner Frank T. Bell presided.

The council was organized in 1934 to coordinate the fishery conservation work of the State and Federal Governments, to achieve maximum fish protection at minimum cost, to apply efficiency methods in the distribution and planting of fish, and to exchange information of mutual interest and value to fish culturists. Among the chief benefits of this institution has been the elimination of overlapping in fish-distribution activities.

A fishery committee was appointed at the annual meeting of the National Association of Marketing Officials, held in October 1936, in Nashville, Tenn. The committee, which consists of prominent marketing officials in important fish-producing States, has been established to study the various aspects of the marketing of fishery products.

In the conduct of its statistical research work, some form of cooperation is given the Bureau in about every State where commercial fishing is prosecuted. This cooperation on statistical work probably has reached its greatest development in the Lake States, the Pacific Coast States, and in Maryland and Virginia.

In its technological work, the Bureau has carried on cooperative investigations with several colleges and universities and other State institutions. In these cooperative projects the scientific staffs and other facilities of these agencies were available to the Bureau's staff. Among the institutions cooperating in these investigations are: State Medical College, Charleston, S. C.; George Washington University, Washington, D. C.; Washington State College, Pullman, Wash.; University of Washington, Seattle, Wash.; University of Maryland, and the Maryland State Agricultural Experiment Station, College Park, Md., Western Maryland College, Westminster, Md., and the Massachusetts State Department of Agriculture, Boston, Mass.

Inasmuch as agreements or informal working arrangements are in effect with most of the States relative to the propagation and distribution of fish, there was but limited extension of cooperative relationships in this field. By agreement with the State of Ohio, fish cultural work at Put in Bay was consolidated with the State utilizing the Bureau's properties by accepting the responsibility for the actual propagation work. In Maine and Massachusetts, the State authorities cooperated in the resumption of lobster propagation at the Bureau's Boothbay Harbor, Maine, and Gloucester, Mass., stations.

The Bureau laid out a program of rearing pond development in the Finger Lakes region and, with local county authorities as sponsors, a W. P. A. project was approved providing for construction of rearing ponds. The Bureau is now supervising this development and will cooperate in its operation on completion. A total of six carloads of fish were assigned to the States of South Dakota and North Dakota for the purpose of stocking new ponds and reservoirs in that area. The respective States defrayed the costs of transportation, and similar assignments on a smaller scale were made to several other States. There has also been an extension of the system of submitting Federal fish applications to State authorities for check and review prior to delivery of the fish.

### ALASKA FISHERIES SERVICE

#### ADMINISTRATION OF FISHERY LAWS AND REGULATIONS

In the control of commercial fishing in Alaska to assure an escape-ment of brood fish sufficient to maintain an undiminished supply of the fishery resources, the conservation program that had been in effect since 1924 was continued. The Commissioner of Fisheries was in Alaska for a number of weeks for personal observation of both fishery and fur-seal operations.

Revised fishery regulations effective February 8, 1937, contained comparatively few changes from those of 1936, in view of the expectation of generally satisfactory runs upon the basis of known escapements. Some additional restriction was placed on salmon fishing in the Bristol Bay region, particularly in the Nushagak district, and the regulations were relaxed in certain areas, a few closed waters in southeast Alaska being opened to commercial fishing and the limitation on the take of razor clams in the Seward-Katalla region being changed to permit an increased pack.

Fourteen vessels of the Bureau and a number of launches and chartered boats were engaged in the patrol of the fishing grounds in 1936. There were 249 persons identified with fishery protective work, including wardens, stream watchmen, crews of vessels, weir operators, scientific investigators, and special workmen. Airplanes were used to advantage as a supplementary patrol, as well as for transporting officials to isolated districts and in the inspection of certain spawning areas.

Studies of the life history and migration routes of salmon and herring were continued, in connection with which tagging experiments were carried on in southeast Alaska. Eleven weirs for counting the escapement of spawning salmon were operated in typical streams as a means of determining the relation of the catch to the brood stock. The information thus derived from the weir counts and biological investigations is of value in determining adequate conservation measures.

In addition to the regulation of commercial operations to assure the perpetuation of the salmon runs at a high level, the improvement of conditions for natural propagation was given further attention. Through the removal of debris that hinders the passage of salmon upstream, larger spawning areas are made available; the destruction of predatory trout that feed upon salmon eggs and fry

likewise tends to increase the size of the future runs of salmon. The latter work was carried on, particularly in the vicinity of salmon-counting weirs in central Alaska, but the most important program of this kind was, as heretofore, in the Bristol Bay region, where a bounty was paid on predatory trout taken by bona fide residents. Funds for this purpose have been supplied for a number of years by the Territory and by the salmon packers of the district. At its 1937 session the Territorial Legislature appropriated \$25,000 to continue the work of clearing salmon streams.

No collection of salmon eggs for artificial propagation was made in 1936, and the hatchery of the Pacific American Fisheries, Inc., at Hugh Smith Lake was abandoned after liberation of the fry hatched from eggs taken in the preceding year.

#### PRODUCTS OF THE FISHERIES

Although there was some curtailment of fishing operations in the herring and salmon industries by reason of price disagreements between packers and fishermen and in the crab fishery on account of a strike on the Copper River Railroad and the Cordova docks which caused a shortage of cans and other supplies during part of the season, the total amount of fishery products was the largest ever obtained from Alaska waters. This was primarily the result of the heavy runs of salmon in practically all districts. A contributing factor, also, was the unusually large size of pink salmon, especially in the Kodiak and Chignik areas.

Salmon products comprised approximately 81 percent in quantity and 92 percent in value of the total output of the Alaska fisheries in 1936. About 95 percent of the salmon products consisted of canned salmon, the pack amounting to 8,437,603 cases, or 405,004,944 pounds, valued at \$44,751,633. Red salmon represented 30 percent and pinks 54 percent of the total pack of canned salmon, as against 16 percent and 63 percent, respectively, in 1935. As compared with the pack of the preceding year, the output of canned salmon in 1936 showed an increase of 64 percent in quantity and 74 percent in value. The number of canneries operated increased from 99 in 1935 to 117 in 1936, owing chiefly to the reopening of certain plants on Bristol Bay that had been closed in the previous year because of the stringent curtailment of fishing in order to rebuild the weak cycle of red salmon in that district.

Products of the herring fishery were somewhat less than in the previous year, although well above the general average. The chief decline was in the Scotch-cured product, owing to the fact that herring suitable for curing were less abundant in all districts except Kodiak Island. Low prices on herring oil and the difficulty of meeting higher prices demanded by the fishermen caused three saltery and reduction plants in southeast Alaska to close for the season. Halibut landings of the Alaska fleet showed a considerable gain over the preceding year and there were increases also in the output of a number of the minor fisheries, although whale, clam, and crab products declined somewhat.

The total output of Alaska fishery products in 1936 was 524,042,000 pounds valued at \$50,455,000, as compared with an average of 375,265,211 pounds valued at \$32,788,840 for the 5-year period from 1931

to 1935, inclusive. The value of the 1936 catch to the fishermen was approximately \$13,891,000, or about \$5,188,000 more than in the preceding year. There were 30,383 persons employed in the various branches of the industry, as against 22,620 in 1935.

### ALASKA FUR-SEAL SERVICE

#### GENERAL ACTIVITIES

Sealing operations at the Pribilof Islands resulted in the take of 52,446 fur-seal skins in 1936, or 4,850 less than in the previous year. It was thought that the decline in the number of surplus 3-year-old male seals available on the hauling grounds was owing to unfavorable weather conditions, rather than to an interruption in the normal increase of the various elements of the herd.

The work at the islands was under the direction of a staff of 14 regular employees and a number of special assistants. One hundred and twenty natives of the Pribilofs and approximately 90 natives of the Aleutian Islands participated in sealing activities during the season. Twenty-seven employees of the Fouke Fur Co. were also at the islands to assist with the curing and packing of the skins.

Fur-seal carcasses were utilized at the byproducts plant on St. Paul Island and yielded 25,252 gallons of oil and 276,040 pounds of meal. Except for small amounts retained at the islands for fox feed, the products were shipped to Seattle, where the oil was sold through competitive bidding and the meal was delivered to the Division of Fish Culture for use as fish food at the Bureau's hatcheries throughout the country.

A building to house the new electric-power and cold-storage plant was erected on St. George Island and an addition was made to the garage, and there was considerable extension of improved roads to facilitate the transportation of sealskins from the hauling grounds to the curing stations.

The management of the blue fox herds at the islands continued to be one of the important seasonal activities. During most of the year these animals find an abundant supply of natural food along the beaches, but in the winter they are fed prepared rations and salted seal carcasses. At this time, too, their fur is prime, and they are trapped for their pelts and for marking for the breeding reserve.

Through the courtesy of the Navy Department the annual shipment of supplies was taken from Seattle to the Pribilof Islands on the U. S. S. *Vega* and the season's take of sealskins was brought out on the return trip.

Delivery of 7,867 fur-seal skins, or 15 percent of the take of such skins at the Pribilof Islands in 1936, was made to an agent of the Canadian Government at Seattle. The Japanese Government, entitled to a like number under the provisions of the fur-seal treaty, continued the practice of sharing in the proceeds of sale, rather than taking actual delivery of the skins. Two hundred and fourteen sealskins taken by the Japanese Government on Robben Island in 1936 were allotted to the United States as its share under the provisions of the treaty and were shipped to the Department's selling agents at St. Louis, Mo., for processing and sale.

## SEAL HERD

The computed number of animals in the Pribilof Islands fur-seal herd on August 10, 1936, was 1,689,743, an increase of 138,830, or 8.95 percent over the number for the preceding year.

## TAKE OF SEALSKINS

In the calendar year 1936 there were taken on the Pribilof Islands 52,446 fur-seal skins, of which 43,522 were from St. Paul Island and 8,924 from St. George Island. This was a decrease of 4,850 from the total take in 1935.

## SALE OF SEALSKINS

Two public auction sales of fur-seal skins taken on the Pribilof Islands were held at St. Louis, Mo., in the fiscal year 1937, and several hundred skins were disposed of at private sales under special authorization of the Secretary of Commerce. In all, 42,793 Pribilof Islands sealskins were sold during the year for a gross sum of \$1,274,185.06.

## FOXES

The take of foxskins in the 1936-37 season consisted of 97 blue and 9 white skins on St. Paul Island, and 902 blue and 4 white skins on St. George Island, a total of 1,012. One hundred foxes on St. Paul Island and 113 on St. George Island were marked and released for breeding stock.

In the fiscal year 1937 there were sold at public auction 1,019 blue and 15 white-fox skins that had been taken on the Pribilof Islands in the 1935-36 season. The blue pelts brought \$27,502.50, and the white pelts \$238, a total of \$27,740.50.

## FUR-SEAL SKINS TAKEN BY NATIVES

The privilege of taking fur seals at sea is granted to aborigines dwelling along the Pacific coast of North America, under provisions of the fur-seal treaty, although such sealing is restricted to primitive methods. In accordance therewith, Indians of the United States and Canada in 1936 took 1,927 fur-seal skins, which were authenticated by officials of the respective Governments. Of these skins, 11 were taken by Indians of southeast Alaska, 28 by Indians of Washington, and 1,888 by Indians of British Columbia.

## FUR-SEAL PATROL

Five cutters and four patrol boats of the United States Coast Guard were detailed to the patrol for the protection of fur seals during their northward migration and while at the Pribilof Islands. Three vessels of the Bureau also participated in this work in 1936, two at Neah Bay and one in southeast Alaska.

## PROTECTION OF SEA OTTERS, WALRUSES, AND SEA LIONS

The killing of walruses and sea lions in Alaska is permitted only under limited conditions, and the killing of sea otters is prohibited

at all times. Through the latter prohibition, which has been in effect since 1910, the sea otters have been saved from threatened extinction on the Alaska coast and are slowly becoming reestablished, although it will undoubtedly be many years before the numbers will increase sufficiently to permit an open season for the hunting of these animals. Meantime the protection of the herd from illegal killing requires increased vigilance, and plans are being made to expand the patrol in the Aleutian Islands region.

#### PROPAGATION AND DISTRIBUTION OF FOOD AND GAME FISHES

The yield of fish and eggs derived from the Federal hatcheries showed a slight recession in comparison with that of last year. The 1937 output comprised 7,919,100,000, in comparison with 8,120,000,000 recorded for the previous year. The 1937 output, however, surpasses all previous years with the exception of 1936. There was a noticeable recession in the number of larger fish produced. Fish listed as fingerlings to adults in size totaled 136,000,000, in comparison with the 157,000,000 of the previous year. An analysis of the production of individual species reveals that there was a drop in the output of Pacific salmon with the exception of the chum salmon and the steelhead. The only species of game trout produced in greater numbers was the brook trout. There was a material increase in the production of black bass, this being confined to the largemouth variety. Special attention was given to extending the propagation of shad with a consequent increase in the number distributed. A more satisfactory season was experienced with the commercial whitefish of the Great Lakes. In the marine-fish cultural work, much of which is confined to the fertilization and planting of eggs of commercial species, an increased number of haddock and pollock eggs and fry was handled by the Division's hatchery forces. The artificial propagation of lobsters was also resumed in the New England States with a hatch of  $3\frac{1}{4}$  million fry. Much of the Bureau's fish cultural work is affected by weather conditions, and the fluctuations in the output of the different species are to be expected from year to year. It should be pointed out that the production of larger size game fish for distribution requires tremendous quantities of fish food, and steadily increasing costs for this item are partly responsible for inability to release all of the game fish as a "finished product" of large size.

#### PROPAGATION OF COMMERCIAL SPECIES

*Marine species, Atlantic coast.*—Largely because of low unit cost of production and the fact that the salvaging of eggs from the commercial fishing boats represents a byproduct recovery, greater attention has been given to the propagation of strictly marine species. The cod, haddock, pollock, and flounders handled at the New England hatcheries frequent inshore waters and are the basis of a more or less local fishery. Consequently, it is felt that the distribution of approximately  $6\frac{1}{2}$  billion of the eggs and fry of these species from the Boothbay Harbor, Maine, and Gloucester and Woods Hole, Mass., stations has real economic significance, although it makes no direct contribution to the great offshore fisheries. Recent developments in the artificial feeding of lobster fry have warranted a resumption of the

propagation of this shellfish, and such work was undertaken in Maine and Massachusetts in cooperation with the State authorities.

*Pacific salmon.*—Extremely satisfactory results were achieved in the salmon cultural work on the Columbia River. Less favorable conditions elsewhere on the Pacific coast resulted in a reduction in the output of the chinook salmon and the sockeye salmon, the most important species handled. Over 32,000,000 fingerlings of the two species were reared to larger size before release. Salmon cultural operations on the Columbia River will be greatly modified by the program of dam construction now approaching completion in that basin. The needs have been foreseen, and ample provision is being made to modify and enlarge operations so as to meet the new development.

*Anadromous species, Atlantic coast.*—Intense interest on the part of State authorities on the eastern seaboard in the perpetuation of the shad runs prompted more intensive effort to increase the hatchery output of this species. This was reflected in an augmented distribution of fry of 18½ million in comparison with the 12 million of the previous year. Less attention was given to the hatching of yellow perch, and in the case of Atlantic salmon the work was virtually discontinued. This was due to inability to secure any eggs from the Dominion of Canada on an exchange basis as had been the case previously.

*Commercial species, interior waters.*—There was a material increase in the production of whitefish fry, a total of 88,000,000 being derived principally from operations at the Cape Vincent, N. Y., station and at the Put in Bay, Ohio, establishment. The latter hatchery has been taken over by the State of Ohio, which agency has assumed responsibility for the actual fish cultural work. The Bureau, however, has assigned certain personnel to supervise and assist in the activities. The Duluth, Minn., station obtained limited quantities of lake trout and whitefish eggs. As usual, the center of pike perch propagation, conducted in the spring months, was the Put in Bay station, the output being approximately one-half the production of the previous year. A considerable number of carp fry were produced for replanting in the commercial fishing areas of the Mississippi River.

*Game species.*—The production and distribution of species which constitute the most prized trophies of the angler were closely comparable to the record of the previous year. Brook trout were distributed in larger numbers, and a production of 8,000,000 large and smallmouth bass constitutes a new record for these species. Over 5,300,000 of these were good-size fingerlings. While the percentage of fingerlings and larger fish was below that of the previous year, the records only cover the size of the fish as they left the Bureau's hatcheries. Millions of them were transferred to rearing pools and were subsequently released when they approached legal size. It is regretted that there are still several sections, including the far southwest and central and southern Florida, which are not accessible from any of the existing Federal hatcheries. Only by the construction of new hatcheries in the areas to be served can this condition be overcome.

## RESCUE OPERATIONS

In spite of the fact that the salvage work was somewhat restricted by the development of the 9-foot channel in the Upper Mississippi River, the number of fish rescued in that area was slightly above last year's figures; 50,500,000 were salvaged from the overflowed sloughs, of which over 50,000,000 were returned directly to the main river channels. The provision of artificial cultural ponds in the areas adjacent to the pools created by the new dams is an expedient of proved success. An excellent hatch of bass and other species has been achieved in the ponds already constructed, and at the close of the fiscal year some 400,000 bass fry were being stocked in the storage reservoirs. In the future, the removal of fish by means of rescue operations will be discontinued, and the current supply of game fish in the Mississippi River will be augmented by the output of these large ponds.

## FISHERY INDUSTRIES

## ECONOMIC AND MARKETING INVESTIGATIONS

*Fishery trade in San Francisco Bay area.*—A survey made during the year showed that the annual per-capita consumption of fish and shellfish in the San Francisco Bay area is about 25 pounds, or nearly twice that of the entire United States. About 90 percent of the fish handled in the area originates along the California coast. The survey provided much useful data concerning supply, marketing channels, nature of market, and trade practices and problems.

*Marketing shad on the Atlantic coast.*—In addition to large and consistent decreases in the total supplies of shad on the Atlantic coast, there has been an apparent decline in the popularity of this species. As a result of a study of the markets for shad, it was found that decreased sales for shad have occurred in retail stores rather than through public eating houses. In order to stimulate demand the publication resulting from the survey recommends, among other things, that boned shad as well as half shad or other smaller portions be featured in the various sales channels.

*Frozen fish.*—Owing to the mild winter of 1936-37, fishing operations were conducted almost continuously throughout the winter. This condition, coupled with retarded sales due to floods in the Middle West, resulted in unusually large holdings of fish in cold storage, which had a depressing effect on markets for fish in general. Consequently, appropriate legislation was introduced in Congress and enacted into law to authorize the Federal Surplus Commodities Corporation to purchase surplus fish up to \$1,000,000 in value. This program had a stimulating effect in permitting fishing to be resumed on a more normal basis and in creating a demand for fish in areas where this surplus fish was distributed.

*Retail sale of fishery products.*—A study was made during the year to determine the order of importance of the 6 species of fish or shellfish leading in retail sales of about 60 cities of this country. While the study was designed primarily to develop basic information on which to investigate the feasibility of inaugurating a service for the collection of retail prices of these commodities, it was most interesting in showing the geographical variation in preferences for the several

species. Usually the most important of the six species predominating in the retail sales of cities close to important producing waters are the species taken in abundance in these waters; but in cities located farther inland the number of sources of these commodities increases. However, such species as haddock, halibut, salmon, shrimp, and oysters appeared among the six species leading in retail sales in many inland cities as well as in those close to their natural habitats.

*North Pacific halibut fishery.*—A study was undertaken during the year of the marketing of halibut. While the annual limit of halibut taken from the North Pacific during the past few years has been set by the International Fisheries Commission of the United States and Canada at around 46,000,000 pounds, it is anticipated that as the reserve brood stock is replenished, a higher limit of the annual take may be set. If this is done the current marketing problems may be augmented by new ones. Consequently the survey is undertaking a broad field of inquiry, to include distribution, competition, vessel operation, transportation, warehousing, merchandising practices, consumer attitude, and a chronology of the fishery from its inception in the North Pacific.

*Cooperative marketing.*—In connection with the administration of Public No. 464, authorizing associations of producers of aquatic products, studies have been made pertaining to fishery cooperatives and the financing of fishermen. Also, information has been supplied to interested parties as to the organization and operation of fishery cooperatives. There are more than 100 associations of various types, 54 of which are classed as either commercial or semicommercial. The associations engaged in selling fish and buying supplies for their members had a volume of business in 1935 of more than 9 million dollars and had investments in association property in excess of \$5,200,000. The 54 associations had members and crews exceeding 12,500 fishermen. These members had investments in boats and vessels of over \$20,700,000. Investment in fishing gear for these members amounted to more than \$3,600,000 in 1935, not considering replacement which ranges from 30 percent to 300 percent annually. The studies revealed that the conduct of fishing enterprises generally is without an adequate financial foundation. Independent fishermen for the most part rely upon buyers, dealers, and others in the trade for financing fishing operations. Fishery cooperatives generally have inadequate equipment and facilities and are in need of more appropriate financing.

#### STATISTICAL INVESTIGATIONS

##### FISHERIES OF THE UNITED STATES, CALENDAR YEAR 1935

*New England States.*—During 1935 the commercial fisheries of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut employed 18,449 fishermen. Their catch amounted to 655,430,000 pounds, valued at \$17,894,000—an increase of 31 percent in volume and 33 percent in value as compared with 1933. Landings of fish by American fishing vessels at Boston and Gloucester, Mass., and Portland, Maine, amounted to 373,118,000 pounds, as landed, valued at \$9,005,000—an increase of 24 percent in volume, and 14 percent in value as compared with 1934.

*Middle Atlantic States.*—The commercial fisheries of New York, New Jersey, Pennsylvania, and Delaware in 1935 gave employment to 9,620 fishermen. Their catch amounted to 279,438,000 pounds, valued at \$6,416,000—an increase of 65 percent in volume and 33 percent in value as compared with 1933. Landings of fish at New York City during 1935 amounted to 39,615,000 pounds. The shad fishery of the Hudson River was conducted by 498 fishermen, who caught 847,000 pounds of shad, valued at \$71,000. The value of the shad increased 96 percent as compared with 1934.

*Chesapeake Bay States.*—In 1935 the commercial fisheries of Maryland and Virginia employed 19,116 fishermen. Their catch amounted to 265,827,000 pounds, valued at \$5,525,000—a decrease of 8 percent in volume and 7 percent in value as compared with the previous year. The shad and alewife fisheries of the Potomac River were prosecuted by 650 fishermen, who caught 631,000 pounds of shad, valued at \$56,000, and 4,457,000 pounds of alewives, valued at \$27,000.

*South Atlantic and Gulf States.*—No survey was made of the fisheries of this area for the year 1935.

*Pacific Coast States.*—The commercial fisheries of Washington, Oregon, and California in 1935 employed 20,583 fishermen. Their catch amounted to 1,676,236,000 pounds, valued at \$23,089,000—an increase of 8 percent in volume and 16 percent in value as compared with 1934. The total catch of halibut by United States and Canadian vessels amounted to 45,772,000 pounds, valued at \$3,252,000—a decrease of 1 percent in volume, but an increase of 10 percent in value as compared with the preceding year.

*Lake States.*—No survey was made of the Lake fisheries (Lakes Ontario, Erie, Huron, Michigan, and Superior, and Namakan and Rainy Lakes, and Lake of the Woods), for 1935.

*Mississippi River and tributaries.*—No complete survey of the commercial fisheries of the Mississippi River and tributaries was made for 1935. The catch of Lakes Pepin and Keokuk and the Mississippi River between these two Lakes in 1935 amounted to 6,695,000 pounds, valued at \$282,000—an increase of 19 percent in volume and 36 percent in value, as compared with the yield of the same waters in 1934.

MANUFACTURED PRODUCTS OF THE UNITED STATES AND ALASKA, CALENDAR  
YEAR 1935

*Fresh and frozen packaged fishery products.*—Based on the most recent available data, the domestic production of fresh and frozen packaged fishery products amounted to 191,273,000 pounds, valued at \$25,379,000. Important commodities in this group were fresh-shucked oysters, 7,338,000 gallons, valued at \$9,391,000; packaged haddock, 46,488,000 pounds, valued at \$4,427,000; and fresh-cooked crab meat, 6,370,000 pounds, valued at \$2,195,000.

*Frozen products.*—The production of frozen fishery products in 1935 amounted to 149,643,000 pounds, estimated to be valued at \$15,000,000. The volume of the production was 12 percent greater than in 1934. The most important products frozen were groundfish, salmon, whiting, halibut, and mackerel.

*Cured products.*—Based on the most recent data available, the production of cured fishery products amounted to 120,516,000 pounds,

valued at \$15,691,000. Important products in this group were smoked salmon, 8,822,000 pounds, valued at \$2,674,000; mild-cured salmon, 10,571,000 pounds, valued at \$2,148,000; and boneless cod, 8,678,000 pounds, valued at \$1,535,000.

*Canned fishery products.*—Canned fishery products produced in 1935 amounted to 672,756,000 pounds, valued at \$74,999,000—a decrease of 4 percent in volume and 6 percent in value as compared with 1934. Canned salmon alone amounted to 289,339,000 pounds, valued at \$32,475,000. Other important canned products were tuna and tuna-like fishes, sardines, mackerel, shrimp, clam products, and oysters.

*Byproducts.*—During 1935 the value of the production of fishery byproducts amounted to \$29,520,000—an increase of 30 percent as compared with the preceding year. Important products in this group were marine-animal oils and meals, and aquatic-shell products.

#### TECHNOLOGICAL INVESTIGATIONS

*Preservation of fishery products for food.*—During 1936, major projects in this field covered a continuation of the development of electrometric tests for the freshness of fish, studies of rancidity in fish, variation in the fat content of halibut, identification of canned salmon, development of methods for canning various fishery products, and studies of the low temperature preservation of Pacific oysters. The problem of preventing or retarding the development of rancidity of the oil or fat in fish has always been a serious one and one which is very difficult of practical solution. However, during the past year, the Bureau's technologists continued a study of the possible application of various harmless antioxidants for preventing or retarding this rancidity and among those antioxidants or inhibitors of oxidation tested were the cereal flours, such as oats, rice, etc. Studies of the chemical and physical characteristics of various salmon oils prepared from cannery trimmings indicate that the variation in the characteristics of these oils may provide a method for checking the identity of the species of salmon after it is canned. Experiments in the development of methods for canning various fishery products, both in the home and for application on a commercial scale, have aroused considerable interest. In fact, in some instances, widespread use is being made of methods already published by the Bureau.

*Bacteriological studies.*—The Bureau's bacteriological studies have been closely correlated with other investigations of the technological staff, as many of these problems require a knowledge of the action of bacteria. These bacteriological investigations have included examinations of the experimental packs of canned fishery products to determine which processes produce sterility; bacterial counts on samples used in experiments on freezing oysters; studies of the role of bacteria in the different types of decomposition or spoilage described in preceding paragraphs, with special reference to the studies on mackerel; determinations of the effectiveness of formaldehyde and other chemical preservatives in preventing or retarding the development of bacterial spoilage in fishery byproducts; and other miscellaneous bacterial control problems.

*Pharmacological studies.*—The pharmacology of fishery products is a comparatively new investigational field, and interest in it has been greatly stimulated by discussions in scientific journals and in the press

concerning the role or effect of mineral constituents as they naturally occur in fishery products, as compared with these same minerals in inorganic form, on metabolism in both human and animal nutrition. Such studies on arsenic and copper, which included tests not only on experimental animals, such as albino rats, but also included clinical tests with humans, have been published by the Bureau. These tests showed that arsenic, which occurs in shrimp in a stable, undissociated, organic state, is readily soluble in water and is rapidly eliminated by the kidneys.

*Preservation of fishery byproducts.*—In this field the Bureau's technologists studied the utilization of salmon cannery waste, the extraction of oil from halibut livers and fish livers of similar type, methods for preventing or retarding the development of rancidity in fish and fish-liver oils, the place of oily fish meals in animal feeding, studies of methods for determining the fat content of fish meal, and the development of methods for the chemical preservation of fish waste. Developments in the preservation of fishery byproducts have yielded results of great economic value both to the fishery industries and to the agricultural industries, as fish oils and fish meals, kelp meal, oyster and clam shell products, etc., are becoming of increasing economic value to the farmer in providing to him for the livestock ration feed concentrates of unexcelled nutritive properties.

*Nutritive value of aquatic products.*—This is also a most important phase of technological investigations, since the ultimate nutritional value of finished aquatic products, ready for consumption, is the only true yardstick for evaluating improvements and advancements in the utilization of fishery products and byproducts for human and animal nutrition. Among the major projects in nutrition occupying the technological staff during the past year were studies of the vitamin potency of fish-liver oils, the further development of menhaden fish oil for poultry feeding, studies of the vitamin content of fresh fish flesh, the value of menhaden fish meal as an ingredient of the dairy ration, summary or compilation of literature on the nutritive value of shellfish, studies of the chemical composition and nutritive value of fish proteins, and of mineral constituents in fishery products and byproducts.

*Fish cookery.*—In the fish-cookery laboratory there have been continued the development and testing of recipes for the preparation of various fishery products. During most of 1936, however, the Bureau's fish cookery expert carried on educational work and practical demonstrations in the preparation and cooking of fish and shellfish at schools, women's clubs, and various other gatherings. As a result of this work considerable interest has been stimulated among the public in fish cookery and in the food value of fishery products.

#### BIOLOGICAL FISHERY INVESTIGATIONS

The program of biological investigations pursued by the Bureau of Fisheries during the fiscal year 1937 followed three major lines of endeavor: (1) population studies of commercial and game fishes to measure the effect of fisheries of known intensities, to determine the effectiveness of various conservation measures, and to devise methods of managing or controlling the fisheries so as to maintain a self-sustaining level of population abundance; (2) management of in-

terior waters for the purpose of developing scientifically sound methods of hatchery procedure, of formulating stocking policies compatible with the productive capacities of the waters stocked, and of improving environmental conditions in streams by investigating methods of eliminating pollution hazards; and (3) development of more effective methods of shellfish culture through control of natural enemies and improvement of the market quality of oysters.

#### INVESTIGATIONS OF COMMERCIAL FISHES

*North and Middle Atlantic fishery investigations.*—With the continued rise in fish prices and the increasing activity in the fishing business, New England fishery landings were the largest in their recent history. It should nevertheless be noted that the yield of several staple species, such as mackerel, haddock, and cod, declined. The larger total production was the result of increases in the landings of rosefish (a species hitherto little exploited) from 17 million to 66.6 million pounds for the calendar year 1936, and in vessel-caught whiting from less than 2 million to nearly 18 million pounds.

Observations on the condition of the haddock fishery have been continued to the full extent that limitations of personnel and equipment permit. A continued improvement from the low level of 1930-31 was noted in the fishery on Georges Bank, which remains, however, far below the 1925-29 level. On the Nova Scotian banks the average productivity was less than during the preceding year, owing to the scarcity of haddock spawned since 1929. As a result of the long-period program of study inaugurated in 1930 it has been learned that the haddock populations on the New England and Nova Scotian banks are subject to wide fluctuations in abundance not only from year to year but to an even greater extent over periods of years. The direct cause of such fluctuations is the varying survival of the young. The combination of an intensive fishery and a succession of poor spawning years may reduce the population to disastrously low levels, as happened between 1927 and 1931. It is further evident that the haddock populations of the various Nova Scotian banks differ markedly from each other and from that of Georges in their variations in abundance; each therefore requiring individual observation if effective measures for the management of the fishery are to be prescribed. Direct observations over widely scattered areas of the fishing grounds to assess the abundance and distribution of young haddock below commercial size are highly desirable, but are not practicable with present facilities. Up to the present time the fluctuations and trends in the haddock fishery have been considered mainly in qualitative terms.

As a result of findings and recommendations of the Bureau, the majority of the New England operators of large and medium otter trawlers voted to begin the use of larger meshed otter trawls early in 1937 and to continue such use for a trial period of 6 months. Such savings gear is considered the most effective and practical measure to decrease the destruction and capture of undersize haddock.

Continuation during the year of research on the natural history and fluctuations in abundance of mackerel provided more definite information on the seasonal movements of these fish; the location of important spawning grounds; the rate of growth during larval, juvenile, and adult existence; fluctuations in survival rate of the young;

and the attendant effects on the commercial stock available to the fishery. Information has also been obtained on the migratory, spawning, feeding, and schooling habits of the mackerel, and progress has been made toward discovering the relationship between the northern and southern subdivisions of the stock which have been found to have an important bearing on availability to the fishermen.

During the 1936 season the abundance of mackerel remained at a fairly high level, although the total catch, 40,173,400 pounds, represented a decrease of 24 percent as compared with the previous year. During the first half of the 1937 season the decline has been even more marked, and appears to be too severe to be ascribed to variations in year-class survival. Without hydrographic work from a research vessel, however, the abundance of yearling mackerel, often a determining factor in the success or failure of a fishing season, must remain an element of uncertainty in the predictions made each year by the Bureau.

Because of the migratory habits of the shore fishes of the Middle Atlantic region, the division of jurisdiction among many States, and the interstate traffic in the products of the fishery, the problems of this area are far beyond the scope of the conservation organizations of the several States. In recognition of this fact, leaders of the fishing industry and of angler organizations have united during the year in urging that the Bureau of Fisheries undertake scientific and economic studies necessary for formulation of a conservation policy to arrest the evident depletion of several important species.

From data collected between 1927 and 1935, a comprehensive study of the problems of squeteague or weakfish conservation has been completed. Observations have been continued on the new and important winter trawl fishery off the Virginia Capes. During the 1937 season, an observer spent considerable time at sea aboard fishing boats collecting detailed information on fishing activities and composition of catch as to kind, quantity, and sizes of fish; and gathering data on various types of trawls with particular attention to the need for and practicability of modifications in size of mesh to insure release of undersized and unsalable fishes, especially scoup and sea bass.

In response to general complaint of depletion of the winter flounder, the Bureau is beginning investigations of the life history and conservation needs of this species. During the spring of 1937, a tagging experiment was undertaken to obtain information on the seasonal migrations of flounders and to gain some measure of the intensity of the fishery.

*Shrimp investigations on the South Atlantic and Gulf coasts.*—Total catch statistics collected for the important shrimp fishery of the South Atlantic and Gulf coasts reveal the fact that the yield is not increasing in proportion to the increase in fishing effort. This fact, considered in relation to the scarcity of spring shrimp that has prevailed during the past three seasons, indicates a heavy drain on the fishery.

The tagging program, designed to secure data on migrations, growth rate, and fishing intensity, has been continued on both the South Atlantic and Gulf coasts. Returns from tagging, together with length-frequency data that have been collected, indicate that on the South Atlantic coast the shrimp move from the area of southern South Carolina, Georgia, and northern Florida to the central Florida

coast in winter, some traveling upward of 300 miles; while on the Gulf coast the winter movement is offshore, with a probable return to shallow water in the spring. Growth studies of the shrimp have been continued, and data have been collected for a report on the shrimp and shrimp fisheries of Texas.

During the year extensive collections of eggs and larvae of important commercial species have been studied, and a manuscript is being prepared which will set forth the characters by which these immature forms may be identified. The *Pelican*, a 73-foot Diesel ship, was transferred during the year to the shrimp investigation and will be used next season in offshore work. Aided by the life history studies now completed, it will be possible to determine the distribution of larvae and young and possibly to discover basic causes for the fluctuations in abundance that disturb the fishery. With the *Pelican*, an attempt will also be made to discover whether the larger shrimp congregate in deep offshore waters after they leave the shallower areas in the fall and winter. If they are found to do so, an important new fishery may be opened up.

*Pacific coast and Alaska fishery investigations.*—Investigations on the Pacific coast and in Alaska are concerned mainly with the maintenance and rehabilitation of the salmon and herring fisheries of Alaska and the salmon fisheries of Puget Sound and the Columbia River. All of the major investigations in progress during the fiscal year 1936 were continued in 1937.

In the Columbia River area the collection and analysis of catch records has been continued to determine the condition and trend of the commercial fishery, to demonstrate the extent of depletion of the supply if it prevails, and to establish a basis for proper regulation of the fishery. Excellent progress has been made on the stream-survey program, out of which is emerging a clear picture of the extent of available spawning areas, the location of barriers which may be removed or modified to permit the passage of fish, and the number of unscreened irrigation outlets that menace downstream migrants. A manuscript tracing the history and development of the fisheries of the Columbia and the parallel development of other natural resources which directly or indirectly influence the fisheries has been prepared for publication. Studies of the migrations and the size and seasonal occurrence of the runs of salmon have been aided by tagging experiments performed during the year and by counts of migrating salmon passing through the three fish ladders at the Rock Island Dam and through weirs in the Okanogan and Wenatchee Rivers.

In Puget Sound special attention has been given to determining the causes and extent of the decline in abundance of the sockeye salmon. These statistical and biological studies provide essential data for the scientific management of this seriously depleted fishery. The coho salmon of Puget Sound has been the object of special studies on rebuilding depleted populations through artificial propagation and transplanting of fingerlings. Marking experiments have been undertaken to determine the success of liberating hatchery-produced fingerlings of different sizes and of transplanting fish to "foreign" stream systems.

In Alaska the long-term studies of the red salmon runs of the Karluk River have been continued. One of the more important findings of the year was the accumulation of evidence indicating a positive correlation

between the growth of seaward migrants during their stay in Karluk Lake and the returns from the escapements. Such a correlation, if established beyond question, will throw light on observed fluctuations in abundance and will prove useful in predicting the relative size of the runs to be expected in any season. Chemical analyses of lake and stream waters to determine factors influencing the growth and survival of fingerlings have been continued. Returns from marking experiments of previous years were consistently large, indicating that Karluk fingerlings, most of which migrate seaward during the spring of their third or fourth year, have a higher survival value in the sea than those which migrate at an earlier age.

Similar studies are being made of pink salmon, the most valuable species in southeastern Alaska. Studies of the migratory routes of pink salmon in Clarence Strait may be expected to aid the fishery in the establishment of boundaries for future protective measures to allow adequate escapement. Cooperative work with the National Cannery Association of Seattle on the physical and chemical changes that take place within pink salmon during their period of spawning migration was continued. The native and exotic distribution of the Pacific salmon has been investigated during the past year and a report has been prepared for publication.

The collection of statistics of the Alaska salmon fisheries was continued. These data provide a permanent source of information of the daily catch records of the various forms of gear from each of the geographical divisions of the Territory, and are indispensable to the important regulation of the fishery.

The investigation of Alaska herring, which has been prosecuted since 1925, has established the fact that these fish are not a homogeneous population, but are composed of separate races, each of which inhabits a restricted area. During the past year the tagging program has been extended to include areas for which data had not previously been available, and has demonstrated that certain races support the fisheries of two separate areas during different parts of the season, and are therefore especially susceptible to overfishing. Studies have also been carried on to evaluate the effect of dominant "year classes" in producing the fluctuations in abundance which have been observed to occur.

*Great Lakes fisheries investigations.*—The program of investigations on the Great Lakes has continued during the fiscal year 1937 to emphasize the practical phases of scientific research, that is, the conservation of the fisheries. This has been made an urgent necessity by the fact that the more important species, such as the whitefish, yellow perch, and the several species of chubs are definitely on their way to commercial extinction, a fate that has already overtaken the Lake Erie cisco. Although no field work was conducted during the fiscal year 1937, the staff made excellent progress in the compilation of data collected during earlier investigations. Active cooperation with the fishery authorities of the various States fronting on the Great Lakes included the furnishing of a large amount of data to be used as a basis for uniform fisheries legislation. The detailed analysis of commercial fishery statistics of the Great Lakes waters under the jurisdiction of the State of Michigan was continued. One of the important findings resulting from the application of statistical methods was the demonstration that fluctuations in the abundance and production of yellow

pike perch in Saginaw Bay over the period 1929-35 showed no correlation with the plantings of fry in earlier years. Methods for the simplification of statistical procedure have been evolved. Racial and life history studies of several important commercial species were continued during the year.

#### POLLUTION INVESTIGATIONS

Investigations concerning the toxicity of industrial effluents on aquatic life have been continued in 22 States, so that to date some 60 major groups of effluents representing over 200 kinds of industrial wastes have been studied, assayed, and the biological effects of their components standardized. For many of these substances detoxifying procedures have been devised and tested. From these data on effluents and soil constituents the manuscript for the second part of the series of pollution studies, "Trade wastes, chemical effluents, and natural pollutants," has been prepared for publication. Part I of this series of studies, "Detection and measurement of stream pollution," was published during the year.

One of the striking findings in the investigations of natural pollutants has been the demonstration of the high toxicity of minute quantities of selenium to fish. This work is particularly significant in view of recent surveys which show this element to be a widespread menace in several Western States. Besides selenium, several other substances that occur in small quantities in some natural waters and soils, as boron, fluorin, titanium, and others, have been found to present previously unrecognized hazards to fish and other aquatic life.

The investigations on fish physiology as related to water conditions have been greatly extended during the past year with the perfection of new apparatus for studying fish respiration, heart action, and internal metabolic activities.

At Fort Worth, Tex., the long-time experiments on mussels in confined areas have been continued with satisfactory returns. These tests have confirmed the previous findings that the river mucket is the most promising species studied thus far for commercial propagation, and have given additional information on the survival of fresh water mussels under adverse conditions.

#### AQUICULTURAL INVESTIGATIONS

Trout investigations during the year consisted of field studies in streams of the George Washington National Forest and in various other waters; and of hatchery investigations at Leetown, W. Va., and Pittsford, Vt. The use of "test waters" in Vermont to obtain much-needed information on the productive capacity of streams under intensive fishing and the best methods of maintaining maximum production was increased to the full extent allowed under the State law, a maximum of four test waters. Arrangements were completed with the United States Forest Service for the operation of four experimental streams in the White Mountain National Forest for the purpose of obtaining information on the relative value of different sizes for stocking, and for the utilization of the streams

of the Pisgah Division of the Pisgah National Forest, N. C., as an experimental project to demonstrate the value of scientific stream management in improving angling conditions.

Laboratory studies on trout culture included: (1) Feeding experiments at the Leetown hatchery to determine efficiency of certain low-cost diets; (2) breeding experiments at the Pittsford hatchery in which it appears that a strain of trout more resistant to disease is being developed; and (3) experiments to determine the cause of the heavy losses of brook trout eggs suffered at the Leetown hatchery.

The California trout investigations have proceeded along two major lines of effort: Experiments at the Hot Creek Station to develop a superior brood stock, and coastal stream studies of the steelhead trout. Detailed plans have been drawn up for the development of a major stream and lake management project on the Convict Creek drainage in eastern California. Investigations dealing with the life histories and migrations of the steelhead and salmon of the coastal streams have been continued in the Klamath River and in Scott and Wadell Creeks.

Investigations in pond culture for bass and other warm-water fishes were conducted at Marion, Ala., during the year. The results confirmed those of previous years, showing that production of food organisms is greater in ponds containing vegetation than in those without an appreciable growth of higher plants. Comparative studies of the suitability of two streams, one in West Virginia and the other in Virginia, for the production of bass, showed marked differences in the rate of growth of both bass and forage fish.

Facilities for the study of fish diseases were markedly improved during the year by space provided in the new hatchery at Quilcene, Wash., where various methods for the prevention and cure of diseases will be tried under experimentally controlled conditions. As in previous years, epidemics reported from hatcheries were investigated and hatcherymen were advised on disease problems. The disease service has proved very popular and a large number of specimens submitted by various State and Bureau hatcheries and by private individuals were examined at both the Washington, D. C., and Seattle laboratories.

#### SHELLFISH INVESTIGATIONS

Shellfish investigations during the fiscal year 1937 comprised studies of the metabolism and fattening of the oyster; determination of the factors involved in sex changes in oysters and clams; investigations in the biology and control of various natural enemies of the oyster; and observations on the effect of pulp mill pollution on shellfish.

The production of oysters of high nutritive value is at present the principal problem of oyster culture in the Northern States. Good oysters are characterized by the storage of a large amount of glycogen in their tissues and by the presence of lesser quantities of metals important in human nutrition, especially iron and copper. Observations on the seasonal fluctuations in the chemical composition of oysters kept under known natural conditions have now been completed and form an important contribution to studies upon

which oyster growers may eventually be able to produce a standard product of known chemical composition. Experimental methods for increasing the iron content of the northern oyster have been tested. As a practical aid to oyster growers of Long Island Sound, where the amount of set to be expected in any given year is very uncertain, studies of spawning and setting have been undertaken and will make possible the prediction of the date and intensity of setting.

Studies of the biology of the starfish have demonstrated that the distribution of this oyster pest is correlated with the presence of food; that the migrations of starfish are restricted, probably not exceeding a mile; that there is no seasonal migration; and that certain areas of the western part of Long Island Sound and of the Connecticut shore serve as dispersal centers from which spawn may be carried considerable distances to infest new grounds. Investigation of the damage done by oyster drills was continued on the Eastern Shore region of Virginia, and a manuscript on the life history and methods of control of the oyster drill was prepared for publication. Details of the life history of a sporozoan parasite of the oyster were demonstrated at Beaufort, and experiments on the control of the conch or borer were continued in Florida.

The investigation of the effects of pulp mill pollution in the York River consisted of extensive surveys of hydrographic conditions in the York and Piankatank Rivers; studies of the effects of transplanting oysters from the upper York, where shellfish are of markedly poor quality, to areas not affected by pulp mill pollution; laboratory analyses of oyster meats; and studies of the effect of the pulp mill pollutant on diatoms, which constitute oyster food, and on the physiological processes of the oyster. Evidence is accumulating to show that the pollutant interferes with normal respiratory and feeding activities. When transplanted to more favorable environments, oysters from the upper York show increased growth, fattening, and improvement in the condition of the shells.

During the year the following special investigations were carried out: A program for experimental and field studies of the effect of dredging operations on oysters, prepared for the War Department; an investigation of the destruction of shellfish on the Eastern Shore of Virginia by a September hurricane; a survey of oyster bottoms in Mobile Bay to assist State authorities in rehabilitating depleted beds; a survey of oyster-producing areas in Florida to determine where extension of natural bottom could be accomplished by planting and culture; and an investigation of the unusual abundance of starfish in Chesapeake Bay during the spring of 1937.

#### LAW ENFORCEMENT DIVISION

This Division has charge of the enforcement of the law regulating the interstate transportation of black bass and administers that part of The Whaling Treaty Act of May 1, 1936, charged to the Department, which includes the issuance of licenses to shore whaling stations, floating reduction ships, and catcher boats. The Division also conducts an anglers' section, where information pertaining to angling is compiled and made available to the public.

The Federal black bass law was administered, as in previous years, by 2 regular field employees, 2 temporary assistants, and 1 perma-

ment employee in the Washington office, assisted by 125 deputy black bass law inspectors who are regularly employed State officials serving the Federal Government without pay under the direction of the Chief of the Division.

Over 100 investigations were made of reports of violations. No cases were reported for prosecution in Federal court, as this drastic procedure was not found necessary to obtain compliance with the law. Two seizures were made, and a number of cases were successfully prosecuted in State courts.

Progress was made in obtaining improvements in State black bass laws, the most important of which was the adoption of a closed season in Florida. Considerable work was done in Tennessee, South Carolina, Maryland, and Kentucky in connection with giving black bass better legal protection. Daily and size limits were improved in many States, and 3 States adopted resident anglers' licenses for the first time. Three States adopted part-time nonresident anglers' licenses. Over 40 State legislatures were in session, and more changes than usual were made in the sport fishing laws, both by statute and regulation, than in any previous year. Five States made very definite changes in their regulatory bodies administering fish and game work.

A Fishery Circular containing the text of the black bass law and a synopsis of the laws of the United States and Canada was revised and published. Also several of the series of leaflets on various angling subjects were revised and issued. Articles, press releases, and radio talks were prepared; fish codes corrected for national magazines; addresses were prepared and delivered to various fish and game organizations on black bass protection.

The Division has prepared under the terms of the act of Congress for the protection of whales a total of 36 licenses: 3 of these were for floating factory ships, 2 for shore stations, 1 for a combination observation and killer boat, and the others for catcher boats operated by ships or shore stations. The total revenue received from the issuance of these licenses was \$10,250, which was turned into the United States Treasury. The Division has cooperated with officials of the Treasury Department, State Department, and others in administering The Whaling Treaty Act.

The act of Congress providing for the issuance of permits to take certain small fish for bait in the District of Columbia is also administered in the Division, and over 30 permits were issued during the year.

#### AQUARIUM

The aquarium, located in the Department building, has maintained its status as a focal point of interest to visitors, school classes, and students of biology. However, increasing chlorination of the city water supply which feeds the aquarium is presenting a serious problem in the maintenance of the specimens. In order to assure a continuation of the displays, particularly of young fish and a model hatching apparatus, it will be necessary to provide suitable equipment for dechlorinating the water.

## VESSELS

Fifteen vessels of the Alaska service cruised approximately 127,000 nautical miles in the fiscal year 1937 as compared with 120,000 miles in the previous year. The *Penguin* covered approximately 28,000 miles, the *Crane* 17,000 miles, the *Brant* 15,000 miles, and the *Teal* and *Eider* each about 11,000 miles.

The *Penguin* served as tender for the Pribilof Islands and made five round-trip voyages between there and Seattle, carrying personnel and emergency supplies. Interisland service also was performed, and native workmen from the Alaska Peninsula and Aleutian Islands were transported to the Pribilofs to assist with the season's sealing activities.

The *Auklet*, *Kittiwake*, *Merganser*, *Murre*, and *Widgeon* were engaged in the fishery-protective work in southeast Alaska during the 1936 season. The *Blue Wing* was in the Kodiak area until June, when it was transferred to Prince William Sound. The *Eider*, after assisting with the Works Progress Administration project of stream improvement in southeast Alaska in the early spring, transported crews and supplies from Seattle to the Alaska Peninsula and intermediate points, and then was on patrol duty in the Kodiak area from May 30 until the latter part of September.

The *Crane* and *Red Wing* patrolled the Alaska Peninsula area, the *Ibis* was at Chignik, and the *Coot* was on the Yukon River. The *Scoter* engaged in the Bristol Bay patrol during the fishing season, and in August it assisted with the stream survey in the Alaska Peninsula region. The *Teal* was on Cook Inlet from May 26 until the early part of September, after which it participated in the patrol and stream inspection in southeast Alaska. The *Brant* was again used primarily for general supervisory work, chiefly in southeast Alaska, although one trip was made to the westward as far as Bristol Bay.

In the spring of 1937 the *Teal* was used in herring tagging in southeast Alaska, and the *Scoter* was assigned to seal patrol duty in the vicinity of Neah Bay, Wash. From about the middle of November 1936, to February 4, 1937, the *Crane* was detailed to the service of the Post Office Department for the purpose of transporting mail between Seattle and Juneau during the maritime strike on the Pacific coast. Expenses in connection with this service were paid by that Department.

The *Pelican* was reconditioned for use in the shrimp investigations in the South Atlantic and Gulf area.

## APPROPRIATIONS

Appropriations for the Bureau for the fiscal year aggregated \$1,565,920 as follows:

Salaries, Commissioner's office.....	\$156,420
Propagation of food fishes.....	667,000
Maintenance of vessels.....	160,000
Inquiry respecting food fishes.....	172,000
Fishery industries.....	62,000
Protecting seal and salmon fisheries of Alaska.....	278,000
Upper Mississippi Wild Life and Fish Refuge.....	18,000
Enforcement of black-bass law.....	15,000
Fisheries Cooperative Marketing Act.....	12,500
Shellfisheries investigation.....	25,000
Total.....	1,565,920

## LIGHTHOUSE SERVICE

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In common with the centering of much of the public thought of the past year upon employment conditions and personnel administration, intensive study has been directed to similar problems in the Lighthouse Service. Some of these problems are of gradual growth along with progress in the sociological and technological aspects of modern life and the growth of the country, and others have developed mainly during the past year as a result of rapidly changing economic conditions in directly related and competitive lines of employment.

In September 1936, a conference, attended by Bureau officers and a group of Lighthouse Superintendents, also representatives of the Department, the Bureau of Marine Inspection and Navigation and the Civil Service Commission, was held to consider personnel problems and policies in the Lighthouse Service, with especial attention being directed to the following needs. For the past two decades or longer the rapid and accelerating mechanization of the Service has created demand for a quality of personnel at light stations and on the vessels of this Service more thoroughly in keeping with present day requirements in technological fields, with a resulting need for revision of the entrance requirements for lighthouse keepers and for officers of lighthouse vessels. Also in keeping with the policies necessary for the administration and development of a better service, provisions should be made for facilitating the advancement to positions of higher responsibility of qualified and experienced petty officers on vessels of the Service.

With a view to the development of well-rounded personnel in a service whose function it is to serve nautical interests through technical means, there should be provided increased facility for the development of selected officers by a better interchange of duty between ship and shore. To effect this most desirable arrangement without disrupting the normal functioning of important units of the Service, a few extra positions should be authorized both in the technical engineering line and in the nautical line of duty.

The functions of personnel administration in the Lighthouse Service, while given much constant and careful attention, are in their execution undesirably divided among a number of officers. The Lighthouse Service comprises a personnel of over 5,000 persons, or nearly one-third of that of the Department of Commerce, and it seems probable that no expenditure of funds for supervisory personnel would be more productive than the authorization of a staff officer in the Bureau with a view to the development and standardization of modern and progressive policies and practices of personnel administration. Such an officer should be almost entirely relieved of routine personnel paper work, and much of his time should be

spent in the field where 99 percent of employees of the Service operate.

During the fiscal year just passed and subsequent to the conference above mentioned, there took place a general and widespread rise in the wage level in the maritime industry, which, coupled with trends toward the shortening of hours of labor and reenforced by new governmental regulation setting up standards for such hours of labor, has reacted directly upon employment conditions in the Lighthouse Service and has brought about conditions of disparity which appear to be remediable only by augmented appropriations to provide increased complements on certain vessels and at certain light stations and an increase in compensation in all lines of employment on vessels of the Service.

The recommendation made last year that the appropriations, Salaries, Bureau of Lighthouses, and Salaries, Lighthouse Service, be consolidated into a single appropriation with proper limitation upon the proportion of the combined amount available for expenditure in the District of Columbia is renewed. Such consolidation is strictly consistent and in line with legislation enacted by the Seventy-fifth Congress.

The demands upon the Lighthouse Service for extension of its facilities into new areas, particularly in connection with the great increase in small motor vessels, continue to be in excess of the abilities of the Service to fully meet them, especially as respects funds for the continued maintenance of such new aids. Not only the progressive growth of this character of traffic, and the great extension of improved channels of inland waterways throughout the country, but the concurrent increase in the cost of commodities and labor lately experienced and continuing, have created demands upon the maintenance funds of the Lighthouse Service which will require adjustment to meet these new conditions.

Another maintenance problem which presses with increasing urgency is the resumption of a normal and regular program for the construction of Lighthouse Service vessels. During the past 4 years the total number of aids to navigation necessarily maintained by the Lighthouse Service has increased from 22,495 to 28,106. Concurrently, the number of vessels in its fleet has been reduced from 113 to 103, largely by reason of the replacement of lightships by fixed structures, lighted buoys, or other aids less expensive to maintain, but there remains no margin of safety as respects either lighthouse tenders or lightships, both of which are unique and special types of vessels. Provision for the replacement of worn out and obsolete units of the fleet is therefore an essential feature of the normal maintenance of the Lighthouse Service, and is not susceptible of either long deferment or of marked acceleration within the limitations of sound economic planning. The average age of the vessels in this fleet is now 21 years, 42 percent of these vessels being over 30 years of age, and 15 percent being 40 years of age or over. The emergency has become acute for the resumption of a replacement program of the oldest of these vessels by abler, more efficient, and more commodious units.

Fair progress continues to be made in the systematic improvement of aids to navigation, especially as to radio aids, all lightships now

being equipped with radiobeacons, 29 of these having been synchronized with fog signals for distance finding. The total number of radiobeacons now in commission is 125, of which 84 are in synchronous operation with sound signals. Progress in the elimination of interference as respects radiobeacon signals has improved conditions to the point where interference is no longer a serious problem, although in many localities the demand for additional radiobeacon stations can with difficulty be met within the band of frequencies available for their operation. The establishment and operation of monitoring stations in the Lighthouse Service has been of material value in reducing the difficulties from interference, and excellent cooperation has been received from the Bureau of Air Commerce and from merchant shipping.

Constantly increasing evidence of the value of radiotelephone communication facilities in the Lighthouse Service has been noted throughout the year. There are now 66 such installations in service, and while this establishment has been primarily to facilitate administrative control and to increase the security of personnel at remote stations, the value of this instrument of communication in the collecting and disseminating of information relative to important changes or emergency defects in aids to navigation has been noted. Concurrently, the increase in the availability of facilities aboard ship for receiving radiotelephone broadcasts has indicated that this channel of communication might advantageously be made use of for emergency communication with merchant shipping. The initial installation for the broadcasting by radiotelephone of Notices to Mariners regarding aids to navigation of the Lighthouse Service is being established at Sault Ste. Marie, Mich. This station by cooperative arrangement will also be available for the broadcasting of weather forecasts and for other emergency items of importance, such as ice conditions, wrecks, derelicts, etc.

An extensive revision of the Light Lists of the Service has been accomplished during the year, reducing the number of volumes from 9 to 6, and providing a special list for the Intracoastal Waterway from Norfolk, Va., to Key West, Fla. All lighted, as well as unlighted, aids for any given section of the country are now included within a single volume. This change has met with favorable reaction from maritime interests.

Included in the issues of these Light Lists for the calendar year 1937 are descriptions of the systematic buoy light characteristics which bring their significance into accord with the shape and color characteristics of buoys by day, which revision was completed during the past fiscal year. There is also included in the new Light Lists a description of the standard system of synchronous operation of radio beacons and sound signals for distance finding purposes. The special Light List for the Intracoastal Waterway includes a description and color plate of the special standard system of marking adopted for this waterway and proposed to be extended along the Gulf coast as this waterway is further developed.

Some progress has been made during the year in the improvement of secondary fog signals both at light stations and on buoys. Much work of this character remains a desirable accomplishment to be undertaken as funds become available.

Intensive study continues to be given to projects for the development of improved signalling apparatus, especially in the lines of radio and acoustics, and automatic or distant control of fog signals. These are described in a subsequent section of this report.

The total number of aids to navigation maintained by the Lighthouse Service at the close of the fiscal year was 28,106, an increase of 1,447 over the previous year. Of these additional aids 281 were lighted aids, 41 of which included sound signals, and 1,144 were unlighted buoys and daymarks. The number of the latter provided with reflectors increased from 551 to 936. Thirty-four additional sound signals were established. A large proportion of this increase is directly occasioned by the continuing development of rivers, harbors, and inland waterways. Two first-order light stations have been converted from attended stations to unattended, and work on a third is in progress. In all these instances the automatically operated lights are being supplemented by additional lighted buoys close to the track of navigation. The policy of changing oil-burning fixed lights to flashing or occulting lights using acetylene or electric illuminant has been continued, there now being 1,644 more flashing lights than fixed lights in service.

The continuing extension of commercial electric power lines is placing within the reach of the Service a reliable source of energy for the operation of signals at an increasing number of lighthouses in many parts of the country. This commercial current is in many cases obviating the necessity for expensive generating equipment, and is also reducing the labor of attending certain lights and fog signals and is effecting improvements in the lighting of rivers.

Comparable to the increasing use of electricity, through the spreading of commercial electric power lines even into the remoter sections of the country, is the change in transportation methods which is following the development of highways. The Lighthouse Service is taking advantage of the rapid improvement of even local roads, and is increasing its use of motortrucks for servicing aids to navigation, particularly in emergencies, with resulting economies as well as improved service.

The retirement of E. C. Gillette, who, since 1914, was Superintendent of Naval Construction and Chief of the Marine Engineering Division, took place at the close of the fiscal year, and C. C. Brush has been transferred from the position of superintendent of the first lighthouse district and detailed to the position of chief of this Division, now known as the Division of Marine Engineering and Construction.

During the year, lightship *No. 112* was commissioned and placed on station on Nantucket South Shoals. This vessel has demonstrated her seaworthiness and is perhaps the most important aid to navigation in the Lighthouse Service. The new tender *Hollyhock* has been completed and delivered to the twelfth lighthouse district for duty on Lake Michigan in place of the tender *Sumac*.

A description of certain important engineering projects completed during the year will be found under the heading of "Description of important works completed."

## IMPROVEMENTS IN APPARATUS AND EQUIPMENT

Improvement in candlepower and effectiveness of coastal landfall lights, and of important ranges, has been further extended, and a considerable number of unattended automatic lights of both the electric and acetylene type has been established for the increased safety of navigation.

Field tests of the battery-operated fog horn have continued with improvements in vibrator and contact assemblies, with development work still continuing. Units are in commission at three locations in the field.

Development of remote control apparatus for fog signals by means of a modulated light beam has continued, and two field installations are in commission to test the practicability of this method. One installation controls the compressed-air fog signal at Point Chehalis Range Light Station, Wash., and one, the fog (bell) signal, at Old Point Comfort Light Station, Va.

Work on a battery-operated electric solenoid-operated fog bell striker of the clapper type has continued. One installation has been in successful operation for the past year at Peshtigo Reef Light Station, Lake Michigan. A plunger type electric solenoid-operated bell striker suitable for use on buoys was tested, and shows promise of effectiveness at considerable economy of operation over the CO<sub>2</sub> gas-operated bell striker.

Kerosene engine generator units of less than 5 kilowatt size, with suitable controls and carburetion features for automatic starting, have been developed, and a few units have been ordered for field installation. There was a need for this type of equipment in the small sizes.

Nonspill and nonflooding caps for low-discharge type lead acid batteries have been developed; the first type for adapting the batteries for buoy use, the second to prevent infiltration of flood waters into batteries used with aids on the rivers. This type of battery is being used in increasing numbers for all classes of minor electric aids.

The use of lead acid type storage batteries floated across the line in connection with gasoline and Diesel engine driven generator plants has been extended to provide added capacity for peak loads and maximum emergency power.

Remote control of lights and fog signals placed on exposed ends of breakwaters, from existing main light station structures now manned by keeper personnel, has been applied where important new aids at exposed points have been established. The new light and fog signal recently established on the Calumet Harbor Breakwater Southeast Light Station, Lake Michigan, is an example.

A 375 millimeter duplex lantern has been designed for use on a single masted lightship. An initial order has been placed for two of these to be manufactured from aluminum alloys.

Modern compressed-air fog-signal equipment has been installed at several stations to replace worn out or obsolete equipment, including fog bells. Additional tests have been carried out at the Cape Henry Fog Signal Testing Laboratory.

Improvements and modernization of existing radiobeacons have included broadening of the service area of 16 radiobeacons, by im-

provement either of antenna systems or radio transmitters, or both. The continuing extension of radiobeacon service has required improvement in the quality of the radiobeacon signals to minimize interference between radiobeacons and to permit the use of more selective radio direction finders by mariners. Of the 125 radiobeacons operating at the close of the fiscal year, 50 are equipped with crystal frequency control equipment, and 36 additional installations are in progress.

Interlocked operation of the radio and sound signals for distance finding has been accomplished at 27 additional stations, bringing the total number of such aids to 84. In connection with this extension of distance finding there has been provided at such stations an improved centralized timing and control equipment to control all aids at the station from a single point.

Improved communication facilities have been provided at many important isolated ships and stations by the installation of radiotelephones. The total number of radiotelephones in operation in the Service is 66. Existing radiotelegraph stations on five lightships have been improved.

The monitoring system for supervision of radiobeacons has been improved and extended with a total of 19 complete radiobeacon monitoring stations now in daily operation and 48 observation stations in intermittent use. During the coming year it is planned to establish three additional monitoring stations, which will complete a satisfactory network.

The use of radio control for major light stations has continued with two such stations in regular operation. A radio-controlled lightship is still in experimental operation and further progress has been made in the process of elimination of occasional defects in its equipment.

As specialized radio equipment required for radiobeacon service cannot usually be procured readily, it has been found necessary for the Service to develop model or sample equipment as a basis for the procurement of such apparatus. The Lighthouse Service Radio Laboratory during the year completed development of an intermediate power radiobeacon transmitter. This sample was used in contracting for the year's requirements, considerably reducing the developmental charges and providing equipment markedly improved in performance. Other equipment developed in the Service Radio Laboratory included a sample frequency control exciter, a radiobeacon alarm device, and timing equipment. Other important developments are in progress, including a high-power radiobeacon amplifier and other projects important in the progress of the work of the Service. The radio laboratory also afforded facilities for the assembly of urgently required equipment to meet unforeseen needs involving radiobeacon improvements and establishments where commercial products could not be procured. Notable cases during the year involved assembly of complete radiobeacon equipment for a new radiobeacon at St. Paul, Pribilof Islands, Alaska, and improved equipment for two radiobeacon stations in the Panama Canal approaches.

A series of tests were conducted by a Bureau officer at the Lazaretto Depot, Baltimore, seeking an improved type of minor light structure suitable to the bottom conditions found in the Chesapeake Bay area and at the same time resistant to the overturning action of heavy ice. The results of these tests made with scale models are being studied

along with the histories of existing structures. In anticipation of the future use of ultra high frequencies for radiobeacon purposes the Service has devoted considerable study to the development of a radiobeacon transmitter suitable for installation upon one of the larger types of buoys. Considerable progress has been made in the development work and it is planned to conduct a service test at an early date.

Following tests of the use of battery-operated electric lights on buoys with nonventilated lanterns, which at times are subject to complete submergence, a number of buoys so lighted are now in use, including eight in the seventeenth district.

Considerable progress has been made in carrying out the program for the improvement of secondary fog signals, outlined in last year's report. The number of fog bells struck by gravity-driven clockwork mechanisms has been reduced from 139 to 133.

In the first district an electrically-operated fog bell striker utilizing the major parts of the older weight operated striker was designed and installed. It was so designed that in the event of electrical failure the use of weights could be quickly resumed. This installation is in line with the announced policy of replacing the older weight operated fog signals with those of more modern types.

#### ADMINISTRATION

Appropriations for the maintenance of the Lighthouse Service totaled \$10,485,990 for the fiscal year 1937. There were no additional allotments by the Public Works Administration during the fiscal year 1937 for special projects, but the work previously provided for was continued and substantially completed from allotments made during 1934. These allotments, which totaled \$5,620,334 were reduced by the withdrawal of \$12,009. Of the balance, \$17,696 was unexpended on June 30. In addition, previously impounded funds available for special projects were released by the President to the amount of \$1,250,000 during the fiscal year, which supplemented similar released funds in the preceding fiscal year amounting to \$1,055,135, a portion of which was available in 1937. There were also allotted from the 1937 Department appropriations \$6,000 for contingent expenses and approximately \$35,000 for printing and binding.

There were received and deposited in the Treasury the following: From sale of Government property, \$20,518.68; rent of buildings, \$1,345.25; forfeitures by contractors, \$417.06; reimbursement for property destroyed or damaged, \$4,270.77; work done for private interests, \$2,568.39; commissions received on telephones, \$22.81; miscellaneous, \$3,668.74; total, \$32,811.70.

Effective January 1, 1937, the dividing point between the sixth and seventh lighthouse districts on the east coast of Florida was moved northward from Hillsboro Inlet to St. Lucie Inlet. The change was made in connection with the development of the trans-Florida waterway through Lake Okechobee. Aids to navigation in the lake were already maintained by the seventh district and the change in the district limits places the entire waterway under one jurisdiction.

**PERSONNEL**

During the fiscal year there was a net decrease of five in the authorized personnel for the operation and maintenance of the Service. The total number of personnel employed as of June 30, 1937, was 5,056, including 1,183 lightkeepers and assistants; 1,791 officers and crews of lightships and tenders; 108 Bureau officers, engineers and draftsmen, district superintendents, and technical assistants; 183 clerks, messengers, janitors, and office laborers; 139 depot keepers and assistants, including laborers; 1,210 laborers, etc., mostly part-time employees; and 442 field force employed on construction and repair work.

During the year, in addition to their regular duties, a number of employees rendered aid to those in distress. About 100 instances of saving life and property or rendering other valuable aid were reported, many of these acts having been performed at great personal risk.

Additional to those already mentioned, the following changes in the officers in charge of the various lighthouse districts were made during the fiscal year: Lewis M. Hopkins, superintendent of the fifth district, was retired on January 31, 1937, and Norman C. Manyon, superintendent of the fourth district, was transferred to that position; G. W. Hitchens, formerly superintendent of the ninth district, became superintendent of the fourth district on February 1; F. C. Hingsburg, formerly assistant superintendent of the eleventh district, was made superintendent of the ninth district on March 1.

Signal service was performed by the officers and crew of the lighthouse tender *Rose*, when fire destroyed the town of Bandon, Oreg., on September 26, 1936. Everything possible was done to aid in fighting the fire, parties being sent ashore to assist the inhabitants in getting clear of burning structures. Large numbers were ferried to the other side of the river. Old persons, and those injured or ill, were sheltered aboard the tender, and the vessel's facilities were utilized to the utmost in feeding the needy until relief agencies took over the work.

A number of Lighthouse Service employees assisted with flood-relief work in the Ohio and Mississippi River Valleys during the flood of January and February 1937, and under the general direction of the Coast Guard and Engineer officers engaged in the transportation of food and medical supplies, transporting doctors to various parts of stricken cities and towns, and in the general relief of distressed persons.

**LIGHTHOUSE TENDERS**

At the end of the year there were 59 lighthouse tenders in commission. Of these, 43 were steam-propelled, 11 had Diesel engines, 4 had Diesel electric drive, and 1 was gasoline-engine-propelled. Twenty-five percent of this fleet burned coal, while the remainder utilized oil in one form or another. The average age of the fleet of tenders is 19 years.

Of these vessels 31 have radiotelegraph communication, 15 have radiotelephones, and 35 are fitted with radio direction finders.

The following tenders have been extensively overhauled during the year: *Larkspur*, *Lotus*, *Rose*, and *Kukui*. Of these, the *Larkspur* was supplied with new boilers and equipped for burning oil fuel.

It is expected that the following tenders will be extensively overhauled or reconditioned during the coming year: *Shrub*, *Tulip*, *Speedwell*, *Mangrove*, *Ivy*, and *Greenbrier*.

#### LIGHTSHIPS

Lightships were maintained on 31 stations and a total of 44 ships were in service at the close of the year. In addition to the regular station ships, 9 were held as relief ships and 4 were in reserve.

Lightships *No. 53*, *No. 54*, *No. 81*, *No. 83*, *No. 85*, *No. 94*, *No. 96*, and *No. 98* have been reconditioned or overhauled. The lightship station at Grays Reef, Lake Michigan, has been discontinued, the lightship having been replaced by a fixed lighthouse structure.

Lightship *No. 47* was sold on April 9, 1937, for \$610, and lightship *No. 89* was sold on April 1, 1937, for \$1,828. Both ships were beyond economical repair. Lightship *No. 69* has been condemned and will be sold during the coming year.

Lightship *No. 76* is to be reconditioned during the next year.

#### PROGRESS ON VESSELS UNDER CONSTRUCTION

*Tender "Hollyhock."*—This tender, which was described in last year's annual report, was under construction at the plant of the Defoe Boat & Motor Works, Bay City, Mich. Official trials of the vessel were held on May 6, 1937, and it was delivered to the Government on June 25. Contract price, \$347,800.

*Tender "Elm."*—This tender is being constructed under contract with the Defoe Boat & Motor Works, Bay City, Mich., at a cost of \$77,177. It has been specially designed for the maintenance of buoys and other aids to navigation in the shallow rivers and other inland waters of New Jersey. The vessel is of steel, 72 feet long, with twin screws, and propelled by two Diesel engines of 150 horsepower each. This tender will have a displacement of 69 tons at a draft of 3 feet 8 inches. The derrick has a working capacity of 1 ton. On May 11, 1937, the tender was approximately 29 percent completed. Owing to labor troubles, no further progress has been made on the vessel. The contract date of completion is September 22, 1937.

*Lightship "No. 118."*—This vessel is being constructed under a contract with the Rice Bros. Corporation, East Boothbay, Maine, at a cost of \$223,900, to replace Lightship *No. 44* on the Cornfield Point Station, Conn. It is being provided with a considerable amount of protection against sinking in the event of collision by subdividing the hull into an unusually large number of watertight and oiltight compartments below the main deck. This protection is considerably increased by dividing the space above the main deck into watertight passages and compartments. Diesel engines are provided for main and auxiliary power, including the signaling equipment. The signaling equipment is of the latest type and consists of a radiobeacon, a compressed-air fog signal, a powerful masthead light, and a warning whistle. The radiobeacon and fog signal are synchronized for distance finding. On June 30 this vessel was approximately 16 percent completed. The contract date of completion is March 18, 1938.

*Tender "Goldenrod."*—This tender is being constructed under a contract with the Dubuque Boat & Boiler Works, Dubuque, Iowa, at a cost of \$115,375. It is of special design to work in the shallow waters of the interior rivers. It will be provided with jetting equipment for securely anchoring buoys in the hard bottoms of rivers. The vessel is of steel, 104 feet long, with shallow draft. It has twin screws and is propelled by two Diesel engines of 150 horsepower each, through reduction gears. The displacement is 170 tons at a draft of 3 feet 6 inches. The derrick has a working load capacity of 2½ tons. The contract became effective on June 21, 1937, and preliminary work only has so far been accomplished.

**PROGRESS OF SPECIAL WORKS UNDER CONSTRUCTION OR  
COMPLETED**

*Maine.*—An automatic acetylene light has been established on the easternmost part of Monroe Island, and the supporting structures of other such lights have been improved by being changed from iron spindles to steel towers with tank houses.

*Cape Cod Canal, Mass.*—Four automatic lights have been established to mark the east side of the Hog Island Channel. A contract has been let for constructing five similar structures on the west side of this channel, and for a light and fog signal on Hog Island, at a total cost of \$12,190. The east entrance range lights have been moved to new towers on the new range line and the radio and fog-signal apparatus moved to a new and more suitable location, at a cost of \$5,800.

*Annisquam River, Mass.*—The seven steel sheet-pile light structures being erected under contract at the beginning of the year have been completed and an automatic electric light established on each, at a cost of \$9,064.

*New York Bay, N. Y.*—Romer Shoal Light Station has been extensively improved by the installation of new fog-signal equipment, water tanks, and fuel tanks, together with a modern heating system, at a cost of \$6,555.

*New York Bay, N. J.*—Extensive repairs have been made to the riprap break-water protecting the light tower at Sandy Hook Point Light. Cost, \$11,000.

*Connecticut and New York.*—Riprap has been deposited for the protection of the caisson foundations of Greens Ledge, Orient Point, Stratford Shoal, Execution Rocks, Race Rock, and Bridgeport Harbor Light Stations, and of various stations in the Connecticut and Hudson Rivers, at a cost of \$86,765.

*Delaware River, N. J. and Pa.*—The moving of old and erection of new range structures to mark the newly-dredged channels above Philadelphia, in progress at the beginning of the fiscal year, has been completed at a cost of \$15,947.

*Chesapeake and Delaware Canal, Del. and Md.*—The deepening of this canal and its approaches has necessitated the establishment of a large number of additional aids to navigation. Preliminary plans for this work have been made and leases obtained for some of the land sites. The work of establishing the new aids between Courthouse Point and Chesapeake City is now in progress. The estimated cost of the entire project is \$221,000.

*Ocean City and Sinepuxent Bay, Md.*—The establishment of 10 lighted aids on fixed structures and 19 day beacons has been completed. Cost, \$5,730.

*Core Sound, N. C.*—The erection of lights on fixed structures to mark the newly-dredged channel has been completed. Cost, \$5,425.

*Hobucken, N. C.*—A steel sheet-pile bulkhead has been built along the water front at the Hobucken Light Station to prevent erosion of the bank. Cost, \$5,987.

*Intracoastal Waterway, S. C., Ga., and Fla.*—Ninety automatic 200-millimeter electric flashing lights, supported on 3 pile structures shaped and colored in conformity with the standard intracoastal waterway marking system, together with 93 daymarks and 28 unlighted buoys, have been established. Material and equipment have been purchased for approximately 120 additional lights and the work of installation is now in progress.

A piece of property for a depot at Fort Pierce, Fla., has been purchased. An interlocking steel sheet-pile bulkhead has been constructed along the Taylor Creek side of the property and material removed from the creek, which was dredged to 6 feet below mean low water, placed behind this bulkhead as fill. The project is approximately 70 percent completed. Expenditure to June 30, \$96,774.

*Intracoastal Waterway, Fla.*—Twenty minor electric lights have been established, and the buoyage extensively changed, in the section of the waterway between Hillsboro Inlet and Miami. Cost, \$5,732.

*Caloosahatchee River and Lake Okeechobee, Fla.*—This project included the establishment of 11 lighted aids and 165 day beacons to mark the new trans-State waterway. The work in the Caloosahatchee River has been completed and work is now under way in Lake Okeechobee. Estimated cost, \$7,750.

*New Orleans, La.*—Improvements at the lighthouse depot have been made, consisting of paving, fencing, grading, and the installation of a stiff-leg derrick. The work has been completed with the exception of erecting the derrick. Cost \$14,893.

*Intracoastal Waterway, Ala., Miss., and La.*—This project consists of establishing aids to navigation in Dog River, Cat Island West End Channel, Bayou Perot, Bayou St. Denis, Bayou Petit Anse, Mud Lake, Lake Arthur, and Bayou Villars. The work is in progress and approximately 60 percent completed. Estimated cost, \$10,000.

*Sabine-Neches Waterway, Tex.*—Additional lighted aids are being established to mark this waterway more fully for night navigation following the channel improvements made by the War Department. The work is in progress, 37 lights and 1 lighted buoy having been established in the Neches River south of Beaumont, and is approximately 42 percent completed. Materials and equipment are being purchased for lights on the Sabine-Neches Canal, Sabine Pass, and Port Arthur sections of this waterway.

*Hiccal Beach, P. R.*—A new tower on a substantial concrete foundation has been constructed for supporting the rear range light. The illuminating apparatus of both the range lights has been changed to locomotive headlight lanterns with a material increase in candlepower. Cost, \$2,183.

*Guanica Harbor, P. R.*—The rear range light has been moved from the city water tower to a new structural-steel tower built on a concrete base. The focal plane of the front light has been lowered. Total cost, \$1,311.

*St. Lawrence River, N. Y.*—Unattended acetylene lights have been established on concrete-block foundations at Pullman Shoal and Excelsior Shoal. The project has been completed at a cost of \$5,328.

*Lake St. Clair, Mich.*—St. Clair Flats Canal Range, see 1936 annual report. The keeper's dwelling which was under construction at the beginning of the fiscal year has been completed, this concluding the work on this project. Cost, \$31,048. See description of important works completed.

*Detroit River, Mich.*—A new fog-signal building has been constructed at the Detroit River Light Station housing the fog-signal equipment and a new modern heating plant for the entire station. A new triplex diaphragm air horn has been installed, greatly improving the efficiency of the fog signal. Cost, \$11,477.

*Lake Superior, Mich.*—The construction of five wooden pile groins to prevent shore erosion and damage to station property at Whitefish Point Light Station has been in progress. The work is being done by contract, and was 45 percent completed at the end of the year. Contract price, \$14,747.

*Portage Lake Ship Canals, Mich.*—On account of extensive channel improvements and dredging by the War Department, it was necessary to completely rebuild the Portage Lake Ship Canals Light Station on a new site. The old buildings have been razed, and the light, for signal, and keeper's quarters established in temporary buildings. A contract has been let for the construction of a service building and a three-family keepers' dwelling. Steel work and the lantern for the new tower have been fabricated and will be erected on the outer end of the south breakwater as soon as the foundation pier has been completed. Total estimated cost \$120,000.

*Lake Superior, Mich.*—Repairs to the dock and the shore-protection groins at Crisp Point Light Station, made necessary by ice damage, have progressed to a point where it is estimated that they are 55 percent completed. Estimated cost, \$4,700.

*Lake Michigan, Mich.*—Grays Reef Light Station, see annual report, 1936, page 119. This project reached completion during the year. The total cost was approximately \$212,000. See description of important works completed.

*Calumet Harbor, Ill.*—See annual report, 1936, page 119. The fog-signal equipment and lighting apparatus have been installed on the south breakwater in the tower which had been moved from Holland, Mich., and connected by cable with the power source at the Illinois Steel Co., and with Calumet Harbor Light Station, from which point the light and fog signal are controlled. The equipment consists of a diaphragm air-horn fog signal, gasoline-driven air compressor, electric-driven air compressor, and a fourth-order fixed lens. The light and fog signal were placed in commission June 4, 1937, and the work is now 98 percent complete. The total cost will be approximately \$25,000.

*Lake Michigan.*—Unattended acetylene lights are to be established at Kewaunee South Shoal Light and Green Bay Angle Light, Wis., on fixed structures consisting of 30-foot diameter cylindrical piers made by driving interlocking steel sheet piling, filling the cylinder with small stone, and capping with a concrete slab. The work, being done by contract, is under way at each site and is estimated to be 25 percent completed. Estimated cost, \$49,530.

*Missouri River.*—The lighting of this improved waterway, from its mouth to St. Joseph, Mo., has been practically completed this year by the establishment of approximately 350 lighted aids to navigation at a cost of approximately \$30,000.

*Alaska.*—The old wooden light tower and fog-signal building at Mary Island Light Station, no longer serviceable, is being replaced by a concrete building and tower. The concrete work has been completed and the interior finish and in-

stallation of machinery is in progress. Completion estimated at 90 percent. Estimated cost, \$51,100.

*Washington.*—Unattended automatic lights and fog signals have been established on pile structures at Olympia Shoal, Puget Sound, and Chinook dike, Columbia River. The former consists of a 300-millimeter electric light and a diaphragm horn and the latter a 200-millimeter electric light and electrically operated fog bell. See 1936 annual report, page 120. Cost, \$9,503.

*Washington.*—It was found necessary to rebuild the tramway and wharf and to provide riprap protection for the shore line at New Dungeness Light Station. Plans have been completed for the tramway and wharf, and 2,390 cubic yards of rock have been placed. Estimated 64 percent completed. Estimated cost, \$12,500.

*Columbia River, Celilo to Wallula, Oreg.*—Improvements in the channel in this section of the Columbia River have made additional aids to navigation necessary. The establishment of 30 lighted aids, including 10 sets of range lights, and 27 unlighted buoys, is practically completed. Estimated cost, \$8,000.

*San Francisco Bay, Calif.*—At Yerba Buena Depot reinforced-concrete pavement for the storage of chain and spar buoys has been laid and other improvements to walkways made at a cost of \$5,493.

*San Diego and Newport Bay, Calif.*—See 1936 annual report, page 120. The work of establishing nine lights and one fog signal has been completed at an estimated cost of \$15,000.

*Honolulu, Hawaii.*—Channel light 6 has been established on a three-pile reinforced-concrete structure replacing a lighted buoy. This 200-millimeter electric light is operated by a dry-cell pack. Cost, \$3,425.

*Pauwela Point Light Station, Hawaii.*—This light was established in 1910 as an unattended acetylene light. As a more powerful and reliable light at this important point has since been found necessary, the light was changed to an electrically operated 36-inch revolving light with the electricity generated at the station. An engine house, keeper's dwelling, and combined storehouse and garage were constructed. The work has been completed except the storehouse. Cost, \$10,175.

*Radiobeacons, general.*—A special project covering the extension and improvements of the radiobeacon and communication systems has been under way during the year. A new radiobeacon station was constructed at Nobska Point Light Station, Mass., and new installations are under way at Manana Island, Maine, Buffalo South Entrance, N. Y., Superior Entry, Wis., and Mackinac Point, Mich. Improvements in radiobeacon equipment were made on Overfalls Lightship and similar improvements are in progress at the following stations and lightships:

West Quoddy Head, Maine  
 Dry Tortugas, Fla.  
 Egmont Key, Fla.  
 Galveston, Tex.  
 South Pass, La.  
 Buffalo Breakwater, N. Y.  
 La Pointe, Wis.  
 Detour Reef, Mich.  
 Grays Harbor, Wash.

Point Arguello, Calif.  
 Portland Lightship  
 Five Fathom Bank Lightship  
 Fire Island Lightship  
 Chesapeake Lightship  
 Frying Pan Shoal Lightship  
 Umatilla Reef Lightship  
 Blunts Reef Lightship

The installation of new radiophones was in progress at Little Gull Island Light Station, N. Y., Stratford Shoals Light Station, N. Y., at the lighthouse depot, Staten Island, N. Y., and on the tender *Amaranth*. The project is 50 percent completed and the estimated cost is \$75,000.

*Fog signals, general.*—This project, a general service item, covering improvement and extension of fog signals, is under way and is considered to be 35 percent completed. A new horn has been installed on lightship No. 94, and a diaphragm-type air horn has been installed at Love Point Light Station in Chesapeake Bay. A fog bell and electrically driven striker has been established at the mouth of the Christiana River, Del. The estimated cost is \$45,000.

#### DESCRIPTION OF IMPORTANT WORKS COMPLETED

*Lake Michigan, Grays Reef Light Station.*—The station is located on the shoal of that name and marks the westerly side of the 3,000-foot channel newly dredged through the reef. The construction of the new station permitted the withdrawal of Grays Reef Lightship No. 99.

The foundation is a timber crib 60 feet square and 24 feet deep, which was built on the shore at St. Ignace, Mich., launched, towed to the site and sunk in 1934. The crib is divided by cross timbers into 49 pockets. The inner 25

pockets are filled with stone, and the remaining 24 pockets, around the outer wall, with concrete. On top of the crib a solid slab of concrete 6 feet thick was placed, forming the basement floor. The sides of the basement are also of concrete 6 feet thick with the main deck slab of concrete forming the roof of the basement. The basement is used as a machinery room, housing the electric generating equipment, batteries, fog signal engines, radiobeacon equipment, and heating plant.

The building proper, in which the living quarters are located, is of steel construction, lined with concrete blocks and insulated. It is approximately 29 feet square, one and one-half stories in height, and covered with a flat roof inclosed by a low parapet.

A square steel tower of slender proportions emerges from the center of the roof on wide sweeping curves. The tower encloses a series of stair flights extending up to the circular helical-bar lantern which surmounts it. The simple architectural treatment, in which horizontal lines and projections are subdued or suppressed, is effected entirely by means of steel plates and standard steel shapes.

The lighting equipment is a fourth-order fixed lens, with electricity used as the illuminant to produce a light of 13,000 candlepower. This light shows occulting red of 4 seconds' duration every 6 seconds. The electric current is produced by a Diesel-engine-driven generator, and a 110-volt battery is floated on the line. The fog signal is a diaphragm horn actuated by compressed air, sounding a blast of 2 seconds' duration every 20 seconds.

The radiobeacon transmits a dash-dot-dot-dash signal on 296 kilocycles and is in sequence with Lansing Shoal and Manistique Light Stations.

The station was placed in commission April 1, 1937. Total cost, \$220,000.

*Atlantic Coast and Great Lakes, ice damage.*—The damage to aids to navigation caused by the severe ice conditions of January–March 1936, has been repaired and all aids restored to service condition. Congress appropriated \$390,000 for this purpose which was allotted as follows:

First district.....	\$9,800	Fourth district.....	\$56,000
Second district.....	20,200	Fifth district.....	200,000
Third district.....	79,270	Eleventh district.....	15,000

In the first district the damage was largely confined to lost and damaged buoyage.

In the second district extensive repairs to the foundations of three light stations were necessary. The cast-iron cylinder foundation at Deer Island Light Station was reinforced by placing an auxiliary outer cylinder of interlocking steel sheet piling and filling the intervening space with riprap capped with concrete. The foundations at Duxbury Pier and Bullock Point Light Stations were protected by additional riprap.

In the third district the damage was confined largely to the buoyage and to the displacement of riprap at stations in the Connecticut River, Long Island Sound, and the Hudson River.

In the fourth district the lanterns and cage work of many lighted buoys were damaged and additional riprap protection was found necessary at Harbor of Refuge and Elbow of Cross Ledge Light Stations. Repairs to the sea wall at Deepwater Point Range front light were also found necessary.

The fifth district suffered the greater part of the ice damage. In addition to the destruction of Janes Island Light (a screw pile structure) and extensive damage to buoyage, approximately 270 minor light structures and day beacons were destroyed, largely in the waters of Chesapeake Bay and its tributaries. As these waters are on the southern border of the ice area, wooden-pile structures had previously been considered satisfactory, particularly as they had a low first cost, and replacement costs were also low. However, as rising costs of labor and materials, and more expensive automatic lighting apparatus have increased the capital invested in each light structure to approximately five times the original cost, more permanent construction has become necessary. Prior to the damage of 1936 a study had been made of the structures destroyed during the past 20 years, so that the area in which ice damage occurred most frequently and the individual structures most often destroyed were known. In repairing the damage of 1936, a start was made on a program of erecting better ice-resisting structures with the expectation of a material reduction in expenditures for replacements and greater service efficiency in the future. Several different types of structures were considered and two or more of each type erected.

On account of either the depth of the water or softness of the bottom, lighted buoys were substituted for fixed structures at 16 sites. In order to repair the ice damage without undue delay it was necessary to rebuild many wooden-pile structures which will be replaced by better structures as may be required in the future.

Janes Island Light Station was replaced by a 15-foot diameter, interlocking steel sheet-pile structure lined with reinforced concrete 24 inches thick, supported on wooden piles. The cylinder was filled with gravel and capped with a concrete slab. The light and fog signal is now unattended and consists of a 375-millimeter acetylene light and fog bell operated by a CO<sub>2</sub> striker.

Approximately 8,200 tons of riprap were placed around 19 screw pile structures to renew displaced riprap and as a protection against future damage. Extensive repairs were made at Holland Island Bar, Windmill Point, and Old Plantation Flats Light Stations.

In the eleventh district it was found necessary to repair the foundations of lights in the St. Marys River and to rebuild the groins and wharf at Crisp Point Light Station.

*Lake St. Clair, Mich.*—Improvements in the channel across Lake St. Clair and in the St. Clair River necessitated moving and improving the range lights and other aids to navigation in the vicinity. Lake St. Clair Flats Canal Range Light Station was entirely rebuilt, the range now occupying two sites about 4,000 feet apart. The front light is located on a 40-foot and the rear light on a 100-foot standard structural-steel tower with solid daymarks on the range sides. The tower foundations are concrete piers supported on wooden piles. The illuminating apparatus for each light is a 14-inch locomotive-headlight reflector using 110-volt commercial electric current providing a light of 120,000 candlepower. A small generator set was installed as stand-by equipment for both lights.

A six-room keeper's dwelling adjoins the front light and serves also as the control station for the radio-controlled Lake St. Clair lightship (No. 75), 8 miles away.

St. Clair River lights 4 and 6 were rebuilt using interlocking steel sheet-piling cylinders capped with concrete and surmounted by 25-foot structural steel towers. The total cost of the project was \$31,048.

## COAST AND GEODETIC SURVEY

### REVIEW OF THE YEAR

The commercial growth of our country and the gradual expansion of its maritime and aeronautical activities have been accompanied over a long period by steadily increasing demands upon the Coast and Geodetic Survey for the services which it is its function to provide. During recent years the normal increase in this respect has been accelerated by recovery from the depression, with the result that during the past year the Bureau was called upon to render a volume of service considerably greater than for any other year in its history.

During the fiscal year 1937 orders for aeronautical charts increased 45 percent over 1936, and orders for nautical charts increased 21 percent, while for all navigational publications the increase was approximately 27 percent for the year and 125 percent as compared with the issue 10 years ago. Requests for geodetic data more than doubled during the year.

With the development of aviation, a substantial growth in the need for aeronautical charts is to be expected for some time to come, but the greater demand for nautical charts is rather remarkable. On account of the expansion of naval and merchant-marine activities during the World War, the issue of nautical charts, which previously had averaged about 100,000 copies a year, rose rapidly to a maximum of 311,000 copies, which it was thought would constitute an all-time peak. It is, therefore, interesting to note that in 1937 orders for nautical charts for the first time exceeded the war-time peak, requiring the issue of over 333,000 copies.

The work of the Bureau also has been augmented by the increased activities of other agencies. The improvement of waterways by the United States Engineers, the marking of new channels and the betterment of existing systems of aids to navigation by the Lighthouse Service, and the expanded program of the Bureau of Air Commerce all create conditions which add materially to the Bureau's work of revising its charts and necessitate the issue of new editions with greater frequency.

A continued advance in efficiency and economy of operations, through the development of improved methods and equipment, together with a moderate increase in appropriations, have enabled the Bureau to meet a part of the increased demands upon it, but existing facilities are inadequate to cover all needs. This situation is aggravated by the rapid rise in commodity prices, which has increased the cost of all branches of operations.

As a result of these conditions there is a growing arrearage in the Bureau's work, which is a cause for serious concern. Work laid out ahead for the cartographic force to chart data on hand has increased

from 2,340 man-days 1 year ago to 3,143 man-days at the present time. In spite of every effort the stock of various charts becomes exhausted with increasing frequency and the work required to renew the supply cannot be accomplished promptly as it must be loaded on a production force having from 4 to 5 months' work already on hand. In the field it has been necessary to postpone indefinitely resurveys of important areas, as required to maintain the accuracy of the charts, and further to shorten the field seasons of the Bureau's survey ships on account of the greater cost of fuel oil and other supplies.

The products of the Bureau are required for the protection of life and property at sea and in the air. They are essential to the operation of our Navy and merchant marine and for military and civil aviation. The supply of such products has long been recognized as a national governmental function and consequently the Coast and Geodetic Survey is the only source of supply for this material for this country and its possessions. The volume of production, of course, is governed entirely by the demand therefor. The desirability of providing the Bureau with adequate resources which will enable it promptly and fully to meet this demand is obvious.

So far as permitted by available facilities, good progress was made in all branches of the Bureau's work. Details concerning these various activities are given in subsequent sections of this report. Among the outstanding accomplishments of the year are the completion of the series of 87 sectional aeronautical charts covering the entire United States, the completion and successful use for field surveys of the nine-lens aerial camera designed by the Bureau, the discovery of numerous dangers to navigation with the wire drag on the Pacific coast, and the extension of the use of automatic buoys to replace the station ships formerly required for the radioacoustic method of locating survey ships engaged in offshore work.

There were 1,169 employees on duty in the Bureau and in its field service on June 30, 1937, distributed as shown in the following table:

Staffs	Com-mis-sioned	Civilian				Staff totals		Total
		Classi-fied	Unclassified			Wash-ington	Field	
			Labor-ers	Sea-men	Hands			
Washington office.....	18	303	3			324		324
Field service.....	153	66		1 495	1 131		845	845
Total.....	171	369	3	495	131	324	845	1,169

<sup>1</sup> Includes 51 civilian employees on duty at the Manila field station and 50 members of the crew of the ship *Fathomer*, paid by the Philippine insular government but under the jurisdiction of this Bureau.

The library and archives acquired during the year 110 hydrographic and 137 topographic sheets, representing new Bureau surveys. Other additions were 915 blueprints (mostly surveys by Army engineers); 2,089 maps; 1,291 charts; 8,298 field, office, and observatory records; 276 negatives; 295 prints; 255 lantern slides; 877 books; and 3,274 periodicals.

The regular appropriations for the year totaled \$2,505,300. These were supplemented by the following additional appropriations: Transfer from Salaries and Expenses, Soil Conservation Service (transfer to Commerce), 1937, \$81,700; Salaries and Expenses, Soil Conservation Service (transfer to Commerce), 1937, \$4,500; repayment by Soil Conservation Service for work performed at their request, \$29,654.97; Working Fund, Commerce, Coast and Geodetic Survey (Hospital and Domiciliary Facilities and Services, Veterans' Administration), \$5,000; Maintenance of Air Navigation Facilities, 1937, \$75,000; and Deficiency Appropriation, Pay and Allowances, Commissioned Officers, Coast and Geodetic Survey, 1936, \$2,640.99.

In addition to these sums, there were available small unexpended balances on account of appropriations and allotments for the fiscal year 1936.

Collections on account of the sale of nautical charts and other publications, and miscellaneous Government property, deposited in the Treasury Department to the account of miscellaneous receipts, totaled \$109,659.29, as compared with \$95,589.74 during the preceding year, an increase of 14.7 percent.

Disbursements during the year ended June 30, 1937, totaled \$2,738,084.36, distributed among the various appropriations as follows:

Party expenses, 1935.....	\$226. 02
General expenses, 1935.....	6. 50
Pay, etc., officers and men, vessels, 1935.....	216. 01
Pay and allowances, commissioned officers, 1936.....	64, 187. 85
Salaries, 1936.....	156. 94
Party expenses, 1936.....	84, 265. 87
Repairs of vessels, 1936.....	12, 945. 19
General expenses, 1936.....	26, 577. 89
Pay, etc., officers and men, vessels, 1936.....	91, 792. 38
Pay and allowances, commissioned officers, 1937.....	712, 956. 51
Salaries, 1937.....	583, 247. 44
Party expenses, 1937.....	387, 718. 08
Repairs of vessels, 1937.....	53, 000. 98
General expenses, 1937.....	34, 352. 23
Pay, etc., officers and men, vessels, 1937.....	439, 666. 25
Maintenance of air navigation facilities, 1937.....	68, 563. 31
National Industrial Recovery, 1933-37.....	47, 424. 18
Public Works Administration, allotment to Commerce, Bureau of Air Commerce, 1935-37.....	560. 13
Chicago World's Fair Centennial Celebration.....	52. 24
California Pacific International Exposition.....	49. 75
Texas Centennial Exposition.....	1, 863. 38
Public Works Administration, allotment to Interior, Soil Erosion Prevention (transfer to Commerce from Agriculture, 1935-37) ..	24, 997. 62
Salaries and Expenses, Soil Conservation Service (transfer to Com- merce, C. and G. Survey, act of Apr. 27, 1935), 1936.....	18, 327. 66
Salaries and Expenses, Soil Conservation Service (transfer to Com- merce, C. and G. Survey, act of Apr. 27, 1935), 1937.....	81, 497. 45
Working Fund, Commerce, C. and G. Survey (Hospital and Domi- ciliary Facilities and Services, V. A.).....	3, 432. 50
Total.....	2, 738, 084. 36

#### IMPROVEMENTS IN METHODS AND EQUIPMENT

A comprehensive program of instrumental improvement was maintained throughout the year by the Instrument Division, which included modernization of existing stock and the design of new instruments to keep pace with changing needs and advances in scientific knowledge and materials of construction.

Among the more important results of this program are:

The design of an all-metal signal lamp, which is light, strong, and free from the warping experienced in wooden lamp cases. A medium-sized signal lamp, mounted in a metal case, was also developed for use on lines of medium length and in mountainous regions where portability is especially important.

A new standard tide gage was designed for interchangeability of certain essential parts of simpler and more rigid construction and fitted with an integral all-metal cover for dust and weather protection.

A portable tide gage is in process of modernization to provide an improved gear system to reduce lost motion and friction.

A replaceable bushing for the precision theodolites and levels, in which wear of the leveling screws may be a critical factor in the instrument's accuracy, was so designed that no loosening can occur.

Methods of constructing geodetic level rods were improved to reduce cost and to speed up production.

Special attention also has been given to the improvement of magnetic observatory instruments, especially the development of convenient means of adjusting and maintaining the recording magnets of the variometers in proper orientation to the magnetic meridian at the site.

Additional usefulness of the Dorsey Fathometer, an improved type of echo-sounding instrument developed by the Bureau, was indicated during the summer of 1937, when the ship *Hydrographer* observed tides at sea with the instrument, obtaining a very satisfactory tidal curve 27 miles from shore. The computation of tidal factors for offshore areas in the past has been based almost entirely on theory and a means for obtaining actual observations will have great value.

Construction of the nine-lens aerial camera designed by the Bureau was completed and the instrument was used on the first flight for survey purposes on April 30, 1937. The Air Corps, United States Army, through a cooperative arrangement, altered a large airplane to accommodate the camera and made the flights required for the preliminary tests and adjustments, and for the surveys. The prints obtained by the camera and transforming printer measure about 35 inches square, affording an excellent, detailed, view of the ground. The large area covered by a single exposure with this camera reduces the ground control necessary for aerial photographic surveys. A marked reduction in the cost of surveying with photographs, especially in areas difficult of access, will result when the necessary equipment for mapping from the photographs can be obtained.

During the past year a crystal chronometer was first used for gravity-at-sea observations on an expedition to the West Indies in which this Bureau cooperated with the United States Navy and the American Geophysical Union. Later this chronometer, together with the Meinesz gravity apparatus, also used on the expedition, were tested in the vicinity of Bethlehem, Pa., for the purpose of determining whether the apparatus was adaptable and efficient for land observations. This equipment was also used in determining the force of gravity at several different elevations in the Empire State Building, New York City. The crystal chronometer functioned perfectly throughout. The use of this instrument has made it possible practically to eliminate time errors and it appears to be equally adaptable

to astronomical observations. It should be noted that the total error of the chronometer for the entire 6 weeks of the gravity-at-sea expedition was only 0.36 second.

During the year, further improvements have been made in gravity apparatus and methods. The recording unit of the Brown gravity apparatus, particularly as regards the radio devices, has been improved. The use of two sets of instruments has made it possible to check the accuracy of each gravity station observed.

Field tests have been made with new types of levels to determine their adaptability to first- and second-order leveling. Tests have been made on the use of color filters both for theodolites and leveling instruments. It has been found that the use of certain filters with levels eliminates some of the constant vibrations caused by the radiation of heat near the earth's surface, and the observer is thereby enabled to see the rod clearly at longer distances and thus obtain greater progress.

A new vacuum printing frame has aided in speeding up the work of processing the printing plates for the charts.

#### COOPERATIVE ACTIVITIES

Several officers detailed to duty with the Lighthouse Service, under cooperative arrangements with that Service, have demonstrated the value of this arrangement. Numerous details relative to the charting of aids to navigation were handled efficiently and accurately. The arrangement also has enabled the officers of the Lighthouse Service to become more familiar with charting methods.

The following projects were handled on a cooperative basis with the organizations named:

Geodetic control survey agencies of Connecticut, Massachusetts, and New Jersey: Determination by these organizations of magnetic declination at many new stations and at some of the existing magnetic stations of the Bureau, the work including diurnal variation observations in some cases.

Department of terrestrial magnetism, Carnegie Institution of Washington: (a) Better determination and maintenance of national and international magnetic standards as a result of joint observational programs at the Cheltenham Magnetic Observatory; (b) operation of a cosmic ray meter at Cheltenham Magnetic Observatory; (c) continuation of atmospheric electric and earth current observations at Tucson Magnetic Observatory (with added cooperation of the Bell Telephone Laboratories and the Mountain States Telephone & Telegraph Co. in the work at Tucson); and (d) the extension of weekly broadcasts of magnetic conditions for the benefit of the investigators in the field of radio transmission. The Navy Department, science service, and others also have cooperated in the latter work.

Special tide and current surveys: Completion of a tide survey of Barnegat Bay, N. J., in cooperation with the New Jersey Board of Commerce and Navigation; assistance to the United States Engineers and Bureau of Fisheries in their current surveys of Galveston Harbor and York River, Va., respectively; and special current observations on *Stone Horse Shoal*, *Ambrose*, and *Scotland* lightships, through the cooperation of the Bureau of Lighthouses.

Soil Conservation Service: Extension of second-order triangulation in Indian reservations in South Dakota, Utah, Washington, and Wyoming for use in controlling mosaics from air photographs.

Florida mapping project, under auspices of the Works Progress Administration: Completion of arc of second-order triangulation between Orlando and Okeechobee, and elsewhere.

Forest Service: Triangulation in the vicinity of Cedar Point, Idaho, to locate fire towers.

Galveston district engineer, Corps of Engineers, United States Army: Completion of leveling in progress at the close of the last fiscal year, consisting of some 250 miles of lines in the vicinity of Galveston Bay.

California Works Progress Administration: Rerunning lines of levels in the vicinity of San Jose, Calif., for the purpose of studying earth settlement.

Seismologists of the University of Montana (with funds allotted by the Public Works Administration): Rerunning of old lines of levels and the extension of new leveling in Helena, Mont., and vicinity.

Works Progress Administration project of King County, Wash.: The continued detail of an officer to assist in airphotographic mapping and extending necessary triangulation.

New Jersey, Massachusetts, and Connecticut geodetic control surveys and the Pennsylvania State planning board: Detail of an officer for limited periods to assist in the extension of control surveys.

United States Navy and the American Geophysical Union gravity-at-sea expedition to the West Indies: Detail of an officer to make the necessary instrumental preparations, including the standardization of the Meinesz apparatus, and to accompany the expedition.

Guatemala-El Salvador Mixed Boundary Commission: Detail of an officer to determine a Laplace azimuth on the boundary between the two countries.

An officer was assigned to each of the computing offices of the State geodetic survey projects in Arkansas, Connecticut, Georgia, and Oklahoma to supervise the personnel, paid by the Works Progress Administration, engaged on geodetic computations.

The Bureau continued serving in an advisory capacity with 14 States in carrying on horizontal and vertical control surveys as part of the Works Progress Administration program initiated by this Bureau in November 1933 under the Civil Works Administration.

#### CHART PRODUCTION

The results of the Bureau's field surveys, together with information from other sources, are utilized for the production of nautical charts of the waters of the United States and possessions for the benefit of the mariner, and aeronautical charts of the land area for use by the aviator. It is essential for safe navigation that these charts show existing conditions with the highest possible fidelity. This can be accomplished only by the frequent revision of charts to cover the continual changes in topographic conditions and in the lights, buoys, radiobeacons, etc., maintained by the Federal Government as aids to navigation both on the sea and in the air.

Improvement in channels and waterways to meet the increasing demands of commerce required the issue of 110 revised editions of the nautical charts within the year. To meet further the requirements of marine commerce in those places where detailed surveys have re-

cently been made, 23 new charts on larger scales were compiled and issued as listed below.

MASSACHUSETTS: Westport River and approaches.

NEW JERSEY: Shark and Manasquan Rivers.

SOUTH CAROLINA:

Charleston Harbor entrance.

Parts of Coosaw and Broad Rivers.

Longitude 78°58' to McClellanville.

McClellanville to Wadmalow River.

SOUTH CAROLINA and GEORGIA: Port Royal Sound to Johnson Creek.

GEORGIA: Johnson Creek to Brunswick River.

GEORGIA and FLORIDA: Brunswick River to Nassau Sound.

FLORIDA:

Port Everglades.

Nassau Sound to Matanzas Inlet.

Matanzas Inlet to Mosquito Lagoon.

Delray to Cape Florida.

LOUISIANA: Barataria Bay and approaches.

CALIFORNIA:

San Clemente Island.

Anacapa Passage.

Santa Cruz Channel.

San Miquel Passage, Cuyler Harbor.

ALASKA:

Portland Canal, Dixon Entrance and Hattie Island.

Etolin Island to Midway Islands.

Midway Island to Cape Spencer, including Lynn Canal.

Marmot Bay and Kupreanof Strait.

Kodiak and St. Paul Harbors.

Orders for aeronautical charts to meet the needs of civil and military aviation have continued to increase greatly in consonance with the growth of the aviation industry. To maintain the accuracy of these charts in sections of the country where the establishment of new airways, airports, and other new construction has made important changes, there were printed 96 revised editions of 71 individual charts.

At the close of the year there were available 87 sectional aeronautical charts, covering the entire United States, and 4 of the regional series. The completion of the series of sectional charts enabled the military services to discontinue publication of aviation strip maps, thus eliminating overlapping and duplication.

The steady and substantial growth in the need for nautical and aeronautical charts and related publications is shown by the following table giving the distribution of these publications for the past 4 years.

Item	1937	1936	1935	1934
Nautical charts <sup>1</sup> .....	333,366	275,800	309,765	293,889
Aeronautical charts <sup>1</sup> .....	277,878	178,973	61,268	38,313
Strip maps.....	.....	12,186	9,210	11,304
Air planimetric maps.....	4,544	4,236	2,907	558
Miscellaneous maps.....	3,166	2,857	2,192	1,339
United States coast pilots.....	8,062	6,167	6,077	7,046
Intracoastal waterway pilots.....	1,463	1,022	943	1,027
Tide tables.....	559	429	588	1,435
Distances between United States ports.....	24,567	24,184	21,984	24,851
Current tables.....	9,114	9,002	7,588	7,652
Tidal current charts.....	1,628	1,607	1,705	701
Practical air navigation.....	1,837	5,167	.....	.....
Total.....	666,184	521,630	424,227	388,115

<sup>1</sup> Annual reports prior to 1936 did not include charts withdrawn from sale because of the issue of revised editions.

"Cartography," a manual outlining the principles of constructive cartography, was compiled and published early in the year. This met with unusually favorable comments from engineers, cartographers, and students of this branch of science in the development of human activities. A revision of the manual "Practical Air Navigation" is being made to meet the demand for a new edition of this publication. Printed for the benefit of aviators, this publication has been particularly successful in meeting the needs of a new group of chart users. The published supply has been exhausted and orders have continued to come in for additional copies.

#### HYDROGRAPHY AND TOPOGRAPHY

On the Atlantic coast, the vessels *Oceanographer*, *Lydonia*, *Gilbert*, and *Welker* completed surveys off the approaches to New York and continued work southward along the Delaware and New Jersey coasts. At the end of the fiscal year they were at work off the New Jersey coast extending the coastal surveys from the shore line out to approximately the 1,500-fathom contour.

The *Hydrographer*, with the tenders *Faris* and *Pratt*, completed hydrographic surveys eastward along the Gulf coast of Louisiana as far as the Delta of the Mississippi River, and in the spring of 1937 took up work in the vicinity of Galveston, Tex. These new basic hydrographic surveys extend from the coast line out to the edge of the coastal shelf, which, in this particular region of the Gulf of Mexico, lies about 100 miles offshore. These extensive shoal areas are being thoroughly surveyed and the work has been greatly speeded up by the use of the Dorsey Fathometer, which was mentioned in last year's report. With this fathometer, a vessel under way at full speed can obtain 20 soundings per second and the results provide a most satisfactory hydrographic survey with respect both to accuracy and economy.

The continued use of the taut-wire apparatus and sun azimuths for the fundamental control of hydrographic operations has strengthened all of these surveys of the Atlantic and Gulf coasts, and the work has been further facilitated by the satisfactory development of the sonaradio buoys mentioned in last year's report. These buoys are used in connection with the radioacoustic method of ascertaining the position of a ship engaged in offshore surveys. Anchored and accurately located, they receive the sound of a bomb exploded under water near the survey ship and transmit an instantaneous radio signal so that the survey ship, knowing the time required for the sound to reach the buoy and the velocity of sound through the water, can compute its distance from two or more buoys and thereby ascertain its position. These easily portable and entirely automatic units have given results beyond original expectations, distances up to 60 nautical miles having been obtained. Their use results in greater economy of operations and the elimination of hazards to the small vessels formerly used for this purpose.

As previously stated, construction of the nine-lens aerial camera designed by the Bureau was completed during the year and, after test flights in the vicinity of Dayton, Ohio, it was used successfully in the field for an airphotographic survey of the head of the Chesapeake Bay to secure data for a new chart made necessary by recent

improvements in the Chesapeake and Delaware Canal. This work was completed in 3 days, ending on May 2, 1937. During this period the shore line and other land features, as required for charting purposes, were photographed over an area of about 1,600 square miles. A number of the photographs were sent out for field inspection preparatory to the compilation of maps therefrom.

Small airphoto compilation units were continued in Connecticut, New Jersey, Maryland, Virginia, and Florida.

The *Mikaw*e continued inshore topographic and hydrographic surveys in Florida, New Jersey, and Maryland.

A special wire-drag project was carried out to locate obstructions detrimental to the shrimp fishing industry in the vicinity of the Cape Fear River. More than 50 submerged snags, or other obstructions, were accurately located and subsequently marked by the Lighthouse Service.

A shore party continued basic topographic and hydrographic surveys of the Florida Keys eastward of Key West.

Work was continued in the Washington office on the compilation and assembly of accumulated triangulation data along the Atlantic and Gulf coasts. Index sketches, descriptions of stations, and positions are being prepared in temporary form for public use until it becomes possible for the Bureau to publish these data in permanent form. These valuable triangulation data are needed by many engineers within the Government service, as well as those in civil life, and the accessibility of the data to them is important. Until provision for funds is made to publish these data in permanent form, their reproduction in temporary form by lithography serves as a substitute.

On the Pacific coast hydrographic surveys were continued by the *Pioneer* and *Guide*. The *Pioneer* was engaged in surveys in the vicinity of the Santa Barbara Islands and the *Guide* conducted wire-drag and offshore surveys in the vicinity of Cape Mendocino. Numerous rocks, dangerous to shipping, are being discovered and charted by the use of the wire drag on this coast.

The *Explorer* completed basic surveys in the southern part of Puget Sound, and in the spring of 1937 took up work in Sumner Strait, Alaska, where she will make complete triangulation, topographic, and hydrographic surveys.

A shore party continued triangulation, topographic, and hydrographic surveys of the Columbia River, Oreg.

The *Surveyor* and *Discoverer*, with the tenders *Wildcat* and *Helianthus*, continued work on original surveys in the Aleutian Islands in the vicinity of and west of Unimak Pass. This work is difficult and hazardous, due to the severe weather conditions prevailing in the region, as well as the lack of previous surveys. Safe anchorages are scarce and the exposed coasts are forbidding and difficult to land upon. One party on Unimak Island is using horses for transportation while making the topographic and triangulation surveys of the Island. This will obviate landings on the exposed coasts from the survey vessels. The surveys which are being made are most important to insure the safety of vessels which may use the desirable westward route to the Orient through Unimak Pass, north of the Aleutian Islands, as well as to naval vessels and commercial interests

in the Islands. The *Surveyor* and *Discoverer* also ran lines of soundings across the Gulf of Alaska to and from the working grounds.

The *Westdahl* completed triangulation in conjunction with the International Boundary Commission in the vicinity of Juneau, Alaska, and in the spring of 1937 took up work in the vicinity of Taku Inlet.

The 13 United States Coast Pilot volumes published by the Bureau contain a wide variety of important information supplemental to that shown on the charts, such as a description of the coast and information concerning waterways, as well as maritime data for all the ports of the United States and possessions. It is essential that these Pilots be kept up-to-date, and this is done by annual supplements and revisions based on field examinations. During the year 10 supplements were published and 4 Pilots were being revised for new editions.

Two field examinations were in progress, one of the Philippine Islands and the other of Puerto Rico and the Virgin Islands.

In the Philippine Islands, the *Fathomer* completed triangulation, topographic, and hydrographic surveys of the northeast coast of Luzon Island and at the beginning of the fiscal year 1938 was prepared to take up work on the west coast of Palawan Island.

On August, 15, 1936, the *Fathomer* was stranded in a typhoon in Port San Vicente, a small landlocked harbor on the northeastern extremity of the Island of Luzon. The severity of this storm can well be described by mentioning that the lighthouse and lightkeeper's dwelling on Cape Engano, in the vicinity of Port San Vicente, both concrete structures, which had withstood such typhoons for 50 years, were destroyed. The ship was salvaged and put in as good, if not better, seaworthy condition than prior to the accident, by the Insular Government from a typhoon fund which is maintained for this purpose. The lowest official barometer reading recorded in the Philippine Islands probably was taken on the *Fathomer* during the passing of the center of this storm. The reading was 26.96 inches (685 mm).

The *Pathfinder* remained in a decommissioned status at Manila.

Field stations were maintained at Boston, New York, New Orleans, San Francisco, Seattle, Honolulu, Territory of Hawaii, and Manila, P. I. The station at Manila supervises all field surveys in the Philippine Islands and compiles and prints the charts of the archipelago. All stations continued to render invaluable service; to the Bureau, through the supply of data for the correction of the charts of their vicinities, and to the public by the dissemination of information resulting from the Bureau's work.

*Hydrography, topography, and coastal triangulation*

Locality	Hydrography			Topography		Coastal triangulation		
	Sound- ing lines	Area	Sound- ings	Shore- line	Area	Length of scheme	Area	Geo- graphic posi- tions
	<i>Miles</i>	<i>Square miles</i>	<i>Number</i>	<i>Miles</i>	<i>Square miles</i>	<i>Miles</i>	<i>Square miles</i>	<i>Number</i>
Approaches to New York Harbor, New York and New Jersey coasts— North Shore Long Island Sound, Connecticut	13,441	6,774	124,051	96.0	57.3			
Vicinity of New York City, New York, and New Jersey				195.0	57.8			
Inland Waterway, Barnegat to Cape May, N. J.	2,850	92	115,392	374.0	175.0			
Vicinity of Norfolk, Va., and N. C.				65.7	93.7			
Entrance to Cape Fear River, N. C.		37						
St. Johns River, Fla.	1,154	85	36,163	548.0	18.0			1
Florida Keys, Fla.	1,355	116	50,458	709.4	313.5	5	40	7
Coast of the Gulf of Mexico, Louisi- ana and Texas	12,989	7,389	126,885	31.0	11.0	17	136	17
Vicinity of the Santa Barbara Is- lands, Calif.	9,069	11,616	45,189	11.0	5.0			3
Vicinity of Cape Mendocino, Calif.	1,504	475	22,724	19.4	7.5			
Columbia River, Oreg., and Wash.	1,275	61	43,785	153.0	8.0	21	38	157
Puget Sound, Wash.	1,041	32	43,861	194.8	82.9	36	15	97
Southeastern Alaska	953	48	31,742	131.3	117.0	67	313	84
Aleutian Islands, Alaska	11,894	3,888	121,035	402.9	718.0	308	2,705	236
Philippine Islands	5,587	3,755	105,412	129.4	191.0	57	151	51
Total	63,112	34,368	866,697	3,060.9	1,855.7	511	3,398	653

## GEODESY

The geodetic work of the Bureau consists of triangulation, leveling, gravity, and related measurements in the field, and the computation, adjustment, and compilation of the results of these measurements in the office.

The triangulation and leveling stations provide basic starting points for all mapping and for many other kinds of surveying operations. They are used in the delineation of State, county, city, and international boundary lines; in alinement and profile surveys of railroads and highways; in the location of drainage and irrigation canals; and in practically all engineering operations where extensive works must be coordinated in both geographic position and elevation. The perpetuation of these stations is assured, since they can be definitely reestablished, if destroyed, from undisturbed triangular stations, even though the latter may be some distance away.

During the year, 2,211 miles of first- and second-order triangulation and 2,770 miles of first- and second-order leveling were completed, the work being done in 19 States.

One gravity party was in continuous operation establishing stations in Alabama, Arizona, Louisiana, New Mexico, Oklahoma, Rhode Island, Texas, and Virginia. Old stations in Louisiana, Oklahoma, and Texas were reoccupied to test the coordination of the work of several different seasons.

The variations of latitude observations at Ukiah, Calif., and Gaithersburg, Md., were continued throughout the year with satisfactory results. The records have been forwarded directly to the central office of the International Latitude Service. Cooperation with other agencies in the extension of control surveys is covered elsewhere in this report.

While the situation regarding horizontal and vertical control surveys was greatly improved through the use of emergency funds from 1932 to 1935, there is still a large amount of work required to provide the basic data for any future mapping program. That the adoption of such a program is imminent seems certain if we are to judge either from the standpoint of national economy or from the practices of countries whose experiences with mapping are much longer than our own. Practically all of the countries of Europe have been accurately mapped, and Great Britain and Switzerland are now remapping their countries in greater detail than ever before.

It is particularly important that the data resulting from the computation and adjustment of control surveys be available for distribution immediately upon the adoption of any mapping program in order that delays and inefficient operation may be avoided. The present demands for these data are a convincing proof of their value even in their present state of incompleteness. A tabulation of requests for information over a period of 2 months from May 7 to July 7, 1937, showed the receipt of 670 requests for geodetic data, of which 380 could not be fully supplied on account of noncompletion of field or office work.

*Geodetic triangulation, base lines, reconnaissance, and leveling, and astronomical and gravity observations*

Locality	Length of scheme	Area	Locality	Length of scheme	Area
<b>TRIANGULATION, FIRST ORDER</b>			<b>RECONNAISSANCE, FIRST ORDER TRIANGULATION</b>		
Colville and Spokane Indian Reservations, Wash.....	Miles 100	Square miles 4, 000	Colville and Spokane Indian Reservations, Wash.....	Miles 100	Square miles 4, 000
Pine Ridge and Rosebud Indian Reservations, S. Dak.....	390	6, 400	Pine Ridge and Rosebud Indian Reservations, S. Dak.....	390	6, 400
Fort Hall Indian Reservation, Idaho.....	60	1, 800	Fort Hall Indian Reservation, Idaho.....	60	1, 800
Uintah-Ourray Indian Reservation, Utah.....	130	4, 550	Uintah-Ourray Indian Reservation, Utah.....	130	4, 550
Upper Rio Grande, Colo.....	90	2, 850	Upper Rio Grande, Colo.....	90	2, 850
Southern Ute Indian Reservation, Colo.....	160	4, 445	Southern Ute Indian Reservation, Colo.....	160	4, 445
San Juan River, Utah.....	120	4, 800	San Juan River, Utah.....	120	4, 800
Little Colorado River, Ariz. and N. Mex.....	220	10, 600	Little Colorado River, Ariz. and N. Mex.....	220	10, 600
Lower Rio Grande, N. Mex. and Tex.....	200	6, 350	Lower Rio Grande, N. Mex. and Tex.....	200	6, 350
Yarmouth base net, Mass.....	4	12	Yarmouth base net, Mass.....	4	12
Wellfleet base net, Mass.....	5	15	Wellfleet base net, Mass.....	5	15
Newbury base net, Mass.....	1	6	Newbury base net, Mass.....	1	6
Bohlen-West Hills Connection, N. Y.....	2	14	Bohlen-West Hills Connection, N. Y.....	2	14
Northern New Jersey.....	32	320	Connecticut-Rhode Island boundary.....	45	360
Collinsville, Conn., to Providence, R. I.....	82	987	Total.....	1, 527	46, 202
Total.....	1, 596	47, 149	<b>RECONNAISSANCE, SECOND ORDER TRIANGULATION</b>		
<b>TRIANGULATION, SECOND ORDER</b>			Shoshone Indian Reservation, Wyo.....	75	5, 250
Shoshone Indian Reservation, Wyo.....	75	5, 250	Lake Wales to Melbourne, Fla.....	45	450
Orlando to Okeechobee, Fla.....	140	1, 400	Abilene to Benjamin, Tex.....	80	960
York to Lee, Fla.....	150	1, 500	Hollis to Duncan, Okla.....	120	1, 800
Shady to Lily, Fla.....	160	1, 600	Iowa Park to Breckenridge, Tex.....	115	1, 610
Northern Idaho.....	90	1, 800	Cross City to La Crosse, Fla.....	40	400
Total.....	615	11, 550	Northern Idaho.....	90	1, 800
<b>BASE LINES, FIRST ORDER</b>			Crystal City to Menard, Tex.....	155	1, 550
Yarmouth, Mass.....	2.2	-----	Eastland to San Saba, Tex.....	105	1, 575
Wellfleet, Mass.....	2.7	-----	San Saba to San Antonio, Tex.....	85	2, 125
Newbury, Mass.....	4.8	-----	San Antonio to San Diego, Tex.....	140	1, 680
Matecumbe, Fla.....	3.5	-----	Osage to Decatur, Tex.....	160	2, 080
Total.....	13.2	-----	Decatur, Tex., to Norman, Okla.....	135	1, 960
			Norman, Okla., to Caldwell, Kans.....	160	2, 080
			Caldwell to Salina, Kans.....	130	1, 950
			Okeechobee to Fort Myers, Fla.....	70	490
			Total.....	1, 705	27, 706

State	First order	Second order	State	First order	Second order
LEVELING			LEVELING—continued		
	<i>Miles</i>	<i>Miles</i>		<i>Miles</i>	<i>Miles</i>
California.....	90	120	Ohio.....		254
Georgia.....	67	23	Oregon.....	330	257
Idaho.....	26	173	Pennsylvania.....		191
Indiana.....	5	46	Tennessee.....		40
Maine.....		74	Vermont.....		78
Montana.....	29		Virginia.....		43
Nevada.....		131	Washington.....	146	210
New Hampshire.....		47	West Virginia.....		6
New Jersey.....		63	Total.....	769	2,001
New York.....	76	117			
North Carolina.....		128			

State	Number of determinations		State	Number of determinations	
	New	Redeterminations		New	Redeterminations
GRAVITY			GRAVITY—continued		
Alabama.....	21	1	Pennsylvania.....	1	
Arizona.....	4		Oklahoma.....		2
Louisiana.....	6	2	Rhode Island.....	2	
Massachusetts.....	1		Texas.....	22	12
Mississippi.....		1	Virginia.....	16	1
New Mexico.....	9		Total.....	83	19
New York.....	1				

The office computation and adjustment of 42 arcs of first-order and 33 arcs of second-order triangulation were completed during the year, and the computation of 25 arcs of first-order and 15 arcs of second-order triangulation were in progress. Office computations were also made of 5 first-order and 7 second-order bases. A field party in New York City was engaged on triangulation, leveling, and plane-coordinate computations during the last 7 months of the year.

Personnel detailed to the Washington office by the Chief of Engineers, United States Army, were engaged in the adjustment of the triangulation along the Mississippi River from Vicksburg, Miss., to New Orleans, La. The manuscript for the publication containing the results of this adjustment was also being prepared.

Two large level adjustments were made during the year. One of these was the readjustment of the leveling in southeastern Texas, which was made necessary as a result of new leveling and a change in the tidal datum. The other was a readjustment in the southeastern part of the United States, where several errors in old lines had been detected. Several small adjustments of second-order leveling were also completed.

The office computations and isostatic reductions were made of 97 gravity stations in various States which were determined by this Bureau, and the isostatic reductions were made of 48 stations in Pennsylvania, the data for which were furnished by the Gulf Research & Development Co., and of 56 gravity-at-sea stations in the West Indies. In addition, the isostatic reductions for 31 old gravity stations in the United States were revised because of the availability of improved maps.

Two geodetic publications were printed during the year, one an international report on geodetic work done in this country over the 3-year period, 1933-35, and the other a revised manual for the use

of lightkeepers on triangulation. Three other publications were in press at the end of the year, two of which are State publications giving the results of triangulation in Utah and Wyoming, and the third a State publication on the leveling in North Carolina.

The report for 1935 mentioned the systems of plane coordinates which have been devised for all the States. These have now been in use for a sufficient period to demonstrate their practical value and adaptability to the general problems of surveying and mapping. The purpose of the coordinate systems is to form a practical method of referencing all local surveys to a uniform system which is also connected to the Federal net of horizontal control, and thus be available for future use. Another purpose is to have a system suitable for small local areas which is simple for the average engineer to apply and does not involve the more difficult computations of geodetic coordinates.

These systems of plane coordinates have each been made to cover as large an area as possible consistent with political subdivisions and the problem of obtaining scale accuracies practically within 1 part in 10,000 for the entire United States. In some States, like New Jersey, a single coordinate system is sufficient, while in California six different zones are required. The number of zones naturally depends on the shape and size of each individual State.

New Jersey and Pennsylvania have enacted legislation which makes the plane coordinate systems for each of those States legal for referencing land surveys. The Federal Board of Surveys and Maps, after considering the coordinate systems for a period of about a year, decided to recommend them to all surveying and mapping agencies throughout the country. The adoption of these systems will ultimately result in a tremendous saving to the Government, as all future surveys properly referenced thereto will be good for reuse as long as their monuments exist.

#### TIDES AND CURRENTS

The rise and fall of the tide plays an important role in the development and complex activities of our water-borne commerce, affecting as it does the hydrographic planes of reference for charts, the location and design of piers, bridges, and factories, and the schedules of deep-draft ships. The tidal data essential for these various activities are derived from tide observations.

During the year continuous tide observations were obtained from 38 primary and 29 secondary tide stations, distributed as follows: 26 on the Atlantic coast, 11 on the Gulf coast, 25 on the Pacific coast, 4 in Alaska, and 1 in the Hawaiian Islands. Of these stations, 31 were conducted in cooperation with other organizations: United States Engineers, 12 stations; Navy Department, 7 stations; State of Delaware, 3 stations; and 1 station each with the Department of Agriculture, State of Texas, Woods Hole Oceanographic Institute, town of Stratford, Conn., Los Angeles Harbor Department, city of Santa Monica, Port of Oakland, Port of Willapa Bay, and the University of Washington.

Supplemental data covering shorter periods of observations were obtained in connection with hydrographic surveys and other activities for some 125 other places.

The commercial value of water-front property makes the accurate determination of local datum planes and their relation to sea level datum of prime importance in the determination of boundaries. To supply such information, the Bureau is undertaking comprehensive tide surveys of coastal sections. On the Pacific coast, a survey of San Francisco Bay, started in June 1936, was continued during the year to determine with precision the tidal datum planes at various points and develop whether any changes in the tidal regime may have taken place in consequence of changes in hydrographic features at various points in the bay.

Accompanying the rise and fall of the tide is a horizontal movement of the water known as the tidal current. This ebb and flow affects the speed and direction of a ship and controls the circulation of the tidal water throughout our bays and harbors. A knowledge of the current is consequently of practical importance to both navigation and harbor engineering.

Information derived from the tide and current investigations by the Bureau are made available to the public in tide and current tables and miscellaneous publications.

Advance information regarding the stage of the tide is covered in the tide tables issued annually in two volumes. The Tide Tables, Atlantic Ocean, 1938, contain daily predictions for 49 reference stations and differences for obtaining predictions for about 2,400 other places. Revised data for the New Jersey coast and for the Florida Keys were incorporated in these tables. The Tide Tables, Pacific Ocean and Indian Ocean, 1938, contain daily predictions for 49 reference stations including 2 new Alaskan stations, Cordova and Dutch Harbor, and data for obtaining predictions at some 1,800 other places. Considerable new and revised data for Puget Sound and the North Pacific Islands were entered in this edition.

To supply the mariner with advance information relative to the velocity and direction of the current likely to be encountered at any time, two current tables are issued annually. The Current Tables, Atlantic Coast, 1938, contain daily predictions for 18 reference stations and differences for obtaining predictions for about 900 other stations. The Current Tables, Pacific Coast, 1938, contain daily predictions for 11 reference stations and current differences for some 500 other stations.

The description of tidal bench marks and their elevation above the principal tidal datums are being made available to engineers through a series of publications covering the various coastal States. During the year, publications were issued for the States of South Carolina, Georgia, New York, and Louisiana, and those for Florida and New Jersey are in preparation.

A special publication was issued giving in detail the results of current surveys in Narragansett and Buzzards Bays, and Nantucket and Vineyard Sounds.

#### TERRESTRIAL MAGNETISM

The inadequate contribution during the year to the magnetic survey of the United States, particularly with regard to the occupation of stations to determine the secular change, is cause for concern, since the usual 5-year map due in 1940 cannot be prepared without consid-

erable increase in this type of field work. The magnetic data furnished for the preparation of nautical and aeronautical charts are in danger of becoming less and less reliable with lapse of time. There can be no substitute for a systematic annual survey, which is not possible under present conditions with the funds available. In addition, a strong demand has developed for more accurate and more frequent determinations of vertical intensity to meet the needs of local magnetic surveys for geological investigations.

In order that the results of observations of the earth's changing magnetism may be made available for safe and satisfactory use by the mariner, aviator, land surveyor, geophysical prospector, and the investigator of terrestrial magnetism itself, it is essential to keep track of the changes so that observations at all stations, old or new, may be brought up to date. The completion of work of this type during the year has been below a proper minimum and has included only a portion of the central and southwestern parts of the United States. Determinations of magnetic declination (sufficiently accurate for all purposes except secular change reductions) have been made by various field parties of the Bureau, by State Geodetic Surveys, and by others.

Observations have been continued at all five of the magnetic observatories of the Bureau, forming in every case a continuous series with preceding records. Such observations were started at Cheltenham, Md., in 1901; at San Juan, P. R., in 1926; at Tucson Ariz., in 1909; at Honolulu, Territory of Hawaii, in 1902; and at Sitka, Alaska, in 1902. The value of the past year's work to science and industry is related directly to the length of the span of years over which similar records have been obtained.

The Cheltenham Observatory is beginning to assume an important place in regard to magnetic standardization because of its almost continuous use for this and related purposes by the Bureau and by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington.

The never-ending demand for magnetic information has been met through correspondence, by publications, by furnishing original or photostatic copies of records, and by broadcasts of magnetic information originating within the Bureau.

Distribution of magnetic observations during the year is shown by the following table:

Place	Stations				Place	Stations			
	Repeat		Declinations	Total		Repeat		Declinations	Total
	Old	New				Old	New		
Alaska.....			17	17	Oklahoma.....		1		1
Arizona.....			6	6	Oregon.....			3	3
California.....	2	1	27	30	Texas.....	1	1	11	13
Florida.....			33	33	Virginia.....			1	1
Kansas.....	1			1	Washington.....			8	8
Louisiana.....	1	1		2	Pacific Ocean.....			143	143
Missouri.....		1		1					
Nevada.....	1			1	Total.....	6	5	251	262
New Mexico.....			2	2					

## SEISMOLOGY

The seismological work of the Bureau properly deals with furnishing data needed for the solution of practical problems. Earthquakes are located and described by collecting and analyzing non-instrumental and instrumental reports from many sources. Instruments are maintained in readiness to obtain records of destructive earthquake motions which are needed in connection with the design of earthquake resistant structures. For the same reason the natural vibration periods of buildings and other structures and of the ground have been determined, and ground-tilt measured. Measurement of crustal changes by geodetic methods is described elsewhere in this report.

The instrumental data for locating earthquakes are obtained from a number of seismological observatories, of which the Bureau operates four directly—San Juan, P. R.; Tucson, Ariz.; Sitka, Alaska; and Ukiah, Calif. (at the International Latitude Station)—and six with more or less cooperation at Columbia, S. C.; Chicago, Ill.; Bozeman and Butte, Mont.; Honolulu, Hawaii; and College, near Fairbanks, Alaska. A number of independent stations also make their records available. Many of these records are furnished to various organizations for special studies.

Immediate interpretations of the instrumental records are furnished by many stations so that epicenters are located immediately for all important earthquakes. Cooperation of the Jesuit Seismological Association and Science Service makes this possible. This preliminary information is of interest to the public and useful to the individual stations.

Information regarding earthquakes and related matters appears in form of bulletins and in the annual series of publications entitled "United States Earthquakes."

Recording of strong earth motions continued in California, Montana, and Panama, and new stations were established in Nevada. Fifty instruments were operated in California, four in Nevada, four in Montana, and one in Panama. One instrument is held in reserve at Washington, D. C., and one at Chicago. Tests of the accelerographs were made on a shaking platform at the Massachusetts Institute of Technology to determine the fidelity with which earth motions are recorded. Several records were completely analyzed, and progress was made on a mechanical method of analysis.

Twenty-six sets of vibration observations were made on bridges in 16 locations; there were 7 tests in 5 buildings without a shaking machine, and 21 tests in 15 buildings with such a machine; 4 vibration tests at Boulder Dam, and 27 ground tests using artificial methods to set the ground into vibration. Observations of the last-named types were made for the Veterans' Administration in California in connection with hospital facilities.

Four tilt-meters continued in operation with the cooperation of the University of California.

Intensive questionnaire coverage was obtained in the case of 10 earthquakes, and 70 pictures of earthquake effects were taken. More than 1,200 noninstrumental reports on earthquakes were received covering approximately 150 earthquakes.

Special Publication No. 201 describing all phases of the strong-motion work was issued.

An officer of the Bureau attended the meeting of the International Geodetic and Geophysical Union at Edinburgh, Scotland. Coordination of methods and international prosecution of work was advanced in terrestrial magnetism and seismology.

## BUREAU OF MARINE INSPECTION AND NAVIGATION

### ADMINISTRATION

The activities of the Bureau of Marine Inspection and Navigation have been greatly accelerated during the past fiscal year. Extension of authority by recent legislation has greatly increased the duties and responsibilities of the Bureau, and has resulted in considerable overtime work on the part of loyal employees.

The routine reports covering the work performed during the year do not present a true picture of the actual conditions and handicaps under which the field force is working.

Studies have been made of the duties and responsibilities of these positions for the purpose of bringing into effect salary rates commensurate with those received by employees in other branches of the Government engaged upon work of a similar nature. These studies revealed, among other things, that the salaries paid steamboat inspectors are considerably lower than those received by others for similar work, although the duties and responsibilities of the steamboat inspectors are more varied and complex.

It is most strongly recommended that immediate consideration be given to sufficient appropriations in order that the pay of the present inspection force may be raised, that sufficient additional inspectors be appointed to administer the laws properly, and that the Bureau be provided with adequate clerical and stenographic assistance both in the field and at Washington.

### LOSS OF KEY MEN

During the year, the Bureau suffered severe losses in personnel. On October 18, 1936, three young members of the Bureau's staff were drowned in Chesapeake Bay during a severe squall. On November 25, 1936, Arthur J. Tyrer, who was Commissioner of Navigation since 1927, and Assistant Director of the Bureau in charge of the Navigation unit since the Bureau's consolidation, died at the age of 68. On January 11, 1937, Capt. Alvin A. Morrison, supervising inspector at Cleveland, died. On May 15, 1937, the Director, Joseph B. Weaver, resigned. On June 11, 1937, Capt. Oscar G. Haines, who had been supervising inspector at Boston since May 1918, died. The loss of these key men within a short space of time seriously retarded and handicapped the Bureau during its period of reorganization.

### REVISION OF REGULATIONS

The Bureau, however, in spite of the handicaps cited above made unusual progress during the past year. A recodification of the inspection and navigation laws was started and an intensive study was

made, and is being continued, of the proposed regulations prepared by the Senate Technical Committee in order that the revised draft of the Bureau's Rules and Regulations may contain every new proposed rule which is practicable of application and administration. In addition, the Bureau is preparing a draft of proposed regulations covering dangerous cargo. There is an urgent need for these regulations, but the Bureau is reluctant to proceed hastily, owing to the far-reaching effect and controversial character of many of the requirements. A definite program has also been laid down in regard to the preparation of manuals of instruction for seamen and officers and a revision of the entire system of examination of licensed officers and seamen. Early in the year a manual for able seamen and lifeboat men and a manual for the use of seamen employed on tank vessels were published and widely distributed with exceptionally gratifying results. There has also been issued and distributed a complete set of rules governing the construction, operation, and equipment of tank vessels.

#### ADMINISTRATIVE SET-UP CHANGED

"An act to provide for a change in the designation of the Bureau of Navigation and Steamboat Inspection, to create a marine casualty investigation board and increase efficiency in administration of the steamboat-inspection laws, and for other purposes", was passed by the Seventy-fourth Congress. This act changed the name of the Bureau to "Bureau of Marine Inspection and Navigation" and provided for certain major changes in its functions and organization, all of which were effected during the fiscal year. These changes are mentioned briefly in this section but will be discussed in greater detail in that part of the report setting forth the accomplishment under the various activities during the year.

*Supervising inspection districts.*—Among other things, the act reduced the number of supervising inspectors from 11 to 7. The Board of Supervising Inspectors established the boundary lines of the supervising inspection districts. The districts were necessarily made larger geographically and are now referred to by number and name, as follows:

- No. 1, the New England District, with headquarters at Boston.
- No. 2, the New York District, with headquarters at New York.
- No. 3, the Middle Atlantic District, with headquarters at Norfolk, Va.
- No. 4, the Gulf District, with headquarters at New Orleans, La.
- No. 5, the Interior Rivers District, with headquarters at Pittsburgh, Pa.
- No. 6, the Great Lakes District, with headquarters at Cleveland, Ohio.
- No. 7, Pacific Coast District, with headquarters at San Francisco, Calif.

*Principal traveling inspectors.*—The act further provided for the appointment of 10 principal traveling inspectors in the field service of the Bureau. These positions were filled by promotion within the service and by the appointment of practical seagoing personnel, shipyard superintendents, etc.

*Marine casualty boards.*—The act further provided for establishment of Marine Casualty Investigation Boards. These boards were set up and began to function during the latter part of August 1936, inasmuch as the law was effective 90 days after its enactment.

*Technical staff.*—Section 5 of the act created a Technical Staff in the Bureau.

*Inspection of crew quarters.*—By the provisions of section 4 of Public 808 the field inspection force of the Bureau is now required to inspect crew quarters of all American vessels at least once in each month when the ship is in American waters. It should be pointed out that this provision requires a large number of additional inspection visits to ships.

#### REVISED RULES NEEDED

The General Rules and Regulations, covering all classes of vessels under inspection jurisdiction of the Bureau, are very much in need of revision, since they have not been reprinted in complete form since 1931. They have been repeatedly amended and supplements have been issued, but in this form they are very confusing to the industry. Numerous circular letters and Bureau bulletins are the only source of accurate information concerning the correct text of many sections of the regulations. The Bureau's inspectors, shipping commissioners, and allied enforcement officers are handicapped because of the confusion which results from this form of instruction. The Bureau has attempted to prepare a revision of the Rules and Regulations, but owing to interruptions of other important matters, as well as the lack of clerical assistance, progress has been exceedingly slow.

#### PATROL FLEET

The patrol fleet maintained by the Bureau for the purpose of enforcing the navigation laws, particularly the Motor Boat Act, has been utilized further during the past year for the enforcement of Bureau regulations pertaining to the inspection of vessels. They have proved particularly valuable in carrying inspectors of the Bureau to areas where large numbers of vessels recently placed under the jurisdiction of the Bureau are being operated. By this means, inspectors are enabled to board such vessels while they are being navigated for the purpose of conducting inspections and determining whether such vessels are being operated in accordance with the inspection or navigation laws.

#### INSPECTION SERVICE

Personnel connected with this service, both in the Bureau and in the field, are responsible for the direct enforcement of the laws and regulations covering the seaworthiness of vessels. The work of the section includes actual inspections and reinspections of all cargo and passenger ships, tank vessels, ferryboats, seagoing barges, and many other miscellaneous types of vessels, as well as the inspection of all foreign passenger and many foreign cargo vessels which depart from ports of the United States with passengers on board.

A most important phase of the work of the inspection force is performed at steel mills and factories in order to ascertain definitely that materials used in the manufacture of boilers, and propelling and auxiliary machinery meet the standards set by the Bureau's regulations and that life-saving equipment and other accessory appliances are manufactured according to the approved specifications. On much of this material continual tests are required, both during and after

manufacture. The work of the inspectors often takes on a character of a consulting and advisory engineering service.

The Bureau receives no inspection fees from shipowners or operators, either domestic or foreign, nor are there any charges made for the inspection of materials and equipment at manufacturing plants.

The inspectors are charged with many regulatory responsibilities, such as fixing the complement of all vessels granted certificates of inspection, examination of officers and seamen for licenses and certificates, and the issuance of such licenses and certificates.

The provisions of the International Convention for Safety at Sea of 1929, including the issuance of all certificates required by the convention, that is, Safety Certificates for passenger vessels engaged in international voyages and Safety Radiotelegraphy Certificates for cargo vessels, necessitated the preparation of amendments to the General Rules and Regulations, detailed administrative instructions to the field forces in regard to those regulations, as well as instructions for the issuance of certificates.

#### FIELD INSPECTORS

The field service group of traveling inspectors attached to the Bureau consisted, at the end of the year, of 10 principal traveling inspectors and 1 traveling inspector. Since their appointment these men have been primarily employed in the inspection of passenger vessels and in the drilling and instruction of officers and crews. Owing to conditions affecting the morale and discipline of the crews of American ships, this work has been of the utmost importance. During the year, 201 passenger vessels have been subjected to detailed reinspections by principal traveling inspectors.

During the year, 100 inspectors were added to the field inspection force, bringing the total number in the field, including 7 supervising inspectors and 2 assistant supervising inspectors, to 384. Ninety-four of these men are local inspectors who must of necessity remain in their offices to carry on their duties there. Thus, there remain 281 assistant inspectors who must actually conduct the inspections, examine seamen, make investigations and surveys, visit shipyards, factories, steel mills, ship repair plants, and drydocks.

Vessels inspected and certificates of inspection issued to steam and motor vessels and to barges, by districts

Supervising and local districts	Domestic vessels										Foreign passenger steam and motor vessels		Total	
	Steam vessels		Motor vessels		Passenger barges		Seagoing barges		Total		Number	Gross tonnage	Number	Gross tonnage
	Number	Gross tonnage	Number	Gross tonnage	Number	Gross tonnage	Number	Gross tonnage	Number	Gross tonnage				
<b>First supervising district:</b>														
Bangor, Maine.....	2	3,881	20	761			1	943	23	5,585	2	1,106	25	6,691
Boston, Mass.....	135	302,322	25	32,752			13	11,936	173	347,010	8	60,568	181	407,578
New London, Conn.....	8	12,220	17	5,017			1	1,034	26	18,271			26	18,271
Portland, Maine.....	19	2,068	35	1,746			2	3,517	56	7,331			56	7,331
Providence, R. I.....	32	51,555	11	2,397			2	2,482	45	56,434			45	56,434
<b>Second supervising district:</b>														
Albany, N. Y.....	51	20,875	15	6,461			1	795	67	28,131	1	94	68	28,225
New York, N. Y.....	942	1,998,334	221	237,715	2	1,598	55	58,061	1,220	2,295,708	106	2,021,292	1,326	4,317,000
New Haven, Conn.....	18	3,168	33	1,374			3	3,847	54	8,389	1	8,856	55	17,245
San Juan, P. R.....	3	5,506	5	789					8	6,295	7	40,434	15	46,729
<b>Third supervising district:</b>														
Baltimore, Md.....	244	785,025	108	29,224			15	13,687	367	827,936			367	827,936
Charleston, S. C.....	9	11,493	39	1,804			2	2,801	50	16,098			50	16,098
Norfolk, Va.....	143	205,025	115	14,636	2	620	53	72,008	313	292,889			313	292,889
Philadelphia, Pa.....	183	446,845	99	172,061			46	52,267	328	671,173	1	3,900	329	675,073
Savannah, Ga.....	20	59,984	7	412	3	112			30	60,508	1	4,693	31	65,201
<b>Fourth supervising district:</b>														
Galveston, Tex.....	171	814,078	16	43,074	1	945	17	22,232	205	880,320	1	8,379	206	888,708
Jacksonville, Fla.....	19	31,392	83	4,502			2	1,510	104	37,404	1	3,445	105	40,849
Mobile, Ala.....	120	521,263	38	1,928			4	7,938	162	531,129			162	531,129
New Orleans, La.....	167	446,557	27	3,211	3	1,996	1	2,109	198	453,873	10	71,167	208	525,040
Tampa, Fla.....	11	45,543	24	1,767					35	47,310			35	47,310
<b>Fifth supervising district:</b>														
Cincinnati, Ohio.....	31	8,579	3	103	1	219			35	8,901			35	8,901
Dubuque, Iowa.....	25	3,639	27	1,054					52	4,693			52	4,693
Evansville, Ind.....	19	7,785	4	122					23	7,907			23	7,907
Louisville, Ky.....	18	4,267	4	281					22	4,548			22	4,548
Memphis, Tenn.....	36	12,225	5	265					41	12,490			41	12,490
Nashville, Tenn.....	27	6,423	4	148	1	160			32	6,731			32	6,731
Pittsburgh, Pa.....	60	17,586	9	226	1	318			70	18,130			70	18,130
Point Pleasant, W. Va.....	19	3,766	6	139					25	3,905			25	3,905
St. Louis, Mo.....	51	19,448	21	1,292					72	20,740			72	20,740

Vessels inspected and certificates of inspection issued to steam and motor vessels and to barges, by districts—Continued

Supervising and local districts	Domestic vessels										Foreign passenger steam and motor vessels		Total	
	Steam vessels		Motor vessels		Passenger barges		Seagoing barges		Total		Number	Gross tonnage	Number	Gross tonnage
	Number	Gross tonnage	Number	Gross tonnage	Number	Gross tonnage	Number	Gross tonnage	Number	Gross tonnage				
Sixth supervising district:														
Buffalo, N. Y.....	135	363,476	9	9,779	2	233			146	373,488	8	23,897	154	397,385
Chicago, Ill.....	92	321,503	6	9,978					98	331,481			98	331,481
Cleveland, Ohio.....	133	559,726	4	5,670					137	565,396			137	565,396
Detroit, Mich.....	86	254,161	6	20,269			2	2,739	94	277,169	4	6,158	98	283,327
Duluth, Minn.....	43	154,956	2	136					45	155,092	1	469	46	155,561
Grand Haven, Mich.....	24	50,446	9	471					33	50,917			33	50,917
Marquette, Mich.....	22	23,772	7	327					29	24,099	2	1,111	31	25,210
Milwaukee, Wis.....	70	270,279	6	941					76	271,220			76	271,220
Oswego, N. Y.....	23	5,890	25	1,972					48	7,862	6	2,100	54	9,962
Port Huron, Mich.....	15	11,797	7	210					22	12,007	2	12,170	24	24,177
Toledo, Ohio.....	90	425,098	5	2,338					95	427,436			95	427,436
Seventh supervising district:														
Honolulu, Hawaii.....	12	55,507	10	1,402					22	56,909	12	204,043	34	260,952
Hoquiam, Wash.....	9	22,033							9	22,033			9	22,033
Juneau, Alaska.....	3	137	15	917			1	1,809	19	2,863			19	2,863
Portland, Oreg.....	48	124,270	8	1,363	1	538			57	126,171			57	126,171
San Francisco, Calif.....	256	956,630	110	46,356	1	103	5	9,499	372	1,012,588	20	158,504	392	1,171,092
San Pedro, Calif.....	81	382,579	33	5,883			12	13,392	126	401,854	16	132,901	142	534,755
Seattle, Wash.....	134	450,340	60	20,797			8	17,204	202	488,341	23	150,658	225	638,999
St. Michael, Alaska.....	4	2,132	8	327					12	2,459	2	2,186	14	4,645
Grand total.....	3,863	10,285,584	1,351	694,397	18	6,842	246	302,410	5,478	11,289,233	235	2,918,131	5,713	14,207,364

Special surveys of passenger vessels numbering 213 have been conducted by the field force to the end of the fiscal year. In their inspections, the traveling inspectors covered a total of 143,534 miles.

In addition to the above inspections, the field force of the Bureau conducted 2,286 reinspections, 11,318 special examinations, and 3,923 drydock examinations. Certificates were withdrawn from or refused to 82 vessels of the United States. The hulls of 89 Government vessels were inspected and 1,815 Government boilers were inspected, both afloat and ashore.

#### TANKER REGULATIONS

A major accomplishment during the year was the preparation and promulgation under the provisions of Public, 765, of a complete set of rules governing construction, inspection, manning, and operation of tank vessels. The important and far-reaching effect of these new rules in raising the standard of safety of all tank vessels carrying hazardous liquid cargoes, particularly those operating in congested areas of large ports, cannot be overemphasized. As these rules apply to all classes of tank vessels regardless of size, tonnage, or manner of propulsion, they brought more than 2,500 additional vessels under the surveillance of the field inspection force.

Since the promulgation on November 10, 1936, of the tanker rules, 1,576 tank vessels have been inspected under their provisions. In order to expedite the inspection of large numbers of tank vessels located in the Gulf area and in the ports of the eastern seaboard, the principal traveling inspectors were placed aboard patrol vessels of the Bureau in these areas and were thus enabled to board over 234 vessels. In addition, personnel of the Bureau's patrol fleet have conducted 308 special inspections of tank vessels. Forty-six tank vessels, which applied for inspection under the new rules, were found to be in such condition as to necessitate the refusal of certificates, even of a temporary nature.

#### FIRE PROTECTION

The Bureau personnel and the field inspection force have concentrated on the application of new provisions to the Rules and Regulations concerning additional fire protection for passenger vessels. Previous to the enactment by the Seventy-fourth Congress of a bill requiring automatic sprinkler systems aboard all existing vessels having sleeping or berth accommodations for 50 or more passengers, the effective date of which was July 1, 1937, the Bureau had, through the field inspection force, conducted a fire hazard survey of all existing passenger vessels of over 150 feet in length. Regulations and administrative instructions based on the results of this survey, which set forth the minimum additional fire protection requirements for existing vessels, were promulgated.

The provisions of Public, 722, effective June 20, 1936, just at the close of the preceding of fiscal year, brought under inspection all sea-going motor vessels of over 300 gross tons except those engaged in any branch of the fishing industry. Over 1,500 additional vessels were thus placed under the full jurisdiction of the Bureau.

## STOWAGE AND CARRIAGE OF DANGEROUS CARGO

Personnel of the Bureau are engaged in the preparation and drafting of a new set of regulations covering the stowage and carriage of dangerous cargo. It is expected that these regulations will be in suitable form during the early part of the coming year, when they will be submitted for discussion at a public hearing. It is intended to prepare a handbook to assist licensed masters and licensed deck officers, stevedores, and others concerned, to mark and stow dangerous cargoes properly. Additional qualified personnel are needed in the field offices in order to enforce properly present requirements of the regulations and to serve as instructors concerning dangerous articles when the new rules are promulgated.

## MANNING OF INSPECTED VESSELS

In order to secure definite evidence as to whether American vessels are undermanned, the Bureau obtained through its field offices the number of crew which the local inspectors were requiring on all vessels subject to inspection. The data were analyzed and from the results obtained a proposed manning scale was prepared. Work on this scale has not yet been completed.

## SHIP PERSONNEL

The amendment to the Seamen's Act, which was approved on June 25, 1936, and became effective during the fiscal year, was of far-reaching effect and provided for: (1) Qualifications, examinations, and issuance of certificates of service or efficiency to unlicensed seagoing personnel; (2) the issuance of continuous discharge books to all seagoing personnel, and the establishment of a central records office at the Bureau; (3) it also provided a three-watch system and an 8-hour day for licensed officers, sailors, and certain members in the engine department; (4) provisions were also made for the inspection of crews' quarters once each month by local inspectors; (5) citizenship requirements were provided by this act, in addition to the citizenship requirements provided for in section 302 of the act approved on June 29, 1936.

## CERTIFICATES AND DISCHARGE BOOKS FOR SEAMEN

The provisions concerning the issuance of certificates of service and efficiency and continuous discharge books became effective on December 25, 1936, while the maritime strike was in progress. The heavy demands for these books and certificates upon termination of the strike brought about considerable confusion in the offices of the shipping commissioners and local inspectors because they were not adequately staffed for this extra work. Factional disputes among seamen as to the advisability of accepting these books and certificates further complicated the work.

The Congress, on March 24, 1937, amended Public, 808, so as to give the seamen the option to take either continuous discharge books or certificates of identification.

To give effect to and to comply with the provisions of Public, 808, 122,496 continuous discharge books, 44,749 certificates of identification, 29,635 able seamen's certificates, 40,538 lifeboat men's certificates, 29,259 qualified members of the engine department certificates, 82,744 certificates of service, and 1,546 tankermen's certificates were issued during the fiscal year 1937, making a total of 350,967 books and certificates issued to unlicensed personnel. Duplicate copies of these are maintained in the Bureau.

The Bureau, through its shipping commissioners, is responsible for supplying seamen and supervising the signing of the articles of agreement between the seamen and the master on all vessels except those navigating the inland waters of the United States. This supervision is required by law on all vessels engaged in foreign and intercoastal voyages. In complying with the above these shipping commissioners, their deputies, and the collectors and deputy collectors of customs in those ports where there are no shipping commissioners, shipped and reshipped 216,592 seamen during the fiscal year. In addition they heard many disputes submitted to them for determination by the masters and members of crews on board American vessels. The number of cases heard is not as yet available.

#### INTERNATIONAL CONVENTIONS

An officer of the Bureau attended the International Labor Office Conference at Geneva, Switzerland, in October 1936 concerning the adoption of international standards relative to officers and seamen of vessels. At this conference consideration was given to six conventions and two recommendations relating to the following matters: (1) Hours of work and manning; (2) annual holidays with pay for seamen; (3) minimum qualifications of licensed officers; (4) sickness insurance for seamen; (5) owners' liability for sickness, injury, or death of seamen; (6) minimum age requirements for service on shipboard; (7) seamen's welfare in ports (recommendation); (8) hours of work and manning (inland vessels recommendation).

#### EXAMINATIONS OF OFFICERS AND CERTIFICATED PERSONNEL

In order to raise the standard of examinations for deck and engineer officers' licenses and certificated personnel, a planning board has been established in the Bureau to formulate examinations. It is planned to circulate the examination questions throughout the 47 local inspection districts where the examinations will be held. The papers will be graded by the local inspectors and sent to the Bureau for final review and approval.

It is further planned to rotate the examination questions and to have a constant formulation and injection of new and different types of questions. This system will also be applied to the examination of all unlicensed persons required to be examined under the provisions of Public, No. 808, namely, able seamen, lifeboat men, qualified members of the engine department, and others. It should result in securing the highest type of licensed and unlicensed personnel for service on vessels of the United States.

## LICENSES ISSUED

During the fiscal year 1937 the various boards of local inspectors examined and issued 7,042 licenses to deck officers, including pilots; 8,805 licenses to engineer officers; and 11,117 licenses to motorboat operators.

**MARINE INVESTIGATION BOARDS**

The amendment on May 27, 1936, section 4450 of title LII, provided for the creation of Marine Casualty Investigation Boards. The jurisdiction of the board embraces the investigation of all marine casualties and accidents or any violation of any provisions of title LII or any rules promulgated thereunder, and the subsequent trial of all licensed and certificated personnel, if there is sufficient evidence of misconduct, inefficiency, or negligence. The local inspectors were relieved of their power to suspend or revoke licenses, and this power was vested in the Director of the Bureau. Appeal from a suspension or revocation is made to the Secretary of Commerce.

Pursuant to the provisions of the act, which became effective on August 26, 1936, the Department promulgated rules and regulations for its enforcement.

The law provides for the establishment of three classes of investigation boards. The "A" Marine Investigation Boards, consisting of an official from the Department of Justice (learned in maritime law), a Coast Guard officer, and an official from this Bureau, were created for the investigation of all marine casualties involving loss of life. The "B" Marine Investigation Boards, consisting of a supervising inspector and two principal traveling inspectors of this Bureau, were created to investigate all marine casualties of a serious nature. The "C" Marine Investigation Boards, consisting of representatives of the Bureau (usually local inspectors), were created for the investigation of all marine casualties and accidents and other matters not properly within the jurisdiction of the "A" or "B" Marine Investigation Boards.

The personnel available for the "A" and "B" marine boards are strategically located throughout the United States, and upon the occurrence of a marine casualty the appropriate board is immediately convened by the Secretary of Commerce.

A "C" Marine Investigation Board is permanently appointed for each of the 47 local districts and takes automatic jurisdiction of cases occurring within these districts and also of cases the venue of which is properly transferred to them by the Director.

The procedure of all the marine boards is essentially the same. Immediately upon the occurrence of a marine casualty or accident or other matter properly within the jurisdiction of the boards, investigation and hearings are commenced. After completion of the hearings, if any charges have been preferred and the trial has been completed, the boards submit all the testimony, exhibits, documents, and other evidence, with their findings in narrative form with recommendations, to the Director for review and approval. The Director, based upon the record, suspends or revokes the license or certificate of service and efficiency of any personnel involved if such course is proper; and if the record reveals that any laws, rules, or regulations have been or are being violated corrective action is taken. The records also

serve as a valuable basis on which to consider proposal for future legislation.

During the fiscal year ending June 30, 1937, the Bureau received records of investigations of 2,367 cases dealing with marine casualties and accidents, and other matters over which the Bureau has supervision. There were 39 cases of marine casualties involving loss of life investigated by the "A" Marine Investigation Boards. None of these cases involved the loss of life of any passenger traveling on board vessels subject to the inspection laws of this Bureau. Sixty cases involving marine casualties or accidents of serious or major gravity, were investigated by the "B" Marine Investigation Boards. The remaining 2,268 cases were of a less serious nature, and were investigated by the "C" boards.

#### TECHNICAL DIVISION

The organization of the new Technical Division under the act approved May 27, 1936, has been accomplished during the year and although in a formative stage it has creditably discharged its responsibilities. The act provided that all plans and specifications for passenger vessels of the United States of 100 gross tons and over which are propelled by machinery must be approved by the Director with the advice and assistance of this technical staff, and that no such vessel shall be granted a certificate of inspection by a board of local inspectors of the Bureau until the plans have been submitted for approval by the Director before construction or alteration is commenced. Compliance with this act, which was effective as to vessels of 500 gross tons and over on June 26, 1936, and on vessels of under 500 gross tons on August 26, 1936, necessitated the appointment of naval architects, and marine and electrical engineers in order to carry out the work as required by the new statute. The work performed by the Division has assisted the Bureau materially in raising the standard of safety at sea.

#### STRUCTURAL, STABILITY, AND SUBDIVISION SECTION

The duties of this section include, briefly, the examination of plans and specifications for the building or alteration of passenger, cargo, tank, and towing vessels, as well as lifeboats and other equipment and appliances for ships. Also included are stability tests and investigation, answering questions submitted of a technical nature, and preparing all correspondence relative to the above.

During the fiscal year ended June 30, 1937, designs for the construction of 5 ocean passenger and freight vessels, 4 Great Lakes freighters, 10 ferryboats, 3 towboats, 3 dredges, 147 tank vessels, 1 river passenger and freight vessel, and 5 miscellaneous and cargo vessels were submitted. The arrangement of the passenger and crew accommodations, the adequacy of escapes, the number, type, and size of lifeboats, the watertight integrity of the vessel, the stability characteristics, the type and arrangement of fire-detecting and extinguishing apparatus, and the extent of fireproofing in the structure, were all checked to determine compliance with existing laws and regulations before plans were approved or rejected.

In addition to the new designs enumerated above, plans for the conversion of 13 vessels from one type of service to another were submitted and acted on, and appropriate action was taken in regard to the substantial alterations on 124 passenger and cargo vessels.

The investigation of the watertight integrity of existing ocean and coastwise and Great Lakes passenger vessels has been continued, and calculations were made for subdivision and damaged stability of 30 ships during the past year. The American Bureau of Shipping was notified of the assignment of 119 subdivision load lines.

This section has conducted 101 inclining experiments, and made all the necessary calculations to determine the stability of the ships so inclined. In numerous cases no plans of these ships existed, so that it was necessary to drydock and measure the vessel, and make up a set of plans from which to work. Ballast was ordered installed, or other steps taken, where necessary to increase stability.

Four fires on ships have been investigated during the past fiscal year to determine the probable causes and by what means fire hazards could be eliminated.

Under the provisions of the General Rules and Regulations, Public 712, and Circular Letter 93, Ocean and Coastwise, as well as inland passenger vessels are required to be fitted with certain fire-detecting and extinguishing systems. In line with these requirements the plans of existing and proposed systems for approximately 90 percent of the whole of the affected vessels have been approved. On 80 percent of these, the systems are installed or the installation well under way. In addition, plans have been approved for the installation of extinguishing systems on 64 tank vessels. Special inspections of fire protection systems have been conducted on 10 vessels. Seventeen vessels, as the result of their failure to meet fire protection requirements, have been withdrawn from service by the owners. Approximately 187 pieces of equipment, such as life preservers, buoyant apparatus, water lights, fire extinguishers, and marine sound transmitting equipment, were either tested by this section or by other governmental agencies and accepted testing laboratories acting under the supervision of the section.

#### ENGINEERING SECTION

The inclusion of oil tankers in the category of vessels coming under the supervision and regulations of the Bureau has greatly increased the work of the engineering section. In addition to the approval of plans and inspection of propelling machinery of the many large tankers now being built in this country, it is now necessary to examine and check the cargo oil and other piping systems of the tankers.

Aside from the self-propelled tank vessels, a very large number of nonpropelled tank barges have been built or are now in course of construction. For all of these, the pumps with their driving engines or motors have to be examined as well as the piping systems and means of tank ventilation.

During the past few years practically all large American steam vessels, as well as many small ones, have been equipped for the use of oil fuel. The entire fuel oil system of every such vessel comes under the Bureau's jurisdiction, involving still further examination of plans and increased work for field inspectors.

The very rapid growth in importance of fusion welding as applied in the construction and repairing of marine machinery has received constant attention. Obviously, a regulatory body must proceed cautiously in the devising of rules to be applied to an art or process still in a formative stage, but substantial progress, nevertheless, has been made. Working in conjunction with the American Welding Society, a code has been prepared covering in detail the welding of boilers and pressure vessels which has been in operation for the past 2 years with satisfactory results. Work is now in an advanced stage on a code covering the welding of piping and pipe fittings.

During the past year the engineering section has primarily tested 237 welding operators, 149 of whom were qualified. One hundred and eight were retested, of whom 67 passed, making a total of 345 tested and 216 qualified. Six hundred and eighteen certificates have now been issued to those who have passed their tests.

Welding rods submitted by 12 companies have been approved and radiographs of 102 welded boilers and pressure vessels have been examined and approved.

During the past year several failures of boiler plate submitted for test have occurred. It appears that these failures may have been caused by the mixture of automobile scrap containing chromium and other similar metals with ordinary mild steel scrap, the result being an alloy steel unsuitable for boiler material. With the cooperation of boiler manufacturers and steel companies this condition is being thoroughly investigated, as the increasing use of automobile scrap may lead to a serious situation. These investigations will be continued until means for remedying this condition are found.

The senior marine engineer has attended meetings of the local inspectors, shipbuilders, and ship operators in different sections of the country. These meetings have had the gratifying result of producing greater uniformity in the local interpretation of the rules, and a more intelligent understanding of the central Bureau's aims and purposes by all parties concerned.

Representatives of the section took active parts in numerous conferences and meetings of insurance associations, boiler manufacturers, steel makers, and other organizations directly concerned with the Bureau's activities.

#### ELECTRICAL ENGINEERING SECTION

The great increase during recent years in the use of electrical machinery and equipment on board vessels has necessitated the formation of an electrical engineering section in the Bureau.

The work being carried on by the electrical engineering section includes the check and approval of all electrical installation plans and specifications of new construction and of alterations to existing vessels; the check and approval of plans and specifications for the installation of fire-detecting systems, manual alarm systems, battery charging equipment, navigation lights, sound powered telephone systems, interior communication systems, loudspeaker systems; the check and approval of all electrical equipment and fittings, and the inspection and testing of electrical installations, such as loudspeaker systems on board the individual vessels. The work of the electrical engi-

neering section has also included the preparation of specifications for electrical equipment required by the regulations.

Owing to the fact that the electrical engineering section was only recently formed, it was necessary, during the year, to do a large amount of research work in gathering data concerning the suitability for marine use of all electrical fittings, cables, and equipment, including the examination, testing, and approval of such materials as were suitable for marine use.

The promulgation of regulations requiring emergency loudspeaker systems on certain types of ocean and coastwise passenger vessels necessitated a great amount of investigation, as loudspeaker systems suitable for marine use had not heretofore been manufactured. During the year seven loudspeaker systems were tested and five systems were approved. Plans covering the installation of loudspeaker systems on board 61 vessels have been checked and approved.

Electrical plans and specifications for 38 new vessels have been checked and approved. Plans and specifications for five-detecting and manual alarm systems on 221 vessels have been approved, as well as supervisory and alarm circuits for all automatic sprinkler system installations.

A continual check is being made of the electrical aspects of all equipment that has been approved in the past in order to insure that all electrical equipment and wiring are in keeping with the best modern marine practice.

#### LOAD LINE SECTION

On August 27, 1936, the Coastwise Load Line Act, 1935, as amended June 20, 1936, became fully effective. This act completes the load line legislation, with the exception of a proposed amendment to the Load Line Act of 1929 that will lower the gross tonnage from 250 to 150 tons and cover the arrival of a vessel at an American port so that the act will be in harmony with the International Load Line Treaty of 1930.

Under the various load line acts and the International Treaty, every United States vessel of the tonnage set out in the acts is required to be marked with load lines when engaged on foreign, coastwise, and Great Lakes voyages.

The amendment of June 20, 1936, provides for subdivision load lines on passenger vessels and also permits, in the judgment of the Secretary of Commerce, variation of the position of the load lines on steam colliers, tugs, barges, and self-propelled barges engaged on certain voyages, from the position fixed by the International Load Line Treaty of 1930.

In order to give effect to the provisions of the amendment of June 20, 1936, amendments have been prepared to the existing load line regulations for foreign, coastwise, and Great Lakes voyages; regulations have been prepared to determine the position of load lines on steam colliers, tugs, barges, and self-propelled barges when engaged on certain voyages and also for the determination of load lines based on the subdivision of passenger vessels engaged in foreign, coastwise, and Great Lakes voyages that are in accord with the provisions of the International Convention for Safety of Life at Sea.

As provided by law, the examination of the physical condition of ships and the application of the formulas for determining the position of load lines (other than subdivision) are performed by the American Bureau of Shipping or other approved classification societies, who report to and receive instructions from this Bureau.

During the fiscal year 1937, 433 vessels were marked and certificated with load lines authorized by the Coastwise Load Line Act, 142 violations of the foreign trade and coastwise load line acts were handled, 16,361 reports of sailings of vessels were received, 1,415 annual load line inspections accomplished, and in the case of 14 foreign vessels, certificates were issued under the American regulations upon the request of the governments under whose flag they are registered.

#### ADMEASUREMENT OF VESSELS

During the fiscal year ended June 30, 1937, 2,873 vessels aggregating 618,741 gross tons were admeasured for documentation. This is over 50 percent increase in tonnage assignment of the preceding fiscal year. Of the larger craft, 114 aggregating 116,296 tons were reviewed in the Admeasurement Division. The tonnage of a vessel is shown on her document, which is required to operate her, and on said tonnage is computed canal tolls, wharfage, dockage, pilotage, other navigation fees, tonnage taxes, etc.

Applications for 435 readmeasurements totaling 532,558 gross tons, due to structural alterations and various changes, were submitted. Each case was reviewed with the use of blueprints, etc., and the tonnage change approved when found correct, otherwise corrections were made and instructions issued to the admeasurers concerned.

Special appendix to Certificate of Registry, showing the tonnage of spaces exempt under our laws, but not so treated in foreign countries, were issued to 36 ships.

There are 118 employees of the Treasury Department engaged full or part time in admeasurement work. In order to secure uniformity of procedure and to instruct these employees in their work, it was necessary to have a representative of this section travel extensively in the field.

While the Director of the Bureau of Marine Inspection and Navigation is charged with the supervision of the admeasurement laws, the field work is performed by Treasury employees. This arrangement has been in existence since 1903 when the former Bureau of Navigation was transferred from the Treasury Department to the Department of Commerce. However, increased work and complex construction make it highly desirable that all admeasurement work be conducted by employees of this Bureau.

#### NAVIGATION DIVISION

This Division has, during the course of the year, reviewed briefs and petitions for mitigation or remission of statutory penalties imposed upon owners, operators, and masters of vessels for violations of the navigation and inspection laws. It has also continued its customary task of interpreting those laws, drafting new legislation, reporting on proposed legislation before Congress; has issued instructions to the personnel of the various customhouses engaged in the work of the Bureau, and has issued instructions and regulations to the field service generally.

## COLLECTION OF FEES AND DUTIES

During the year the Navigation Division has supervised the collection, through collectors of customs, of \$1,621,205.22 in tonnage duties imposed upon vessels entering ports of the United States from foreign countries; also \$202,311.12 in navigation fees. The Bureau has considered petitions of shipowners and operators for refunds of tonnage taxes allegedly illegally or erroneously collected by collectors of customs.

Fees for surveyors' services other than admeasurement, rendered to all vessels, have heretofore been collected by customs officers for this Bureau. However, the statutory authority for making such collections was repealed by act of March 3, 1933.

## DOCUMENTATION OF VESSELS

During the year the Bureau has authorized the change of name of 436 vessels, no vessel of the United States being permitted to change its name without such approval. Fees collected in connection with such changes of names amounted to \$12,070.

In the issuance of official numbers, registers, enrollments, and licenses, the collectors of customs are continually confronted with questions of place of build of vessels, establishment of chain of title of those vessels, and other questions upon the decision of which depends the right of the vessel to documentation as a vessel of the United States. The decision of all such questions rests with the Bureau. During the course of the past year many such questions have been decided.

## SHIP MORTGAGE ACT

The Bureau is also charged with the administration of the Ship Mortgage Act which provides for the recording of all mortgages on vessels of the United States and the endorsement on the vessels' documents of all preferred mortgages. Proper title to a large percentage of the vessels of the American merchant marine depends upon the administration of this act. It is necessary that the owner of every vessel of the United States prior to its documentation and upon every change in ownership or change in build to designate a home port for that vessel which must be approved by this Bureau before such designation may become effective. After such approval by the Bureau the records of that vessel are maintained at the home port so designated; documents are issued from that port; mortgages, bills of sale, conveyances, etc., are recorded there. During the fiscal year 1937, there were approved approximately 7,156 such home port designations.

## PASSENGER ACT

This Navigation Division also is responsible for the administration of the Passenger Act of 1882 which contains certain provisions for the accommodations for steerage passengers. Vessels entering ports of the United States from foreign countries, having on board steerage passengers, are supervised by customs inspectors who see that these provisions are complied with. The purpose of the act is to look after the welfare, health conditions, food, separation of the

sexes, and care in case of illness of future citizens of our country. During the fiscal year 1937, there were 816 voyages made involving 135,753 steerage passengers.

#### PREVENTION OF OVERCROWDING

Under the provisions of Revised Statutes 4464, the board of local inspectors shall state in every certificate of inspection granted to vessels carrying passengers, other than ferry boats, the number of passengers which may be carried with safety. To prevent these vessels taking on passengers in excess of the number so fixed, this Bureau employs inspectors who count such passengers and when the limit is reached, prevent additional persons from going on board. During the year there were counted 4,830,893 such passengers. It was necessary for the inspectors to prevent additional passengers from going on board because the limit of safety had been reached on 333 occasions, involving the safety of 233,890 passengers.

#### FINES, PENALTIES, AND FORFEITURES

The Navigation Division considers reports of all violations of law by all vessels on the navigable waters of the United States or within the admiralty or maritime jurisdiction of this country.

Legislation dealing with navigation and inspection laws enacted by the Seventy-fourth and Seventy-fifth Congresses has imposed a considerable burden upon officers in the field who are engaged in law enforcement and has resulted in the report to the Bureau of a very much greater number of violations than in past years. The handling and reviewing of this increased number of violation reports have taxed the resources of the Navigation Division to the utmost. During the year 17,358 separate fine cases, involving a large number of motorboats as well as other vessels, were reported by the Bureau's personnel in the field and by other governmental agencies.

#### MOTORBOATS

##### NUMBERING

Although the renumbering of motorboats is not, as yet, complete, there are at present, as shown by the Bureau's records, a total of 182,620 motorboats so renumbered in the United States.

Four ports in the United States have over 10,000 motorboats each: New York being first with 23,000, Baltimore 12,000, Philadelphia, 11,000, and Tampa with 10,000.

#### PATROL SERVICE

Another important duty of the Bureau in connection with motorboats is their supervision through the enforcement of the navigation laws. This is done by the patrol vessels of the Bureau, three of which were in operation during the year.

In addition to the work done by these vessels, an inspector was detailed to the Pacific coast during the summer of 1936, and two launches made extended inspection trips on the Mississippi River and on Lake Okechobee and the Atlantic coast from Miami, Fla., to Charleston, S. C.

## COORDINATION OF MOTORBOAT INSPECTION WORK

During the past summer, two inspectors were assigned to Coast Guard vessels in the Great Lakes, and on the Pacific coast to coordinate the inspection work. Assistance was rendered the Bureau of Biological Survey in its enforcement of the migratory wild-fowl laws, and instructions were given certain personnel of the Tennessee Valley Authority preparatory to their appointment as inspectors for the enforcement of navigation laws on the navigable waters created by the T. V. A. project.

A chartered patrol vessel was returned to its owner, a new patrol vessel was purchased, five new launches were built and put into operation, and certain craft no longer suited to this service were sold or transferred to other Government agencies.

Out of a total of 9,067 inspections made by the patrol service, 6,883 violations of the navigation laws were reported, and, in addition, other enforcement officers reported 9,826 violations of those laws.

## PRESENT LAW INADEQUATE

It is felt that the present motorboat law, which was enacted June 9, 1910, and which has not since been amended, is unsatisfactory. It apparently imposes an undue burden on the owners of small boats and does not set forth the requirements which are necessary and proper for the safety of life and property on the larger boats. To correct this situation, the Bureau has for some time been considering the advisability of recommending the enactment of new legislation. As a result, it circularized yacht clubs, motorboat organizations, boat and engine manufacturers, owners and operators of commercial craft, and others concerned, setting forth its views as to proper requirements for such craft, and requested an expression of opinion. The Bureau is now prepared to recommend a bill which it feels will relieve the small boat owners and will impose proper restrictions on the operation of larger boats, and which apparently meets the approval of the great majority of interested persons.

## AMERICAN SHIPPING ON JUNE 30, 1937

On June 30, 1937, the merchant marine of the United States, including all kinds of documented craft, comprised 26,588 vessels of 14,676,128 gross tons, as compared with 25,392 vessels of 14,496,687 gross tons on June 30, 1936. There were of this total 1,884 vessels of 3,853,487 gross tons engaged in the foreign trade, as compared with 2,107 vessels of 4,168,385 gross tons on June 30, 1936, while 24,704 vessels of 10,822,641 gross tons were engaged in the coasting trade. Following is an analysis of the ownership of documented tonnage: Private ownership (5 net tons and over), steel vessels 5,084 of 11,430,234 gross tons; wooden vessels 21,369 of 2,442,760 gross tons; Maritime Commission, steel vessels, 135, of 803,134 gross tons.

Since June 1, 1921, when tonnage in the foreign trade reached its greatest volume, 11,077,398 gross tons, there has been a gradual decline, until June 30, 1937, when it amounted to only 3,853,487 gross tons. The decrease in the foreign trade tonnage is due partly to the scrapping of large obsolete vessels which belonged to the Shipping Board and to changes from foreign to coasting trade. Since June 1,

1921, the tonnage employed in the coasting trade, exclusive of the Great Lakes, has increased 4,748,809 gross tons.

During the year 1,939 vessels of 471,358 gross tons were built and documented, and on July 1, 1937, there were building or under contract to build in American shipyards for private shipowners 302 vessels of 365,862 gross tons. The corresponding figures for 1936 were 1,207 vessels of 224,084 gross tons built and 167 vessels of 153,550 gross tons under contract to build.

There were but six steel steam vessels and two motor vessels of over 1,000 gross tons built during the fiscal year 1937, these being licensed for the coasting trade.

Many unrigged vessels heretofore undocumented are now seeking documentation owing to the provisions of the Social Security Act. Documentation has not been required on vessels, such as barges, that operate wholly within a harbor, although it was the privilege of these vessels to take out documentation should they so desire. Allowance, therefore, should be made for these additional vessels, and they should not be credited to new building during the year, as some of them have been built for many years and have not before sought documentation.

LAIID-UP VESSELS

On June 30, 1937, the laid-up tonnage of the United States aggregated 1,612 vessels of 1,308,679 gross tons, as against 1,907 vessels of 1,955,036 gross tons on June 30, 1936.

Details of the world's laid-up tonnage, classification of American vessels by size, service, and power, and of vessels launched and under construction may be found in "Merchant Marine Statistics, 1937."

APPROPRIATIONS

The following appropriations were made available to this Bureau for the fiscal year 1937:

Departmental salaries .....	\$245, 524. 06
Salaries and general expenses.....	1, 958, 335. 94
Total.....	<u>2, 203, 860. 00</u>

However, the amount appropriated for the Bureau's activities is partially offset by the fees, fines, and penalties collected during the same period. These amounted to \$1,869,876.64.

## PATENT OFFICE

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All but one of the major activities of the Patent Office recorded substantial increases in 1937, compared with the preceding fiscal year, which, in turn, marked notable gains over the same relative periods of 1934 and 1935. The receipts of the Office during 1937 were \$4,565,501.69, the largest in its history. Expenditures were heavier by \$45,810 than in the previous 12 months, but notwithstanding, there was a surplus of \$73,228.22. The excess of receipts over expenditures during the last 4 years has averaged \$152,207.56 despite a deficit of \$78,364.52 in 1936. In the 11 years beginning 1923, annual deficits ranged from \$85,535.71 to \$827,342.81.

Steady growth in the volume of business continued throughout the year. Increases were shown in the total of applications filed for patents, including reissues and designs, and for registration of trade-marks, prints, and labels. There were more numerous recordings of deeds of assignment; greater sale of printed copies of patents and photostats of manuscripts, and an increase in correspondence with the Office.

Applications for patents (including reissues and designs) and for registration of trade-marks, prints, and labels aggregated 89,980, an increase of 4,878, or about 5½ percent, over the total filed in 1936, when the greatest number since 1932 was received. Wider use of design patents following the establishment of the Design Division as a separate unit in 1934 is again attested. The number of applications for design patents in 1937 was 6,617, contrasted with 3,789 in 1934, an increase of 74.63 percent.

Printed copies of patents sold in 1937 numbered 3,816,878, the largest total in 6 years. There were supplied to foreign governments 1,154,419 copies, and to public libraries in various cities of the United States 744,339 copies. The miscellaneous correspondence of the Office increased from a total of 431,181 letters in 1936 to 443,692 in 1937. In addition 40,346 letters, as against 34,845 in the previous year, were returned with information useful to the writers.

In the light of history this considerable and continuous growth in the activities of the Office indicates a corresponding improvement in the industry and general business of the country. Concurrently with the increase in new business and in large part as a consequence of that enhancement, the number of patents granted in 1937 was 39,412, a decline of 566 compared with the total for 1936. This decrease was the principal departure from the upward trend. In the same period, however, there were registered 11,329 trade-marks, the largest total in any year since 1932. An aggregate of 16,032 applications for registration of trade-marks was filed during the last fiscal year. That was slightly less than the number received in 1934, but, with that exception, surpassed the total for any year since 1932.

## RECEIPTS AND EXPENDITURES

With expenditures running from \$45,810 to \$615,588 higher than those for any year since 1933, there was accumulated, nevertheless, a surplus of \$73,228.22. Expenditures on account of salaries were greater by \$46,525.68 in 1937 than in 1936, and larger than those for any previous year since 1932.

## CONDITION OF THE WORK

As an inevitable consequence of the increase in the number of applications for patents filed in 1937—an excess of 3,963 over the total for 1936—the disposition of old cases was retarded. On June 30, last, only 1 mechanical division was within 60 days of current; 50 were within 3 months; 64 were within 4 months; and all within 5 months. The Design Division was virtually current. The work of the clerical divisions also was current.

Patent applications awaiting action on June 30, 1937, were 38,121, or 4,581 more than at the end of the preceding fiscal year. Final disposition was made of 58,091 applications in 1937, a decrease of 3,899 compared with 1936. The number of cases pending on June 30, 1937, was 109,735, or 5,640 more than on the same relative date of 1936. This recession is attributable to the heavy increase in new work without an offsetting increase in personnel in the examination of applications.

## CLASSIFICATION OF PATENTS

In the course of the year covered by this report 5 new classes (30, 38, 70, 71, and 244) containing 40,443 original patents and 33,149 cross-references were revised. In addition, there were established during the year 235 subclasses in existing classes involving 8,355 patents and 5,707 cross-references. The transfer of 2,200 miscellaneous patents from different classes was completed, and 2,800 new cross-references were made with the purpose of facilitating searches in existing classes. A total of 37,322 cross-references was made in the weekly issue of patents.

Work was proceeding on 28 classes containing 214,807 patents as follows: (1) A new class of air conditioning to contain an estimated 4,000 patents was in process of formation, a necessary step in view of the rapid development of this art. (2) Re-revision of classes 124, 250, and 260, containing 26,559 patents, was practically completed at the end of the fiscal year. (3) The first revision of 24 classes containing 172,604 patents necessitated the re-revision of classes 247, 251, and 277, containing 15,644 patents. Nine classes containing 46,535 patents have never been revised and were awaiting revision.

It is believed that, with the present force, revision of classes heretofore unrevised and undefined can be completed in the course of the next 2 years, and that within the same period a beginning can be made in the correction and re-revision of classes long unrevised but now requiring review and re-formation.

Official class definitions and all amendments made during the year were typed, and photolithographic copies of the complete definitions were supplied to the scientific library, to the search room, and to each of the examining divisions of the Office. The last pre-

vious printing of the class definitions was that of 1912. These definitions fill 4,381 typed sheets, bound in 9 volumes.

Checking of the classification and cross-referencing of the weekly issue was started in October 1936. Such work takes on the average 5 hours a week for 22 men.

The work on questions of division (rules 41 and 42) involved written decisions in 2,768 applications.

Written decisions were made in 911 cases involving disputes as to the classification of pending applications.

In oral interviews, at least half as many cases on division and classification of pending applications were disposed of.

#### LONG-PENDING APPLICATIONS

For many years the long pendency of patent applications has been recognized as a serious evil and one which it has often been sought to correct. Since 1933 the solution of this problem has been the subject of careful study, and considerable progress toward its solution may now be recorded.

Of the large total of cases pending on June 30, 1937, only about 2,200 were more than 5 years old. Five years ago there were some 4,000 such cases. The 2,200 figure shows a decrease of approximately 500 in the last 12 months. The total of applications pending for periods of from 2 to 3 years was reduced to 14,347, and the number of those pending from 3 to 5 years was diminished from 8,388 on June 30, 1936, to 6,357 on June 30, 1937, a gain of over 2,000 in this group. The reduction in the aggregate of such cases between December 31, 1935, and June 30, 1937, was 4,288.

Three years has been regarded as a reasonable period of time for the prosecution of an application. The efforts to shorten the period of pendency have therefore achieved an advance toward this fair average. There are now in the Office only 5,350 applications between 2½ and 3 years old; and slightly fewer than 9,000 between 2 and 2½ years old. The large majority, namely, about 72,000 pending applications, of a total of 109,735, are less than 2 years old.

Meeting the present stress of increased business without increased force in the Office while still reducing the time of pendency of patent applications is a problem which can be met in part by reducing the number of actions required in each case.

Statutory provisions and limitations restrict the Office in thus undertaking to lessen the time of prosecution, but study of the problem of effecting the expeditious disposition of applications continues in the light of all the circumstances in each individual case and while keeping in view the objective of fair and equitable treatment of applicants.

#### PATENT OFFICE ADVISORY COMMITTEE

As in each of the previous years since July 1933, when it was created by the Secretary of Commerce, the Patent Office advisory committee continued in 1937 to be most helpful to the Commissioner of Patents in the study of problems submitted for its consideration. As a result, the committee made numerous recommendations for the clarification and simplification of the rules of practice and procedure.

Members of the advisory committee are: George Ramsey, of New York, N. Y., chairman; John J. Darby, Washington, D. C.; John A. Dienner, Chicago, Ill.; Thomas J. Griswold, Jr., Midland, Mich.; Franklin E. Hardy, Pittsburgh, Pa.; Delos G. Haynes, St. Louis, Mo.; Herman Lind, Cleveland, Ohio; Robert Lund, St. Louis, Mo.; Dean S. Edmonds, New York, N. Y.; John D. Myers, Philadelphia, Pa.; Col. C. O. Sherrill, Washington, D. C.; Milton Tibbetts, Detroit, Mich.; and Charles E. Townsend, San Francisco, Calif.

#### SPECIAL CASES

During the last fiscal year there were received 302 petitions from applicants seeking to have their applications examined out of turn in accordance with the practice of according such special status when there is a prospect that the issuance of a patent would result in investment of capital and the employment of labor in the manufacture of inventions covered, or would otherwise be of public benefit.

The total of such petitions was 34 below that received in 1936. Of the petitions filed in 1937 there were granted 111, of which 62 received such favorable consideration in the interest of prospective manufacture necessitating original or additional use of capital and labor.

#### STATISTICS

Following is presented the usual statistical information regarding the activities of the Patent Office.

*Applications received during the fiscal year ended June 30, 1937<sup>1</sup>*

With fees:	
Applications for patents for inventions.....	63, 772
Applications for patents for designs.....	6, 617
Applications for reissue of patents.....	441
	70, 830
Applications for registration of trade-marks..... <sup>2</sup>	16, 032
Applications for registration of labels and prints.....	3, 118
	19, 150
Total, with fees.....	89, 980
Without fees:	
Applications for inventions (act Mar. 3, 1883).....	389
Applications for reissue (act Mar. 3, 1883).....	3
Total, without fees.....	392
Grand total.....	90, 372

<sup>1</sup> Including applications in which fees were refunded and transferred.

<sup>2</sup> Includes 1,548 applications for renewal of trade-mark registrations.

#### *Applications for patents for inventions with fees*

Year ended June 30—	Year ended June 30—Continued.
1928.....	1933.....
88, 482	59, 408
1929.....	1934.....
87, 039	56, 095
1930.....	1935.....
91, 430	56, 832
1931.....	1936.....
84, 097	59, 809
1932.....	1937.....
73, 465	63, 772

*Applications for patents, including reissues, designs, trade-marks, labels, and prints, with fees*

Year ended June 30—		Year ended June 30—Continued.	
1928.....	116, 844	1933.....	79, 469
1929.....	114, 496	1934.....	79, 367
1930.....	117, 569	1935.....	81, 000
1931.....	106, 717	1936.....	85, 102
1932.....	93, 859	1937.....	89, 980

*Patent applications awaiting action*

June 30—		June 30—Continued.	
1928.....	106, 575	1933.....	49, 050
1929.....	103, 236	1934.....	39, 226
1930.....	119, 597	1935.....	31, 920
1931.....	92, 203	1936.....	33, 540
1932.....	76, 723	1937.....	38, 121

*Patents withheld and patents expired*

	1936	1937
Letters patent withheld for nonpayment of final fees.....	5, 673	4, 773
Applications allowed awaiting payment of final fees.....	15, 147	15, 113
Patents expired.....	37, 316	37, 937
Applications in which issue of patent has been deferred under sec. 4885 R. S.....	594	446
Applications in process of issue.....	2, 844	2, 701

*Patents granted and trade-marks, labels, and prints registered*

	1933	1934	1935	1936	1937
Letters patent.....	50, 766	48, 523	41, 621	39, 978	39, 412
Plant patents.....	52	30	28	61	65
Design patents.....	2, 934	2, 419	3, 437	4, 174	4, 939
Reissue patents.....	375	343	400	400	405
Trade-marks.....	8, 909	10, 139	11, 109	10, 777	11, 329
Labels.....	1, 458	1, 635	1, 908	1, 787	1, 955
Prints.....	479	535	500	519	551
Total.....	64, 973	63, 624	59, 003	57, 696	58, 656

*Statement of receipts and earnings for the fiscal year ended June 30, 1937*

Unearned balance at close of business June 30, 1936.....	\$196, 231. 91	
Collections during fiscal year ended June 30, 1937.....	4, 393, 216. 46	
Total.....	4, 589, 448. 37	
Refundments.....	23, 946. 68	
Net collections.....		<u>\$4, 565, 501. 69</u>

## EARNINGS

Inventions, first fees.....	\$1, 909, 320. 00	
Extra claims.....	34, 614. 00	
Reissues.....	13, 140. 00	
Designs.....	69, 345. 00	
Design extensions.....	33, 555. 00	
Trade-marks.....	235, 515. 00	
Labels and prints.....	15, 948. 00	
Total.....		2, 311, 437. 00
Final fees.....	1, 174, 980. 00	
Extra claims.....	25, 731. 00	
Total.....		1, 200, 711. 00
Appeals.....	55, 965. 00	
Oppositions.....	9, 300. 00	
Disclaimers.....	1, 570. 00	
Revivals.....	3, 700. 00	
Total.....		70, 535. 00
Printed copies, etc.....	388, 029. 70	
Photoprints.....	11, 562. 50	
Photostats.....	61, 576. 20	
Manuscripts.....	127, 244. 10	
Certified printed copies, etc.....	8, 696. 59	
Recording articles of incorporation.....	1, 054. 00	
Recording international trade-marks.....	5. 00	
Registration of attorneys.....	685. 00	
Total.....		598, 853. 09
Drawings.....		18, 517. 40
Assignments.....		156, 277. 70
Total earnings.....		4, 356, 331. 19
Unearned balance June 30, 1937.....		209, 170. 50
Net receipts.....		<u>4, 565, 501. 69</u>

*Expenditures, fiscal year ended June 30, 1937*

Salaries.....		\$3, 377, 554. 85
Photolithographing:		
Current issue, black and white.....	\$40, 786. 66	
Current issue, color.....	9, 115. 00	
Reproduction, black and white.....	57, 051. 17	
Reproduction, color.....	317. 00	
Photographic printing.....	14, 610. 05	
Photostat supplies.....	43, 465. 53	
Total.....		165, 345. 41
Miscellaneous expenses.....		44, 202. 87
Printing and binding:		
Specifications.....	\$741, 994. 55	
Official Gazette.....	98, 220. 54	
Indexes.....	10, 629. 49	
Total.....		850, 844. 58
Miscellaneous.....		54, 325. 76
Total.....		4, 492, 273. 47

*Receipts and expenditures*

Receipts from all sources.....	4, 565, 501. 69
Expenditures.....	4, 492, 273. 47
Surplus.....	73, 228. 22
Receipts from sale of Official Gazette and other publications (Superintendent of Documents).....	77, 796. 23

*Comparative statement*

June 30—	Receipts	Expenditures	Deficit	Surplus
1928.....	\$3, 705, 338. 31	\$3, 839, 771. 66	\$134, 433. 35	-----
1929.....	3, 783, 481. 65	4, 391, 860. 16	608, 378. 51	-----
1930.....	4, 096, 825. 43	4, 552, 685. 41	455, 859. 98	-----
1931.....	4, 565, 377. 08	4, 832, 277. 96	266, 900. 88	-----
1932.....	4, 487, 508. 78	5, 314, 851. 59	827, 342. 81	-----
1933.....	4, 423, 563. 18	4, 588, 585. 02	165, 021. 84	-----
1934.....	4, 383, 468. 11	3, 876, 785. 01	-----	\$506, 683. 10
1935.....	4, 264, 874. 67	4, 153, 591. 21	-----	111, 283. 46
1936.....	4, 368, 099. 17	4, 446, 463. 69	78, 364. 52	-----
1937.....	4, 565, 501. 69	4, 492, 273. 47	-----	73, 228. 22

<sup>1</sup> This does not include the amount received by the Superintendent of Documents for the Official Gazette and other publications.

*Comparative statement of expenditures under separate appropriations*

Appropriation	1936	1937
Salaries.....	\$3, 331, 029. 17	\$3, 377, 554. 85
Photolithographing.....	175, 253. 46	165, 345. 41
Printing and binding.....	847, 926. 66	850, 844. 58
Miscellaneous printing and binding.....	44, 755. 16	54, 325. 76
Miscellaneous expenses.....	47, 499. 24	44, 202. 87
Total.....	4, 446, 463. 69	4, 492, 273. 47

*Litigated cases*

<b>Patent:</b>			
Interferences declared	-----	1,489	
Interferences disposed of before final hearing	-----	1,567	
Interferences disposed of after final hearing	-----	340	
Interferences heard	-----	309	
Interferences awaiting decision	-----	29	
<b>Trade-mark:</b>			
Interferences declared	-----	133	
Oppositions instituted	-----	881	
Cancellations instituted	-----	150	
Interferences disposed of before final hearing	-----	819	
Interferences disposed of after final hearing	-----	371	
Interferences heard	-----	370	
Interferences awaiting decision	-----	14	
<b>Before the Board of Appeals:</b>			
Appeals in ex parte cases	-----	2,899	
Appeals in interference cases:			
Priorities	-----	258	
Motions	-----	240	
		507	
		-----	3,406
Ex parte appeals decided	-----	2,510	
Appeals in interference cases decided:			
Priorities	-----	232	
Motions	-----	262	
		494	
		-----	3,004
Ex parte cases awaiting action	-----	2,083	
Interference cases awaiting action:			
Priorities	-----	191	
Motions	-----	167	
		358	
		-----	2,441
Oldest ex parte case awaiting action, May 26, 1937.			
Oldest interference case awaiting action, May 27, 1937.			
<b>To the Commissioner:</b>			
Appeals in trade-mark interferences	-----	10	
Appeals in trade-mark oppositions	-----	86	
Appeals in trade-mark cancellations	-----	23	
Appeals in ex parte trade-mark cases	-----	44	
Interlocutory appeals	-----	18	
		181	
<b>Petitions to Commissioner:</b>			
Ex parte	-----	7,490	
Inter partes	-----	217	
To make special	-----	302	
		8,009	
		-----	8,190
<b>Cases disposed of by Commissioner:</b>			
Appeals in trade-mark interferences	-----	8	
Appeals in trade-mark oppositions	-----	57	
Appeals in trade-mark cancellations	-----	18	
Appeals in ex parte trade marks	-----	30	
Interlocutory appeals	-----	18	
		131	
<b>Petitions disposed of:</b>			
Ex parte	-----	7,490	
Inter partes	-----	217	
To make special	-----	302	
		8,009	
		-----	8,140

*Litigated cases—Continued*

Notices of appeals to United States Court of Customs and Patent Appeals:		
In ex parte cases (including 4 trade-marks)-----	107	
In inter partes cases (patents)-----	75	
In design applications-----	2	
In trade-mark interferences-----	3	
In trade-mark oppositions-----	21	
In trade-mark cancellations-----	5	
		213
To the District Court of the United States for the District of Columbia suits--		89

**OTHER DETAILS OF BUSINESS FOR THE FISCAL YEAR**

As to the volume of business, the Office received during the year 70,830 applications for patents, reissues, and designs; 14,484 trade-mark applications and 1,548 applications for renewal of trade-mark registrations; 3,118 label and print applications; 176,863 amendments to patent applications, 10,170 amendments to design applications, and 17,342 amendments to trade-mark, label, and print applications.

As previously stated, the number of letters constituting the miscellaneous correspondence received and indexed was 443,692. In addition, 40,346 letters were returned with information.

The number of printed copies of patents sold was 3,816,878; 1,154,419 copies of patents were shipped to foreign governments, and 744,339 copies furnished public libraries. The total number of copies of patents furnished was 6,384,732, including those for Office use and other Departments.

The Office received for record 43,663 deeds of assignment.

The drafting division made 837 drawings for inventors, and corrected 11,729 drawings on request of inventors; 123,464 sheets of drawings were inspected, and 15,241 letters answered.

Typewritten copies of 3,625,100 words were furnished at 10 cents a hundred words. The Office certified to 17,807 manuscript copies, and furnished 7,213 miscellaneous certified copies. The Office also furnished 549,297 photostat copies of manuscript pages, 41,890 photographic copies, and 320,896 photostat copies of publications and foreign patents, for sale; 16,507 photostat-manuscript pages, 186 certified manuscript copies and 8,891 photostat copies for Government Departments, without charge; 33,407 photostat and 13,976 photographic copies for use of the Patent Office; 17,010 photostat copies for sale through photo-print section, and 208 photostats for Office use; also 79,927 photostats for assignments, grants, and disclaimers for official use; in all, 1,026,143 photostat and 65,866 photographic copies.

